



**A Review of the Documentation of the
Indigenous Knowledge (IK)
Associated with Biodiversity in South Asia**

**Draft for Discussion
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Chapter I

Introduction

1.1 Indigenous Knowledge (IK) and its Protection¹

Indigenous Knowledge (IK) plays a vital role in the lives of local communities: it is a key element in their food security, health, education, natural resources management, and other vital activities.

For a number of reasons bio-diversity and associated IK are declining at a rapid rate.² In view of its importance for society in general and local communities in particular, it is vital that steps are taken to protect IK.³ Furthermore, there is an increased tendency on the part of commercial interests to use IK without the consent of, and compensation to, local communities. This has led to a growing concern that any benefits arising from the use of IK are not being shared fairly. It is therefore also important to prevent bio-piracy and any misappropriation of IK.

A number of steps can be taken to preserve and protect bio-diversity and associated IK. These include:⁴

- a. The Government should follow policies that give importance to IK in the development process and promote its use, particularly in health care and agriculture.
- b. *Sui generis* systems to protect IK should be established, to ensure a fair and equitable sharing of any benefits arising from the use of biological resources and associated IK.
- c. Prior informed consent for the commercial use of IK should be promoted and benefit sharing ensured.
- d. Documentation of IK associated with biodiversity.;
- e. Sustainable use and conservation of biodiversity.

The rest of the paper deals with the documentation of IK associated with biodiversity in South Asian countries and its contribution to the preservation and protection of IK.

1.2 Documentation of IK

Documentation can contribute to the protection of IK in a number of ways.⁵ For example:

1. Documentation can provide a reliable estimate of the nature and extent of biodiversity and associated IK.

¹ See: For a discussion of the importance of IK, see: Gorjestani, undated; Gupta, 2001; Kothari, 1999; Sahai, date? ; UNCTAD, 2004

² For a discussion of the reasons for the decline in the use of IK, see: Shankar, 2002: 51-58.

³ Sahai, 2000; India, 2002

⁴ India, 2002

⁵ UNU, 2004

2. It can facilitate researchers and others in examining the threats faced by biodiversity and IK.
3. Documentation can help to establish the property rights of local communities over their IK and prevent bio-piracy. There have been several cases of bio-piracy of IK from developing countries in recent years. These include IK related to the wound healing properties of *haldi* (turmeric); the fungicidal properties of *neem*; and the hypoglycemic properties of *karela* (bitter gourd). In all these instances, companies obtained patents in developed countries, using Indian IK . Although these patents were eventually revoked through the joint efforts of NGOs and the Indian government, the cost was very high.⁶ It is suggested that the documentation of IK would make it difficult for commercial companies to take out patents or other forms of IPRs based on IK.
4. Furthermore, in cases where IK is commercialized, documentation could facilitate prior informed consent (PIC) and an equitable sharing of benefits.
5. Documentation can also serve as a mechanism for obtaining protection of IK through national *sui generis* systems.

Although interest in the protection of biodiversity and IK has only recently increased, its documentation is not new. Researchers (anthropologists and sociologists) in South Asia have long been engaged in the documentation of local practices and knowledge. These studies are primarily aimed at understanding the relationship between communities and their resources as well as knowledge pertaining to these resources. Similarly, ethno-botanists have collected a great deal of information on local knowledge associated with the plant resources of South Asia. In addition, government agencies such as the Zoological Survey of India and the Botanical survey of India have carried out a number of surveys of bio-resources. Others, such as the Council for Scientific and Industrial Research and the Indian Council of Agricultural Research have documented national bioresources and IK related to industrial use and agriculture.

Recent years have seen a change in the objectives of the documentation of IK. In the past, documentation of IK was primarily aimed at preparing inventories of resources, which could be exploited for economic gains. With the increased concern for the conservation of biodiversity and associated IK, a number of documentation efforts have been motivated by the objective of protection of IK. These include People's Biodiversity Registers and Traditional Knowledge Digital Diary (TKDL).

The rest of the paper describes various efforts to document IK, and their implications for its protection, carried out in South Asia.

⁶ India, 2002.

Chapter II

Documentation of IK: India

Most of the work to document IK in South Asia is being carried out in India. This includes:

a) the preparation of Community Biodiversity Registers (CBRs) and People's Biodiversity Registers (PBRs); b) the documentation of local innovations, with the twin objectives of facilitating the protection and commercialization of these innovations; c) the documentation of IK pertaining to Indian Systems of Medicine (ISM) in a digitalized format; d) ethno-botanical studies. These efforts are described in the following paragraphs.

2.1 Community and People's Biodiversity Registers (CBRs and PBRs)⁷

India has seen the most extensive and ambitious efforts to document IK and biodiversity in the form of registers anywhere in the world; according to a Government of India document, about 75 Plant Biodiversity Registers had been established by mid 1990s⁸. The PBRs prepared in India include the following:

1. PBRs by FRLHT and IIS

The first attempt to prepare a PBR was undertaken in 1995, as a collaborative effort between FRLHT (Foundation for Revitalization of Local Health Tradition) and IIS (India Institute of Science) in Bangalore.⁹ It was expanded in 1996 to 52 sites in a number of states and covered about 1000 villages. The programme covered the states of Himachal Pradesh, Rajasthan, Bihar, Assam, Orissa, Karnataka, Maharashtra and the Union Territory of the Andaman and Nicobar Islands. These eight regions were selected as representative of the varied ecological and social regimes in the subcontinent. They included tropical wet (18), tropical moist (16), tropical dry (6), tropical semi-arid (4), subtropical (4), temperate (3) and alpine (1). They also covered a whole range of ecosystems: forest (30), pasture (8), wetland (14), degraded forest (3), agriculture (33), horticulture (8) and desertic (3). This work was carried out between 1996-98 as part of the Biodiversity Conservation Prioritization Programme, supported by the World Wide Fund For Nature (India).

The first Register for this programme was prepared by 'Research and Action in Natural Wealth Administration' (RANWA), during 1995-96. It covered Supegaon village, bordering the Phansad Wildlife Sanctuary in Murud Taluka, in the Raigad district of Maharashtra. The Register was deposited with RANWA, the local panchayats and IISc.¹⁰ As this was the first effort of its kind, the register largely consists of lists of plants of economic value, with a description of their important uses.

⁷ Initially, the registers were called "Community Biodiversity Registers". Later, the name was changed to People's Biodiversity Register (PBR).

⁸ Very few registers have been prepared since the later 1990s.

⁹ See: Gadgil, undated a; Ghate, undated a; Ghate undated b

¹⁰ Information provided by Mr. Utkarsh Ghate, FRLHT.

With greater experience, registers with more detailed information have been prepared under this programme. The main objectives of the registers prepared under this programme are:

- to document, monitor and provide information for the sustainable management of local biodiversity resources and strengthen the process of decentralized management of natural resources. Included is information on the status of biodiversity resources; factors which affect the conservation of biodiversity resources; the extent of local community involvement in the conservation of biodiversity and the local community's use of IK for this purpose.
- to establish the claims of individuals and local communities over the knowledge associated with their biodiversity resources and to bring to them an equitable share of the benefits flowing from the use of such knowledge and resources;
- to act as a tool for teaching environment and biology, with particular focus on the preservation of local communities' ecological knowledge and indigenous medicines, such as Ayurveda and Unani medicine.

The Registers are expected to promote:¹¹

- an awareness of the economic value of bioresources and IK. This can lead the community to develop an interest in the sustainable harvesting of its natural resources;
- an understanding of the role of ecological processes in the conservation of biodiversity;
- indigenous practices, which can contribute to the conservation of biodiversity and IK;
- social mobilization at community level;
- the commercialization of IK.

The methodology for the preparation of the registers was finalized through a process of discussions between FRLHT, ISI and various collaborators. A common manual, specifying methodology, was used by all the groups involved in the preparation of PBRs under this programme. The fieldwork was largely carried out by local people, but it was supervised by college and university teachers, rural development workers and environmental NGOs. In addition to local communities, help was also taken from local institutions such as the Gram Panchayat, Taluk Panchayat, Zila Panchayat and government agencies involved in the management of natural resources.

Data was collected through the following steps:

- a) The rationale of the project was explained to local people, which helped to build a close rapport with them.
- b) Important biodiversity user groups and individuals with knowledge of the distribution of biodiversity and its uses were identified and interviewed.
- c) The landscape of the study site was mapped.
- d) Group discussions involving knowledgeable individuals and user group members, in the presence of the entire village population, were held.
- e) Discussions were also held with outside elements which affect the resources, such as nomadic shepherds, artisans, traders and government officials.

¹¹ Gadgil, undated a

Ten modules were used for the collection of information. These pertain to information on the following aspects of IK: ¹²

- a) Description of the habitats and bio-resources on which the community depends, such as fuel wood, dung, medicinal herbs, small timber, cane, reeds, bamboo etc.
- b) Extent and distribution of biodiversity and IK.
- c) Local community's perceptions and practices of sustainable use, conservation and restoration of biodiversity resources.
- d) Local community's perceptions of current conservation and development efforts.
- e) The community's relationship with local resources and changes which might affect a habitat and the community's relationship with it.
- f) Economic transactions using local biodiversity resources and the perceptions of local people as to how fair such transactions are.
- g) Personal aspirations of local people and how these could affect their relationship with the natural, especially the living, world.
- h) Local people's perceptions of options for the development and management of their natural resource base in an environmentally friendly fashion.

The PBRs prepared under this programme documented both "secret" and widely known information. The information was collected from members of local communities who interact with biological resources. The focus has been to document IK pertaining to the medicinal uses of bio-resources, agricultural practices and sustainable management of resources. Wherever considered necessary, only limited information is revealed in the registers. This is in order to protect the intellectual property rights of the individual/community.

The basic documents were first prepared in local languages. Later, many of these were translated into English.

The documents are freely available to the community concerned. Commercial companies can gain access after paying a prescribed fee and signing a "benefit-sharing" agreement.

In the long term it is planned to link the community level, decentralized databases to form a national database. As a part of this work, it is also proposed that communities will be provided with market related information, such as prices and the size of demand, which would help them to increase their earnings.

2. Community Biodiversity Registers prepared by CCD (Madurai)¹³.

The registers prepared by Covenant Centre for Development (CCD) document information on the following:

- Indigenous health practices and home remedies used by folk healers and household women. This work was done with technical and financial support from the FRLHT. It is

¹² Gadgil, 2003

¹³ Information provided by Mr. N.Muthu Velaytham, Secretary, CCD

a very detailed survey, covering the socio-economic background of the healers, the cultural context in which the practices are sustained, the mode of knowledge transmission, the practitioners' attitude towards further dissemination of IK, the health conditions treated, the herbs and other raw drugs used for the medicines, the method of preparation, dosage, indications, contra indication, the practitioners' perception of the drug efficacy etc.

- Indigenous crop varieties and IK associated with their cultivation. This register profiles the varieties, their characteristics and associated agricultural practices. It also covers farmers' access to seed and their practices with regard to the saving, conservation and exchange of seed.
- Grass root level innovations. This includes information on the circumstances which led to the innovation, the process and steps involved and the comparative advantages vis-a-vis existing practices / equipment. This work was done on behalf of the National Innovation Foundation (NIF).

The information for the Registers is being collected through field surveys. CCD is acting as the repository of the documented IK. The documents have been released to the public through district administration officials. The use of documented IK for academic and non-commercial purposes is permitted without charge. Commercial use is allowed, but the benefits accruing from this are to be shared with the local community. There is no information as to whether any commercial use of the IK documented in these registers has taken place and what mechanism of benefit sharing has been used.

3. Gene Campaign

The Gene Campaign has documented biodiversity and IK in Bihar, Madhya Pradesh, and Uttaranchal. The work is focussed on three tribal populations: the Munnars in South Bihar (in the Chotanagpur region); the Bhils of Madhya Pradesh; and the Tharus of the Terai region of Uttaranchal. The Department of Science and Technology of the Indian government supported the documentation.

The main objective of the documentation was to establish that the IK held by these communities was their intellectual property. It is hoped that the documentation will help in challenging IK based patents taken by private companies, check biopiracy and enable communities to get a fair share of the benefits, when the documented IK is used commercially.

A large number of villages were covered in the documentation exercise. For example, 50 villages of the Tharu communities of Uttaranchal were included. The fieldwork was carried out by trained members of the community. In addition to a standardized, structured questionnaire, techniques such as semi-structured questionnaires, informal interviews and group discussions were used for the collection of data. Group discussions exclusively for women were also conducted. In some villages it was found that the women were more curious and enthusiastic about the documentation work than their male counterparts.

Each community has been assured that the data would remain their property and its misuse would not be permitted. Only the community itself would have the power to grant permission for commercial use of the IK contained in the documents. The data is presently with the Department of Science and Technology, Government of India.

In addition to the collection of information on IK, the project also involved making these communities aware of the threat of biopiracy, the implications of IPRs and various national and international developments concerning the protection of biodiversity and IK. They were also informed of their right to a share of benefits derived from the commercialization of IK.

4. M.S. Swaminathan Research Foundation

The M.S. Swaminathan Research Foundation of Chennai is engaged in the preparation of a Farmers' Rights Information System (FRIS). With focus on the conservation of agro-biodiversity, the main objective of the database is to help local communities derive economic benefit from the conservation of agro-biodiversity. It also aims to give recognition and reward to tribal and rural communities for their contribution to genetic resources conservation and enhancement.¹⁴

FRIS is a comprehensive database linked to the Community Gene Bank (CGB) set up by MSSRF, which holds samples of farmers' varieties of seeds for different crops from Tamil Nadu, Kerala and Orissa. The objective of the gene bank is to collect and document biological materials, and to regenerate plants facing threat of extinction. The system includes a database of IK and ethno-botanical information on economically important plants, both in manual and electronic format. The information is being collected from farmers through field visits and surveys by researchers.

The Foundation has a strict policy governing access to the material and information contained in its Gene and Data Banks. It performs the role of the custodian of genetic resources, which continue to be owned by farming and tribal communities. Access to collections is not at the discretion of the Foundation but requires the prior informed consent of farmers.

MSSRF has also prepared PBRs in the Wynaad district of Kerala.

5. Kerala Sastra Sahitya Parishat, a leading member of the People's Science Movement in Thiruvananthapuram, has prepared PBRs covering all 85 village councils of the Ernakulam district. This work was done during 1998-99 and was part of their work on local level mapping of natural resources to support decentralised systems of resource management. The information is being collected through field surveys in the villages.

¹⁴ UNU, 2004.

6. **Kalpavriksh (A Delhi and Pune based NGO) and the Beej Bachao Aandolan** (Save the Seeds Campaign), Tehri-Garhwal, Uttaranchal have collaborated with the villagers of Jardhar village of the Tehri Garhwal district of Uttaranchal to document the bio-resources and conservation practices of the community. The information contained in the registers is collected through intensive interaction with the villagers. A copy of the register is kept in the village, while another copy is kept by Kalpavriksh. The information in the register can be used and distributed only with the consent and knowledge of the villagers. The conditions under which commercial use of the information is permitted is not known.

6. **The Research Foundation of Science, Technology and Ecology (RFSTE)** has been engaged in documenting biological resources and associated indigenous knowledge with the help of a movement called the Jaiv Panchayat (Living Democracy). The information, which is being collected from local villagers, is being compiled in the form of Community Biodiversity Registers (CBRs). An important objective of the work is to try to establish the sovereignty of local communities over their biodiversity resources. Most of this work is concentrated in Uttaranchal. The first register was completed in Agasthyamuni village, Uttaranchal, in 1999. According to RFSTE, these efforts are underway in 292 sites in the country.

Details of the methodology used and the contents of documentation carried out by RFSTE are not available.

8. **The Green Foundation (Bangalore)** has prepared an inventory of local biodiversity resources and IK. The objective of the work, carried out with the active participation of local communities, is to a) create an awareness of biodiversity and associated IK among community members and b) create a sense of ownership of the resources within the community.

9. **Deccan Development Society of Hyderabad** has documented the occurrence and management practices of land races of cultivated crops to support their on-farm conservation work. The information has been collected through field surveys and detailed discussions with farmers.

10. **Paschim Banga Vigyan Manch of Kolkata** has prepared a PBR in the Hoogly district of West Bengal.

2.2 Database of local innovations

This work is largely being done by the Society for Research into Sustainable Technologies and Institutions (SRISTI) and the Honeybee Network.¹⁵

SRISTI, a grassroots NGO working primarily in the arid and semi-arid areas of Gujarat, has developed a national network of NGOs, local communities, local government,

¹⁵ See: Anonymous, undated; Gupta 2001
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scientists, State Administration and the Forest Department. This network is working towards the conservation of biological diversity and IK. An objective of the Society is to document and add value to IK so that its contribution to the lives of local communities, and others, is increased.

As part of this work, SRISTI has set up a global network of grassroots organizations and individuals in more than 70 countries. It is called the "Honey Bee Network". The main objectives of the Network are: to forge links between knowledge providers and innovators; acknowledge the contribution of knowledge providers and collectors; and ensure fair distribution of benefits among all stakeholders, including communities.¹⁶

The Network, which is engaged in the documentation and dissemination of IK -, probably has the world's largest database on grass root innovations. About 10,000 innovations are included, with the names and addresses of the innovators (individuals or communities). Established about ten years ago, the database focuses on IK and innovations related to the use of bio-resources in agriculture and health care by individuals and local communities. It includes information from India and other developing countries in Africa, Asia and Latin America. The Network brings out a Newsletter (the Honey Bee Newsletter) to disseminate information on grassroots innovations to more than 75 countries.

The Network provides local innovators with an opportunity to register their innovations with the database. It is hoped that registration will prevent unlawful commercial use of innovations. It will also facilitate the commercialization of grass root innovations on a basis of fair and equitable sharing of benefits. For example, efforts are being made to commercialize these innovations through a micro venture promotion fund.¹⁷ The activity is being supported by the the Gujarat government, which has set up a fund to convert the innovations on the Honey Bee database to commercial enterprises. The fund, which is being operated by the Gujarat Grassroots Innovation Augmentation Network (GIAN) supports innovators with risk capital, technical know-how or design inputs.

Another step taken to promote and diffuse innovation is the establishment of the National Innovation Foundation (NIF), set up in 2000 by the Indian Government's Department of Science and Technology, with a corpus of US\$ 5 million. The objective of the Foundation is to create a national and international Register for Innovations and act as a clearinghouse for local innovations.¹⁸ It is hoped that the Foundation will facilitate the building of bridges between informal and formal science and create awareness in society of the importance of grass root innovations. It can also help in providing low cost protection for local innovations.

¹⁶ UNU, 2004

¹⁷ Gupta, 2001

¹⁸ Gupta *ibid.*

The Fund has developed a prior informed consent (PIC) system to seek the consent of the innovators and IK holders for documenting, and adding value to, the information. The PIC system sets out procedures and conditions for the sharing of innovations and IK with third parties; benefit-sharing arrangements for the commercial use of innovations and IK; and the assignment of technology to NIF.¹⁹ Under this PIC system, NIF can mediate and negotiate with potential entrepreneurs and investors on behalf of the innovators and IK holders. Also, in the event that disputes arise with regard to the transfer of technology to third parties, NIF will provide legal support to the IK holders.

One potential concern about placing IK in the database is that communities may be deemed to be placing it in the public domain, and thereby may lose any rights over such information. For this reason, innovators are given an option to have their information kept confidential.

2.3 Traditional Knowledge Digital library (TKDL).

This is an Indian Government's initiative to prepare a computerized database of IK related to medicinal plants. The project was born out of India's experience in seeking to overturn two patents granted in the US and Europe over products based upon Indian IK (the wound healing properties of *turmeric* and fungicidal properties of *neem*). The time and resources required to contest these two patents convinced the Indian government of the need for a mechanism to prevent the granting of inappropriate patents. TKDL is planned as an important element in this mechanism.

The TKDL database is primarily targeted at examiners in patent offices in various countries. It is hoped that they will use TKDL to ascertain whether, when a patent is applied for, the claim is already in the public domain. Also, if for some reasons TKDL does not become available to the examiner at the examination stage, it can be used to challenge the patent at the time of opposition proceedings. Moreover, some countries such as the United States do not invite objections before the grant of patents. TKDL, therefore, is the only viable way to challenge the granting of patents based on IK by establishing prior art.

As patent claims based on IK are not permitted in India, TKDL can also be used to check whether the innovation described in a patent application is derived from IK.

The project, which was initiated in 2002, is a collaborative effort between the National Institute of Science Communication and Information Resources (NISCAIR) and the Department of Ayurveda Yoga Naturopathy Unani Siddha and Homeopathy (AYUSH) Ministry of Health and Family Welfare. It is being coordinated by NISCAIR. A number of institutions, including National Botanical Research Institute various laboratories of the Council for Scientific and Industrial Research (CSIR) and FRLHT, are working on the project.²⁰

¹⁹ UNU, 2004

²⁰ Indigenous Knowledge Digital Library, http://www.infinity-foundation.com/mandala/_es/t_es_TKDL.htm

The project has two components. The first component is concerned with preparing a digital database of IK contained in published texts of Indian systems of medicines (*Ayurveda, unani and siddha*). The second component, called Networking Programme, is a collaborative effort of various CSIR laboratories. In this, databases of IK related to the fields of specialization of these laboratories will be prepared. For example, National Botanical Research Institutes (NBRI) will prepare a database of health related IK available in oral sources.²¹

The TKDL project is also preparing a Traditional Knowledge Resource Classification System (TKRC).²² This is required because the classification system used in the existing IPR regime can not accommodate much of the IK. The proposed classification system is based on the structure of the International Patent Classification (IPC) system. TKRC will be able to be used systematically to arrange, disseminate and retrieve about 5,000 sub-groups of IK related to medicinal plants. It also converts Sanskrit *Slokas* into English, German, French, Japanese and Spanish.

During its first phase the digital library has focused on IK related to *ayurveda*. So far 36,000 *Slokas* (formulations in verse forms) have been identified and transcribed from the *Ayurvedic* texts for inclusion in the database. Of these, 29,000 formulations have been verified and validated by *Ayurveda* experts. Their translation into Spanish, German, French and Japanese has also been completed.

Access to the data contained in TKDL will be closely regulated. The Department of Ayurveda Yoga Naturopathy Unani Siddha and Homeopathy (AYUSH) has set up an Inter-Ministerial Access Policy Committee, which is currently developing a system to ensure safeguards against the misuse of data, while giving access to global patent examiners and others at national and international levels. It is proposed that the database will be made available to patent examiners throughout the world under a non-disclosure agreement. The database may also be made available via the internet on a secure access basis.

TKDL is expected by its promoters to play an important role in preventing the patenting of IK innovations by foreign interests. However, some critics argue that it may inadvertently promote biopiracy of IK.²³ According to them the digital library may be used by foreign companies to get easy access to IK available in India. It is, therefore, important that every effort is made to ensure that the information contained in the library is used only for the purpose of patent evaluation, and not divulged to commercial interests.

An important limitation of TKDL project is that its scope is limited to IK related to medicine. As IK related to other areas (especially agriculture) is vitally important, it also needs to be protected. Therefore, the scope of the project should be expanded to cover IK in other fields, which faces the threat of patenting.

²¹ Based on information provided by Dr. Sudarshan Kumar (NBRI) and Dr. B. Subrahmanian (NISCAIR)

²² UNU, 2004

²³ Jayaraman K S, 2002

2.4 Ethno-biological Studies

Ethnobiology is the study of indigenous societies and their relationship with surrounding flora and fauna. Many ethnobiological studies focus on IK associated with the use of flora and fauna by local communities. For this reason, ethnobiological studies are an important source of information on IK.

India has a long tradition of ethnobiological studies, and efforts to conduct these have intensified during the post-independence period.²⁴ The first major step in this direction was taken by the Economic Botany section of the Botanical Survey of India, in the mid-1950s, when it took a number of initiatives.²⁵ The volume of research has seen a steady increase since then. The 1980s saw a particularly large increase in interest in these studies. According to a review of ethnobotanical literature published between 1982-2000, about 1250 publications appeared in India during this period.²⁶

Most Indian ethnobotanical studies deal with tribal people, who account for about 19% of the population.²⁷ IK associated with health care has been the major focus of these studies.²⁸ Our analysis of 121 papers published in major journals during 1995-2004 shows that almost half the ethnobiological studies during this period focused on the IK related to the medicinal use of plants.²⁹ See Table 1

Table I
Focus of Ethnobiological Studies

Focus of the Study	Medicinal properties	Conservation	Food	General	Others	Total
Number	60	7	11	37	8	121
(%)	49	6	9	30	6	100

Perhaps the most ambitious attempt to document ethnobiological information in India was carried out under the All India Coordinated Research Project on Ethnobiology. Launched in 1982, the project covered about 80% of India's tribal area. An important reason for setting up the project was the feeling that "...biological resources in tribal and other backward areas are becoming scarce as a result of their indiscriminate and unplanned management".³⁰ It was considered necessary to carry out a comprehensive all-India survey to collect this information before it was lost. It was also hoped that the project would contribute to improving the economic condition of the tribal population. According to the Status Report of the Project: "It is hoped that information generated

²⁴ Jain, undated.

²⁵ Lalramnghinglova and Jha, 1999.

²⁶ Jain and Srivastava, 2001

²⁷ Arora, 1995.

²⁸ Our findings are also supported by other observers. For example, see: Jain and Srivastava, 2001:2

²⁹ For a list of papers included in the analysis, please see Appendix I

³⁰ Pushpangadan, undated

by this project may help the planners, policy makers and administrators a great deal to evolve realistic tools to aid development and welfare programme of the tribals....”³¹

The main objectives of the Project were to:

1. document tribal knowledge systems before they are lost. Collect new information on unexploited natural resources, and new uses of existing resources pertaining to food, medicine, fibre and fodder.
2. revitalize disappearing knowledge and promote its use for the benefit of both the local community and the whole society.
3. contribute to the conservation of biodiversity and IK. “.... document methods to preserve/conserv e all indigenous belief and knowledge systems that promote conservation oriented practices and sustainable utilization of local resources by the tribal people.”
4. collect information which could help in the cultivation of threatened plants.
5. document indigenous skills and crafts and “..find ways to reorganize and upgrade these vocational jobs so that the tribals could improve the standards and quality of the living.”

The Project was supported by the Ministry of Environment and Forest and involved a number of research centres. It has resulted in a large body of ethnobiological information, which covers a large number of tribal groups and local communities. In terms of bio-resources, the project focused on plants with medicinal and food value; it covered 200 plants with medicinal properties and 200 wild edible plants. Access to these documents is closely controlled by the Ministry of Environment. The information collected for the project has not been made public, although some of the individual researchers associated with the Project have published their findings in academic papers.

³¹ *ibid.*

3.1 Community and People's Registers

Following India's lead, a number of government agencies and NGOs in other South Asian countries are engaged in the preparation of these registers. Their objectives are similar to those in India. By and large, these efforts are in their infancy, and their impact on the protection of IK is small. The important initiatives are described in the following paragraphs.

i. Bangladesh

Very limited work on the documentation of IK is being carried out in Bangladesh; most of the work on documentation is focused on biodiversity. For example, The Bangladesh Centre for Advanced Studies (BCAS) has carried out a number of studies to document biodiversity in wetland and forest areas. The Bangladesh Agriculture Research Institute and Bangladesh Institute for Rice Research have collected information on agricultural biodiversity. Similarly, UBINIG has prepared a list of rice land races found in Bangladesh. The Bangladesh Environmental Lawyers Association (BELA) is preparing a document on the state of bio-diversity (plant species) in a hill district of Bangladesh.³²

We have information on only one project related to the documentation of IK in Bangladesh. This is a project to document health related IK by the Bangladesh Centre for Advanced Studies (BCAS).³³ The focus of this work is indigenous healers, locally called *Kabiraj*. The work is being carried out in the *Chanda Beel* wetland area. The information contained in the document will be placed in the public domain. There is a danger that this could pose threat to the community's claim to the ownership of IK. BELA will need to devise a system so that the access to IK contained in the register will be closely controlled and would not compromise the interests of the local communities.

ii. Nepal

Nepal has a plan to document IK. The IUCN and the Nepalese Ministry of Environment are the main supporters of this ambitious project.³⁴ A number of other agencies, including the National Federation of Ethnic and Indigenous people of Nepal, the Nepal Agricultural Research Council, the Ministry of Law and Justice and local NGOs are also involved in the implementation of the project. It is expected that about 30 CBRs of various indigenous communities from all over Nepal will be prepared. The objectives of the documentation include:

- To promote the preservation of IK;
- To protect the rights of indigenous communities over their knowledge by following a defensive publication strategy;

³² Information provided by Syeda Rizwana Hasan, Bangladesh Environmental Lawyers Association, Dhaka, Bangladesh.

³³ Information provided by Mr. Tapas Ranjan Chakraborty, Bangladesh Centre for Advanced Studies (BCAS).

³⁴ Information provided by Mr. Sagendra Tiwari, Programme Coordinator, IUCN-The World Conservation Union, Nepal

- To prevent misappropriation of biological resources and associated IK;
- To establish a mechanism to facilitate the commercialization of IK and create conditions for benefit sharing between the users and providers of biological resources and associated IK;
- To promote sustainable use and conservation of biological and genetic resources and associated IK and further development of indigenous innovation and practices;
- To disseminate selected elements of the IK already in the public domain to other communities for public benefit.

The registers will consist of two parts: one part will contain information on bio-resources while the other part will document IK. The first part (with information on bio-resources) will be deposited with the government ministry dealing with biodiversity. The part of the register containing IK will be the property of the concerned communities, and access to it by outsiders will be solely at their discretion.

However, work on the preparation of these registers has been delayed because of the uncertain political situation prevailing in Nepal. Currently, the work is focused on building the capacity to carry out the IK documentation work. As part of this, training modules and case study methodologies are being prepared. According to IUCN, it is difficult to say when the documentation work will begin.

Two other initiatives to document IK in Nepal are being planned. These are being undertaken by: a) Local Initiatives for Biodiversity, Research and Development (LIBIRD), Nepal in collaboration with Nepal Agricultural Research Council and International Plant Genetic Resources Institute (IPGRI); b) Unitarian Service Committee (USC) Nepal. As these initiatives are at an early stage, it will be some time before these registers are ready.

iii. Pakistan

Very little information on the documentation of IK in Pakistan is available. At Sustainable Development Policy Institute (SDPI) there is a proposal to document IK related to health care in Northern Pakistan. The documentation, which will be based on information collected through field surveys, will cover about 60 plants and will be in electronic format. The information will be made public and will be placed on the internet as a digital library. The main objective of the work is to prevent the patenting of IK by commercial interests and discourage biopiracy. However, there is a danger that placing the IK in public domain will result in the loss of any future claim of ownership by the local community.

Some large companies with interest in herbal medicine are also working on the conservation of biodiversity and IK.³⁵ These include a collaborative effort by Qarash Industries and WWF Pakistan. It is reported that the Hamdard Group is also involved in similar work.

³⁵ It is not clear whether they are also working on the protection of IK.

iv. Sri Lanka

Indigenous medicinal knowledge in Sri Lanka exists largely as part of the formalised systems such as Ayurveda, Siddha, and Unani. There is very little indigenous knowledge available on non-formalised systems as much of it has already been lost.³⁶

Whatever remains is being protected as family secrets handed over from one generation to another. Only a handful of communities maintain a separate identity. These include the *Veddahs*, the *Rodiyas* and a community of gypsies, who speak their own dialect. While each of these groups have their own indigenous treatments for disease, there has been little or no attempt to document them.

The documentation of formalized indigenous knowledge has been carried out by the Sri Lankan Government's Department of Ayurveda, as part of an Ayurveda Pharmacopoeia. The Pharmacopoeia documents the raw materials used in the indigenous medicinal system and drug preparation methods. The work will be based on published sources.

In addition to this, the following agencies are engaged in the documentation of IK in Sri Lanka:³⁷

- The Ministry of Environment and Natural Resources.
- IUCN
- Intermediate Technology Development Group (ITDG) of Sri Lanka
- National Federation for the Protection of Agri resources of Sri Lanka

Work on the documentation of biodiversity in Sri Lanka is being carried out by:

- The Law and Society Trust (LST), which has documented indigenous crop varieties of rice. This work was done as part of a larger project on Farmers' Rights in collaboration with the South Asian Watch on Trade, Economics and Environment (SAWTEE), Nepal. The work is based on both published information and field surveys.
- The Plant Genetic Resource Centre (PGRC) of the Department of Agriculture of the Government of Sri Lanka. PGRC has documented indigenous plant varieties in Sri Lanka. The work is done using information already available with various research institutes.

3.2 Ethnobiological Studies

Compared to India, very limited work on ethnobotany has been carried out in other South Asian countries. Our study of literature suggests that, as in India, the focus of ethnobiological work in these countries has been on preparing inventories of plants and

³⁶ Kumar, 2000

³⁷ Information provided by Ms. Avanthi Weerasinghe, Law and Trust Society (LTS), Sri Lanka.

their uses by tribal populations for health care purposes.³⁸ Again, the studies are not concerned with issues concerning ownership of IK, its protection and benefit sharing.

3.3 International Programmes

In addition to work by national researchers, international institutions and agencies have also undertaken ethnobiological studies. Their role in collecting IK related information has been particularly important in the smaller South Asian countries. One of the most important of these was carried out by ICIMOD, under a programme called 'Promotion of Sustainable and Equitable Use of Plant Resources by the Application of Ethnobotany'. This three-year programme, which began in 1995, was centered in six Hindukush countries, including India, Pakistan, Bangladesh and Nepal. The major objectives of the program were to improve the management and conservation of plant resources and IK through the use of ethnobotanical studies.³⁹

Some of the documentation of IK carried out under the project includes:

- Ecology and indigenous management techniques of the home gardens of the *Marma* community in the Chittagong hill tracts of Bangladesh;
- Sustainable cultivation practice of *Alder* (*Alnus nepalensis*) by the *Angami Naga* community in Nagaland, India;
- Management of fruit plants using indigenous knowledge in the Drosh valley, Chitral, Pakistan;
- Indigenous methods of cultivation of fruits and practices to maintain soil fertility in orchards in the Drosh valley, Pakistan;
- Ethnobotanical study of the impact of harvesting medicinal herbs in the buffer zone of the Valley of Flowers National Park, Garhwal, India;
- Study of the ethnobotanical uses of local plants in the Margalla Hills National Park, Pakistan;
- Community based forest management of *Sal* (*Shorea robusta*) forests at five sites in the Chitwan district of Nepal;

³⁸ For example, see: Rahman, 1999: 89-93; Alam, M.K., Medical Ethnobotany of the Marma Tribe of Bangladesh, *Economic Botany*, Vol. 46, No. 3, pp. 330-335; Chowdhury J.S., M.K. Alam and M.A. Hasan, "Some Traditional Folk Formularies Against Dysentery and Diarrhoea in Bangladesh, *Journal of Economic Taxonomic Botany*, Additional Series 12, pp. 20-23; Rahman M. Atiqur, S.B. uddin and C.C. Wilcock, "Indigenous Knowledge of Herbal Medicine in Bangladesh: Diarrhoea, Dysentery, Indigestion and Stomach Pains", *Journal of Medicinal and Aromatic Plant Sciences*, Vol. 25, 2003, pp. 1001-1009; Siwakoti and Siwakoti, 1999; Siwakoti, M. and S.K.Varma, "Medicinal Plants of Terai of Estern Nepal", *Journal of Economic Taxonomic Botany*, Additional Series 12, pp. 423-438; Panthi Mohan P. and Ram P. Chaudhary, "Ethnomedicinal Plant Resources of Arghakhanchi District, West Nepal", *Ethnobotany*, Vol. 15, 2003, pp.71-86; Bhattacharyya, 1999.

³⁹ Rastogi, 1998

- Compilation of an ethnobotanical inventory with a focus on medicinal plants, an assessment of the current use pattern of herbal medicines, and their availability;
- Cultural background and forest resource management by local communities in the Chittagong hill tracts, Bangladesh;
- Study of the status of indigenous medicinal plants and their conservation in the Newar community in Bungamati, Lalitpur, Nepal;
- Ethnobotanical studies of medicinal plants and indigenous health care practices of the Gurung community in Bichauri village of Lamjung, Nepal.

The United Nations is funding an international effort to prepare an electronic (on-line) network of ethnobotanical databases of countries in the Asia- Pacific region. The Indian component of the network (called the Asian-Pacific online Network for Transfer of Indigenous Medical & Herbal Technology) is being coordinated by the Department of AYUSH, Government of India. The technical aspects of the database are looked after by the National Botanical Research Institute (NBRI).

3.4 Types of IK covered

Before concluding this chapter, we would like to briefly describe the types of IK covered by the efforts aimed at the protection of IK. As shown in the following table, the documentation efforts in South Asia have concentrated on three types of IK.

Types of IK Documented by Various Organizations Concerned With its Protection

Organization	Type of IK Documented
FRLHT and IIS	<ol style="list-style-type: none"> 1. IK associated with sustainable management of biodiversity resources. 2. IK associated with indigenous medicine and health practices
CCD	<ol style="list-style-type: none"> 1. Indigenous medicine and home remedies practiced by folk healers and household women 2. Indigenous crop varieties and IK associated with their cultivation
Gene Campaign	Health practices of Tribal communities
MS Swaminathan Research Foundation	<ol style="list-style-type: none"> 1. ethno-economical information on economically important plants. 2. IK associated with genetic resource conservation and enhancement

Kerala Sastra Sahitya Parishat	Decentralized systems of resource Management
Kalpavriksh and the Beej Bachao Aandolan	Conservation and development of indigenous crop varieties
Green Foundation	Conservation of natural resources
Deccan Development Society of Hyderabad	Management practices of land races of cultivated crops
TKDL	Indian systems of medicine
Bangladesh Centre for Advanced Studies (BCAS).	Practices of local healers, called <i>Kabiraj</i> .
UBINIG (Bangladesh) has prepared a list of rice land races found in.	Development and improvement of land races of rice by local farmers
BELA (Bangladesh)	Management of biodiversity in the hill areas of Bangladesh
The Bangladesh Agriculture Research Institute and Bangladesh Institute for Rice Research	Management of agricultural biodiversity
SDI (Pakistan)	Use of plants for medicinal purposes
IUCN and Ministry of Environment (Nepal)	Conservation of biodiversity, with especial emphasis on health and farming practices
Department of Ayurveda (Government of Sri Lanka)	Indigenous systems of medicine, with emphasis on formalized systems
Law and Society Trust (LST), Sri Lanka	Indigenous crop varieties
Plant Genetic Resource Centre (PGRC), Department of Agriculture, Government of Sri Lanka.	indigenous plant varieties

These are:

- a) IK associated with traditional systems of medicine, including folk and oral traditions, and indigenous systems of medicines (such as ayurveda, unani and siddha) which are already in the public domain;
- b) IK involved in the management and conservation of natural resources (especially biological resources);
- c) IK pertaining to the development and improvement of indigenous crop varieties and farming techniques.

Chapter IV

Documentation and Protection of IK

The protection of IK has two main components:

- a) Promotion of the use of IK, so that it is not lost due to neglect. Also, if already in danger of being lost, IK needs to be recorded and preserved in a documented form. In this sense, all efforts to document IK (databases, registers, ethnobiological studies) contribute to the preservation of IK. However, as the loss of IK is caused by a number of political, economical and social reasons, mere documentation of IK is not adequate to ensure its long-term conservation in a dynamic form. This requires changes in government policies in favour of IK.
- b) Protection of IK from misappropriation by others (those not belonging to the community which is the source of the IK). With the increased role of IPR, the threat of misappropriation by commercial interests has become particularly serious. It is important that: a) the patenting (or any other form of IPRs) of inventions based primarily on IK is prevented and b) the rights of communities over their IK is established. The strategy favoured by most observers is to place this information in the public domain so that it can be used to challenge patent (and other IPR applications, such as Plant Breeder's Rights) applications involving IK based inventions. This can be done by preparing comprehensive and searchable databases of IK, which can be made available to patent offices for use while assessing patent applications.⁴⁰

Let us now consider how effective documentation has been in contributing to the protection of IK in South Asia. As mentioned above, IK has been documented either as a part of ethnobiological studies, in people's registers, innovation databases or digital libraries. Of these, the ethnobiological studies have covered the largest number of local communities and their IK; they have made a significant contribution to the preservation of IK by recording it. However, most ethnobiologists have not been concerned with issues related to the ownership of IK and its protection from misappropriation by commercial interests. Their studies consist of inventories of bio-resources, and their uses by tribal communities.⁴¹ For example, our analysis of the ethnobiological literature of South Asia between 1995-2004 shows that most of these studies are merely lists of plants found in the area inhabited by the community concerned, and the uses of these plants for medicinal and other purposes. Only 6% of the papers were explicitly concerned with the protection of IK.

Most of the ethnobiological information is freely published in academic journals. As a result a large body of IK is now available in the public domain. However, as this information is not arranged in a searchable format, it has only a limited role in preventing the patenting of IK. Only if it is put in databases can this information become a useful tool in defence of IK, preventing it from being patented by outside interests.

⁴⁰ UNU, 2004

⁴¹ Arora, 1995: 134.
Gene Campaign IK Project
Draft Report Analysis of IK Documentation in South Asia

A group of ethnobiologists and the governmental agencies involved with ethnobiological studies are beginning to be concerned about the negative impact of putting IK in the public domain, worried that developing countries could subsequently lose control over their indigenous knowledge. For this reason, government agencies that fund ethnobiological studies are beginning to adopt a policy of keeping information on IK confidential.

This change of policy is best seen in the case of the All India Coordinated Research Project on Ethnobiology, described above. At the time when the Project was conceived, there was little awareness of the issues concerning the ownership of IK. However, during the second phase of the project the issues of biopiracy and unlawful use of IK by commercial interests had become important. Recognising the need to keep control over IK, the Ministry of Environment and Forests, which sponsored the Project, decided in 1985 that the project would not publish any information which was new (not published). As a result of this policy, the results of the Project have not been officially published.⁴² The information will only be published when a system to protect IK is in-force in India.⁴³

The organizations involved with ethnobiological studies are also beginning to be aware of the need to give greater recognition to the contribution made by local communities. This is being done through acknowledgements in publications and, in at least one case, through co-ownership of patents; NBRI now has a policy of making a community the co-owner of patents based on their IK. It has already filed 4 patents in India in which the community is a co-owner.⁴⁴

Unlike ethnobiological studies, peoples' registers, innovation databanks and digital libraries of IK are explicitly concerned with the ownership of IK and the distribution of benefits arising from its commercial use. Most of them seek to establish the rights of local communities over IK and prevent the patenting of IK based innovation by outsiders. The strategy adopted for this is to place the IK in the public domain. How effective has this strategy been? It must be emphasized at the outset that, except in India, the preparation of people's registers and databases in South Asian countries is at an initial stage, and it is too early to examine their contribution to the protection of IK. However, the documentation of IK in these countries is very similar to the work done in India, so its impact on the protection of IK is also likely to be similar to that experienced in India.

⁴² Individual researchers involved with the Project have published a number of papers based on the information collected for the project.

⁴³ The conventional system of intellectual protection is not suited to provide protection to indigenous knowledge. This is for a number of reasons: the cost of effective protection is too high for most holders of indigenous knowledge; the limited period of protection does not fully compensate for the disclosure of the knowledge developed and conserved for centuries; the protection is weak since the novelty of indigenous knowledge is likely to be legally challenged. See: Kumar, 2000

⁴⁴ Discussions with Dr. Pushpangdan

A number of IK registers and databases have been prepared in India. Their objectives include: establish local communities' control over IK; prevent its patenting by outsiders; control access to IK by outsiders through PIC; increase the income of local communities through commercialization of IK, and help communities to receive a fair share of the benefits arising out of its commercial use.

We find that, although the objectives of the documentation are to place IK in the public domain, most of the documents are being kept as confidential. As India and other South Asian countries do not have *sui generis* systems to protect IK, the organizations responsible for the preparation of these documents are reluctant to disclose their contents. Also, the information contained in the documents is not being used to prevent the patenting of IK based inventions. This is for the following reasons. a) The information is not compiled in a searchable format. b) There is no mechanism to make this information available to the patent offices. c) There is no agreement between national governments and patent offices to ensure that the information is used for patent assessment only. Furthermore, the absence of national *sui generis* systems increases the risk of making this information available to patent offices.

In addition there has been no increase in the commercialization of IK following documentation. Judged by the lack of diffusion of information on documentation of IK, it can be suggested that, by and large, industry may not even be aware of these documents. Again, those responsible for the documentation are reluctant to publicize the IK contained in the registers and databases. There is a feeling that, in the absence of legal protection, industry will use the knowledge without sharing the benefits with local communities. Therefore documentation, expected to promote PIC and benefit sharing, has failed to provide economic benefits to communities as it has not promoted the commercial use of IK.

The organizations engaged in the documentation of IK are faced with a serious dilemma. On the one hand they consider it important to place IK in the public domain so that its patenting can be prevented. On the other hand, they are concerned that public disclosure of this information could undermine the rights of local communities over their IK and enable companies to exploit the IK contained in the documents commercially without sharing the benefits.⁴⁵ For this reason, most organizations involved in the documentation of IK have adopted a policy of either keeping the information secret (as in case of PBRs) or providing access for the limited purpose of patent assessment (as in the case of TKDL).⁴⁶ It is very important that this dilemma is

⁴⁵ In the absence of control over the use of IK, commercial companies are under no obligation to acknowledge the contribution of local communities and share benefits with them. For example, anti-diabetic properties of Sri Lankan plant, *Salacia reticulata*, are being invested in Japan and the United States. This has resulted in a number of papers and patents in both countries. However, the researchers have not made any mention of the contribution of indigenous knowledge obtained from Sri Lanka. The commercial exploitation of this work is unlikely to result in the sharing of benefits for the holders of the indigenous knowledge in Sri Lanka. See: Kumar, 2000

⁴⁶ In case of TKDL, the access to the data will be closely regulated by the Indian government. It is developing a system to ensure safeguards against the misuse of data, while giving access to global patent

resolved. This can only happen through a national *sui generis* system, which will allow the sharing of IK information with others without losing ownership rights.

To summarize, the documentation of IK has made little contribution to the protection of IK in South Asian countries. India's experience shows that documentation alone is not enough to establish a community's rights over its IK and protect it from misappropriation by others. A number of measures, including the preparation of searchable databases, arrangements with patent offices for the transfer of information on IK and agreement to use this information only for the evaluation of patent applications are necessary to make documentation of IK more effective. Most importantly, the governments in South Asian countries need to devise *sui generis* systems to provide legal bases for the protection of IK.⁴⁷ Only then will communities be safe from the danger of losing control over their IK.⁴⁸

examiners and others at national and international level. It is proposed that the database will be made available to patent examiners throughout the world under a non-disclosure agreement. See UNU, 2004

⁴⁷ The need for defensive protection is shown by the fact that has a study by a TKDL task force of 762 randomly selected US patents with a direct relationship with medicinal plants found that out of these, 374 (49 per cent) patents were found to be based on indigenous knowledge. For example, see: UNU, 2004

⁴⁸ The Indian government has taken some steps to increase the control of local communities over their bio-resources and associated IK. It has drawn rules (called the Biological Diversity Rules, 2004), These rules will govern the formation of National Biodiversity Authority. The Authority will regulate access to biological resources and associated knowledge for research or for commercial utilization. It will also frame rules for commercial use of IK, including benefit sharing arrangements. The rules came into force on 15th April 2004. See: India, 2004

CHAPTER V

Conclusions

There is a growing concern that IK, which plays a vital role in the lives of local communities and is also an important source of innovations in agriculture and the pharmaceutical industry, is under threat. It is also felt that national and multinational commercial interests are undermining the rights of local communities over their IK. With the increased use of IPR in agriculture and pharmaceuticals there is a danger that IK based innovations may be patented outside India by these interests without acknowledgment to the contribution of local communities. The patenting of *neem*, *haldi* and other IK based technologies confirm that this is a real possibility. Faced with this situation, there is a conviction that measures to establish the rights of local communities over their IK must be taken, and its patenting by commercial interests be prevented. Furthermore, the commercial use of IK should be conditional to consent from the communities, who should receive a fair share of any benefits accruing from the use of IK.

The documentation of IK is considered by most observers to be an important part of the strategy to protect IK. This is for a number of reasons. 1] It can provide a reliable estimate of the extent of IK and its nature. 2] It can be used to establish a community's rights over its IK, which can lead to benefit sharing. 3] By placing IK in the public domain it can help to prevent the patenting of IK based innovation outside India by non-community interests. 4] Documentation can facilitate the commercialization of IK.

In South Asian countries IK has been documented in a number of forms. The most important of these are ethnobiological studies, Community and People's Biodiversity Registers, innovation databases and digital libraries. While all South Asian countries have undertaken documentation of IK, only in India has a significant amount of documentation been prepared. This includes: i) a large body of ethnobiological studies carried out by academic researchers, Government agencies such as the Botanical and Zoological Surveys and the All India Coordinated project on Ethnobiology; ii) a number of Community and People's Biodiversity Registers; iii) innovation databases and iv) Traditional Knowledge Digital Library (TKDL). The other South Asian countries have largely followed India's example and the documentation in these countries, though on a much smaller scale, follows a similar pattern.

We find that documentation has made only a very limited contribution, both to the protection of IK and its commercialization. Even Biodiversity Registers and Innovation databases, which are compiled explicitly for the protection of IK, have had very little impact. This is largely because of the conflict between the need to place IK in the public domain and a fear that this will result in the loss of communities' claims of rights over its IK. For this reason, the information in the registers and databases (and in some cases, in ethnobiological studies) is being treated as confidential. In fact, there is little awareness of these registers/documents beyond a small number of NGOs and individuals. Once completed, the registers have been deposited either with the community or the sponsoring

agency. There is no mechanism to use these documents and registers on a continuous basis to prevent the patenting of IK. This defeats the main objective of the documentation: to establish a community's right of IK and prevent its patenting. Also, the information is not available to industry for commercialization.

This situation will continue unless a) legal basis for the protection of IK exists and b) institutional arrangements are made with patent authorities to ensure IK related information is used for the purpose of patent evaluation only. Unless a national and international legal framework is developed and adopted, the documentation efforts are unlikely to have much impact, either in terms of providing protection to IK or promoting commercialization of IK and benefit sharing. This requires a national *sui generis* system in South Asian (and other developing) countries to provide legal protection to IK. Only then will it be possible to make full use of documentation to establish a community's rights over IK and prevent its misappropriation by others.

References

- Alam, M.K., Medical Ethnobotany of the Marma Tribe of Bangladesh, *Economic Botany*, Vol. 46, No. 3, pp. 330-335
- Anonymous (2001), "Indigenous knowledge digital library on anvil", Business Line, January 25, 2001 at <http://www.hinduonnet.com/businessline/2001/01/25/stories/14255435.htm>
- Anonymous (2002) "Civil Society Consultation on Indigenous Knowledge- A Report", 4th April 2002, New Delhi. Document provided by Gene Campaign.
- Arora R.K., "Ethnobotanical Studies on Plant Genetic Resources-National Efforts and Concerns", *Ethnobotany*, Vol. 7, 1995, p. 134.
- Bhattacharyya Goutam, "Ethnobotanical Wealth of the "Druk-Yul" (Bhutan)", *Journal of Economic Taxonomic Botany*, Vo. 23, No.1, 1999.
- Chakravarthy A.K. et. al., "On networking Indian biodiversity databases" BD DB Networking Workshop, March 23-24, 2004 Report
- Chowdhury J.S., M.K. Alam and M.A. Hasan, "Some Traditional Folk Formularies Against Dysentery and Diarrhoea in Bangladesh, *Journal of Economic Taxonomic Botany*, Additional Series 12, pp. 20-23
- Gadgil Madhav (2003), "People's Biodiversity Register: Outline of a Methodology Manual", <http://ces.iisc.ernet.in/hpg/cesmg/downloads/pbrmanual.pdf>, May 10, 2003.
- Gadgil Madhav (undated a), "People's Biodiversity Registers: Lessons Learnt", Centre for Ecological Sciences, Indian Institute of Science, <http://www.etfrn.org/etfrn/workshop/biodiversity/documents/gadgil/bioreg.pdf>
- Gadgil Madhav (undated b), "People's Biodiversity Register A Record Of India's Wealth", <http://www.etfrn.org/etfrn/workshop/biodiversity/documents/gadgil/amruth.pdf>
- Ghate Utkaarsh (undated a), "People's Biodiversity Register", <http://www.etcint.org/PDF/COMPAS%20Newsletter/No2/16-17-UIKarsh>.

- Ghate Utkarsh (undated b), "People's biodiversity register for access and benefit sharing", Research and Action in Natural Wealth Administration (RANWA), at <http://sdnp.delhi.nic.in/nbsap/themes/accessbenefit/peoplesbiodiversity.html>
- Gorjestani Nicolas Undated), "Indigenous Knowledge For Development: Opportunity and Challenges", http://www.worldbank.org/afr/ik/ikpaper_0102.pdf
- Gupta Anil (2001), "How Can Asian Countries Protect Indigenous Knowledge, Farmers Rights and Access to Genetic Resources through the Implementation or Review of the WTO TRIPS Agreement", Indian Institute of Management, Ahmedabad, Paper Presented at The Joint ICTSD/CEE/HBF Regional Dialogue for Governments and Civil Society, organised by International Centre for Trade and Sustainable Development, Geneva at Chiang Mai, Thailand March 29 – 30, 2001. <http://www.ictsd.org/dlogue/2001-03-29/Gupta.doc>
- Gupta, V K (2002), "An Approach for Establishing a TKDL, National Institute of Science Communication, New Delhi at <http://www.patentmatics.com/pub2002/pub69.htm>
- India, "The Gazette of India EXTRAORDINARY- PART II – Section 3- Sub-section (i)", Ministry Of Environment And Forests, Government of India, New Delhi, April 15, 2004
- India," Protecting Indigenous Knowledge : Why it is Important" Text of Paper by Department of Commerce, Government of India, presented at an International Seminar on Systems of Protection of Indigenous Knowledge, Jointly organised in New Delhi, by India and UNCTAD, 3-5 April, 2002., *India and the WTO*, A Monthly Newsletter of The Ministry of Commerce and Industry, Government of India, volume 4, No 4, New Delhi, April 2002
- Jain S.K. and Sumita Srivastava, "Indian ethnobotanical literature in last two decades-A graphic review and future directions", *Ethnobotany*, Vol. 13, 2001, pp. 1-8.
- Jain S.K. and Sumita Srivastava, "Indian ethnobotanical literature in last two decades-A graphic review and future directions", *Ethnobotany*, Vol. 13, 2001, pp. 2.
- Jain SK., "Ethnobotany and research on medicinal plants in India", National Botanical Research Institute, Lucknow, India, undated.
- Jayaraman K S,"Biopiracy fears cloud Indian database" SciDev.Net, 19 November 2004, <http://www.scidev.net/News/index.cfm?fuseaction=readnews&itemid=404&language=1>
- Kothari Ashish (1999), "Biodiversity And Intellectual Property Rights: Can The Two Co-Exist?", *Linkages Journal*, Volume 4, Number 2, May 28 1999 at <http://www.iisd.ca/linkages/journal/kothari.html>
- Kumar Vijaya, "Systems And National Experiences For Protecting Indigenous Knowledge, Innovations And Practices – Sri Lanka, Presented At Unctad Expert Meeting On Systems And National Experiences For Protecting Indigenous Knowledge, Innovations And Practices, Geneva 30 October – 1 November 2000
- Lalramnghinglova H and L.K.Jha," Ethnobotany:A Review", *Journal of Economic Taxonomic Botany*, Vol. 23, No.1, 1999.
- Nijar Gurdial Singh (2003), "In Defense of Local Community Knowledge and Biodiversity: A Conceptual Framework and Essential Elements of a Rights Regime", September 26, 1997, Regional Consultation On PGR "Community Seed Bank Network", Green Foundation, 2003,

- Panthi Mohan P. and Ram P. Chaudhary, "Ethnomedicinal Plant Resources of Arghakhanchi District, West Nepal", *Ethnobotany*, Vol. 15, 2003, pp.71-86
- Pushpangadan P, "Ethnobiology in India-A Status Report", All India Coordinated Research Project on Ethnobiology, Ministry of Environment and Forest, Government of India, New Delh, undated.
- Rahman M. Atiqur, S.B. uddin and C.C. Wilcock, "Indigenous Knowledge of Herbal Medicine in Bangladesh: Diarrhoea, Dysentery, Indigestion and Stomach Pains", *Journal of Medicinal and Aromatic Plant Sciences*, Vol. 25, 2003, pp. 1001-1009
- Rahman, M.A., "Ethno-Medico-Botanical Knowledge Among Tribals of Bangladesh", *Journal of Economic Taxonomic Botany*, Vol. 23, No.1, 1999, pp. 89-93
- Rastogi Ajay, "Applied Ethnobotany for Biodiversity Conservation", ICIMOD Newsletter, 31 Spring 1998, <http://www.panasia.org.sg/nepalnet/ecology/ethnobot.htm>
- Sahai Suman (undated d), "Indigenous Knowledge confers rights on Communities" Asia Pacific Consultation on PGR, Asia-Pacific Regional Consultation on PGR in, R.K. Arora and K.W. Riley (eds.) Asia-Pacific Regional Consultation on Plant Genetic Resources <http://www.ipgri.cgiar.org/regions/apo/publications/asia/chap-13.pdf>
- Sahai Suman, "Commercialisation of Indigenous Knowledge and Benefit Sharing", UNCTAD Expert Meeting on Systems and National Experiences for Protecting Indigenous Knowledge, Innovations and Practices Geneva, 30 October – 1 November 2000
- Sen Nirupa (2002), "TKDL- A safeguard for Indian indigenous knowledge", *Current Science* 82 (9): 1070-71.
- Shankar Darshan, "My Encounter and Reflections on Indian Medical Heritage", *Indian Journal of Traditional Knowledge*, Vol. 1 (1), July 2002, pp. 51-58.
- Sharma Devinder (2002), "Digital Library- Another Tool For Biopiracy" <http://www.mindfully.org/GE/GE4/Indigenous-Knowledge-Digital-Library-TKDL29may02.htm>
- Sharma Devinder (2002), "Corporate theft of 'indigenous knowledge' Biopiracy by another name", HIMAL
- Siwakoti, M. and S.K.Varma, "Medicinal Plants of Terai of Eastern Nepal", *Journal of Economic Taxonomic Botany*, Additional Series 12, pp. 423-438
- Siwakoto, M., and Siwakoti S., "Ethnomedicinal Uses of Plants Among the Satar Tribe of Nepal", *Journal of Economic Taxonomic Botany*, Vol. 23, No.1, 1999
- Tripathi S.K., "Traditional Knowledge: Its Significance and Implications", *Indian Journal of Traditional Knowledge*, Vol. 2(2), April 2003, pp. 99-106.
- UNCTAD (2004), "Systems and National Experiences for Protecting Indigenous Knowledge, Innovations and Practices", Issues Note by the UNCTAD Secretariat, UNCTAD, Geneva, 19 July, 2004
- UNU, "The Role of Registers & Databases in the Protection of Indigenous Knowledge-A Comparative Analysis", United Nations University Institute of Advanced Studies (UNU-IAS), Japan, January 2004

Appendix-I

Analysis of Ethnobotanical Literature- List of papers

1. Acharya, K. P., (2003), Sustainability of support for community forestry in Nepal, *Forest, Trees and Livelihoods* Vol.13, 247-260.
2. Arora, R. K. (1995), Ethnobotanical studies on plant genetic resources- National efforts and concern, *Ethnobotany* Vol. 7, 125-136.
3. Arora, R. K. (1997), Ethnobotany and its role in the conservation and use of Plant Genetic Resources in India, *Ethnobotany* Vol. 9, 6-15.
4. Bajpayee, Kaptain Kishor and Gopal Dixit (1996), Ethnobotanical studies on food-stuffs of tribals of Tarai region, Uttar Pradesh, *J. Econ. Taxon. Bot. Additional Series*, 12, 128-132.
5. Balasubramanian, P., and S. Narendra Prasad (1996), Medicinal plants among the Irulars of Attappady and Boluvampatti forests in the Nilgiri Biosphere Reserve, *J. Econ. Taxon Bot. Additional Series*, 12, 253-259.
6. Balodi, Bipin and D. K. Singh (1997), Medico- Ethnobotany of Ladakh, *Ann. For.*, 5(2)189-197.
7. Banerjee, Archana (1996), Medicinal uses of some flowers by Santhals of West Bengal, *J. Econ. Taxon. Bot. Additional Series*, 12, 314-317.
8. Banerjee, R. N. and Chhabi Ghora (1996), On the domestic use of some unreported plants of West Dinajpur district (West Bengal), *J. Econ. Taxon. Bot. Additional Series*, 12, 325-328.
9. Bhakat, R. K., and P. K. Pandit (2004), An inventory of medicinal plants of some sacred groves of Purulia district, West Bengal, *Indian forester*, 37.
10. Bhalla, Suman, J. R. Patel and N. P. Bhalla (1996), Ethnomedicinal observation on some Asteraceae of Bundelkhand region, Madhya Pradesh, *J. Econ. Taxon. Bot. Additional Series*, 12, 175-178.
11. Bhandary, M. J., K. R. Chandrashekhar and K. M. Kaveriappa (1996), Ethnobotany of Gowalis of Uttara Kannada district, Karnataka, *J. Econ. Taxon. Bot. Additional Series*, 12, 244-249.
12. Bhattacharya, Goutam (1999), Ethnobotanical wealth of the “Druk-Yul” (Bhutan), *J. Econ. Tax Bot* Vol.23 (1), 94-98.
13. Bhattacharyya, Goutam (1996), Medico-Ethno-Botanical value of Saurashtra weeds, *J. Econ. Taxon Bot. Additional Series*, 12, 166-168.

14. Billore, K.V., (2000), Depleting state of medicinal plants in Rajasthan (India) and their conservation, *Indian Forester*, 419.
15. Bora, H. R., and A. K. Pandey (1996), Less known wild food plants of Assam, *J. Econ. Taxon. Bot. Additional Series*, 12, 357-358.
16. Chakrabarti, Kalyan (1996), Forests and tribals –An Environment Impact study, *Indian Forester*, 706.
17. Chandrasekar K., and S. K. Srivastava (2003), Ethnomedicinal studies in Pin Valley National Park, Lahaul Spiti, Himachal Pradesh, *Ethnobotany* Vol. 15, 44-47.
18. Chowdhury Jasim Uddin, M. K. Alam and M. A. Hassan (1996), Some traditional folk formularies against dysentery and diarrhoea in Bangladesh, *J. Econ. Taxon Bot. Additional Series*, 12.
19. Cyrilnayagam, M., R. Ravi and R. Kandaswamy (1996), Plants used by Kattunayakkas for stupefying fishes, *J. Econ. Taxon Bot. Additional Series*, 12, 287-288.
20. Dagar, H.S. and J. C. Dagar (1996), Ethnobotanical studies of the Nicobarese of Chowra Island of Nicobar Group of Islands, *J. Econ. Taxon Bot. Additional Series*, 12, 381-388.
21. Duhoon, S. S., M. N. Koppar and Umesh Chandra (1996), Seabuck Thorn (*Hippophae* spp.)- A less known wonder plant of Ethno-Medico-Botanical importance in cold desert of India, *J. Econ. Taxon Bot. Additional Series*, 12, 43-45.
22. Dwarakan, P., and A. A. Ansari (1996), Less known uses of plants of Kollimalai (Salem Dt., Tamil Nadu) in South India, *J. Econ. Taxon Bot. Additional Series*, 12, 284-286.
23. Farquee, N. A. and Annapurna Nautiyal (1999), Traditional knowledge and practices of Bhotia pastoralist of Kumaon Himalaya: The need for value addition, *International J. Sustainable Development and World Ecology*, 6(2), 60-67.
24. Geetha, S., G. Lakshmi and P. Ranjithakani (1996), Ethno veterinary medicinal plants of Kolli Hills, Tamil Nadu, *J. Econ. Taxon Bot. Additional Series*, 12, 289-291.
25. Geetha, S., G. Lakshmi and P. Ranjithakani (1996), Ethnobotanical review: Wild fibre yielding plants of Kolli Hills, Tamil Nadu, *J. Econ. Taxon Bot. Additional Series*, 12, 250- 252.
26. Ghose, Ashis, Sarathi Maity and Malaty Maity (1996), Ethnomedicine in Bankura district, West Bengal, *J. Econ. Taxon. Bot. Additional Series*, 12, 318-320.
27. Goud, P. Saiprasad and T. Pullaiah (1996), Ethnobotany of Kurnool district- Some wild plants used as food, *J. Econ. Taxon. Bot. Additional Series*, 12, 224-227.

28. Gurmet, Padma (2004), "Sowa- Rigpa": Himalayan art of healing, *Indian Journal of Traditional Knowledge* Vol. 3(2), 212-218.
29. Hosagoudar, V. B., and A. N. Henry (1996), Ethnobotany of Kadars, Malasars and Muthuvans of the Anamalais in Coimbatore district, Tamil Nadu, India, *J. Econ. Taxon Bot. Additional Series*, 12, 260-267.
30. Hosagoudar, V. B., and A. N. Henry (1996), Ethnobotany of Soligas in Biligiri Rangana Betta, Karnataka, Southern India, *J. Econ. Taxon. Bot. Additional Series*, 12, 228-243.
31. Hosaoudar V. B. and A. N. Henry (1996), Ethnobotany of tribes Irular, Kurumban and Paniyan of Nilgiris in Tamil Nadu, Southern India, *J. Econ. Taxon Bot. Additional Series*, 12, 272-283.
32. Huidrom, B. K. Singh (1996), Ethnobotanical observation on the preparation on Choarak (a Local wine) in Tripura state, India, *J. Econ. Taxon Bot. Additional Series*, 12, 373-374.
33. Huidrom, B. K. Singh (1996), Plants used in Medico-Sexual purposes by Meitei community in Manipur State, India, *J. Econ. Taxon. Bot. Additional Series*, 12, 364-366.
34. Islam, M. (1996), Ethnobotany of certain underground parts of plants of North-Eastern region, India, *J. Econ. Taxon. Bot. Additional Series*, 12, 338- 343.
35. Jain, S. K. (2003), Ethnoveterinary recipes in India-A Botanical analysis, *Ethnobotany* Vol.15, 23-33.
36. Jain, S. K. and Sumita Srivastava (2001), Indian Ethnobotanical literature in last two decades- A graphic review and future directions, *Ethnobotany* Vol.13.,1-8.
37. Jain, S. P. (1996), Ethno-Medico-Botanical survey of Chaibasa, Singhbhum district, Bihar, *J. Econ. Taxon. Bot. Additional Series*, 12, 403-407.
38. Jana, S. K., and A. S. Chauhan (2000), Ethnobotanical studies on Lepchas of Dzongu, North Sikkim, India, *Ann. For.*, 8(1), 133-144.
39. Jha, Vidyanath, Sunita Mishra, A. N. Kargupta and Abha Jha (1996), Leaves and flowers utilized as supplementary vegetables in Darbhanga (North Bihar) and Their ethnobotanical significance, *J. Econ. Taxon. Bot. Additional Series*, 12, 395-402.
40. Kala, Chandra Prakash (2003), Indigenous uses of plants as health tonic in Uttaranchal Himalaya, India, *Ann. For.*, 11 (2), 249-254.
41. Kapur, S. K. (1996), Traditionally important medicinal plants of Bhaderwah Hills-Jammu Province-III, *J. Econ. Taxon Bot. Additional Series*, 12, 62-69.

42. Kapur, S. K. (1996), Traditionally important medicinal plants of Bhaderwah Hills-(Jammu Province)-Part II, *J. Econ. Taxon Bot. Additional Series*, 12,56-61.
43. Kapur, S. K., (1996), Traditionally important medicinal plants of Bhaderwah Hills-Jammu Province-VI, *J. Econ. Taxon Bot. Additional Series*, 12,70-74.
44. Kapur, S. K., and Paviter Singh (1996), Traditionally important medicinal plants of Udhampur district (Jammu Province) Part-I, *J. Econ. Taxon Bot. Additional Series*, 12,75-81.
45. Kapur, S. K., S. Nanda and T. N. Srivastava (1996), Ethnobotanical uses of RRL-Herbarium-III, *J. Econ. Taxon Bot. Additional Series*, 12, 50-55.
46. Khanna, K. K., G. Shukla, and V. Mudgal (1996), New traditional medicinal uses of plants from Jalaun district, Uttar Pradesh, *J. Econ. Taxon. Bot. Additional Series*, 12, 108-111.
47. Khanna, K. K., P. K. Srivasatava and V. Mudgal (1996), Noteworthy medicinal plants uses from rural folklore of Raebareli district, Uttar Pradesh, *J. Econ. Taxon. Bot. Additional Series*, 12, 118-122.
48. Khanna, K. K., V. Mudgal, G. Shukla and P. K. Srivastava (1996), Unreported Ethnomedicinal uses of plants from Mirzapur district, Uttar Pradesh, *J. Econ. Taxon. Bot. Additional Series*, 12, 112-117.
49. Kshirsagar, Sanjay R., M. H. Parabia and M. N. Reddy (2003), Ethnobotany of coastal areas in South Gujarat, *Ethnobotany* Vol.15, 60-63.
50. Kulkarni, D. K., V. V. Agte and M. S. Kumbhojkar (2003), Leafy vegetables consumed by Mahadeokoli tribe in Western Maharastra with their nutritional potential, *Ethnobotany* Vol.15, 34-38.
51. Kumar, Anand (1996), Some Ethnomedicinal plants of the Murias of Indravati Tiger Reserve, Bastar (Madhya Pradesh), *J. Econ. Taxon. Bot. Additional Series*, 12, 201-205.
52. Kumar, Binoj M. S. and N. P. Balakrishnan (1996), Ethnobotanical studies of the genus *Euphorbia* L. (Euphorbiaceae), *J. Econ. Taxon Bot. Additional Series*, 12,46-49.
53. Kumar, S., and Neeti Rohatgi (1996), A note on some important medicinal plants of Garhwal Himalayas, *Ann. For.*, 4 (2), 175-185.
54. Kumar, Vivek and R. L. S. Sikarwar (2003), Plants used as fish poison by tribals of Surguja district in Chhattisgarh, India, *Ethnobotany* Vol. 15, 87-89.
55. Lalramnghinglova, H., and L. K. Jha (1999), Ethnobotany: A review, *J. Econ. Taxon Bot* Vol.23 (1), 1-27.

56. Lalramnghinglova, J. H. (1996), Ethnobotany of Mizoram- A preliminary survey, *J. Econ. Taxon. Bot. Additional Series*, 12, 439-459.
57. Mahato, Ashwin Kumar and Pushpa Mahato (1996), Ethnobotanical wealth of Chhotanagpur plateau-VI. Some medicinal plants used against intestinal worms, *J. Econ. Taxon. Bot. Additional Series*, 12, 389-391.
58. Maheshwari, J. K. (1996), Ethnobotanical documentation of primitive tribes of Madhya Pradesh, India, *J. Econ. Taxon. Bot. Additional Series*, 12, 206-213.
59. Maikhuri, R. K., K. S. Rao and R. L. Semwal (1998), Bioprospecting for economic development in the rural Himalaya- A case study, *Research for Mountain Development: Some Initiatives and Accomplishment*, 235- 250.
60. Manandhar, Narayan P., (1996), Ethnobotanical observation on ferns and fern allies of Nepal, *J. Econ. Taxon Bot. Additional Series*, 12, 414-422.
61. Manandhar, Narayan P., (1996), Traditional practice for oral health care in Nepal, *J. Econ. Taxon Bot. Additional Series*, 12,408-413.
62. Mandal, S. K., and S. K. Basu (1996), Ethnobotanical studies among some tribals of Nilgiri district, Tamil Nadu, *J. Econ. Taxon Bot. Additional Series*, 12, 268-271.
63. Mandal, Sujit Kumar, and Ambarish Mukherjee (2003), An Ethnobotanical envision into Santhali festivals in Purulia district, West Bengal, *Ethonbotany* Vol.15, 118-124.
64. Mishra, Dipak Kumar, Godhuli Samanta and Tapan Kumar Mishra (1996), Ethnomedicine of the tribe Kharia of Midnapore district, West Bengal, *J. Econ. Taxon. Bot. Additional Series*, 12, 329-331.
65. Mishra, Rajeev (1997), Conserving the Kumaun forests through people's participation: A case study, *Indian Forester*, 568.
66. Mohanty, R. B. (2003), Oral and dental healthcare in folklore's of Orissa: An Ethnobotanical observation, *Ethonbotany* Vol.15,125-126.
67. Molla, H. A., and B. Roy (1996), Some Ethnobotanical claims from the Jalpaiguri district of West Bengal, *J. Econ. Taxon. Bot. Additional Series*, 12, 322-324.
68. Mukherjee, S. D., (1997), Is handling over forests to local communities a solution to deforestation? Experience in Andhra Pradesh-(India), *Indian Forester*, 460.
69. Nadankunjidam, S., (2003), Traditional botanical knowledge of the tribals of Attapadi hills, Western Ghats on some economically useful plants, *Ethonbotany* Vol. 15, 6-10.
70. Nagiyan, Paridhi, Amit Kumar Dhiman and A. K. Bhargava (2003), Medicinal value of gum and resin secreting plants of district Saharanpur, *Ann. For.*, 11(2), 245-248.

71. Nath, T. K., Inoue Makoto, M. J. Islam and M. A. Kabir (2003), The Khasia tribe of Northeastern Bangladesh: Their Socio-Economic status, hill farming practices and impacts on forest conservation, *Forest, Trees and Livelihoods* Vol.13, 297-311.
72. Nayak, Prateep, K. (2003), Community- based forest management in India: the significance of tenure, *Forest, Trees and Livelihoods* Vol.13, 135-160.
73. Nazarudeen, A., S. Seeni, K. C. Koshy and P. Pushpangadan (1996), Folk plants of food, medicine, adornment and repellent used by the Paniyar community in North Kerala, *J. Econ. Taxon. Bot. Additional Series*, 12, 299-305.
74. Painuli, R. M., and J. K. Maheshwari (1996), Some interesting Ethnomedicinal plants used by Sahariya tribe of Madhya Pradesh, *J. Econ. Taxon. Bot. Additional Series*, 12, 179-185.
75. Panda, S. (1996), Plant use- A recent perspective from Eastern Himalayas, *J. Econ. Taxon. Bot. Additional Series*, 12, 332-337.
76. Pandey, Ashok K., H. R. Bora and S. C. Deka (1996), An Ethno-Medico- Botanical Study of Golaghat district, Assam: Native plant remedies for Jaundice, *J. Econ. Taxon. Bot. Additional Series*, 12, 344-349.
77. Pandey, Indu Bhushan (2003), Some traditional herbal home remedies used in and around Kanpur City (Uttar Pradesh), India, *Ethonbotany* Vol.15, 129-131.
78. Panthi, Mohan P., and ram P. Chaudhary (2003), Ethnomedicinal plant resources of Arghakhanchi district, West Nepal, *Ethnobotany* Vol.15, 71-86.
79. Patel, N. B., B. S. Sidana and B. K. Jain (2003), Tribal artefacts of Dholwani forest of Sabarkantha (Gujarat), *Ethonobotany* Vol.15, 40-43.
80. Patil, S. H. and Manoj M. Merat (2003), Ethnoveterinary practices in Satpudas of Nandurbar district of Maharashtra, *Ethnobotany* Vol. 15, 103-106.
81. Prakash, Ved (1998), Indian Medicinal Plants: Current Status-I, *Ethnobotany* Vol.10, 112-121.
82. Pramod, C., M. Sivadasan and N. Anilkumar (2003), Ethnobotany of religious and supernatural beliefs of Kurichya of Wayanad district, Kerala, India, *Ethnobotany* Vol.15, 11-19.
83. Prasad, P. Nagendra, A. J. A. Ranjit Singh, L. M. Narayanan and C. R. Natrajan (1996), Ethnobotany of the Kanikkars of South Tamil Nadu-I, *J. Econ. Taxon. Bot. Additional Series*, 12, 292-298.
84. Pullaiah, T., and T. Dharma Chandra Kumar (1996), Herbal plants in Mannanur forest Mahaboobnagar district, Andhra Pradesh, *J. Econ. Taxon. Bot. Additional Series*, 12, 218-220.

85. Rahman, M. A. (1999), Ethno-Medico-Botanical knowledge among tribals of Bangladesh, *J. Econ. Taxon Bot* Vol.23 (1),89-93.
86. Rahman, M. A.,and M. Yusuf (1996), Diversity, Ecology and Ethnobotany of the Zinziberaceae of Bangladesh, *J. Econ. Taxon. Bot. Additional Series*, 12, 13.
87. Rahman, M. Atiqur, S. B. Uddin and C. C. Wilcock (2003), Indigenous knowledge of herbal medicine in Bangladesh: diarrhoea, dysentery, indigestion and stomach pain, *Journal of Medicinal and Aromatic plant Sciences* 25, 1001-1009.
88. Rai, Brajesh Kumar, Shiv Shankar Ayachi and Arvinder Rai (1996), A note on Ethno-Myco- Medicines from Central India, *J. Econ. Taxon. Bot. Additional Series*, 12, 186-191.
89. Rajendran, A., N. Rama Rao and A. N. Henry (1996), Hepatic stimulant plants of Andhra Pradesh, India, *J. Econ. Taxon. Bot. Additional Series*, 12, 221-223.
90. Reddy, M. Hemambara (1996), Indian medicinal plants: 1. *Achyranthes aspera* L., *J. Econ. Taxon Bot. Additional Series*, 12, 37.
91. Reddy, M. Hemambara, K. Vijayalakshmi, and R. R. Venkata Raju (1996), Native Phytotherapy for snakebite in Nallamalais, Eastern Ghats, India, *J. Econ. Taxon Bot. Additional Series*, 12,214-217.
92. Reddy, Ramachandra P., P. Padma Rao and M. Prabhakar (2003), Ethnomedicinal practices amongst Chenchus of Nagarjunasagar Srisailam Tiger Reserve (NSTR), Andhra Pradesh- Plant remedies for cuts, wounds and boils, *Ethnobotany* Vol. 15, 67-70.
93. Roy, Babul, Nihal A Farooquee, S. Sharma and L. M. S. Palni (2002), Indigenous knowledge of wool dyeing: A Bhotia practice on its way out in the higher Kumaun Himalaya, *Indian Journal of Traditional Knowledge* Vol. 1(1), 40-46.
94. Saini, D. C. (1996), Ethnobotany of Tharus of Basti district, Uttar Pradesh, *J. Econ. Taxon. Bot. Additional Series*, 12, 138-153.
95. Samwatsar, Swati and V. B. Diwanji (1996), House and households of tribals of Western M. P.: An Ethnobotanical study, *J. Econ. Taxon. Bot. Additional Series*, 12, 196-198.
96. Samwatsar, Swati and V. B. Diwanji (1996), Plants used for skin disease, cuts, wounds and bruises by the tribals of Western M. P., *J. Econ. Taxon. Bot. Additional Series*, 12, 192-195.
97. Samwatsar, Swati and V. B. Diwanji (1996), Plants used in snakes, scorpion and insect bites/ stings by Adibasis of Jhabua (M. P.) India, *J. Econ. Taxon. Bot. Additional Series*, 12, 199-200.

98. Sen, S. K., and L. M. Bahera (2003), Ethnomedicinal plants used against skin diseases in Bargarh district in Orissa, *Ethnobotany* Vol.15, 90-96.
99. Sharma, G. R. K., (2004), Indigenous moulting practices: Traditional knowledge with Indian rural poultry farmers, *Indian Journal of Traditional Knowledge* Vol. 3(2), 208-211.
100. Sharma, S. C. (1996), A Medicobotanical study in relation to Veterinary medicines of Shahjahanpur district (Uttar Pradesh), *J. Econ. Taxon. Bot. Additional Series*, 12, 123-127.
101. Sharma, V. P., and A. V. Khan (1997), The Ethnomedico Zoological drugs on bird origin used by Garo tribals of Meghalaya, India, *Ann. For.*, 3(2), 167-171.
102. Shukla, Gyanesh and B. K. Verma (1996), Roots – A vital plant part to cure body ailments among tribals/ rural folklore of Western Bihar, *J. Econ. Taxon. Bot. Additional Series*, 12, 392-394.
103. Singh Brahma, O. P. Chaurasia and (Capt.) K. L. Jadhav (1996), An Ethnobotanical study of Indus valley (Ladakh), *J. Econ. Taxon Bot. Additional Series*, 12, 92-101.
104. Singh, Gopal S., (2004), Prospects of indigenous medicinal plants of Himachal Himalaya, *Indian Forester*, 62.
105. Singh, H. B. and M. V. Viswanathan (1996), Useful Pteridophytes of India – A gift of nature to Human beings, *J. Econ. Taxon Bot. Additional Series*, 12, 24-36.
106. Singh, H. Birkumar and Alka Jain (1999), Ethnobotanical observation on the preparation of Millet Beer in Sikkim State, India, *J. Econ. Taxon Bot* Vol.23 (1), 577-579.
107. Singh, Harish (2003), Herbal recipes for spermatorrhoea by Bhoxa tribe of Uttaranchal, *Ethnobotany* Vol 15, 115-117.
108. Singh, J., T. C. Bhuyan and A. Ahmed (1996), Ethnobotanical studies on the Mishing tribes of Assam with reference to food and medicinal plants-I, *J. Econ. Taxon. Bot. Additional Series*, 12, 350-356.
109. Singh, K. K., and Anand Prakash (1996), Observations on Ethnobotany of the Kol Tribe of Varanasi District, Uttar Pradesh, India, *J. Econ. Taxon. Bot. Additional Series*, 12, 133-137.
110. Singh, P. Kumar and H. B. Kumar Singh (1996), Superstition in Botanical folklore with reference to Meitei culture, *J. Econ. Taxon Bot. Additional Series*, 12,367-372.

111. Singh, Ranjit, S.K. Dwivedi, B. Raut and S. N. Mishra (2003), Ethnobotany of Hippophae “Seabuckthorn” in Ladakh, *Ethnobotany* Vol. 15, 1-5.
112. Singh, Subrata, K. R. (2003), Conflicts and disturbance lessons from community-based Natural Resource Management Institutions in Orissa, India, *Forest, Trees and Livelihoods* Vol.13, 233-246.
113. Sinha, B. K. and R. D. Dixit, Ethnomedicinal plants sold in Omkareshwar, Madhya Pradesh, *Ethnobotany* Vol.15, 127-128.
114. Sinha, B. K., Vinod Maina and P. M. Padhye, Ethno-medicinal plants of Bay Islands for skin care, *J. Econ. Taxon Bot. Additional Series*, 12, 375-380.
115. Siwakoti, M., and S. K. Varma (1996), Medicinal plants of the Terai of Eastern Nepal, *J. Econ. Taxon Bot. Additional Series*, 12, 423-438.
116. Siwakoti, M., and S. Siwakoti (1999), Ethnomedicinal uses of plants among the Satar tribe of Nepal, *J. Econ. Tax Bot* Vol.23 (1), 99-108.
117. Swami, Ajai, and B. K. Gupta (1996), A note on some commonly occurring medicinal weeds of Udhampur district (J & K), *J. Econ. Taxon Bot. Additional Series*, 12, 89-91.
118. Tiwari, K. C., and V. P. Tiwari (1996), Some important medicinal plants of the Tropical Subtropical and Temperate region of Siang, Subansari and Tirap districts of Arunachal Pradesh, *J. Econ. Taxon. Bot. Additional Series*, 12, 359-363.
119. Tosh, Jayananda (1996), Ethnobotanical study of Western Maharashtra, *J. Econ. Taxon Bot. Additional Series*, 12,169-174.
120. Upadhye, Anuradha and M. S. Kumbhojkar (1996), Ethnobotany of genus *Sterculia* L. from India, *J. Econ. Taxon Bot. Additional Series*, 12, 40-42.
121. Vidhyarthy, Anil Kumar and H. S. Gupta (2004), Ethno-Medicinal study of some important plants of Jharkhand and their conservation, *Indian Forester*, 149.