



# Essence Of Indian Traditional Knowledge Lecture Notes

Electrical Machines (Institute of Aeronautical Engineering)

**LECTURE NOTES**

**ON**

**ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE**

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## ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

### UNIT – I

#### INTRODUCTION TO TRADITIONAL KNOWLEDGE:

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs. western knowledge traditional knowledge vis-à-vis formal knowledge.

### UNIT – II

#### PROTECTION OF TRADITIONAL KNOWLEDGE:

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

### UNIT – III

#### LEGAL FRAMEWORK AND TK:

A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act);  
B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

### UNIT – IV

#### TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY:

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

### UNIT – V

#### TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS:

Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

## UNIT-I

### INTRODUCTION TO TRADITIONAL KNOWLEDGE

#### 1. Define traditional knowledge

##### Traditional Knowledge

Traditional knowledge (TK) is knowledge, know-how, skills and practices that are developed, sustained and passed on from generation to generation within a community, often forming part of its cultural or spiritual identity

- TK in a general sense embraces the content of knowledge itself as well as traditional cultural expressions, including distinctive signs and symbols associated with TK.
- TK in the narrow sense refers to knowledge as such, in particular the knowledge resulting from intellectual activity in a traditional context, and includes know-how, practices, skills, and innovations.

Traditional knowledge can be found in a wide variety of contexts, including: agricultural, scientific, technical, ecological and medicinal knowledge as well as biodiversity-related knowledge.

Traditional knowledge (TK) is a living body of knowledge passed on from generation to generation within a community. It often forms part of a people's cultural and spiritual identity. WIPO's program on TK also addresses traditional cultural expressions (TCEs) and genetic resources (GRs).

Traditional knowledge, indigenous knowledge and local knowledge generally refer to knowledge systems embedded in the cultural traditions of regional, indigenous, or local communities. Traditional knowledge includes types of knowledge about traditional technologies of subsistence (e.g. tools and techniques for hunting or agriculture), midwifery, ethno botany and ecological knowledge, traditional medicine, celestial navigation, craft skills, ethno astronomy, climate, and others. These kinds of knowledge, crucial for subsistence and survival, are generally based on accumulations of empirical observation and on interaction with the environment.

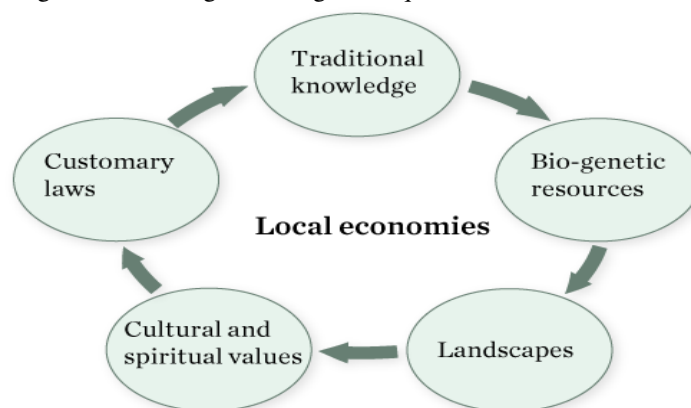
In many cases, traditional knowledge has been passed for generations from person to person, as an oral tradition. Some forms of traditional knowledge find expression in culture, stories, legends, folklore, rituals, songs, and laws. Other forms of traditional knowledge are expressed through other means.

##### Traditional knowledge refers to:

- Knowledge or practices passed down from generation to generation that form part of the traditions or heritage of Indigenous communities
- Knowledge or practice for which Indigenous communities act as the guardians or custodians

##### The type of knowledge that is considered within this scope includes:

- Knowledge about the medicinal properties or effects of flora and fauna
- Knowledge about hunting or fishing techniques



## 2. Nature and characteristics

### Nature:

- Is generated within communities
- Is location and culture specific
- Is the basis for decision making and survival strategies
- Is not systematically documented
- Concerns critical issues of human and animal life; primary production, human and animal life, natural resources management
- Is dynamic and based on innovation, adaption, and experimentation
- Is oral and rural in nature

When discussing TK protection, one must first grasp the special characteristics of TK, in order to create the best type of protection system for TK. For this, a comparison of TK and modern science will help explain the special characteristics of TK.

#### I. The creation of TK is collective and holistic

Science relies on an abstract conceptual framework to interpret phenomena. The description of phenomena is usually quantifiable by scientific experiments, and follows a step-by-step scientific deductive process. In order to figure out the conceptual relationship of complex phenomena of the world, scientific inquiries always involve reduction process. Cause and effect between certain factors are easier to be found by standardizing and leaving alone, as far as possible, all other factors that the inquirer do not looking for. Even with ecology as a science of complex interactions among living and non-living matters of the whole ecosystem, it is inevitable for the research process to be somewhat reductionist.

On the other hand, indigenous peoples or local communities live their lives with vast knowledge formed over the centuries during their daily life interacting with the environment. Epistemologically, this type of knowledge is holistic in nature and cannot be dissected. For example, a festival after the taboo month celebrating the beginning of the hunting season should avoid the breeding season of the animal, a form of TK that assures sustainable hunting. TK is an articulation of phenomena. Instead of step-by-step deduction, TK uses the repeated verification of an idea that a person or group of people deduce from facts.

However, TK is not necessarily a collective creation. Individual creation is also possible. On the other hand, modern science and technology do not exclude collective creation for innovations; although usually only one or more trained individuals own the technology as a small, definite group of individuals.

#### II. Oral transmission of TK from generation to generation

Traditionally indigenous peoples have no writing system. Indigenous people would transmit knowledge by oral language or by body language. On National Research Program for Genomic Medicine Searching for The Rationality of Post Genetic IPR Legal System the other hand, the transmission of scientific information relies on written records and publications, and a teacher simply accelerates the transmission of this knowledge orally.

However, not all TK lack the written records. For example, the distribution of classics on Chinese and Indian traditional medicine disseminated TK on Chinese and Indian traditional medicine. WIPO considers both forms of medicine as model forms of TK. Today, indigenous peoples may also use writing to transmit their TK, whether new or old.

#### III. TK is changeable, and may evolve because of changes in the social environment

“Traditional” does not just mean knowledge of the past, but rather that the method of creation of this knowledge is in the “traditional” way. Since people’s interaction with the environment produces TK, TK is by no means static, but rather dynamic, because of environmental changes. Since, in the past, the environment changed very slowly, TK also changed in a very slow and continuous way.

Science and technology change frequently, and at a rate that is faster than the rate at which TK changes. However, this does not mean that the speed of innovation of modern "TK" is slow. Today, indigenous peoples and tribal inhabitants may exchange new ideas very quickly. Nevertheless, TK changes are not typically revolutionary; unless outside influences affect such TK. Traditional Chinese medicine still maintains the concepts of the five elements and the principles of Yin and Yang from the Chin and Han Dynasty, a good example to illustrate the nature of the TK.

#### **IV. The innovator is often unidentifiable**

Many peoples accumulate TK as a collective creation without a written record. Therefore, the innovators are often unidentifiable. Modern technology, by contrast, has written records as a rule, and places great emphasis on the importance of determining the original creator. Nevertheless, since, in modern times, indigenous peoples can invent some TK quickly, their innovator usually is identifiable.

#### **V. Residents of specific areas share TK**

Often a closed society creates and preserves its TK. The dissemination of TK is limited and non-systematic. One individual, a small group of individuals, or even an entire community may all share TK. The indigenous peoples usually do not have the same concept of private property as in mainstream society. Modern technology, however, spreads in a broad and systematic manner, and mainstream culture embraces science by granting the specific individuals who create technology individual rights through the IP system.

A report of the International Council for Science (ICSU) Study Group on Science and Traditional Knowledge characterizes traditional knowledge as:

"A cumulative body of knowledge, know-how, practices and representations maintained and developed by peoples with extended histories of interaction with the natural environment. These sophisticated sets of understandings, interpretations and meanings are part and parcel of a cultural complex that encompasses language, naming and classification systems, resource use practices, ritual, spirituality and worldview."

Traditional knowledge typically distinguishes one community from another. In some communities, traditional knowledge takes on personal and spiritual meanings. Traditional knowledge can also reflect a community's interests. Some communities depend on their traditional knowledge for survival. Traditional knowledge regarding the environment, such as taboos, proverbs and cosmological knowledge systems, may provide a conservation ethos for biodiversity preservation. This is particularly true of traditional environmental knowledge, which refers to a "particular form of place-based knowledge of the diversity and interactions among plant and animal species, landforms, watercourses, and other qualities of the biophysical environment in a given place". As an exemplar of a society with a wealth of traditional ecological knowledge (TEK), the South American Kayapo people, have developed an extensive classification system of ecological zones of the Amazonian tropical savannah (i.e., campo / cerrado) to better manage the land.

Some social scientists conceptualize knowledge within a naturalistic framework and emphasize the gradation of recent knowledge into knowledge acquired over many generations. These accounts use terms like adaptively acquired knowledge, socially constructed knowledge, and other terms that emphasize the social aspects of knowledge. Local knowledge and traditional knowledge may be thought of as distinguished by the length of time they have existed, from decades to centuries or millennia.

Indigenous knowledge or techniques (ITKs) are the treasure troves of ancient wisdom and are developed through trial-and-error, experiences gained over the centuries, and are time tested but, generally not substantiated by any scientific evidences. However, most of the ITKs were known to be scientifically effective and valid.

Scholarly studies in the naturalistic tradition demonstrate that traditional knowledge is not a natural category, and may reflect power struggles and relationships for land, resources and social control rather than adherence to a claimed ancestry or heritage.

On the other hand, indigenous and local communities themselves may perceive traditional knowledge very

differently. The knowledge of indigenous and local communities is often embedded in a cosmology, and any distinction between "intangible" knowledge and physical things can become blurred. Indigenous peoples often say that indigenous knowledge is holistic, and cannot be meaningfully separated from the lands and resources available to them. Traditional knowledge in such cosmologies is inextricably bound to ancestors, and ancestral lands. Knowledge may not be acquired by naturalistic trial and error, but through direct revelation through conversations with "the creator", spirits, or ancestors. Chamberlin (2003) writes of a Gitksan elder from British Columbia confronted by a government land-claim: "If this is your land," he asked, "where are your stories?"

Indigenous and local communities often do not have strong traditions of ownership over knowledge that resembles the modern forms of private ownership. Many have clear traditions of custodianship over knowledge, and customary law may guide who may use different kinds of knowledge at particular times and places, and specify obligations that accompany the use of knowledge. For example, a hunter might be permitted to kill an animal only to feed the community, and not to feed himself. From an indigenous perspective, misappropriation and misuse of knowledge may be offensive to traditions, and may have spiritual and physical repercussions in indigenous cosmological systems. Consequently, indigenous and local communities argue that others' use of their traditional knowledge warrants respect and sensitivity. Critics of traditional knowledge, however, see such demands for "respect" as an attempt to prevent unsubstantiated beliefs from being subjected to the same scrutiny as other knowledge-claims. This has particular significance for environmental management because the spiritual component of "traditional knowledge" can justify any activity, including the unsustainable harvesting of resources.

### **3. Scope and importance**

#### **I. The scope of TK**

TK includes technical knowledge (including agricultural, technical, ecological, medical, and other forms of related technical knowledge), in addition to general TK (including music, dance, sculpture, weaving, designs, clothing, and other folk custom techniques, and other expression of folklore). While the first kind of TK concerns knowledge of natural resources or science and technology, the second kind of TK concerns cultural expression of the humanities and the arts (note that many people refer to the second kind of TK as "expression of folklore" or "expressions of traditional culture"). The two types of TK are different, and the types of protection for these two types of TK are naturally different as well.

#### **II. Whether or not documented**

The background of TK and manifestation of TK is quite different; some TK is documented, such as TK concerning traditional medicine. However, the vast majority of TK is NOT documented, perhaps due to custom (for example, the transmission of indigenous medical knowledge by word of mouth from master to disciple, or transmission by movement or performance of a dance, play, or ceremony, etc.). Whether one publishes or records the knowledge makes no difference at all, TK published or not, is still traditional knowledge of the peoples.

#### **III. Ownership of TK**

Because tribes and indigenous peoples develop ideas, opinions, or thoughts as TK, the creation of TK is a process of gradual accumulation over time. This is not to say that it is not the product of each individual. The creation of TK may be the work of one individual or the joint efforts of a group of individuals. Therefore, an individual, a family, or a local community, or a tribe may all own TK. For example, several million women and older people have traditional household remedies from their mastery of knowledge of the special medicinal properties of plants. Most TK involves collective ownership by a group of people.

#### **IV. Continuous evolution**

While TK often appeared in early times when tracing the origin of this knowledge was impossible, TK still changes with the times. For this reason, TK is not truly ancient, backward, or unchangeable knowledge, as TK can develop new information and improvements as a result of this unceasing change.

## **V. Importance of Traditional Knowledge**

- Influences individuals and community health
- Reinforces sense of identity and group cohesiveness
- Contributes to present day practices
- Fosters first nation acceptance and participation
- Represents generation of knowledge and experience
- Greater adaptability of adaption programs
- Enhanced participation of affected communities
- Empowerment of people in the decision process
- Better understanding of the situation and local practices by external agents
- Strengthens replicability conditions (use of local resources)

### **4. Kinds of traditional knowledge**

While IK research originally emphasized indigenous technical knowledge of the environment, it is now accepted that the concept of IK goes beyond this narrow interpretation. IK is now considered to be cultural knowledge in its broadest sense, including all of the social, political, economic and spiritual aspects of a local way of life. Sustainable development researchers, however, have found the following categories of IK to be of particular interest:

- Resource management knowledge and the tools,
- Techniques, practices and rules related to pastoralism,
- Agriculture, agro-forestry, water management and the gathering of wild food;
- Classification systems for plants, animals, soils, water and weather;
- Empirical knowledge about flora, fauna and inanimate resources and their practical uses;
- And the worldview or way the local group perceives its relationship to the natural world.

### **5. The physical and social contexts in which traditional knowledge development**

The evolution of TKS is very much local in nature and associated with a particular environmental and/or socio-cultural context. It is designed and developed by the local community through their constant observation, trial and modification/customization to match with its appropriateness. Therefore, TKS has the characteristics of local, empirical, time tested dynamisms. Moreover, TKS is always handed over or transferred from one generation to another and also between communities mostly orally and/or visually.

From its domain of application and associated management approaches, TKS can be categorized as

- (i) Traditional Ecological Knowledge (TEK)
- (ii) Traditional Technical Knowledge (TTK) and
- (iii) Traditional Value and Ethics (TVE).

TEK represents knowledge associated with natural resources and environmental management, TTK refers to knowledge associated with tools and appliances used and TVE refers to value, norm, institution and policy framework evolved with traditional knowledge based practices.

#### **I. Traditional Ecological Knowledge (TEK)**

TEK refers to the evolving knowledge acquired by indigenous and local people over hundreds or thousands of years through direct contact with the environment. This knowledge is specific to a location and includes the relationships between plants, animals, natural phenomena, and the landscape that are used for livelihood and sustenance of life, such as resource gathering through hunting, fishing, agriculture, livestock farming, forestry, agro-forestry, etc. All these can be categorized as natural resource management, as these practices are linked with management of land, water, flora and fauna. Such practices are linked to prioritization of uses along the line of sustainable harnessing, wise use, equitable sharing of benefits, management of future stocks through conservation, defining threshold limits, etc.



There are practices for weather forecasting too. Such TEK considers natural landscape characteristics (topography, slope, soil and rock characteristics), weather and climate as well as types of flora and fauna. The community takes necessary decision based on abundance/ scarcity and seasonality of biotic and abiotic resources, natural disasters, and associated problems. It is a process of indigenous communities for observation, classification, analysis, interpretation and decision making for daily walk of life along with development of world views.



## **II. Traditional Technical Knowledge (TTK)**

TTK represents the knowledge related to design and development of tools, implements and gears for different application in the context of natural resource management by the indigenous communities. Such practices are related to agriculture, fisheries, animal husbandry, forestry, handloom and handicraft etc. Moreover, TTK also represents the knowledge and skill about design and construction like housing, water harvesting structure, roads and bridges, etc.

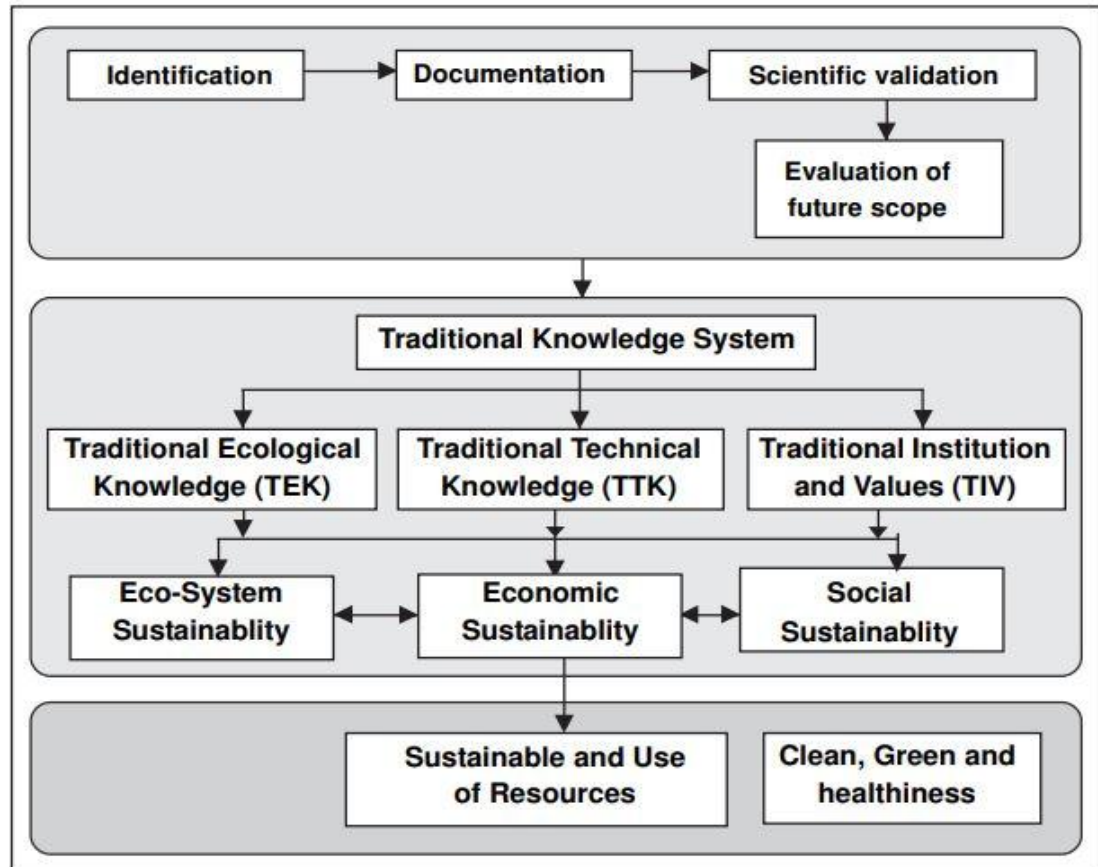


## **III. Traditional Value and Ethics (TVE)**

TVE is linked to traditional cultural practices which prioritize dos and don'ts in the aspects in relation to natural resource harvesting, conservation, and equitable sharing etc. During the process, it evolves the concept of sacred species, space, forests, water bodies, etc. This

involves seasonality based practices like restriction of fishing during breeding season, harvesting forest resources during flowering period, etc. Sometimes institutions are developed to manage human habitation, controlling human practices related to health and sanitation, like restriction of food in different seasons, restriction of waste disposal, norms for location of animal sheds, toilets etc. Exploration and documentation of such practices in local context will help in understanding these practices, creating a knowledge base and analysis and validation of its scientific base. This will help to identify the prospects for the future adopting lifestyles, habitat management, environment, natural resource management, wildlife protection, etc.

**Fig: Framework of the sub-theme**



## 6. The historical impact of social change on traditional knowledge systems

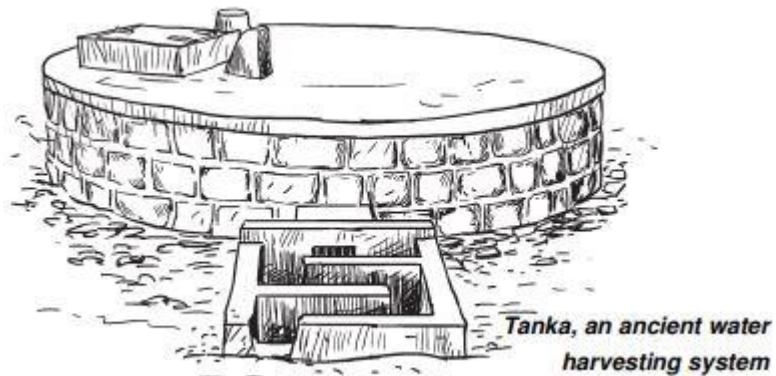
### I. Traditional Water harvesting practices

There are many age-old-practices of harvesting water in the country, basically to collect rainwater, restore surface flow of water, ground water recharging, etc. These are based on simple technology and defined management principles.



*Step well, an ancient water harvesting structure*

A step well is exactly what it sounds like- steps down to a well. The earliest step wells date back to about 550 AD was developed in India as a necessity for areas suffering from torrential seasonal rains.



Though originally found in the desert towns, the system has since gained immense popularity in rural areas. The rural Taankas found In Phalodi, Barmer and Balotra region, were of 6.1 m deep, 4.27 m long and 2.44 m wide. This technique of rainwater harvesting was perfected to a fine art in the arid regions of western Rajasthan.



**Johad, an ancient practice of Rajasthan**

Tanka, an ancient water harvesting system 127 Step well, an ancient water harvesting structure Johd is a dam that collects rainwater to replenish the supply of underground water table.



**Zabo a traditional practices among the Naga communities**



Zabo, which means ‘impounding water’, is an ingenious method of catching rainwater runoff from the mountains. It is located at an altitude of 1270 m in Kikruma, a quaint village nestled in a rain-shadow area of Phek district of Nagaland. Centuries ago, the village evolved a self-organizing system to take care of its water, forest and farm management Johad, an ancient practice of Rajasthan Zabo a traditional practices among the Naga communities

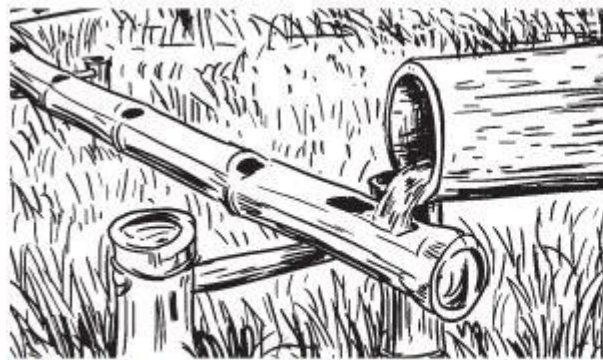
Surangas continue to be one of the relatively less known and gradually disappearing traditional water harvesting systems of Kasargod district of Kerala. Surangas can be compared to a horizontal well or cave excavated in hard lateritic soil formations from which water seeps out, and flows out of the tunnel to be collected in open ponds. Despite their decline, they continue to be a lifeline for a large number of farmers in Kasargod, who depend on surangas to meet their drinking water needs.

## II. Bamboo drip irrigation



*Surangas a traditional practice in Kerala*

In different states of North-Eastern part of India Bamboo drip irrigation is a common practice. The design of the Bamboo pipe for irrigation varies with variation of rainfall, which reflects the uniqueness of traditional knowledge system of the local communities.



**(A) Bamboo drip irrigation of Karbi-Anglong, Assam**



**(B) Bamboo drip irrigation of Meghalaya**

Picture (A) shows the Traditional Bamboo drip irrigation practiced by the Karbi communities (known as Longsor in Karbi) in the rain-shadow area of Karbi-Anglong, Assam.



*Traditional Bamboo drip irrigation in intermediate rainfall area of on the northern plains and foothills of Assam-Aruanachal and Bhutan border area*

A different Traditional Bamboo drip irrigation (B) is practiced in high rainfall area of Meghalaya Surangas a traditional practice in Kerala (B) Bamboo drip irrigation of Meghalaya (A) Bamboo drip irrigation of Karbi-Anglong, Assam

### **III. Traditional Housing - a reflection of STI**

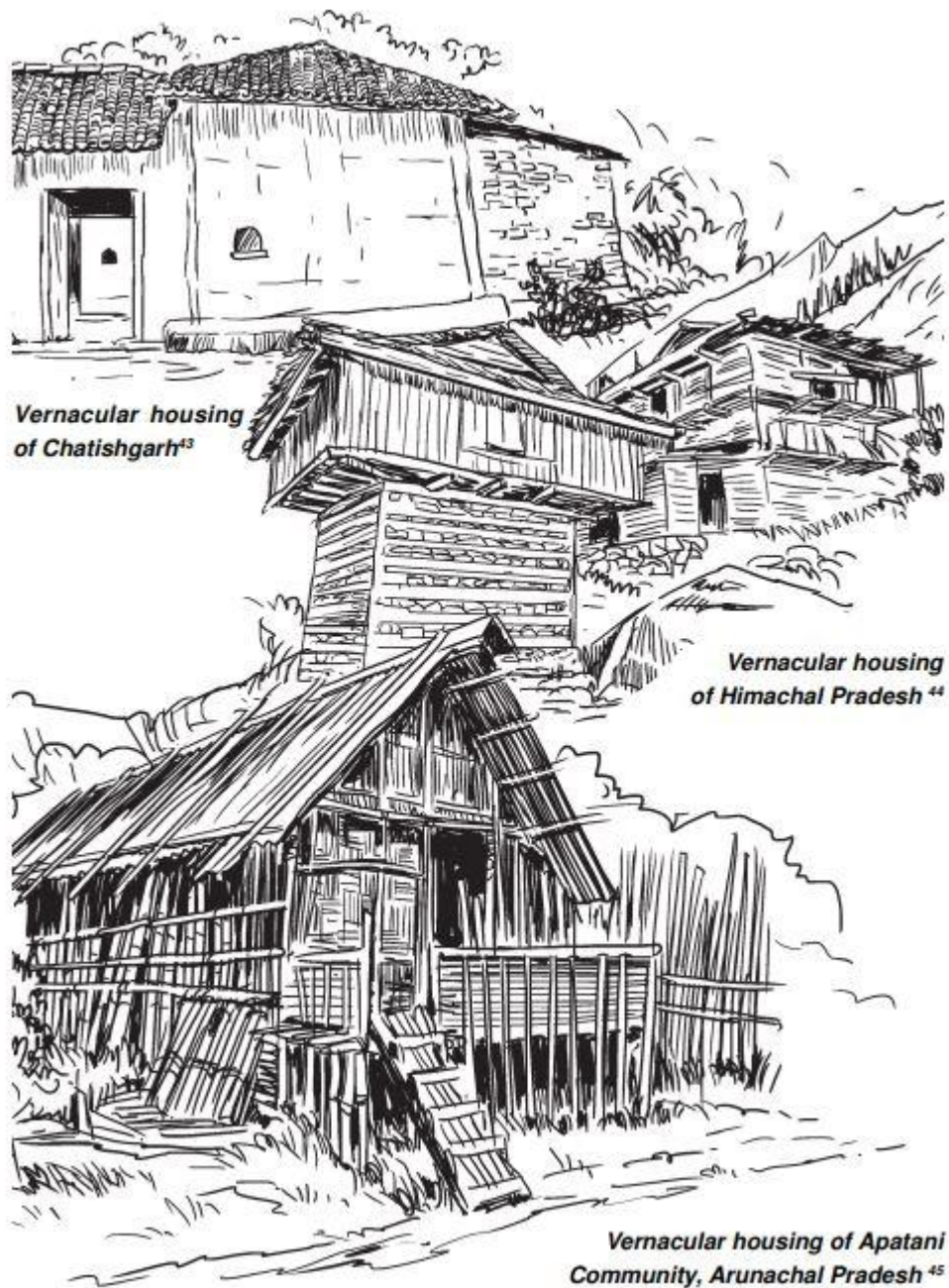
Usually these are called Vernacular Architecture, which is an architectural style and design based on local needs, availability of construction materials and reflecting local traditions. Originally, vernacular architecture relied on the design skills and tradition of local builders/ skilled labors. It tends to evolve over time to reflect the environmental, cultural, technological, economic, and historical context in which it exists. 40 In case of environmental factors major aspects are – geology, land and soil; weather and climate; availability of the building materials in the locality. On the other hand, family size, family structure (joint or nuclear), food habits, materials, cultural practices, belief system etc. Based on the building materials used in wall construction it can be categorized as Adobe (mud blocks or whole walls), Masonry (stone, clay, or concrete blocks), Timber, Bamboo etc. Commonly a combination of materials is generally used. The layout of the building also varies, like Circular plan, Rectangular plan and linear plan. Similarly, there may be Single story or Multi-storied buildings.

In Indian condition such vernacular housing are very common in rural context and its design, plan and building material vary with geographical regions.



*Vernacular housing of Kerala<sup>4</sup>*





Traditional Bamboo drip irrigation in intermediate rainfall area of on the northern plains and foothills of Assam-Aruanachal and Bhutan border area Vernacular housing of Kerala

It is important to explore such practices with the objectives to identify merits and demerits of such practices and its usefulness in the context of climate change adaptation, earthquake resistance, environmental sustainability etc.

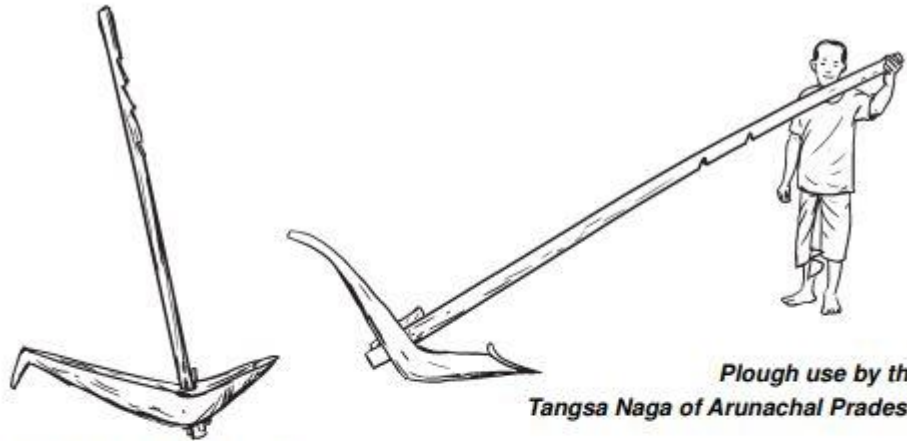
#### **IV. Traditional agricultural practices**

In many areas of the country, traditional agricultural practices are still considered important. These practices are followed in selection of crop varieties, land selection, land preparation, soil fertility management, pest and disease management, irrigation, harvesting, post-harvest management, seed preservation, etc. Moreover there are different tools and implements used for the purposes, some of which are mentioned below:

There are different shapes and sizes of ploughs and hoes used for tilling of soil in the country, which

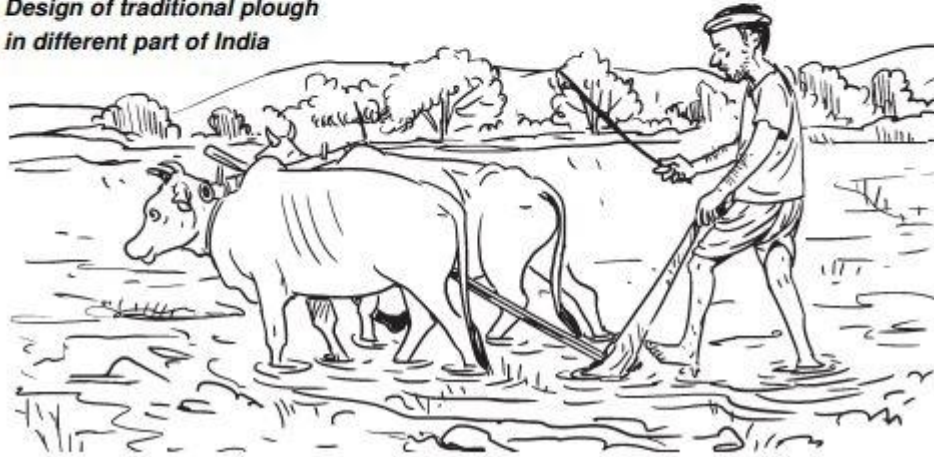
varies from region to region based on soil quality, terrain condition and the crop used for cultivation. Not only that, with variations in the crop varieties, the tools used for harvesting also changes. Best example is variations in the different shape and size of sickle used in different areas from time immemorial.

Similarly there are different types of land cultivar in different regions, which are potential source for climate change adaptation; because many of such crop varieties are either draught and/ or flood tolerant.



**Plough use by the  
Tangsa Naga of Arunachal Pradesh**

**Design of traditional plough  
in different part of India**



**Varied design of Sickle used in different regions of India**



**Traditional rice land races**



**Variety most common in central part of North Eastern Region of India**



**Variety most common in Assam and northern India**



**Variety prominent in The Cauvery Delta near Thanjavur of Tamilnadu**



## Seed Preservation Technique

In different regions people adopt different methods of seeds preservation and storage, some of which are shown below:



*Seed preserved by the Nyishi Women in Lower Subansiri, Arunachal Pradesh*

## V. Weather Forecasting/ Prediction

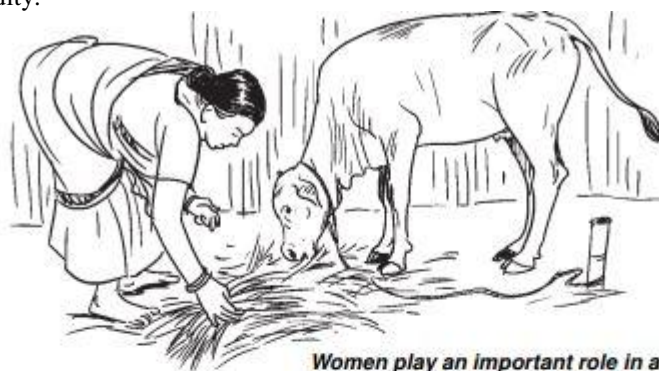
There are many methods of weather prediction practiced by the farmers in different parts of the country. For example, farmers in Himachal Pradesh believe that if the honeybee flies toward northern hill there will be no rainfall, if they fly towards south there will be good rainfall. On the other hand, in Rajasthan many local communities believe that appearance of many butterflies together indicate a good rain and get better crops.

Similarly, Karbi Hill Tribes of Assam have a traditional calendar system which is used for agricultural planning. The months or periods are identified by a few conserved features of plants and animals and also physical factors. These indicators are so marked that there is a specific 'phrase' ascribed to each month or period. For example, the first month of the year is called ThangThang(February), which is noted with phrase "ThangThang- ritlang", where ThangThang represents the month and rit means Jhum (shifting cultivation), lang means – cultivation of land; simply it is the time for preparing land for shifting cultivation. This month is characterised by flowering of Pharche (*Erythrina stricta* Roxb.; Leguminosae) and Pharkong (*Bombax malabaricum* DC.; Bombacaceae). These are the most important indicators of this period, which reminds the people of the appropriate time to look for new jhum land. Similarly, for all the months they have some biological indicators, which acts as the link to agricultural activities. In most of the cases, such phenomenon are related with seasonality and in maintaining season-wise agricultural activities. Similarly, there are many such examples available in different agroclimatic zones of the country. Seed preserved by the Nyishi Women in Lower Subansiri, Arunachal Pradesh



## VI. Traditional practices in animal husbandry

Traditional knowledge regarding animal husbandry can be considered as old as domestication of various livestock species. But these practices are in vogue throughout rural India and those are documented little and hence, there are possibilities of eroding out of these knowledge systems. For example, traditional practice of the feeding includes crop residues like straw, stalks, stovers, tops and crop thrush like wheat, paddy straw, etc as well as crop by-products that includes Bran, Husk, straw of Wheat, Rice, Bajra and Maize. Women have a very important role in the traditional method of integrating agriculture with animal husbandry. Traditional knowledge about treatment of the animal disease includes both preventive and curative practices based on local medicine using herbs. Women understand the importance of each herb and plant combination. They understand which leaves are best for which fodder; and their suitability for milching of the cattle and preparing highly concentrated feeds for the animals for improving milk yield. Thus, it becomes very important to collect and document the practices and also to evaluate their validity.



**Women play an important role in animal husbandry**

**Table-5.1. Treatments practised to cure disease of the animals.**

Sl.no.	Ailments	Practice Followed
1	Wounds	Devadar Tree Oil
2	External Parasites	Cow Urine and Black Ash
3	Loss of Appetite	Dhania +Onion+Kalajeera+Curd
4	Fever	Kala Jeera Powder
5	De worming	Forest Leaves, Stem Peeling
6	Bloat	Kala Jeera + Dhania mix with the feed
7	Rumination	Kala Jeera
8	Treatment of minor injuries	"Bans" leaf pastel local name of some grass
9	Controls of Ticks in Animals	"Karo" grass rubbed on the skin
10	Food and mouth disease	Animals with rotten foot are kept in mud, phenyl is applied to the foot and condition of sour mouth

**Source:** *Animal Husbandry Practices of Organic Farmers: An Appraisal. Subrahmanyeshwari B and Mahesh Chander, Veterinary World, 2008*

Fodder management for domesticated cattle is a challenge for many rural areas. Traditionally people adopted different techniques. For example, in Garo hills area of Meghalaya, successive vegetative growth of grassland abundant in Jhum plots is protected by Garo community as the source of fodder for their cattle. Usually, they shift their cattle shed near to this plot for easy grazing. With variations in such grass plot in abundant jhum they shift their cattle rearing sites. It is noteworthy that, shifting of cattle shed near to such plot also contributes addition of cow dung and urine to jhum plot. In many regions the provisions of cattle shed also varies with their environmental situation. For example, in Barpeta and Baksa districts of Assam, villagers keep their domesticated cattle in multi-storied cattle sheds; the first floor of the bamboo-steel multi-storied cattle shed is used for keeping the cattle. According to many villagers, these practices ultimately help them to maintain clean cattle sheds and make it easy to collect the dung. The clean cattle shed helps in maintaining cattle health, particularly from diseases that occur in the summer and monsoon season.



**Managing fodder plot in abundant jhum plot by Garo community in Meghalaya**



**Multi-storied cattle shed**

Similarly there are many such traditional practices, their documentation along with assessment of scientific basis are important areas of study.

## **7. Indigenous Knowledge (IK), characteristics**

The term "Indigenous" defined according to UN as "Groups of people whose social, cultural and economic conditions distinguish them from other sections of the national communities, and whose status is regulated wholly or partially by their own customs or traditions or by special laws or regulations. People in independent countries who are regarded as indigenous are considered as descent people who inhabited geographical region to which belongs, at the time of colonization or the establishment of present state boundaries".

Considering the diversity of indigenous people, an official definition of "indigenous" has not been adopted by any UN-system body. Instead the system has developed a modern understanding of this term based on the following criteria:

- Historical continuity with pre-colonial and/or pre-settler societies.
- Strong link to territories and surrounding natural resources.
- Distinct social, economic or political systems.
- Distinct language, culture and beliefs.
- Form non-dominant group of society.
- Resolve to maintain and reproduce their ancestral environments and systems as distinctive people and communities.

The term "indigenous" has prevailed as a generic term for many years, in some countries, there may be preference for other terms including: tribes, first people/nations, aboriginals, ethnic groups, Adivasi, janajati, geographical terms like hunter, nomads, peasants, hill people ... etc. In many cases, the term "indigenous" has negative connotations and some nations may choose not to reveal or define their origin as 'indigenous'.

## **LOCAL AND TRADITIONAL KNOWLEDGE and other definitions that should be considered:**

**Local knowledge (LK)** is a collection of facts and relates to the entire system of concepts, beliefs and perceptions that people hold about the world around them. This includes the way people observe and measure their surroundings, how they solve problems and validate new information. It includes the processes whereby knowledge is generated, stored, applied and transmitted to others.

**Traditional knowledge (TK)** implies that people living in rural areas are isolated from the rest of the world and that their knowledge systems are static and do not interact with other knowledge systems.

**Traditional Ecological Knowledge (TEK)** is indigenous or local knowledge and is the body of knowledge or natural history built up by a group of people through generations of living in close contact with nature, which through trial and error they have developed an understanding of the ecosystem in which they lived. TEK includes a system of classification, a set of empirical observations about the local ecology, and a system of self-management that governs resource uses such as hunting, trapping and fishing. .

**Ethno-ecology** is the study of local or native people's interaction with the environment in which they live and work, including their perceptions, use and management, and knowledge. Sub-disciplines of ethno ecology include ethno biology, ethno botany, ethno zoology, and ethno pharmacology.

## **INDIGENOUS/ TRADITIONAL KNOWLEDGE CHARACTERISTICS**

- It is dynamic, systematic and universal in principle. It is unwritten and known through the oral traditions.
- It is practical common sense, based on teachings and experience passed on from generation to generation.
- It is holistic - it cannot be compartmentalized and It is rooted in the spiritual health, culture and language of the people.
- It sets out the rules governing the use of resources - respect; an obligation to share. It is dynamic, cumulative and stable.
- It is a way of life - wisdom is using knowledge in good ways. It is using the heart and the head together. It comes from the spirit in order to survive.
- It gives credibility to people.
- It is based on experience, acquired from observations over time - it is argued that it may be most useful for local scale decision-making;
- It can show an understanding of the complex relationships between these individual components and the dynamic ecosystems within which they act;
- It is frequently linked with the sustainable use of local resources.
- It describes the health of the local environment, wildlife, etc., promotes consideration of the relationships between human and biological systems;
- It often describes these symbiotic relationships and provides the basis for life sustaining decisions about how to relate to the environment.

## **8. Traditional knowledge vis-à-vis indigenous knowledge**

Over time, Indigenous peoples around the world have preserved distinctive understandings, rooted in cultural experience, that guide relations among human, non-human, and other-than human beings in specific ecosystems. These understandings and relations constitute a system broadly identified as Indigenous knowledge, also called traditional knowledge or aboriginal knowledge. Archaeologists conducting excavations in Indigenous locales may uncover physical evidence of Indigenous knowledge (e.g. artifacts, landscape modifications, ritual markers, stone carvings, faunal remains), but the meaning of this evidence may not be obvious to non-Indigenous or non-local investigators. Researchers can gain information and insight by consulting Indigenous traditions; this localized knowledge contains crucial information that can explain and contextualize scientific data. Archaeologists should, however, strive to avoid interference with esoteric knowledge, sacred sites, ritual landscapes, and cultural property. Research consultation with local Indigenous knowledge-bearers is recommended as a means to ensure ethical practice and avoid unnecessary harm to sensitive sites and practices.



Traditional Indigenous knowledge can be defined as a network of knowledge, beliefs, and traditions intended to preserve, communicate, and contextualize Indigenous relationships with culture and landscape over time. One might distinguish "knowledge" as factual data, "belief" as religious concepts, and "tradition" as practice, but these terms are often used imprecisely and interchangeably to describe Indigenous epistemologies. Indigenous knowledge are conveyed formally and informally among kin groups and communities through social encounters, oral traditions, ritual practices, and other activities. They include: oral narratives that recount human histories; cosmological observations and modes of reckoning time; symbolic and decorative modes of communication; techniques for planting and harvesting; hunting and gathering skills; specialized understandings of local ecosystems; and the manufacture of specialized tools and technologies (e.g., flint knapping, hide tanning, pottery-making, and concocting medicinal remedies).

Indigenous communities have devised distinctive methods of encoding useful data within philosophies of thought and modes of activity that are linked to particular landscapes. This data includes geographical, genealogical, biological, and other evidence that maps human relations to flora and fauna, land and water, and supernatural forces. Knowledge is often passed on through regular Indigenous performances--including oral traditions, song, dance, and ceremony---that convey both literal and metaphorical truths about these relations. Skilled individuals and families are entrusted to maintain these traditions; some are specialists who protect esoteric knowledge. Although many aspects of traditional knowledge have been identified and recorded through ethnographic and ethno historical research, some are still unknown to outsiders. Individual ethnic and tribal communities, in different regions of the world, have preserved different versions of traditional knowledge. While this knowledge might share some things in common, they do not comprise a single (or simple) toolkit. Indigenous knowledge can be envisioned as an hereditary system of learned awareness and skill that enables wisdom to be gained and tools to be constructed, as needed, from the materials at hand. This knowledge are rooted in a particular place or ecosystem, but they are not necessarily static or fixed. Religious knowledge, for example, are quite portable, and can be used to mediate human encounters with ancestral spirits and other-than-human beings, wherever these encounters might take place. Ecological knowledge are also portable, in that they call for reliance upon local resources and careful observations of the interactions between living beings and natural processes within an ecosystem (any ecosystem) to ensure human survival.

## 9. Traditional knowledge Vs. western knowledge

Indigenous Knowledge	Western Scientific Knowledge
qualitative	quantitative
intuitive	rational
holistic	reductionist
moral, spiritual	supposedly value-free
considers "mind" and "matter" together	mechanistic
based on empirical observation	based on experimentation and systematization
generated and held by the users themselves	generated by specialists
diachronic (long-time series of information on one locality)	synchronic (short-time series over a large area)

#### 10. Traditional knowledge vis-à-vis formal knowledge

Traditional Knowledge	Scientific Knowledge
<ul style="list-style-type: none"><li>-sacred / interconnected</li><li>-taught through stories</li><li>-learning by doing</li><li>-oral / visual</li><li>-whole system</li><li>-based on experience</li><li>-long term wisdom</li><li>-transfer of knowledge is slow</li><li>-explanations via examples, stories + myths</li></ul>	<ul style="list-style-type: none"><li>-secular / segregated</li><li>-formal teaching</li><li>-formal education</li><li>-written</li><li>-parts make up the whole</li><li>-based on facts</li><li>-short term prediction</li><li>-transfer of knowledge is fast</li><li>-explanations via hypothesis, theories, laws</li></ul>

## **UNIT-II**

### **PROTECTION OF TRADITIONAL KNOWLEDGE**

#### **1. Protection of traditional knowledge**

Need to protect traditional knowledge have increased with changing time, especially in order to stop unauthorized and commercial misuse of such knowledge. It is important to protect the indigenous people from such loss and also help them to preserve such ancient practices. Protection to TK shall also promote its wider and efficient use.

##### **Protection of Traditional Knowledge**

The most difficult aspect of traditional knowledge is in its protection. There has been a lot of debate to protect traditional knowledge under IP regime but that in itself faces a lot of challenges such as; a) under which IP under which traditional knowledge can be protected, b) since every IP protection is provided for a limited period of time then how will traditional knowledge have a continuous protection. Protection of traditional knowledge is rooted in the problem of Bio-piracy. Bio-piracy occurs when there is commercial utilization of traditional knowledge without proper authorization of the indigenous or local people associated with such knowledge.

##### **How to Protect Traditional Knowledge**

There are methods through which TK can be protected: a) Positive Protection, and b) Defensive Mechanism. Positive protection means protecting TK by way of enacting laws, rules and regulations, access and benefit sharing provisions, royalties etc. Defensive Mechanism means steps taken to prevent acquisition of intellectual property rights over traditional knowledge.

India, for example, followed by the well-known case of USPTO, wherein patent was granted on healing properties of turmeric and with much difficulty CSIR proved the prior existing knowledge of such properties of turmeric with help of numerous ancient scriptures and documents, has adopted a Defensive mechanism to protect its traditional knowledge by way of setting up a Traditional Knowledge Digital Library (TKDL) in 2001, in collaboration between Ministry of Ayush and CSIR.

But is TKDL adequate? The digital library, although comprising of voluminous documents and work of Indian traditional knowledge, has its own shortcomings such as; translation problems, disclosure of traditional knowledge as prior art is un-advantageous since it leads to public disclosure of entire traditional knowledge which simultaneously results to fishing expeditions, further one of the major aspect of traditional knowledge is that it is mostly passed by generations in oral manner, therefore, a lot of TK has no documentary record and TKDL maintains no record of oral traditional knowledge.

##### **Adequacy of IP protection to Traditional Knowledge in India**

Unlike other categories of intellectual property rights, India has no substantive act or law to protect traditional knowledge but other IP acts contain provisions with respect to traditional knowledge such as the Patents Act, 1970, Section 25 and Section 64 gives one of the grounds for revocation of a patent application on the basis of traditional knowledge. Under the Copyright Act, 1957, has not specific mention of protecting traditional cultural, literary or artistic work or folklore but Section 31A provides for protection of unpublished Indian work, nonetheless Copyright protection in for a limited time period and also demands certain criteria to be fulfilled, therefore under this IP as well protection of traditional knowledge doesn't have much scope.

Past few years it has been seen that India has actively participated in TK conventions and has made efforts to protect its TK at international level. Access to Indian TK is available at USPTO and EPO and CSIR is day by day improving the efficiency of TK database.

##### **Important International TK related conventions**

The CBD and the 2010 Nagoya Protocol introduces the recognition and protection of TK at international level. Article 8(j) of the CBD, requires parties are required to respect and maintain knowledge held by indigenous communities, and promote broader application of TK based on fair and equitable benefit-

sharing. Article 16 recognizes TK as a 'key technology' for effective practices of conservation and sustainable use of biodiversity, with procedural requirements established in Article 15 for access to genetic resources, including those based on prior informed consent and mutually agreed terms. The Nagoya Protocol broadens the CBD provisions relating to access and benefit-sharing.

### **Call for Sui Generis Protection and its Awareness**

There has been an increasing demand of Sui Generis system of Protection for traditional knowledge since IP protection has its own downside and loopholes. Sui Generis is a Latin word meaning 'of its own kind'. Sui generis instrument shall provide legal framework of protection of TK, enforcement of right of indigenous communities, prevent misuse and control of TK, provisions of ABS (access and benefit sharing) system etc.

In addition to TKDL system, India can work towards a more active approach, foremost to create awareness and understanding among people who are till date completely unaware or have very limited knowledge on Intellectual Property Rights as well as the term 'traditional knowledge'.

## **2. The need for protecting traditional knowledge**

The World Intellectual Property Organization (WIPO) Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (the IGC), which met for the first time in 2001, is in discussions about draft provisions for the enhanced protection of traditional knowledge and traditional cultural expressions against misappropriation and misuse. WIPO's work in these areas involves close cooperation with other international organizations and NGOs, as well as the organization of a wide range of capacity building activities. Capacity-building resources include practical guidelines for indigenous and local communities on developing intellectual property protocols, and information technology tools for managing intellectual property issues when digitizing intangible cultural heritage. In 2000, the WIPO General Assembly established forum for the discussion of intellectual property issues in relation to access to genetic resources and benefit sharing, the protection of traditional knowledge and expressions of folklore. The work program has produced an impressive number of discussion papers, surveys of national laws and data obtained by means of surveys, consultations and fact-finding missions. The technical dimensions of the issues have received a thorough exploration in a number of papers prepared by the Secretariat. The work program also has produced a number of practical outcomes as: A toolkit for the management of intellectual property in the context of documenting traditional knowledge and genetic resources; a practical guide for the protection of traditional cultural expressions and a database of contractual provisions relating to intellectual property and access to genetic resources.

Discussions of WIPO to date have considered the following issues:

- Human rights treaties and other existing or emerging instruments that is applicable to traditional knowledge and genetic resources.
- Elements of customary law that are vested in traditional knowledge protection and transmission.
- Analysis of indigenous participation, including the levels and roles in decision-making, including measures to ensure compliance with free, prior and informed consent.
- Options and opportunities in the proposed certificate of origin, source or legal provenance from genetic resources.
- Role of customary law in the protection of traditional knowledge and development of regimes on access to genetic resources and benefit sharing.

In applying these principles at the domestic and national level, it is envisaged that an international access and benefit-sharing regime would be supported by national legislation that addresses a sui-generis protection of indigenous traditional knowledge, innovation and practices, ensuring compliance.

## **3. Significance of TK Protection**

In just under two years, in Europe alone, India has succeeded in bringing about the cancellation or withdrawal of 36 applications to patent traditionally known medicinal formulations. The key to this success has been its Traditional Knowledge Digital Library (TKDL), a database containing 34 million



pages of formatted information on some 2,260,000 medicinal formulations in multiple languages. Designed as a tool to assist patent examiners of major intellectual property (IP) offices in carrying out prior art searches, the TKDL is a unique repository of India's traditional medical wisdom. It bridges the linguistic gap between traditional knowledge expressed in languages such as Sanskrit, Arabic, Persian, Urdu and Tamil, and those used by patent examiners of major IP offices. India's TKDL is proving a powerful weapon in the country's fight against erroneous patents, sometimes referred to as "bio piracy".

### **The significance of traditional knowledge**

Traditional knowledge (TK) is integral to the identity of most local communities. It is a key constituent of a community's social and physical environment and, as such, its preservation is of paramount importance. Attempts to exploit TK for industrial or commercial benefit can lead to its misappropriation and can prejudice the interests of its rightful custodians. In the face of such risks, there is a need to develop ways and means to protect and nurture TK for sustainable development in line with the interests of TK holders. The preservation, protection and promotion of the TK-based innovations and practices of local communities are particularly important for developing countries. Their rich endowment of TK and biodiversity plays a critical role in their health care, food security, culture, religion, identity, environment, trade and development. Yet, this valuable asset is under threat in many parts of the world.

There are concerns that this knowledge is being used and patented by third parties without the prior informed consent of TK holders and that few, if any, of the derived benefits are shared with the communities in which this knowledge originated and exists. Such concerns have pushed TK to the forefront of the international agenda, triggering lively debate about ways to preserve, protect, further develop and sustainably use TK. Documenting and digitizing TK-related information in the form of a TKDL is proving to be an effective means of preserving TK and of preventing its misappropriation by third parties. India is a pioneer in this field.

### **How it all began**

India's TKDL, a collaborative project between the Council of Scientific and Industrial Research (CSIR), and the Department of AYUSH, is a home-grown effort to ensure patent offices around the world do not grant patents for applications founded on India's wealth of age-old TK. The idea to establish a TKDL came to the fore amid India's efforts to revoke the patent granted by the United States Patent and Trademark Office (USPTO) on the wound healing properties of turmeric, and the patent granted by the European Patent Office (EPO) on the antifungal properties of neem. These endeavors, while successful, proved extremely costly and time-consuming.

Around the time the TKDL was established in 2001, the TKDL expert group estimated that, annually, some 2,000 patents relating to Indian medicinal systems were being erroneously granted by patent offices around the world.

For a patent to be granted, an applicant must satisfy certain criteria as defined by national patent law, in particular, an applicant must prove that a claimed invention is novel and not previously known. Why then had patents been granted for so many applications relating to Indian medicinal systems? When patent examiners assessed these applications for patentability, the claimed inventions did not feature in the prior art searches carried out. They were, therefore, deemed patentable. At that time, however, much of India's traditional medicinal knowledge only existed in Sanskrit, Hindi, Arabic, Urdu and Tamil. These languages were neither accessible to nor understood by patent examiners working in the major patent offices to which the applications had been submitted.

The fact that so many patents had been wrongfully granted in the U.S. and Europe caused a great deal of national distress. The people of India felt that knowledge belonging to India was wrongfully being taken away from them. On top of this, these "wrong" patents conferred exclusive rights to exploit the technology in the country in which patent protection was granted. This posed a very real economic threat to Indian producers and to their freedom to operate in foreign markets.

### **Bridging the divide**

The TKDL has overcome language barriers and is bridging the gaps in TK information in major patent offices. Using information technology tools and a novel Traditional Knowledge Resource Classification

System (TKRC), the TKDL has converted and structured ancient texts into 34 million A4-sized pages along the lines of a patent application. These have been translated into English, French, German, Japanese and Spanish.

Today, thanks to its TKDL, India is capable of protecting some 0.226 million medicinal formulations and at zero direct cost. Access to the database helps patent examiners root out those applications that clearly do not satisfy the novelty requirement at an early stage. Without a TKDL database, the process of revoking a patent can be a costly and time-consuming affair. It takes, on average, five to seven years and costs between 0.2-0.6 million US dollars to oppose a patent granted by a patent office. Multiply this by India's 0.226 million medicinal formulations and it is clear that the cost of protection, without a TKDL, would be prohibitive.

### **An innovative classification system**

India's innovative TKRC is modeled on WIPO's International Patent Classification (IPC). It consists of some 27,000 subgroups for Ayurveda, Unani, Siddha and Yoga and, like the IPC, is indispensable for the retrieval of relevant information.

The TKRC has prompted the reform of the IPC – an essential tool in enabling effective search and examination of patent applications – as it relates to TK. The IPC divides technology into eight sections with approximately 70,000 subdivisions each of which is assigned a symbol consisting of Arabic numerals and letters of the Latin alphabet. Until 2005, only one subgroup – A61K35/78 – existed for medicinal plants, meaning that patent examiners were ill equipped to examine traditional medicine-based patent applications.

India took up the lack of recognition for traditional medicines in the IPC's Committee of Experts. Following the establishment of a five-nation 'Traditional Knowledge Classification Task Force' – comprising China, the European Union, India, Japan and the United States – the number of IPC subgroups relating to medicinal plants rose to 207 bringing about a fundamental and far-reaching reform of the international patent system. In 2004, it was agreed to link the TKRC's 27,000 subgroups to the IPC.

### **Connecting TK holders and patent examiners**

The TKDL is a unique, proprietary database that integrates diverse knowledge systems and languages. It is based on 148 books of prior art relating to Indian systems of medicine, available at a cost of around US\$1,000. The TKDL connects patent examiners around the world with these books of knowledge.

The TKDL is available to all patent offices that have signed a TKDL Access Agreement which has built-in, non-disclosure mechanisms to safeguard India's interests and counter any possible misuse. Under such an agreement, patent examiners may use the TKDL for search and examination purposes only and its contents may only be revealed to third parties for the purposes of citation.

So far, India has signed TKDL Access Agreements with the EPO and the patent offices of Australia, Canada, Germany, the United Kingdom and the United States. Negotiations are also ongoing with the patent offices of New Zealand and Japan where agreement in principle has already been reached.

### **Global IP-watch systems**

The national patent laws of most countries allow for third parties – any member of the public – to file a submission questioning the novelty and non-obviousness of a patent application before a patent is granted. There is a need, therefore, to ensure that patent applications that wrongly claim rights in prior art are readily identifiable so that such "third party observations (TPOs)" can be filed and made easily searchable. Global IP-watch monitoring systems have an important role to play in enabling the identification of published TK-related applications on which third parties – in accordance with the patent law of the country concerned – may file observations.

To date, the submission of TPOs has proven the only cost-effective way of preventing misappropriation of TK at the pre-grant stage. The TKDL database has enabled the submission of TPOs that have resulted in the successful opposition of hundreds of patent applications filed around the world. Without

documenting and digitizing TK and making these databases easily accessible to patent examiners operating in the major languages of commerce, this would not have been possible.

The TKDL has an integrated global biopiracy watch system that allows monitoring of patent applications related to Indian medicinal systems. It enables effective detection of attempts to misappropriate this knowledge by third parties filing applications with patent offices around the world. It means that immediate corrective action can be taken, and at zero direct cost, to prevent biopiracy. India is the only country to date to have put such a system in place.

Comparison of time and costs associated with post-grant opposition and pre-grant opposition based on the submission of prior art evidence supported by TK documentation

No.	Methodology & Process	Post-grant Opposition	Pre-grant Objections supported by a database such as TKDL
1.	Nature	Opposing party is part of re-examination process, can submit counter documents and participate in re-examination and hearing process.	Objecting party can only file evidence as a third party and cannot participate in the examination process.
2.	Cost	Highly expensive and requires legal assistance.	Inexpensive and does not require legal support because prior art evidence is available from the TKDL.
3.	Time period	4 – 13 years	3 – 20 weeks
4.	Documentation	Does not require extensive documentation.	Requires extensive digital documentation.
5.	Patent	Applicant can appeal invalidation of the patent.	Patent applicant cannot appeal as the application is rejected at the pre-grant stage.

#### Impact of TKDL on bio piracy



TKDL outcomes against bio-piracy. Clockwise from top left: green tea; pomegranates; pink lotus; turmeric root.

The TKDL's impact is already being felt at the EPO. Since July 2009, 215 patent applications relating to Indian medicinal systems for which third party TKDL evidence has been filed have been identified. In two such cases the EPO has already reversed – on the strength of TKDL evidence – its earlier intention to grant the patents. In one case the applicant modified the claims submitted and, in 33 other cases, the applicants themselves withdrew their four to five-year-old applications upon presentation of TKDL evidence.

It is expected that in the coming months some 179 cases that are currently in the balance will either be rejected by the EPO or withdrawn by the applicants. A recent study by a TKDL expert team at the EPO shows a sharp decline (44 percent) in the number of patent applications filed concerning Indian medicinal systems, particularly in relation to medicinal plants. The TKDL is clearly proving to be an

effective deterrent against bio piracy.

Misappropriation of TK and bio piracy of genetic resources are of great concern to many countries and indigenous and local communities. While these issues have been taken up within various multilateral forums such as the Convention on Biological Diversity (CBD), the TRIPs<sup>4</sup> Council of the World Trade Organization (WTO) and at the World Intellectual Property Organization (WIPO), a global framework to protect TK has not yet been established. WIPO's IGC5 is, however, making progress and it is hoped that in the near future consensus will emerge on an internationally legally binding instrument to effectively protect TK.

#### **A success story**

India is the only country in the world to have set up an institutional mechanism - the TKDL - to protect its TK. The TKDL enables prompt and almost cost-free cancellation or withdrawal of patent applications relating to India's TK.

To date the TKDL has enabled the cancellation or withdrawal of a large number of patent applications attempting to claim rights over the use of various medicinal plants. India's TKDL is a unique tool that plays a critical role in protecting the country's traditional knowledge.

#### **4. Value of TK in global economy**

There is considerable controversy over the value of traditional knowledge. The valuation of the subset of traditional medicinal knowledge has attracted the most attention. This subset requires plant genetic resources to be valued together with intangible assets in the form of local knowledge. It is true that local communities and countries, with few notable exceptions, have not earned much from their plant genetic resources. It is also widely believed that controlling access is neither desirable, nor effective. Estimates made in developed countries have assumed that the methods of drug discovery are largely technology driven and that the value of fragments of biodiversity hotspots in pharmacological research is not much more than a few cents per hectare (Simpson, 1997).

With the advent of blue gene genomic technologies, advances in proteomics, combinatorial cytochemistry, and the expansion of patent protection and plant varieties protection, the valuation of plant genetic resources tied to traditional knowledge deserves to be reexamined. Prior informed consent cannot be operationalized without valuation because resources cannot be found, let alone allocated, without a priori estimation of trade potential.

The EU Trade Commissioner Pascal Lamy, in his conversation with me during the course of a consultative meeting between EU and India in New Delhi on January 19, 2004 publicly acknowledged that traditional knowledge has high potential whose magnitude is unknown, but the EU's commitment of resources for valuation of traditional knowledge and estimation of trade potential has not been forthcoming.

There is hesitation to reopen Article 27.3 (b) of TRIPS to introduce CBD obligations and restore balance in the asymmetry of information, bargaining power and resources between traditional knowledge holders and patent applicants. It appears that the US and EU are unwilling to jeopardize their Uruguay round gains from TRIPS by reopening its provisions for negotiations. Both are in a comfortable position to consolidate the gains through protection-enhancing technologies and take recourse to the dispute settlement process of WTO as a more effective means of perpetuating the imbalances. Assessments, estimations and valuations of traditional knowledge by developing countries are therefore even more important to increase awareness and mobilize support for resource allocation into competitive biotechnology skills, biodiversity conservation and sui generis protection for traditional knowledge. India and Brazil have demanded the institution of sui generis protection for traditional knowledge at the WTO.

Traditional knowledge can have value also as undisclosed information which is protected in certain national jurisdictions or covered by civil law rights or common law provisions. Such protection has limitations that arise from hindrances in cross-border commercial exploitation through trade in services except through foreign commercial presence (feasible, only with scale) or the movement of natural persons (providers and recipients), and the known hazards of independent disclosure and leakages. There

are enormous difficulties associated with the marketing of unfamiliar knowledge and skills about which people are ignorant. Foreign authorities may not sanction the practice of a trade or a profession, where standards, benchmarks, norms do not yet exist.

Copyrights and related rights are limited to expressions. Unarticulated or tacit traditional knowledge cannot be so protected. Similarly, while commoditized products of artisans or craftsmen may be protected under trademarks or geographical indications and as designs, services (skill-based and knowledge-based) cannot be protected against imitation. There is no bar to their production by others, as long as a specific trademark or a geographical indication is not infringed. New products and services sourced from TK can easily be swamped by branded imitations offering the same benefits. Among the most significant features of traditional knowledge are pattern-recognition skills and the logic underlying such skills which are not easily amenable to protection under conventional forms of formal IPRs. Textile designs and their combinations which are expressible can be in wide circulation. It is problematic to protect these under copyright or design IPRs in first-to-file systems that accord no priority to first-to-invent or first-to-use. In film media, loss-making movies are released in the pirate market to recover costs. TK piracy offers similar static gains to owners and conduits who take advantage of informal porosity.

The economic analysis of costs and benefits of IPRs has attracted some research attention (Maskus, 2000). Questions of economic valuation of intangibles inextricable from tangibles in cases where the divergence between ex-ante and ex-poste calculations is predicated on as-yet-unformulated access and benefit sharing regimes in missing markets have remained an enigma. Curiously, valuation is a basic condition for the practical design and application of incentive measures in the valuation of TK and genetic resources, including biodiversity. Valuation would enable new markets to be created and existing markets to function better. It is also a way to secure sustainable development of long term tangible and intangible benefits and reduce uncertainties for investment and trade.

**The valuation of TK needs to address the following aspects:**

- Direct use value observed in the pursuit of static efficiency.
- Indirect use that supports economic activity and sustains livelihoods in the locality, and elsewhere. (c) Discounted present value of future uses, subject to uncertainty, future demand or availability (including the question of exhaustibility).
- Non-use value which is the existence value or bequest value in economic, social, cultural, aesthetic, intrinsic, ethical or spiritual terms.
- Positive and negative externalities, spillover effects for knowledge, innovation, organization, partnerships, supply side adjustments etc.

Valuation of traditional knowledge and plant genetic resources is the key to structuring access and benefit-sharing regimes. The discussion on valuation continues in the next section contextualizing it for the purpose of constructing access regimes and benefit sharing.

## **5. Role of Government to harness TK**

### **TK in India**

India is a diverse country in all senses. It is counted among the 'mega diverse' countries under the CBD due to its innumerable genetic resources (GRs) and associated TK. With advancements in technology around the world, GRs and associated TK are vulnerable to bio- piracy and similar threats. With a view to protecting biodiversity, the Biodiversity Act was enacted in 2002.

The act governs conservation and use of bio- resources (BRs) and associated knowledge for commercial and research purposes as well as for bio-survey and bio-utilization.

To implement the act, the National Biodiversity Authority (NBA), an autonomous body that performs facilitative, advisory and regulatory functions for the government of India, was established in 2003.

The NBA has supported the creation of State Biodiversity Boards (SBBs) in 28 states and over 32,000 Biodiversity Management Committees (BMCs).

Under the act, Indians and Indian institutions (excluding non-resident Indians) do not need the authorization of the NBA to conduct research or work; however, they need to inform the relevant SBB of the activity. International institutions need the authorization of the NBA. The NBA gives approval after consultation with the relevant SBB and after establishing mutually-agreed terms for sharing the benefits

India has a rich history of traditional medicinal practices that date back to thousands of years. These techniques and components have come into the light during recent times mainly due to the interest shown by multinationals to exploit the knowledge and benefit from the profits. In order to protect the knowledge from being patented, the government has indeed been striving hard.

#### **Steps taken by GOI to protect traditional knowledge from patent**

- **Traditional Knowledge Digital Library**

The government has established a digital library, which contains all the information about traditional medicine, the methods and techniques. This acts as a repository of all existing traditional methods and plays an important role in proving authenticity.

This library has prevented thousands of patents from being filed internationally and it also gives access to various patent agencies of the world so that they can cross check the genuineness of the patent.

- **Direct funding**

The government has stopped funding states and other agencies for carrying out research in traditional knowledge. It has instead made CSIR the sole responsible institution to carry out such research. The funding is directly provided to CSIR. This will prevent research from being leaked to private pharma companies.

- **UNESCO intangible cultural heritage**

The government has been successful in obtaining UNESCO recognition to traditional medicinal knowledge such as Ayurveda, Yoga, Sowa Rigpa, Unani etc. This has allowed India to establish link with the country of origin and prevent patenting by multinational pharma companies.

- **Strengthening IPR**

IPR laws in India have been upgraded to include all type of property rights. The new form will have provisions for protecting traditional knowledge of cultural groups. The main aim will be to protect economic interests of such groups from being exploited by third party.

#### **Way ahead**

A uniform global law must be framed that will prevent such malpractices from taking place. This can help in saving traditional knowledge from extinction.

Thus, the steps taken by the government are indeed successful in preventing misuse by multinational companies. Protecting this knowledge is beneficial on economic as well as cultural front. It keeps the culture and traditions intact.

### UNIT-III LEGAL FRAMEWORK AND TK

#### **1. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006**

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, is a key piece of forest legislation passed in India on 18 December 2006. It has also been called the Forest Rights Act, the Tribal Rights Act, the Tribal Bill, and the Tribal Land Act. The law concerns the rights of forest-dwelling communities to land and other resources, denied to them over decades as a result of the continuance of colonial forest laws in India.

Supporters of the Act claim that it will redress the "historical injustice" committed against forest dwellers, while including provisions for making conservation more effective and more transparent. The demand for the law has seen massive national demonstrations involving hundreds of thousands of people.

However, the law has also been the subject of considerable controversy in India. Opponents of the law claim it will lead to massive forest destruction and should be repealed.

A little over one year after it was passed, the Act was notified into force on 31 December 2007. On 1 January 2008, this was followed by the notification of the Rules framed by the Ministry of Tribal Affairs to supplement the procedural aspects of the Act.

#### **Background**

India's forests are home to hundreds of millions of people, including many Scheduled Tribes, who live in or near the forest areas of the country. Nearly 250 million people live in and around forests in India, of which the estimated indigenous Adivasi or tribal population stands at about 100 million. To put these numbers in perspective, if considered a nation by them, they would form the 13th largest country in the world, even though they cannot be depicted as representing any singular, monolithic culture. Forests provide sustenance in the form of minor forest produce, water, grazing grounds and habitat for shifting cultivation. Moreover, vast areas of land that may or may not be forests are classified as "forest" under India's forest laws, and those cultivating these lands are technically cultivating "forest land". Forest Rights Act is also known as Community Forest Management (CFM) in Telangana.

Since time immemorial, the tribal communities of India have had an integral and close-knit relationship with the forests and have been dependent on the forests for livelihoods and existence. The relationship was mutually beneficial and not one-sided. However, rights were rarely recognized by the authorities and in the absence of real ownership of the land, the already marginalized local dwellers suffered.

The reason for this latter phenomenon is India's forest laws. India's forests are governed by two main laws, the Indian Forest Act, 1927 and the Wild life (Protection) Act, 1972. The former empowers the government to declare any area to be a reserved forest, protected forest or village forest. The latter allows any area to be constituted as a "protected area", namely a national park, wildlife sanctuary, tiger reserve or community conservation area.

Under these laws, the rights of people living in or depending on the area to be declared as a forest or protected area are to be "settled" by a "forest settlement officer." This basically requires that officer to enquire into the claims of people to the land, minor forest produce, etc., and, in the case of claims found to be valid, to allow them to continue or to extinguish them by paying compensation.

Studies have shown that in many areas this process either did not take place at all or took place in a highly faulty manner. Thus 82.9% of the forest blocks in undivided Madhya Pradesh had not been settled as of December 2003, while all the hilly tracts of Odisha were declared government forests without any survey. In Odisha, around 40% of the government forests are "deemed reserved forests" which have not been surveyed.

Those whose rights are not recorded during the settlement process are susceptible to eviction at any time. This "legal twilight zone" leads to harassment, evictions, extortion of money and sexual molestation of forest dwellers by forest officials, who wield absolute authority over forest dwellers' livelihoods and daily lives.

The Statement of Objects and Reasons of the Forest Rights Act describes it as a law intended to correct the



"historical injustice" done to forest dwellers by the failure to recognize their rights.

"The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006" was enacted by the Parliament of India in December 2006.

### **Provisions**

The Act as passed in 2006 has the following basic points.

### **Types of rights**

The rights which are included in section 3(1) of the Act are:

- (i) Right to hold and live in the forest land under the individual or common occupation for habitation or for self-cultivation for livelihood by a member or members of a forest dwelling Scheduled Tribe or other traditional forest dwellers;
- (ii) Community rights such as nistar, by whatever name called, including those used in erstwhile Princely states, Zamindari or such intermediary regimes;
- (iii) Right of ownership, access to collect, use, and dispose of minor forest produce( includes all non-timber forest produce of plant origin) which has been traditionally collected within or outside village boundaries;
- (iv) Other community rights of uses of entitlements such as fish and other products of water bodies, grazing (both settled or transhumant) and traditional seasonal resource access of nomadic or pastoralist communities;
- (v) Rights including community tenures of habitat and habitation for primitive tribal groups and pre-agriculture communities;
- (vi) Rights in or over disputed lands under any nomenclature in any State where claims are disputed;
- (vii) Rights for conversion of Pattas or leases or grants issued by any local council or any State Govt. on forest lands to titles;
- (viii) Rights of settlement and conversion of all forest villages, old habitation, unsurveyed villages and other villages in forest, whether recorded, notified or not into revenue villages;
- (ix) Right to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use;
- (x) Rights which are recognized under any State law or laws of any Autonomous Dist. Council or Autonomous Regional Council or which are accepted as rights of tribals under any traditional or customary law of the concerned tribes of any State;
- (xi) Right of access to biodiversity and community right to intellectual property and traditional knowledge related to biodiversity and cultural diversity;
- (xii) Any other traditional right customarily enjoyed by the forest dwelling Scheduled Tribes or other traditional forest dwellers, as the case may be, which are not mentioned in clauses-1 to 11, but excluding the traditional right of hunting or trapping extracting a part of the body of any species of wild animal

### **These can be summarized as:**

- Title rights - i.e. ownership - to land that is being farmed by tribal or forest dwellers as on 13 December 2005, subject to a maximum of 4 hectares; ownership is only for land that is actually being cultivated by the concerned family as on that date, meaning that no new lands are granted
- Use rights - to minor forest produce (also including ownership), to grazing areas, to pastoralist routes, etc.
- Relief and development rights - to rehabilitation in case of illegal eviction or forced displacement; and to basic amenities, subject to restrictions for forest protection
- Forest management rights - to protect forests and wildlife

### **Eligibility criteria**

According to Section 2(c) of Forest Rights Act (FRA), to qualify as Forest Dwelling Scheduled Tribe (FDST) and be eligible for recognition of rights under FRA, three conditions must be satisfied by the applicant/s, who could be "members or community":

1. Must be a Scheduled Tribe in the area where the right is claimed; and



2. Primarily resided in forest or forests land prior to 13-12-2005; and
3. Depend on the forest or forests land for bonafide livelihood needs.

According to Section 2(o) of Forest Rights Act (FRA), to qualify as Other Traditional Forest Dweller (OTFD) and be eligible for recognition of rights under FRA, two conditions need to be fulfilled:

1. Primarily resided in forest or forests land for three generations (75 years) prior to 13-12-2005, and
2. Depend on the forest or forests land for bonafide livelihood needs.

Section 2(o) refers to “any member or community” for this purpose, and hence if an OTFD village establishes its eligibility under the Act, there is no need for every individual to do so separately.

### **Process of recognition of rights**

Section 6(1) of the Act provides that the gram sabha, or village assembly, will initially pass a resolution recommending whose rights to which resources should be recognized (i.e. which lands belong to whom, how much land was under the cultivation of each person as on 13 Dec 2005, etc.). This resolution is then screened and approved at the level of the sub-division (or taluka) and subsequently at the district level. The screening committees consist of three government officials (Forest, Revenue and Tribal Welfare departments) and three elected members of the local body at that level. These committees also hear appeals.

### **Resettlement for wildlife conservation**

Section 4(2) of the Act lays out a procedure by which people can be resettled from areas if it is found to be necessary for wildlife conservation. The first step is to show that relocation is scientifically necessary and no other alternative is available; this has to be done through a process of public consultation. The second step is that the local community must consent to the resettlement. Finally, the resettlement must provide not only compensation but a secure livelihood.

### **Misunderstanding the Act as a land distribution scheme**

A great deal of the debate is fuelled by misunderstandings of the purpose of the Act. The most common is that the purpose of the law is to distribute forest land to forest dwellers or tribal, often claimed to be at the rate of 4 hectares per family. The Act is intended to recognize lands that are already under cultivation as on 13 December 2005, not to grant title to any new lands.

### **Opposition**

The Act has been met with much concern and opposition from environmentalists and wildlife conservationists. Some of this opposition has been motivated by those who see the law as a land distribution scheme that will lead to the handing over of forests to tribals and forest dwellers. But the strongest opposition to the Act has come from wildlife conservationists who fear that the law will make it impossible to create "involute spaces", or areas free of human presence, for the purposes of wildlife conservation. Tiger conservation in particular has been an object of concern.

Interpretation regarding Deadline cut-off-date: M.SaiSampath, Founder-President ECO FAWN Society had actively engaged in environment and wildlife conservation who also appeared before Hon'ble Parliamentary Committee suggested for incorporation of "Deadline cut-off-date" to complete whole process of identification, verification and recognition of Forest Rights to genuine tribals and other traditional forest dwellers in the country. Also importantly Mr.M.SaiSampath had correlated decline/encroachment of forest land with the implementation of FRA 2006 in the country where the Hon'ble Parliamentary Committee has agreed the submission made and pointed an extent of 16.21 Lakh Ha of forest land encroached after implementation of the Forest Rights Act 2006, subsequently various measures were suggested by the Parliamentary Committee.

Supporters of the Act take the position that the Act is not a land distribution measure, and further that the Act is more transparent than existing law and so can help stop land grabbing. Regarding wildlife conservation, they have argued that the Act actually provides a clear and explicit procedure for resettling people where necessary for wildlife protection, but also provides safeguards to prevent this being done arbitrarily.

Indeed, while concerned at some of the provisions, some environmentalists have also argued that

"Conservationists who have stated that the Forest Bill will be the death-knell of India's forests are indulging in unsubstantiated exaggeration".

Supporters of the Act and others also argue that the provisions in the Act for community conservation will in fact strengthen forest protection in the country. This is said to be because it will provide a legal right for communities themselves to protect the forest, as thousands of villages are already doing in the face of official opposition.

### **Television advertisements**

In October 2003, Vanashakti, a group based in Mumbai, ran television advertisements against the Act. This is the first time any Indian legislation has been attacked through a television campaign.

Six advertisements were run by the organization across major Indian news and television channels, ads which continue to be available on their website. The group criticized the Forest Rights Act as having the potential to cause huge floods, droughts, and to increase global warming. They also decried it as an effort to keep "tribals in the forest" instead of assisting their "development."

In response to questions from a newspaper, Vanashakti claimed to have been formed over "a dinner table conversation" as a result of deep concern about the Forest Rights Act and the lack of media attention to it.

The television ad campaign was met with angry responses from forest rights organizations. The Campaign for Survival and Dignity, a federation of tribal and forest dwellers' organizations from several States of India, wrote an Open Letter to Vanashakti, criticizing them for "attacking the Forest Rights Act through distortions and untruths that do nothing to reinforce forest protection, and a great deal to undermine it." The Campaign also put up a website entitled "Vanashakti's Distortions and Untruths". An exchange of correspondence followed, which can be found both at the Vanashakti website and at the website on the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act" put up by the Campaign.

### **Criticism by forest rights supporters**

While supporting the principles of the law, forest rights supporters are not entirely satisfied with the law as finally passed. The recommendations of a Joint Parliamentary Committee on the law were partly rejected, and supporters of forest rights have claimed that some of the rejected clauses were important. In particular, the final form of the law is said to make it easier to exclude some categories of both tribal and non-tribal forest dwellers, to have undermined the democratic nature of the processes in the Act and to have placed additional hindrances and bureaucratic restrictions on people's rights. The Campaign for Survival and Dignity described the final form of the law as "both a victory and a betrayal" in their official statement on the occasion.

### **Notification**

The one-year delay in the notification of the Act and the Rules was the subject of considerable Parliamentary and political uproar in the winter session of the Indian Parliament in 2007. There were also mass protests across India demanding that the Act be notified in October 2007, and in November 2007 a week-long sit down protest took place in Delhi with the same demand.

On 31 December, the Act was notified into force, and on 1 January the Rules for the Act - which provide the procedures for implementing its provisions - were also notified. The Campaign for Survival and Dignity welcomed the notification but sharply criticized a number of provisions in the Rules, claiming that they undermined democracy and the spirit of the Act.

### **Implementation**

There have been numerous complaints regarding the manner in which the Act has been implemented after its notification. For instance, in September 2010, the Council for Social Development, a New Delhi-based think tank, released a "Summary Report on Implementation of the Forest Rights Act" which stated that:

All of the key features of this legislation have been undermined by a combination of apathy and sabotage during the process of implementation. In the current situation the rights of the majority of tribals and other traditional forest dwellers are being denied and the purpose of the legislation is being defeated. Unless immediate remedial measures are taken, instead of undoing the historical

injustice to tribal and other traditional forest dwellers, the Act will have the opposite outcome of making them even more vulnerable to eviction and denial of their customary access to forests... both the Central and the State governments have actively pursued policies that are in direct violation of the spirit and letter of the Act."

The Ministry of Tribal Affairs releases monthly reports on the status of implementation of the Act. These can be obtained from the Ministry's website.

## **Judgments**

Recently, SC in *Wildlife first vs Moefcc* has ordered eviction of encroachers on forest land, in which majority of tribal and forest dwellers were also ordered to be evicted. This order invited challenges from various quarters as in many cases request was cancelled on non-availability of documents by district level committee under the act. Therefore, court agreed to review its judgment and give time of 4 months to state governments to complete the process again.

## **2. Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act)**

The Protection of Plant Variety and Farmers Right Act, 2001 (PPVFR Act) is an Act of the Parliament of India that was enacted to provide for the establishment of an effective system for protection of plant varieties, the rights of farmers and plant breeders, and to encourage the development and cultivation of new varieties of plants. This act received the assent of the President of India on the 30 October 2001.

The PPV&FR Act, 2001 was enacted to grant intellectual property rights to plant breeders, researchers and farmers who have developed any new or extant plant varieties. The Intellectual Property Right granted under PPV & FR Act, 2001 is a dual right – one is for the variety and the other is for the denomination assigned to it by the breeder. The rights granted under this Act are heritable and assignable and only registration of a plant variety confers the right. Essentially Derived Varieties (EDV) can also be registered under this Act and it may be new or extant. Farmers are entitled to save, use, sow, re-sow, exchange or sell their farm produce including seed of a registered variety in an unbranded manner. Farmers' varieties are eligible for registration and farmers are totally exempted from payment of any fee in any proceedings under this Act.

The period of protection for field crops is 15 years and for trees and vines is 18 years and for notified varieties it is 15 years from the date of notification under section 5 of Seeds Act, 1966. Annual fee has to be paid every year for maintaining the registration and renewal fee has to be paid for the extended period of registration. Farmers can claim for compensation if the registered variety fails to provide expected performance under given conditions. The rights granted under this Act are exclusive right to produce, sell, market, distribute, import and export the variety. Civil and criminal remedies are provided for enforcement of breeders' rights and provisions relating to benefit sharing and compulsory license in case registered variety is not made available to the public at reasonable price are provided. Compensation is also provided for village or rural communities if any registered variety has been developed using any variety in whose evolution such village or local community has contributed significantly. The procedural details and modes of implementing this Act are provided in PPV&FR Rules, 2003. In the present article, we are discussing some of the important legal provisions of this Act along with some of the case studies.

## **Definition**

According to sec 2(c), "breeder" means a person or group of persons or a farmer or group of farmers or any institution which has "bred, evolved or developed any variety."

According to sec 2(k), "farmers" means any person who –

- "Cultivates crops by cultivating the land himself; or"
- "Cultivates crops by directly supervising the cultivation or land through any other person; or conserves and preserves, severally or jointly, with any other person any wild species or traditional varieties"; or
- "Adds value to such wild species or traditional varieties through selection and identification of their useful properties."

Genetic resources of economic plants and their wild relatives particularly in areas identified as agro-

biodiversity hotspots are awarded annually from Gene Fund. The name of the award is Plant Genome Savior Community Award and the amount is INR 10,00,000 for each community. A maximum of five awards are conferred in a year.

The Protection of Plant Varieties and Farmers' Rights Authority also confers Plant Genome Savior "Farmer Reward" and "Farmer Recognition" to the farmers engaged in the conservation of genetic resources of landraces and wild relatives of economic plants and their improvement through selection and preservation and the material so selected and preserved has been used as donors of gene in varieties registerable under the PPV&FR Act, 2001 (53 of 2001). Up to 10 rewards and 20 recognitions are conferred in a year.

### **3. The Biological Diversity Act 2002 and Rules 2004**

The Biological Diversity Act, 2002 is an Act enacted by the Parliament of India for the preservation of biological diversity in India, and provides mechanism for equitable sharing of benefits arising out of the use of traditional biological resources and knowledge. The Act was enacted to meet the obligations under the Convention on Biological Diversity (CBD), because India is a party of the convention.

#### **History**

The Act was enacted to meet the obligations under Convention on Biological Diversity (CBD), to which India is a part in 2002.

#### **Biodiversity and Biological Resource**

Biodiversity has been defined under Section 2(b) of the Act as "the variability among living organisms from all sources and the ecological complexes of which they are part, and includes diversity within species or between species and of eco-systems". The Act also defines Biological resources as "plants, animals and micro-organisms or parts thereof, their genetic material and by-products (excluding value added products) with actual or potential use or value, but does not include human genetic material

#### **National Biodiversity Authority and State Biodiversity Boards**

The National Biodiversity Authority (NBA) is a statutory autonomous body, headquartered in Chennai, under the Ministry of Environment and Forests, Government of India established in 2003 to implement the provisions under the Act. State Biodiversity Boards (SBB) has been created in 29 States along with 31,574 Biological management committees (for each local body) across India.

#### **Functions**

- Regulation of acts prohibited under the Act
- Advise the Government on conservation of biodiversity
- Advise the Government on selection of biological heritage sites
- Take appropriate steps to oppose grant of intellectual property rights in foreign countries, arising from the use of biological resources or associated traditional knowledge.

#### **Regulations**

A foreigner, non-resident Indian, as defined in the clause (30) of section 2 of The Income-tax Act, 1961, or a foreign company or body corporate need to take permission from the NBA before obtaining any biological resources or associated knowledge from India for research, survey, commercial utilization. Indian citizens or body corporates need to take permission from the concerned State Biodiversity Board.

Result of research using biological resources from India cannot be transferred to a non-citizen or a foreign company without the permission of NBA. However, no such permission is needed for publication of the research in a journal or seminar, or in case of a collaborative research made by institutions approved by Central Government.

No person should apply for patent or other form of intellectual property protection based on the research arising out of biological resources without the permission of the NBA. The NBA while granting such permission may make an order for benefit sharing or royalty based on utilization of such protection.

## **Benefit sharing**

Benefit sharing out of usage of biological resources can be done in following manner:

- Joint ownership of intellectual property rights 2 3 4
- Transfer of technology
- Location of production, research development units in the area of source
- Payment of monetary and non-monetary compensation
- Setting up of venture capital fund for aiding the cause of benefit claimers

## **Penalties**

If a person, violates the regulatory provisions he/she will be "punishable with imprisonment for a term which may extend to five years, or with fine which may extend to ten lakh rupees and where the damage caused exceeds ten lakh rupees, fine may commensurate {be in proportion} with the damage caused, or with both."Any offence under this Act is non-bailable and is cognizable.

## **4. The protection of traditional knowledge bill, 2016**

The Protection of Traditional Knowledge Bill was introduced by Dr. Tharoor to provide protection, preservation, promotion and development of India's Traditional Knowledge and for matters connected therewith or incidental thereto. According to Dr. Tharoor, traditional knowledge is neither an innovation nor held by any single person. Rather it is passed down and refined over several generations and thus may not be considered as 'intellectual property'. He argued for a parliamentary recognition to protect our traditional knowledge with a system of registration that identifies the traditional knowledge with its rightful custodians.

According to him State shall be the custodian of all traditional knowledge. Dr. Tharoor also highlighted the need of ensuring appropriate incentives for further research and development on our traditional knowledge. He also made an attempt to recognize the contribution of specific local communities in the development of the traditional knowledge by giving them certain rights, including the right to self-determination. The Traditional knowledge Bill was divided into 6 Chapters and 53 Sections, where the first chapter deals with the preliminary provisions of the Act; Second chapter deals with rights and ownership; third chapter deals with the constitution of national authority on traditional knowledge; fourth chapter deals with the constitution of State board of traditional knowledge; fifth chapter deals with procedures, TKDS, TKDL and functions of government; finally sixth chapter deals with miscellaneous provisions.

## **Observations on the Protection of Traditional Knowledge Bill, 2016**

### **Defining traditional knowledge**

knowledge and expression of culture, which may subsist in codified or oral or other forms, whether publically available or not, that is dynamic and evolving and is passed on from generation to generation, for at least 3 generations, whether consecutively or not, which is associated with group or groups who are maintaining, practicing or developing it in traditional cultural context and includes know-how, skills, innovations, practices, learning, medicinal preparations, method of treatment, literature, music, art forms, designs and marks but does not include any traditional knowledge covered by any law for the time being in force providing for its preservation, promotion, management or unauthorized commercial exploitation;

In a country like India, traditional knowledge is visible in two formats;

- Knowledge which is preserved and practiced by certain communities specifically tribal groups OR particular institutions or families often located at specific territory of the nation. Such knowledge is passed down from generation to generation through a variety of traditional methods.
- Knowledge, whose practice sustains the livelihoods of many persons scattered across the territory of India, which does not have a specific community or institution or family as custodian.

Further, it is assumed that, the mandate of passing the knowledge for at least three generations seems to be for the purpose of registering the same under the provisions of the given Bill. There may not be documentary proofs to prove that, the knowledge is passed down three generations, specifically among the tribal

community, since it was shared orally or through practical experience. Thus, I am of the opinion that, at least three generations may be omitted from the definition clause.

### **Ownership and Rights**

Respective governments shall be the owner of such knowledge, whose practice sustains the livelihoods of many persons, scattered across the territory of India, and which does not have a specific community or institution or family as custodian. On the other side, the knowledge which is preserved and practised by specific community or institution or a family, then such community or institution or the family shall be the owner or custodian of such knowledge.

However, respective government shall act as the trustee of traditional knowledge for its preservation, protection and promotion, where it shall suo motu recognize the ownership of traditional knowledge of respective communities and giving an opportunity of public opposition in case of wrongly identified custodians of traditional knowledge. Provided, the onus of proof shall lie on such person or group of persons who are raising such objection. Strict guidelines shall be implemented in this regard. Either TKDL or TKDS facility or both shall be adopted for this purpose.

### **National Authority or State Board for the protection of traditional knowledge**

Are you confident that, A National Authority on Traditional Knowledge comprising of 12 members and respective State Board on Traditional Knowledge comprising of 10 members each as envisaged under the Bill will be capable enough to preserve, protect and promote the entire traditional knowledge, which is derived and practiced within the territorial jurisdiction of India? No. The proposed system will never ever help the actual cause. It will be just like any other Board/Authority, where the nominees of ruling political parties will find a place.

If you are really interested to preserve, protect and promote the traditional knowledge of India and to safeguard the same from its misappropriation by foreigners or multinational corporations, then the given Bill is not the right solution. We should be adopting a different strategy altogether to protect the interest of India's traditional knowledge.

Quoting from the preamble of the Bill, we should adopt different – different strategies to;

**Preserve:** Functions of the National Authority OR State Board shall be only limited to identifying the traditional knowledge and marking the same to the right community (Identifying the right custodian/owner).

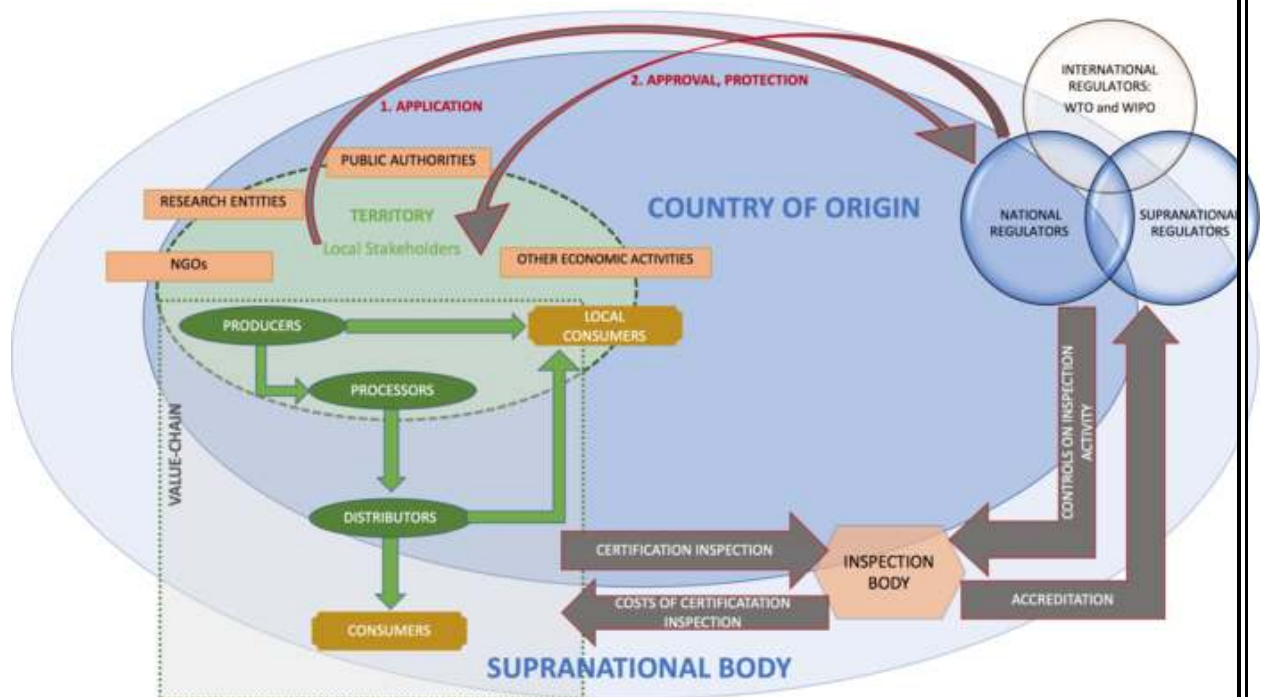
**Protect:** There shall be a separate autonomous institution having quasi-judicial powers like that of Competition Commission of India or Intellectual Property Appellate Tribunal to enforce the provisions in connection with the protection of traditional knowledge. Any dispute in connection with the misappropriation of traditional knowledge shall be heard by such Commission on Indian Traditional Knowledge.

**Promote:** Promoting traditional knowledge is altogether a different activity.

Thus, there shall be a different autonomous institution consisting of qualified persons consisting of scientists, professionals from finance, marketing, law etc. constituted for the promotion of the traditional knowledge addressing the scope of research activities as well as the economic exploitation. This wing shall function with a profit motive and the income generated by exploiting the traditional knowledge shall be proportionately shared among the custodian/owners of such knowledge as identified by the National Authority or the State Board. Further, this wing shall act as a bridge between the indigenous people who is actually practicing the TK and different institutions formed under the Traditional knowledge bill for the protection of traditional knowledge. It shall also carry out various awareness programs on the rights of the TK owners and shall act as a trustee of the Indian traditional knowledge for the benefit of the actual TK owners.

## 5. Geographical indicators act 2003

A geographical indication (GI) is a name or sign used on products which corresponds to a specific geographical location or origin (e.g., a town, region, or country). The use of a geographical indication, as an indication of the product's source, acts as a certification that the product possesses certain qualities, is made according to traditional methods, or enjoys a good reputation due to its geographical origin.



Geographical indications (GIs) are marks, signs or symbols which indicate that the associated goods:

- originate from a specific geographical area or country;
- are produced using traditional knowledge or processes stemming from a specific geographical area of a country; and
- Bear distinctive characteristics, qualities and reputations that are attributable to a specific geographical area or country.

Many countries have adopted GI laws to protect indigenous products, including handicrafts and agricultural, natural, horticultural and industrial products originating from a specific region.

On 27 March 2020, after revisions and much deliberation, Parliament finally passed the Geographical Indications (Registration and Protection) Act 2020 in order to establish a system for the recognition, registration and protection of GI rights in Pakistan.

### Geographical Indications (Registration and Protection) Act 2020

The act's salient features are as follows:

- Its main purpose is to provide:
  - ✓ statutory protection to GIs in consideration of the public interest, economic reforms and Pakistan's least developed areas; and

- ✓ Legal means for interested parties to prevent third party use of a designation or presentation of goods that indicates or suggests that the goods in question originate from a geographical area or constitute an act of unfair competition under the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement).
- Under the act, GIs can be registered by a natural or legal person, government organization or statutory body, association or group of producers or producer organization or operator with an interest in the registration.
- The definition of 'geographical indication' covers agricultural goods, natural goods or manufactured or produced goods of a particular territory, region or locality of certain quality, reputation or other characteristic of the goods or ingredients or components essentially attributable to its geographical origin. Further, GIs for manufactured goods cover activities relating to the production, processing or preparation of the goods in a specific territory.
- The act establishes the Geographical Indications Registry, which will be managed and controlled by the Intellectual Property Organization of Pakistan (IPO). The IPO Trademarks Registry and its branches established under the Trademarks Ordinance 2001 will carry out functions of the Geographical Indications Registry and its branches until a separate GI registry is established.
- GI registration for any or all goods in a definite geographical territory covers classes of goods listed under the international classification of goods for the purposes of GI registration.
- GI registration is prohibited where a mark:
  - ✓ would contravene the definition of 'geographical indication' under the act;
  - ✓ would likely cause deception or confusion;
  - ✓ cannot be protected or protection has ceased or it is no longer used in the country of origin;
  - ✓ is considered a generic name or an indication; or
  - ✓ Is unregistrable on moral or public policy grounds.
- The act also considers homonymous GIs, which are spelled or pronounced similarly but which identify products originating from different places, usually in different countries. In principle, these indications should coexist, but such coexistence may be subject to certain conditions.
- A homonymous GI can be registered provided that:
  - ✓ the registrar is satisfied that it is different from other homonymous GIs;
  - ✓ producers of the associated goods will be treated equally; and
  - ✓ Consumers will not be confused or misled.
- A foreign GI registered in the country of origin can be registered in Pakistan if it has not ceased to be protected in its country of origin.
- The Federal Government will be the exclusive owner of all GIs in Pakistan and may allow other responsible statutory bodies, public bodies, local or provincial administrations,



government enterprises or any governmental organizations to register a GI in their name. Further, registrants may allow producers and operators to use and apply to the registry for obtaining registration as authorized users.

- GI registration applications must include:
  - ✓ the GI mark;
  - ✓ the class of goods and area to which the GI applies;
  - ✓ the country of origin;
  - ✓ producer or operator statements; and
  - ✓ Details of the quality, specifications and characteristics of the associated goods.
- GI registration is granted subject to confirmation of products seeking GI registration by the designated certification body and the registrar's examination and acceptance thereof.
- A party may, with the registrant's consent, apply for registration as an authorized user of a GI. Subject to examination and public notification for opposition purposes and fulfilling certain conditions, an authorized user registration may be granted by the registrar.
- A division for regulatory mechanism will monitor and inspect GI products to ensure compliance with the book of specifications (ie, a document completed by the applicant which specifies the GI goods' geographical area, production standards or product specifications and qualification process).
- GI registrations which are ongoing and authorized generally last for 10 years and can be renewed.
- Authorized users have the exclusive right to use a GI and prevent others from using it.
- Use of a registered GI is subject to compliance with product specifications and includes applying the GI to products, packaging, advertising materials and any other document relating thereto.
- The registry's GI certification comprises the National Geographical Indication logo along with the registered name of the GI product.
- Registered GI infringement includes:
  - ✓ use of an identical or deceptively and confusingly similar mark;
  - ✓ falsely indicating a country of origin; or
  - ✓ Non-compliance with the book of specification, as recorded in the registration.
- Registered GI infringement does not include:
  - ✓ use in good faith or to indicate the intended purpose of goods;
  - ✓ use of a person's name or the name of a place of business or its predecessors that is unlikely to confuse or otherwise interfere with an existing GI; and
  - ✓ Use in comparative advertising.

- In an infringement action, all such relief by way of damages, injunctions, accounts or otherwise will be available to the holder or registrant and the authorized user of the GI as is available in respect of the infringement of any other property right. Further, the rights of action against any party for passing off goods as the goods of another party or the remedies in respect thereof remain unaffected.
- Suit for infringement of a GI or any other GI right can be instituted only in the IP Tribunal.
- Any interested party or group of producers or consumers that seeks to prevent infringement of a registered GI may institute proceedings before the IP Tribunal; however, no proceedings can be instituted for an unregistered mark to recover damages by any other party.
- Use of a GI by a party either without the consent of the GI's registrant or an authorized user thereof or which falsely represents an unregistered GI as registered is punishable with imprisonment and a fine.
- An authorized user's GI rights cannot be subject to assignment, transmission, licensing, pledge, mortgage, licensing or any similar agreement of the registered GI. However, if an authorized user dies, their GI right will devolve to their successor in title.
- An application to rectify a GI registration may be filed by any party having interest in an error or omission in the register. The registrant may file an application to amend, correct or cancel the registration of an authorized user for failing to observe the applicable conditions and restrictions.
- An appeal against any decision of the registrar will lie before the relevant high court with jurisdiction.

## UNIT-IV

### TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY

#### 1. Systems of traditional knowledge protection

There are two forms of intellectual property related protection systems with regards to traditional knowledge. They are:

**Positive protection**, i.e. giving traditional knowledge holders the right to take action or seek remedies against any misuse of traditional knowledge. Any system of positive protection of traditional knowledge must provide for:

- Recognition of value and promotion of respect for traditional knowledge systems.
- Responsiveness to the actual needs of traditional knowledge holders.
- Repression of misappropriation of traditional knowledge and other unfair and inequitable uses.
- Protection of tradition based creativity and innovation.
- Support of traditional knowledge systems and empowerment of traditional knowledge holders.
- Promotion of equitable benefit sharing from use of traditional knowledge.
- Promotion of the use of traditional knowledge for a bottom up approach to development.

**Defensive protection**, i.e. safeguarding against illegitimate intellectual property rights acquired by third parties over traditional knowledge. Any system of defensive protection of traditional knowledge must provide for:

- The criteria defining relevant prior art apply to the traditional knowledge.
- A mechanism to ensure that the traditional knowledge constituting prior art is available and accessible to search authorities.

It is suggested that these two approaches should be undertaken in a complementary way as a comprehensive approach to protection of traditional knowledge is unlikely to rely totally on any one form.

#### 2. Legal concepts for the protection of traditional knowledge

**Certain other legal concepts for traditional knowledge protection are:**

- **Prior Informed Consent:** As per this principle traditional knowledge holders should be fully consulted before third parties use their knowledge.
- **Equitable Benefit Sharing:** This principle prescribes the balancing of the interests of the right holders and the general public.
- **Unfair Competition:** Unfair competition means any act of competition contrary to honest practices in industrial or commercial matters and includes various acts that mislead the public or cause confusion. This principle allows for action to be taken against false or misleading claims that a product is authentically indigenous, or has been produced or endorsed by, or otherwise associated with, a particular traditional community.
- **Patents:** When practitioners innovate within the traditional framework, they can use the patent system to protect their innovations.
- **Distinctive signs:** such signs include trademarks, collective marks, certification marks and geographical indications. Traditional signs, symbols and terms associated with traditional knowledge may be protected as distinctive marks.
- **Customary laws:** Customary laws, protocols and practices are the ones which define how traditional communities develop, hold and transmit traditional knowledge.

### 3. Certain non IPR mechanisms of traditional knowledge protection

Traditional knowledge has been protected by certain mechanisms which are beyond the domain of intellectual property. Such mechanisms are:

- **Environmental:** Concluded in 1994, the UN Convention to Combat Desertification provided for the protection of traditional knowledge in the ecological environments as well as the sharing of benefits arising from any commercial utilization of this TK
- **Health:** The World Health Organization has recognized the relevance of traditional knowledge in the field of medicine as a source of primary health care in the Primary Health Care Declaration of Alma Ata.
- **Trade and Development:** The Doha Declaration adopted by the World Trade Organization in the Doha Ministerial Conference, in 2001, instructed the TRIPS Council to examine issues regarding the protection of traditional knowledge.
- **Food and Agriculture:** The International Treaty on Plant Genetic Resources for Food and Agriculture provides for the recognition of farmers rights and the protection of traditional knowledge relevant to plant genetic resources for food and agriculture.

### 4. Patents and traditional knowledge

#### TK and Patent applicability

From the view of patent laws, TK can be said to be an information, written or unwritten, passed on by various communities and which is already in existence. A documented TK attains the feature and character of prior art and because it is available in public domain, there cannot be any limitation and prevention of commercial use of such knowledge. Adding to this, Section 3 (p) of the Patents Act, clearly mentions that traditional knowledge shall not be considered as an invention or an innovative idea.

To avoid/ prevent patent grants to TK in India, an initiative has been taken to document and publish all the TK by an e-library and such library is called as Traditional Knowledge Digital Library (TKDL). TKDL provides with details of scientific and traditional knowledge arranged in a manner according to the classification of international patents.

For undocumented TK which are held by various communities, patent laws come into picture as there are many organizations trying to get ownership over such TK in order to exploit the same for commercial gains. In case of undocumented TK, in the eyes of the law, it is relevantly easy to prove it to be a novel invention. With the intent to provide a solution to this problem, the Indian Patent Office issued a circular stating that the patents which are pending within the TK domain will be made available online and any objection with regard to the same can be made at the Patent Office.

#### Traditional Knowledge Digital Library and Bio-piracy

TKDL was a major and important step taken by the Indian government as an effort taken to revoke and retract patent on turmeric for its wound healing characteristics by USPTO and patent on neem for its anti-fungal properties granted to EPO. It is worth mentioning here, that traditional knowledge in medicines and Ayurveda exists in various vernacular languages of India like Sanskrit, Urdu, Tamil, etc. and so it is difficult for the patent examiners of international patent offices to access and comprehend. In the year 2005, it was noted that approximately 2000 patents were granted concerning the Indian medicines, annually, across the globe. Concerned with the above statistics, ancient texts on Indian medicines, including Ayurveda, Siddha, Urani and Yoga, have been published, in TKDL, with 5 different foreign languages, namely, English, French, Spanish, Japanese and German. The entire process was done with the help of various IT tools and an exclusive system of classification, called as Traditional Knowledge Resource Classification (TKRC) Bio-piracy and Misappropriation of TK.

Bio-piracy can be said to be use of intellectual property protections and IP systems to make the exclusive use of those biological resources, biological products and patents which have been in existence and in use in the non-industrialized sector over centuries, legal. Bio-piracy can also be seen as the act of misappropriating

traditional knowledge with a malice intention to gain profits by getting patent protection over the knowledge. There are various factors that make traditional knowledge vulnerable to bio-piracy, such as devolution, lack of appropriate laws, tussle between the systems and encroachment. Use of the traditional knowledge can be of a great aid as it can be used to enhance and develop best possible product or processes for people without much investment in R&D and clinical trials. Overall TK can be a great time saver.

## **TK and Bio-piracy cases**

### **1. Neem Patent**

The patent for Neem was first filed by W.R. Grace and the Department of Agriculture, USA in European Patent Office.<sup>4</sup> The patent was granted for the anti-fungal property of neem. In the particular case, a method involving a contact between a fungus and neem oil formulation for the purpose of controlling fungal growth in plants was patented. An opposition was filed against the said grant by India. The opponent proved that the neem plant contains a number of compounds and is used as astringent and antiseptic in many cases. From diabetes to skin diseases, all parts of the plants have been used to cure various types of diseases. Neem twigs have been used as toothbrush from centuries ago. Hydrophobic extracts of the neem seeds were not just known but used to cure skin diseases and fungal infections in plants. The same has been written in the Indian Ayurveda texts.

EPO found the invention not to be novel or innovative and similar to prior art and thus, revoked the patent which was granted.

### **2. Turmeric Patent**

An Indian herb of tropical region, turmeric, is used in variety of ways like food, medicines, etc. Turmeric has many benefits like it acts as blood purifier, treats cold and skin diseases and is also used as an essential food ingredient in Indian kitchen. Patent on turmeric for its wound healing properties was granted to University of Mississippi Medical Centre, by United States in the year 1995.<sup>5</sup> Objection was raised by India on grant of patent on turmeric. Evidences were provided with references stating turmeric was used for healing wound since centuries, in various languages, namely Hindi, Sanskrit and Urdu.

Thus, the patent was revoked by USPTO as the claim in the patent was proved to be obvious and known.

## **A mid-way between TK and Patents**

While TK promotes community interests, patent supports individual monopoly. With concurrence of both these worlds in cases of "TK-derived inventions", there is a necessity to get a balance between the two.

In India, this balance is struck by the Biodiversity Act, 2002. Section 2 (a) of the Act read with Sec. 6 (2), brings the concept of 'benefit sharing' with respect to the product or process derived or made with the help of knowledge and for commercial purpose which is conserved with the 'benefit claimers.' Benefits claimers are referred to the ones who are the holders of knowledge of the use and benefits of such biological resources and innovation in relation to the use and application.

Those who hold the traditional knowledge is referred as 'benefit holder'. National Biodiversity Authority has been taking initiative to protect the benefits of the benefit holders by way of agreements in relation to benefit-sharing that is made between the TK holder and the inventor who wants to exploit TK-derived inventions in commercial market. Such agreements act as a win-win for both the parties – TK holder and his rights are appreciated and the patent holder gains monopoly in the commercial market.

This mid-way was followed in the case of Jeevani drugs, where a patent was granted to the Tropical Botanical Garden Research Institute on energy enhancing property of a fruit from the plant of Jeevani. Fruits of Jeevani were used by the Kani Tribe of Kerala at Western Ghats to reduce fatigue. In this particular case, revenue of 50% was shared with the TK holder by the patent holder.

## **Conclusion**

Traditional Knowledge, definitely, is a cultural heritage and backbone for any country but at the same time is a valuable resource with a lot of potential that needs to be exploited to bring economic growth and development



in a country. It is also obvious that there is a need to maintain a balance between the profits and benefits of such knowledge in the commercial market and the protection of the rights of the native communities, so that the socio-economic harmony of a nation is left undisturbed.

Having enough provisions to protect TK, it has become a gold mine in this regard that needs to be exploited and used. Limited investment and ever growing needs of the people have resulted in showing great potentials in TK and TK-derived inventions. It is a prime time, with many provisions for protection, to get into the world of TK and harness the same for innovations and creations. However, the rights of the local people and the cultural heritage of the country should not be prejudiced for commercial benefits.

## **5. Strategies to increase protection of traditional knowledge**

### **Mechanisms to Increase Management of Off-Reservation Lands**

Tribal traditional ecological knowledge is fundamentally a cultural practice. Tribal TEK is not a static rulebook, but a set of practices that to survive must be played out on a living landscape. Therefore the most immediate and efficient mechanism to achieving knowledge sovereignty is to remove barriers to Tribal sovereignty over traditional management, including management of off-reservation and/or concurrent jurisdiction lands.

One present limitation to exercising sovereignty is limits on Tribal capacity in the form of staff, and legal and economic resources. Definitions of sovereignty are in turn behind this situation. The ability of tribes to proactively engage in the active policy context of climate change is limited by lack of staff as well as economic and legal resources. Mechanisms to enhance Tribal capacity are therefore essential for the retention of knowledge sovereignty as well as other forms of sovereignty.

### **Actions Requiring Legal or Legislative Remedies**

- Expand Federal Compacting Authority for Tribes to include all entities under the DOI, EPA and USDA. While the creation of new Compacting Authority requires an act of Congress, intermediate steps could include the authorization of transfer of funds from appropriations budget from the USFS to the DOI and directly to a specific Tribe for the purpose of gaining efficiencies in the wild land fire management program (2009 Omnibus Appropriations Act). Though this would not enable permanent compacting of these as recurring funds, and would require indirect costs to follow the transfer, it could serve a “pilot” purpose until such time funds could be reinvested in DOI through appropriations language for integration with the beneficial Tribal compact. Note this recommendation is congruent with recommendation #4 of joint Intertribal Timber Council and USFS review of the Tribal Forest Protection Act to “Explore options and opportunities to advance use of Tribal contractors who can promote economic development, use of goods and services and increase Tribal employment.”
- Tribes Should Exert Tribal Joint Tenancy Rights. Within the public and Tribal trust frameworks, tribes can assert their standing as co-tenants and co-trustees of the forests, waterways or atmosphere, just as they do with a shared fishery and assert claims as co-trustees of the atmospheric trust.
- Recognize the Scale of Native Sovereignty. Employ definition of Territorial rather than Reservation Sovereignty Expanded recognition of the scale of sovereignty would enable Tribes to secure the necessary resources to pursue traditional management on millions more acres of their traditional lands.

### **Actions for Forest Service and other Federal Agencies**

Note that these recommendations emerge from lessons learned by the Karuk Tribe where the US Forest Service is the major player. Tribes with off reservation lands managed by the BLM, NPS, FWS or others are encouraged to expand upon these ideas as needed.

- Modify intergovernmental fire allocation funding formulas to reflect Tribal territory size rather than current use of Tribal reservation size. This concept builds on definitions of territorial based sovereignty so that it is for the territorial sovereignty rather than reservation based sovereignty.

- Create and enforce serious repercussions for District level violation of Tribal Consultation agreements by the National USFS office in D.C.
- Develop new, unique, or combined set of Tribally specific funding transfer mechanisms. Present Environmental Stewardship Contracting blends Tribes with private companies or state and local government, posing negative legal implications for Tribal sovereignty. Note this recommendation is congruent with recommendations of the joint Intertribal Timber Council and USFS review of the Tribal Forest Protection Act to “Explore options and opportunities to advance use of Tribal contractors who can promote economic development, use of goods and services and increase Tribal employment” (2013, 6).
- Authorize transfer of appropriation budget funds USFS to the DOI and then directly to Tribes for the purpose of wild land fire management as per 2009 Omnibus Act. Note this recommendation is congruent with recommendation of the joint Intertribal Timber Council and USFS review of the Tribal Forest Protection Act to “Explore options and opportunities to advance use of Tribal contractors who can promote economic development, use of goods and services and increase Tribal employment” (2013, 6).
- Recognize humans as a critical component of ecosystems. Humans are vital for maintaining balance in fire process and function. Forest Service prioritization rubric should incorporate the guidance for categorizing natural versus anthropogenic emission sources from the 2005 Western Regional Air Partnership Fire Emissions Joint Forum. This document outlines how managed wildfire needs to occur in its interval. If a landscape is in condition class 1, fires should not be suppressed. If fires are in condition class 2 then perhaps prescribed fires or cultural burns should be used to maintain the condition class. Or cultural burns / managed wildfires should be used to bring it to a condition class 1. If lands are in condition class 3, then cultural burns should be readied and employed at the correct intervals to restore and maintain the resiliency found in a condition class 1 area. All of these scenarios should fit within a natural emission category as per the 2005 guidance. However development of Tribal implementation plans, or modification of state implementation plans, or agreements between tribes, partners, and the EPA may be needed.
- As per the recommendations of joint Intertribal Timber Council and USFS review of the Tribal Forest Protection Act: Clear USFS agency direction, guidance and support for implementation of the Tribal Forest Protection Act from the National level to the regional and local offices.
- As per the recommendations of joint Intertribal Timber Council and USFS review of the Tribal Forest Protection Act: USFS should assist in effective implementation of TFPA by identifying needed legislation and providing information and comments to the Administration. These should be formulated in consultation with tribes that applied but were denied or have had a difficult time implementing due to forest service barriers.

### **Mechanisms to Enhance Intergovernmental Project Collaboration**

“ . . . WHEREAS, traditional Tribal knowledge is a core part of our identity and ways of life, is highly spiritual and carries obligations for its appropriate use . . . the Federal government, in accord with the federal trust responsibility, should recognize the sovereign rights of tribes to control access to and the use of their traditional knowledge and the right to free, prior and informed consent to give or deny access to it . . . in those cases where traditional knowledge may be shared by the tribes, measures need to be developed to ensure that it is used appropriately. . .

— NCAI #REN-13-035 Request for Federal Government to Develop Guidance on Recognizing Tribal Sovereign Jurisdiction over Traditional Knowledge, 2013

- Create immediate Federal protections eliminating the mandatory disclosure of Tribal ecological knowledge.
- Ensure that grants, partnerships and other federal-Tribal initiatives do not require mandatory disclosure of Tribal traditional knowledge.
- Agencies and other entities seeking to collaborate with Tribes should follow the 2014 Guidelines for Considering Traditional Knowledge in Climate Change Initiatives.
- Implement Sacred Sites Policy: determine potential for local application of recent interdepartmental MOU. The key to this is the language regarding taking sacred sites (cultural management areas) and funding section 110 activities at Tribal THPO departments to assess the sacred sites as TCP’s then look to the identifiable family groupings associated with these sacred sites and ceremonies to tie the management of the land to principles maintained in our ceremonial processes. See the Karuk Draft Eco-Cultural Resources Management Plan. Among the primary

goals of the USFS Sacred Sites Policy and the recently adopted Interdepartmental MOU is the development of effective plans and strategies for the long-term protection and management of sacred sites located on federal lands, thereby reducing conflicts with Tribes and Native American religious practitioners. Therefore, critical to achieving this goal is an implicit understanding and acknowledgement that sacred sites, wherever located, are sacred sites period. The Native American religious practitioners who access and utilize these sacred sites know what is important in terms of protecting that on-going use. Tribes and the individual practitioners are the experts, and are the only ones who can determine what constitutes effective protection measures and strategies. USFS should initiate dialog with Tribes, THPOs, and religious practitioners to evaluate and determine potential for local application of the recently adopted interdepartmental MOU. Collaborate with Tribes to explore pro-active measures to protect and manage sacred sites. Prioritize funding for Section 110 activities that engage Tribes and THPOs to assess and evaluate sacred sites as Traditional Cultural Properties (TCPs). Collaborate with Tribes in the joint development of agreements and management plans to ensure the long-term protection, access, and culturally appropriate management of sacred sites.

- As per the recommendations of joint Intertribal Timber Council and US Forest Service review of the Tribal Forest Protection Act: Expand Forest Service understanding of the Tribal Forest Protection Act authority, as well as the process of proposal development, review, and implementation. TFPA may be an effective authority if the Agency concerned truly honors self-governance and self-determination. Agency interpretation in the interest of complete and perpetual control goes against these principles and will ultimately erode government to government relationships. Create a joint Tribal ITC-USFS working group to assist the agency in developing educational materials to enhance the understanding of the TFPA, and to help guide both the US Forest Service and their Tribal partners through the process of proposal development, project review, and implementation. The USFS should solicit participation in the joint working group from interested Tribes within each region. The U S Forest Service should foster and encourage greater collaboration with Tribes in the development and implementation of TFPA projects to ensure outcomes that fulfill the greatest mutual benefits to both parties.
- As per the recommendations of joint Intertribal Timber Council and US Forest Service review of the Tribal Forest Protection Act: Expand Forest Service understanding of government-to-government relationships and agency trust responsibilities to Tribes. The Tribal relations program should be constructed as a means of building Tribal specific relationships with the sole intent of extending Forest Service programs and resources to tribes in a lasting and meaningful way. All too often this program merely serves as a means to check a consultation box or otherwise protect the agency interest. This approach will never be effective. Establish a joint Tribal-ITC-NCAI-USFS Task Force to develop a national strategy aimed at expanding and enhancing USFS government-to-government relationships with and trust responsibilities to Tribes. This effort should be agency-wide and include district, forest, regional, and headquarter staff.
- As per the recommendations of joint Intertribal Timber Council and US Forest Service review of the Tribal Forest Protection Act: "The ITC and Tribes should explore ways to amend TFPA or other authorities to expedite consideration, approval, and implementation of TFPA projects by addressing environmental compliance categorical exclusions, alternative dispute resolution processes, and allowing for a greater range of management alternatives in specially designated land classification areas." Amendment of the TFPA authority may benefit greatly from taking an integrated approach to connecting the dots between interrelated authorities, while outlining a process of piloting programmatic efficiencies/effectiveness, and enabling long term investments in success

### Research Priorities

Tribal knowledge sovereignty and management are limited by a lack of existing knowledge in matters of importance to Tribes. This is true in part because research questions and priorities by non-Native agencies and Western scientists have perpetuated non-Native understandings of the world. We recommend that agencies including the BIA, NPLCC, USDA, and National Science Foundation fund research in the following areas. Research projects and questions should be initiated, designed and carried out by Tribes wherever possible.

- NPLCC is to fund peer reviewed socio-economic research on some of these subjects. That could end up bringing funding back to us to start doing some of that. Local people need to do the work, Tribal people in particular. That is an institutional barrier (the lack of published material showing

real socio-economic relationships).

- Expanded study of the complex impacts of multi-instructional agency responses to climate change and “the laws of other sovereigns” on Tribal sovereignty, especially for Tribes seeking to manage off-reservation lands. In the face of rapidly changing policy terrain tribes without sufficient capacity face erosion of sovereignty.
- Identify the most effective combination of existing authorities for contracting and compacting to conduct a wide range of management activities from management to planning, to re-assessment as per recommendations in Phase II of the Wild land Cohesive Management Strategy.
- Research on relationships between Tribal forest management activities such as prescribed fire on carbon emissions.

### **Regional and Local Strategies to Enhance Tribal Knowledge Sovereignty**

“Emphasis on the utilization of traditional knowledge should focus on support for its application by tribes to solve environmental and climate problems without the need for sharing it; and in those cases where traditional knowledge may be shared by the tribes, measures need to be developed to ensure that it is used appropriately, that tribes are protected in policy and law against its misuse and that the tribes are able to determine and receive benefits from its use. . .”

National Congress of American Indians Resolution #REN-13-035 Request for Federal Government to Develop Guidance on Recognizing Tribal Sovereign Jurisdiction over Traditional Knowledge

In parallel to the National recommendations, we recommend three categories of action at the Statewide, regional and local levels to enhance Tribal knowledge sovereignty, 1) mechanisms to increase Tribal management of off-reservation lands, 2) mechanisms to enhance intergovernmental cooperation and 3) priorities for additional research.

### **Mechanisms to Increase Tribal Management of Off-Reservation Lands**

Agency actions that provide the opportunity to expand Tribal traditional management are an efficient way to achieve shared goals, as well as fundamentally supporting the sovereignty of traditional knowledge.

- Expand interpretation of USFS Stewardship Agreements. These have been interpreted as contracts in the West, but in other parts of the US are interpreted more broadly. The local interpretation of stewardship management can and should be broadened.
- Development of long term fire management strategy. Implement existing national level USFS directive to work with local communities to plan for catastrophic fires, especially in the face of climate change. At present, when fires occur offices are understaffed and perpetually in “emergency mode.”
- Honor Tribal Consultation Agreements. There are countless instances of the USFS and other agencies failing to follow through on agreements made during Government to Government Consultation.
- Evaluate how emerging policies and procedures related to climate change may affect Tribal sovereignty.
- Promote Use of the Tribal Forest Protection Act As outlined in the Intertribal Timber Council report; the USFS can expand use of TFPA through performance incentives and accountability measures, budget direction, monitoring, reviews, and development of direction and guidance.
- Establish and maintain sustained personal relationships between individuals (NCAI, Walk Softly)
- As recommended by the Intertribal Timber Council report “Improve agency understanding of Tribal Forest Protection Act, government-to-government relationships and trust responsibilities by conducting joint training (i.e., general Tribal relations training currently in development by the USFS and adaptation of modules produced by the Intertribal Timber Council) and providing post-training technical support” (2013).

### **Mechanisms to Enhance Intergovernmental Project Collaboration**

“Expand collaborative land management, community and fire response opportunities across all jurisdictions, and invest in programmatic actions and activities that can be facilitated by Tribes and partners under the Indian Self-Determination and Education Act (as amended), the Tribal Forest Protection Act, and other existing authorities in coordination with the UN Declaration on the Rights of Indigenous Peoples”

- As recommended by the Intertribal Timber Council report Strengthen the partnership between the FS and Tribes through formal agreements to institutionalize working relationships, forums, exchanges, collaborative project planning, engagement in national forest plan revisions, coordinated federal hazard fuel funding, and collaborative efforts to maintain viable infrastructure for utilization of forest products
- As recommended by the Intertribal Timber Council report “Explore opportunities to develop intergovernmental agreements between FS and BIA to enable use of authorities such as self-determination contracts or self-governance compacts” (2013,6)
- As recommended by the Intertribal Timber Council report local agencies should “Undertake a Tribal outreach effort to inform Tribes about the TFPA and encourage its use, including notice of training opportunities and distribution of technical assistance materials, such as templates for preparation of TFPA proposals along with descriptions of FS administrative guidance and proposal review processes”
- Require Agency Trainings on working with Tribes, Cross-Cultural Communication, the Colonial legacy of the USFS, Tribal Management Priorities and the Public and Tribal Trust Responsibilities of Federal agencies.

### Research Priorities

While research priorities are often set at the national level, statewide, regional and local agencies also participate in the conception as well as implementation of research projects. Local entities must design, conduct and carry out research priorities as mentioned in the National recommendations. Local actors must also seek out and use existing peer-reviewed research on the relationships between humans and nature in the forest landscape when preparing their NEPA analyses.

## 6. Global legal FORA for increasing protection of Indian Traditional Knowledge

Indian TK is now available to the United States Patent and Trademark Office (USPTO) and European Patent Office (EPO), who can access the database of TK, courtesy the Indian Government’s permission. India’s Council of Scientific and Industrial Research (CSIR), and the Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy developed the TK Digital Library (TKDL), a 30-million page searchable database of TK translated from several languages such as Hindi, Sanskrit, Arabic, Persian, Urdu and Tamil into English, Japanese, French, German and Spanish.

There are several other international legal platforms and mechanisms that currently address IP protection relating to TK, including the following:

**The UN Draft Declaration on Rights of Indigenous Peoples (UNDRIP):** Article 29 of this UN Draft Declaration specifically states that people from LICs are authorized to the recognition of the complete ownership, control and protection of their cultural and IP. They have the special rights to control, develop and protect their sciences, technologies and cultural expressions, including human and other genetic resources, seeds, medicines, wisdom of the characteristics of flora and fauna, oral traditions, literature, designs and, visual and performing arts.

**Global Guidelines:** Another positive initiative is the inclusion of a set of draft corporate guidelines for businesses that want to use native plants and TK from LICs to make commercial drugs.

The CBD and the 2010 Nagoya Protocol establish the dominant international system for the recognition and protection of TK. Under Article 8(j) of the CBD, parties are required to respect and maintain knowledge held by LICs, and promote broader application of TK based on fair and equitable benefit-sharing. TK is further recognized in Article 16 as a ‘key technology’ for effective practices of conservation and sustainable use of biodiversity, with procedural requirements established in Article 15(4–5) for access to genetic resources, including those based on prior informed consent and mutually agreed terms. The Nagoya Protocol, which became effective from 2014, broadens the CBD provisions establishing a concrete system determining access and benefit-sharing. Other relevant developments relating to TK that evolved simultaneously to progress in the CBD leading up to the Protocol include the establishment of:

- The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) passed by the Food and Agriculture Organization Conference in 2001, effective from June 29, 2004. This treaty provides for protections relating to ‘farmers’ rights’ including TK and traditional breeding



practices.

- The Inter-Governmental Committee (IGC) on IP and Genetic Resources, TK and Folklore, established under the World Intellectual Property Organization (WIPO) in 2000, which provides a forum for negotiations on issues related to development of a binding international mechanism on TK.

## NEED FOR A 'SUI GENERIS' LEGISLATION IN INDIA

The protection of TK raises several policy issues, prominently the objectives and methods of such protection, and its impact and ramifications for intended beneficiaries. Such issues are extremely complex, since there are broad differences about the definition of the subject matter, the justification for protection, and the means for achieving its purposes. The issues pertinent to TK should be addressed in a comprehensive manner, including ethical, environmental and socio-economic concerns. Moreover, there are still several unresolved technical issues such as the problem of collective ownership and the modes of enforcement of rights.

The conviction that TK has helped the industry generate gargantuan profits has proved to be relentless. Of course, much of the international law governing access to genetic resources and benefit-sharing has been woven around this idea. TK should be protected on both human rights and utilitarian grounds, but the political strategy adopted by India for the past two decades needs to be seriously reconsidered. In terms of legal benchmark, this strategy has been dichotomous. The first is the access and benefit-sharing path via the CBD and its Nagoya Protocol. The second is based on IP law and comprises:

- (i) Reforms aimed to reduce misuse of genetic resources and TK, such as by enhancing patent prior art searching, restricting the scope of the subject matter claims in patent law to biological, biochemical and genetic issues, and necessitating patent applicants to disclose the origin of genetic resources and TK that were useful or essential to an invention; and
- (ii) The enactment of *sui generis* TK protection laws, based partly on current forms of IPRs, but with some modern features.

TK cannot flourish when decisions affecting LICs continue to be made by urban educated elites. We need to give up political space to allow LICs to formulate the rules of involvement. The 2007 UNDRIP affirms territorial rights and self-determination, and these must be essential elements of strategies, activities, laws and regulations.

The development of any system for the protection of TK should be established on a logical definition of the objectives sought, and on the propriety of the mechanism selected to accomplish them. IPRs may be one of the devices to be used, but their limits and ramifications should be clearly gauged. A balance should be struck between the protection and promotion of the use of such knowledge. The extent to which the myriad proposals made for the protection of TK convey the aims and cultural values of the LICs they intend to serve should not be ambiguous. There is a risk of transferring concepts and models unsuited to their realities to such communities, or which may prove ineffective in solving the issues they are supposed to address. The protection of TK should not outweigh the fact that its preservation and use requires ensuring the survival and improvement of living conditions in the ambience and cultural setting of such LICs.

## THE WAY AHEAD

The following actions could be taken in future in this field:

- A comprehensive national level development strategy boosting the protection of TK, including the settlement of prime issues such as land rights and the need to respect and maintain the lifestyles of LICs.
- Recognizing the varying needs for the protection and promotion of TK in several areas such as TM and plant genetic resources.
- Administering farmers' rights at the national level.
- Progressing towards the enactment of a misappropriation regime in the short-run.
- Expediting the work in WIPO, UNCTAD, WTO and other fora to clarify the possible role, scope, and content of protection mechanisms for TK.
- Guarantying a wide and effective participation of representatives from LICs in the definition and implementation of any protection system for TK.

## UNIT-V

### TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS

#### 1. Traditional knowledge and engineering

Even four or five decades earlier, the general opinion in India was that science had its origin and development in Europe, and that non-Western societies did not have any noteworthy sciences prior to their colonization. Actually, a lot of work had been done on sciences in India, particularly mathematics and astronomy, and some other disciplines too, for more than 150 years before the 1980s by both Indian and European scholars. But this was all in the scholarly domain and not a part of public discourse.

The 1970s and 80s saw some significant changes in the scenario. This was when the harmful effects of modern science and technology with a Western stamp began to be realized. This led to greater interest in alternate technologies, and the realization that non-Western societies had viable technologies with their own worldviews and social norms.

This is when ‘gobar gas’ and such innovations came into being, and environmental movements like ‘chipko andolan’ and others gained ground. Indian society had functioned well for several millennia. Also, some estimates indicated that a major part of the total world industrial production in the 18th century came from India and China. All these could not have been possible without viable technologies pertaining to various aspects of life. However, some scholars would not consider the traditional technologies as science-based. They exclusively associated science with modern Western science.

There was a significant change in the discourse around the beginning of the 1980s, thanks to a remarkable book named *Indian Science and Technology in the 18th Century* by Dharampal, published first in 1971, but not noticed much till the end of the 70s. It had 17 chapters, which were all contemporary European accounts of the sciences and technologies as practiced in India in the later part of the 17th century.

One remarkable chapter was “Remarks on Astronomy of the Brahmins” by John Playfair, a British astronomer (1790). His analysis was based on four Indian astronomical tables (pertaining to the positions of the sun, moon and planets) from Siam (Thailand), Krishnaboram (Krishnapuram), Narsapour, and Tirvalore. He made a detailed comparison of the data with some contemporary European tables and what could be derived from Ptolemy’s astronomy. He remarked on the great accuracy of the tables and observed that “the construction of these tables implies a great knowledge of geometry, arithmetic and even of the theoretical part of astronomy”.

He rules out the possibility of Indians borrowing from Greeks or Arabs, and argues that the transmission was more likely to have been the other way round. Equally remarkable is the chapter on “Hindu Algebra” by H T Colebrooke (1817). Colebrooke goes into the details of Indian algebra and concedes that it was advanced, but remarks without any justification that Hindus received hints on the methods from Greeks. A review of this in *Edinburgh Review* (November 1817) doubts this remark, and notes that “Greeks had nothing to give on that subject which it was worth the while of the Indians to receive”.

From the three chapters on the indigenous production of iron, one learns that ‘wootz’ steel of very high quality was produced in India. It is estimated that around 10,000 iron and steel furnaces might have been functioning in India in the late 18th century, producing around 20 tons annually. There are two chapters on the Indian method of inoculation against smallpox, which seems to have been practiced in large parts of India for a long time and was very effective. There are also chapters on the making of mortar, paper, ice, on agriculture, and also shorter accounts of dyeing, surgical operations, materials used in buildings, and so on.

All these indicated a significant level of development of sciences like mathematics and astronomy, and technological methods in India before the British conquest. Also, the theories and practices were markedly different from the contemporary European ones.

Dharampal’s book had a great impact, and inspired many people to look at traditional Indian sciences and technologies with a new perspective. It also inspired social activists. Academic work had been going on in areas like astronomy, mathematics, chemistry, metallurgy, agricultural practices, Ayurveda and architecture even earlier, but there was a new impetus. Also, some traditional practices were continuing, if not thriving, as in the case of Ayurveda, local health traditions, textiles, metal works, etc.

There has also been an increase of interest in non-Western science, technology and medicine, the world over. However, all these do not mean that there has been a significant revival of traditional Indian sciences and technologies. Nor are they posing any challenge to the dominance of the modern paradigm of development. One of the reasons for this is the lack of awareness about the traditions in society at large, thanks to our educational system. There is a need for widespread dissemination of authentic information about them.

## **2. Traditional medicine system**

India is known for its traditional medicinal systems—Ayurveda, Siddha, and Unani. Medical systems are found mentioned even in the ancient Vedas and other scriptures. The Ayurveda concept appeared and developed between 2500 and 500 BC in India. The literal meaning of Ayurveda is “science of life,” because ancient Indian system of health care focused on views of man and his illness. It has been pointed out that the positive health means metabolically well-balanced human beings. Ayurveda is also called the “science of longevity” because it offers a complete system to live a long healthy life. It offers programs to rejuvenate the body through diet and nutrition. It offers treatment methods to cure many common diseases such as food allergies, which have few modern treatments. However, one should be aware that Ayurvedic nutrition is not a “magic bullet” system but requires the full participation of the patient to succeed. It is an interactive system that is user-friendly and educational. It teaches the patient to become responsible and self-empowered. Ayurveda is not a nutritional system for those seeking an escape or excuse to further abuse their body or mind. It is a system for empowerment, a system of freedom, and long life.

Food is the major source for serving the nutritional needs, but with growing modernization some traditional methods are being given up. Hence, the modern food habits are affecting the balanced nutrition. There is an ever widening gap in nutrient intake due to which normal life is no longer normal. However, affluence of working population with changing lifestyles and reducing affordability of sick care, in terms of time and money involved, are some of the forces that are presently driving people towards thinking about their wellness.

### **Medicinal Plants Used in Alternative/Traditional Medicines**

Alternative medicines are being used by about 60 percent of the world's population. These medicines are not only used by the rural masses for their primary health care in developing countries but are also used in developed countries where modern medicines dominate. The Indian subcontinent is a vast repository of medicinal plants that are used in traditional medical treatments. The alternative medicines in the traditional systems are derived from herbs, minerals, and organic matter, while for the preparation of herbal drugs only medicinal plants are used. Use of plants as a source of medicine has been an ancient practice and is an important component of the health care system in India. In India, about 70 percent of rural population depends on the traditional Ayurvedic system of medicine. Most healers/practitioners of the traditional systems of medicine prepare formulations by their own recipes and dispense to the patients. In the Western countries, approximately 40 per cent of people are using the herbal medicine for the treatment of various diseases. This interest in traditional medicines is growing rapidly due to the attention being given to it by the governmental agencies and different NGO's comprising of general public and researchers as well as the increased side effects, adverse drug reactions, and cost factor of the modern medicines.

India is the largest producer of medicinal plants. There are currently about 250,000 registered medical practitioners of the Ayurvedic system, as compared to about 700,000 of the modern medicine. In India, around 20,000 medicinal plants have been recorded; however, traditional practitioners use only 7,000–7,500 plants for curing different diseases. The proportion of use of plants in the different Indian systems of medicine is Ayurveda 2000, Siddha 1300, Unani 1000, Homeopathy 800, Tibetan 500, Modern 200, and folk 4500. In India, around 25,000 effective plant-based formulations are used in traditional and folk medicine. More than 1.5 million practitioners are using the traditional medicinal system for health care in India. It is estimated that more than 7800 manufacturing units are involved in the production of natural health products and traditional plant-based formulations in India, which requires more than 2000 tons of medicinal plant raw material annually. More than 1500 herbals are sold as dietary supplements or ethnic traditional medicines.

Alternative medicines are being used by those people who do not use or cannot be helped by conventional medicinal system.

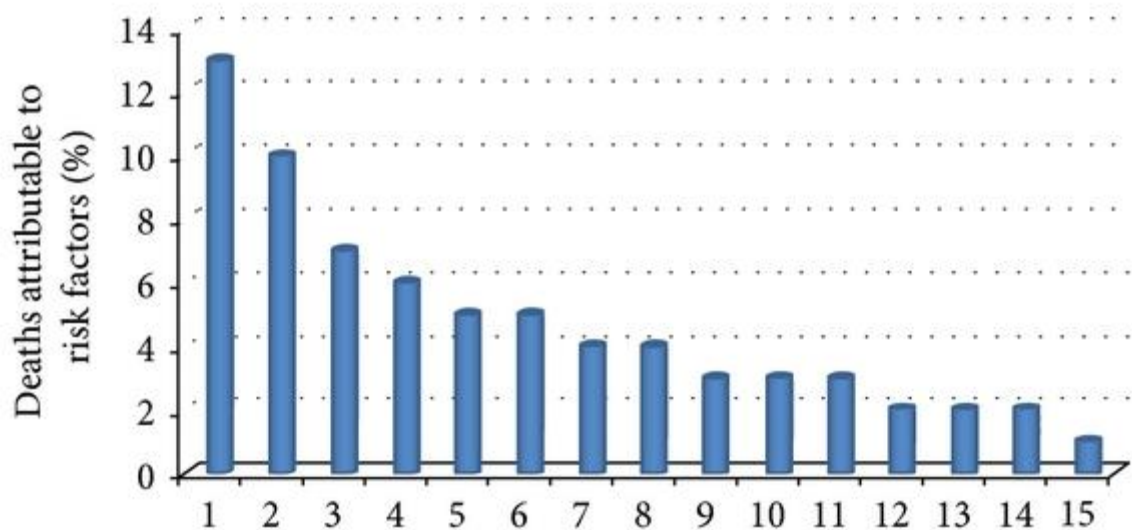
## **Expanding Complementary and Alternative (CAM) Approaches**

More than 80 percent of people in developing countries cannot afford the most basic medical procedures, drugs, and vaccines. Among wealthier populations in both developed and developing countries, complementary and alternative practices are popular although proof of their safety and effectiveness is modest. Evidence-based research in Ayurveda is receiving larger acceptance in India and abroad. The National Center for Complementary and Alternative Medicine has been inaugurated as the United States Federal Government's lead agency for scientific research in this arena of medicine. Its mission is to explore complementary and alternative healing practices in the context of rigorous science, support sophisticated research, train researchers, disseminate information to the public on the modalities that work, and explain the scientific rationale underlying discoveries. The center is committed to explore and fund all such therapies for which there is sufficient preliminary data, compelling public health need and ethical justifications.

Complementary and alternative practices are adjuncts or alternatives to Western medical approaches. Economic factors influence user behavior. Although social, cultural, and medical reasons account for most of the appeal of traditional approaches, economic factors also play a role. It is assumed that users of these approaches choose them because they are cheaper than conventional therapies or systems. However, several studies have found that CAM approaches cost the same or more than conventional treatments for the same conditions; thus, people seek them out for reasons other than cost. At least one study showed that financial factors ranked behind such reasons as confidence in the treatment, ease of access, and convenience, in the choice of a traditional healer. Another common misconception is that the poor are more likely to use traditional medicine, but this is not always true. Nowadays people seek CAM techniques because they believe the side effects will be lower. In both developed and developing countries, users of complementary methods also commonly seek conventional care.

## **Nutraceutical an Evolving Alternative Approach**

Nutrition is a fundamental need. Various risk factors related to health result from an imbalance in nutrition. These imbalances in India are widely prevalent leading to adverse outcomes. A certain section of the population consumes diet which does not provide sufficient calories, let alone sufficient nutrients. In India, nearly 20% of the total population and 44% of young children (below 5 years of age) are undernourished and underweight. On the other hand, there is a huge population that is nourished in calorie intake but not in terms of nutrient intake. This segment would typically include lower middle to upper class population with sufficient purchasing capacity but probably less awareness about their nutrient requirements, leading to imbalanced nutritional uptake. In fact, in our population about 30% in urban and 34% in rural areas consume more than the recommended number of calories with higher than recommended levels of dietary fats and could be the largest contributor in making India the future cardiovascular and diabetes capital of the world. The third population segment, which is about 80 million, consumes nutrients and calories more than those recommended for the lifestyle they have opted for. The main risk factors in developing countries like India are related to nutrition and contribute to nearly 40% of total death and 39% of total disease burden. The main leading risk factors in developing countries are shown in Figure 1.



**Figure 1**

**Risk factors related to nutrition— 1: underweight, 2: unsafe sex, 3: blood pressure, 4: unsafe water, sanitation and hygiene, 5: cholesterol, 6: tobacco, 7: indoor smoke from solid fuels, 8: low fruit and vegetable intake, 9: zinc deficiency, 10: iron deficiency, 11: vitamin A deficiency, 12: physical inactivity, 13: alcohol, 14: overweight, and 15: unsafe healthcare injections.**

According to WHO report, India has the largest burden of cardiovascular diseases and largest number of diabetes patients in the world. The number of cardiovascular diseases patients in Brazil, Russia, China, and India are 4.1, 11.8, 24.5, and 28.9 million, respectively. Likewise the numbers of diabetes patients in same countries are 4.6, 4.6, 20.8, and 31.7 million, respectively. An estimate of the cost of productivity lost on account of mortality due to nutrition-related disorders was estimated to be 0.85% of the GDP in 2004 and is expected to increase up to 1.2% for India's GDP by 2015. Nearly 340 million people, 30% of the population in urban areas and 34% of the population in rural areas, consume calories more than the norms. Even in the population that shows sufficient calorie intake, the micronutrient consumption is not at desired levels. While the intake of calorie-rich foods may be high, micronutrient-rich foods are being consumed in low proportions. As a result, significant micronutrient deficiencies exist in urban as well as rural areas.

Hence, the requirement of external intervention, that can supplement diet to help prevent nutrition-related disorders and promote wellness over treatment of various diseases, has become a necessity, and such products are known as nutraceuticals. A nutraceutical is a food or food component that claims to have health benefits, including treatment and prevention of disease. Nutraceuticals, an emerging concept, can be broadly categorized as products which are extracted from natural sources (nature-like) or manufactured synthetically (man-made), which supplement the diet to provide nutrition over and above regular food and help prevent nutrition-related disorders. Nutraceuticals, foods or food components that help in prevention or treatment of disease, are made from herbal/botanical raw materials. They do more than just supplement the diet. They, as was pointed out, help with disease prevention and treatment. Theoretically, the appeal of nutraceuticals is to accomplish treatment goals without side effects.

The nutraceutical industry is rapidly growing (7%–12% per year). With extensive anecdotal data on exciting health results, nutraceuticals promise significant contributions to disease prevention. The global nutraceuticals market is estimated at 117 billion US dollar of which India's share is a meager 0.9%. United States and Japan are key markets for nutraceutical consumption. Indian nutraceuticals market is about 1 billion USD which is increasing day by day. Globally, this market is expected to reach 177 billion USD in 2013. The dietary supplements category is expected to be the fastest growing product category globally.

### **Herbal Medicines in Dietary Supplements**

Dietary supplements and herbal remedies are popular complementary or alternative products for people. These are the supplements that are intended to supplement the diet and contain one or more dietary



ingredients (including vitamins, minerals, herbs or other botanicals, amino acids, and other substances) or their constituents. These are intended to be taken by mouth as a pill, capsule, tablet, or liquid and are labeled on the front panel as being a dietary supplement. Such products may range from isolated nutrients, dietary supplements, and diets to genetically engineered “designer” foods, herbal products, and processed foods such as cereals, soups, and beverages. These botanicals are sold in many forms as fresh or dried products, liquid or solid extracts, tablets, capsules, powders, tea bags, and so forth. For example, fresh ginger root is often used in various food stores; dried ginger root is sold packaged in tea bags, capsules, or tablets, and liquid preparations made from ginger root are also sold in the market. A particular group of chemicals or a single chemical may be isolated from a botanical and sold as a dietary supplement, usually in tablet or capsule form. An example is phytoestrogens from soy products.

### **Nutraceutical Concept with Varying Definition**

The nomenclature for nutraceuticals is based on the segments it constitutes. In Canada, this term is natural health products; in USA, it is called dietary supplements, and in Japan it is called foods for special health use. There are distinct definitions and regulations for dietary supplements and functional foods in USA, Canada, and Europe. In Japan, dietary supplements and functional foods are governed under the same set of regulations. USA and Canada actually list the constituents that a product must have to be called a nutraceutical, whereas Europe and Japan just provide general guidelines on the properties that a product should have to be called a nutraceutical. Traditional and herbal medicines are included in the definition of dietary or nutritional supplements in Canada. Japan does not mention traditional herbal medicines under functional foods for special health use. USA includes herbal and botanical in its definition. The Indian definition lists down the ingredients that a product should have, and it also specifies general properties of nutraceutical. Traditional medicines though have been excluded from the definition. There are three categories which have been considered under the nutraceuticals.

**Functional Foods,** Foods that have specific physiological benefits and/or reduce the risk of chronic disease, that is, nutrition fortified foods like fortified flour, fortified oil, fortified malt-based powder and probiotic foods like yogurt.

**Dietary Supplements,** Supplements provide nutrients that are missing or are not consumed in sufficient quantity in a person’s diet, that is, vitamin supplements, mineral supplements, macronutrients, antioxidants, tonics, herbal formulations like Chyawanprash, Musli pak, Ashwagandhadi leh, and nonherbal products like cod liver oil.

**Functional Beverages,** Liquids that quench thirst along with replenishing minerals provide energy, prevent ailments, and promote healthy life style, that is, sports and energy drinks, fortified juices, and glucose drinks and powder.

A product category can be classified into a specific need-segment based on its predominant use. The product segments catering to foundation and condition specific need are the largest and growing the fastest. Nutraceutical products aim to fulfill specific needs of the persons based on which they may be classified as follows.

**Enhancement segments:** high protein supplements, energy drinks, sports drinks, glucose drinks, and so forth.

- Specific condition segments: antioxidants, vitamin supplements, and mineral supplements.
- Foundation segments: macronutrient supplements, nutrition fortified foods (fortified flour, soups, biscuits, etc.), probiotic foods (yogurt), and herbal formulations (chyawanprash, Ashwagandhadi leh).

### **Conclusion**

Although some uncertainty exists about the safety, effectiveness, and cost-effectiveness of CAM methods, expanding their use, where reasonable evidence of their effectiveness and good evidence of their safety exists, might yield health, social, and economic benefits. For example, improving the information and services provided in local pharmacies, that are the primary source of treatment for many ailments in rural areas, might serve as an effective substitute for allowing unregulated use of conventional medical treatment. Thus, expanding CAM would require significant investment of time and resources if it is to be done appropriately and have an impact on population health. An important role exists for CAM. However,

more evidence is needed before CAM approaches can be broadly integrated into national health systems for diseases for which they have promise.

Also, numerous nutraceutical combinations have entered the international market through exploration of ethno pharmacological claims made by different traditional practices. To truly consume a healthy diet, the vast majority of the diet must be composed of health-promoting foods and nutraceuticals but disease-promoting foods or junk food must be avoided. Ninety percent of the daily diet should be made up of nutrient rich plant foods, whose calories are accompanied by health-promoting phytochemicals, vegetables, fresh fruits, beans and legumes, raw nuts, seeds, and avocados, starchy vegetables, and whole grains. These foods or nutraceuticals construct a health-promoting, disease-preventing diet with protective substances. The rich nutrient food intake will provide maximum protection against not only infections, asthma, and allergies but also against heart disease and cancer in adulthood.

### **3. TK and biotechnology**

The word ‘biotechnology’ was actually coined early in the 20th century by an agricultural engineer from Hungary, named Karl Ereky, who explained it in such a way that the technology which include all such work by which products are produced from raw materials with the aid of living organisms. Subsequently, over the period, the definition of biotechnology acquired a confusing status due to various interpretations. The first official broad definition given by the US Office of Technology Assessment which states that “biotechnology, broadly defined, includes any technique that uses living organisms (or parts of organisms) to make or modify products, to improve plants or animals, or to develop micro-organisms for specific uses” is also considered now void. In the broadest sense, the term “biotechnology” encompasses techniques applied to living organisms and parts thereof to produce, identify or design substances or to modify organisms for specific applications. Thus there may be many definitions of biotechnology as it is highly multidisciplinary involving almost all areas of science or to say, biotechnology combines disciplines like genetics, molecular biology, biochemistry, embryology and cell biology, which are in turn linked to practical disciplines like chemical engineering, information technology, and robotics.

The global economic value that one can expect from innovation in biotechnology, providing opportunities for traditional knowledge holders to capture some part of the market.<sup>29</sup> Innovative modern products based on traditional knowledge have to be differentiated from innovations or inventions exploiting traditional knowledge. In the first case, the traditional knowledge holder would be involved, directly or indirectly in the production of the traditional knowledge based products, whereas in the second case, the traditional knowledge holder does not play any role apart from transferring the knowledge to someone who works in the knowledge. This part will explain the differences between modern innovation based on traditional knowledge and the innovations exploiting traditional knowledge. The purpose of the discussion is to differentiate the two approaches and the same to explain that innovation based on traditional knowledge is not the same as the innovation exploiting traditional knowledge.

#### **Modern Innovations Using the Traditional Knowledge**

It has been suggested that innovations of modern products using the traditional knowledge need not arise from the organized or formal systems of knowledge.<sup>30</sup> Nevertheless, there are efforts in India, China and other countries to bring the informal sector of traditional knowledge into the modern sector, or in other words to modernize the products produced through traditional knowledge.

In India, in 2000, the Government set up the National Innovation Foundation to identify, recognize and support grassroots innovations and traditional knowledge. This is the extension of the Honey Bee Network created in 1980s to identify the grassroots innovations and traditional knowledge in India and share the traditional knowledge back with the innovators themselves through documentations and dissemination in different languages. The Honey Bee Network was later formalized into The Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI) and The Grassroots Innovation Augmentation Network (GIAN). The Government of India set up the National Innovation Foundation in recognition of the work of the three initiatives. These initiatives documented more than 20,000 innovations and traditional knowledge which are either of contemporary origin or based on outstanding traditional knowledge primarily from Indian. It is found that many of the inventions are relatively simple and can improve efficiency in the traditional sector such as for farmers and farm workers.

It is contended that the efforts to bring improvement by the modern science into the traditional knowledge sector have been slow due to the differing perceptions, communication styles, and different priorities and co-ordinations. It is found that many of the inventors in the traditional knowledge sector are possessive of their inventions and suspicious of any effort to help them. At the same time, many of the inventions are not designed for manufacture, causing problems in bringing the inventions to the commercialization stage. The Indian initiatives also faces several challenges such as the lack of funding and this contributed to the difficulties in securing the protection of intellectual property rights for the innovators. Another challenge is to bring the innovations in the traditional knowledge sector into commercialization which requires market study, finance and maintenance and support for the products.

The successful promotion of the modern adaptation of traditional knowledge can be attributed to the acceptance of the TCM and Traditional Indian Medicine. TCM and Traditional Indian Medicine have undergone transformation from a mere traditional healing processes to accepted methods of preventing and curing various types of illnesses. The transformation in the role played by the two types of traditional medicines necessitates innovations in the manner of production, usage and marketing and at the same time requires the change of mindsets among the stakeholders involved in the sectors.

According to a study by Patwardhan et.al., China has overcome difficulties facing Traditional Chinese Medicine by modernizing its traditional medicine profession with government-sponsored GAPs and GMPs.<sup>36</sup> All manufactures of TCM are mandated to comply with guidelines laid down by China's State Drug Administration (SDA) by 2004 and farms producing raw ingredients must comply with SDA-imposed standards by 2007. For marketing of herbal medicine in China, special requirements such as quality dossier, safety and efficacy evaluation and specific labeling criteria are required. New herbal drugs must be approved according to the Drug Administration Laws.

In India, new rules delineating essential infrastructure, manpower and quality control and licensing requirements in the Traditional Indian Medicine or ayurvedic came into force from 2000 and form part of the Drugs and Cosmetics Act, 1940. Under this law, ayurvedic patent and proprietary medicines need to contain only the ingredients mentioned in the recommended books as specified in the Act. Under this law, any new herbal medicine safety and efficacy data are mandatory. Depending on nature of herbs and market availability, different requirements exist for submission of clinical trial and safety data.

The study by Patwardhan et.al also shows that formal training in traditional medicine in India and China helps in ensuring quality standards in health care delivery. The study also finds that China has been successful in integrating TCM in the national health care system, where science-based approaches were utilized and inculcated in the education of TCM with emphasis on research. In India, a separate department for Indian Systems of Medicine and Homeopathy now known as AYUSH (Ayurveda, Yoga, Unani, Siddha, and Homoeopathy) was established in March 1995 to promote indigenous systems. Priorities include education, standardization of drugs, enhancement of availability of raw materials, research and development, information, communication and larger involvement in the national system for delivering health care. The Central Council of Indian Medicine oversees teaching and training institutes while Central Council for Research in Ayurveda and Siddha deals with interdisciplinary research.

The Governments of China and India have also encouraged research and development in the field of traditional medicine. Chinese medicine became successful in crossing philosophical barriers through constant reworking of the basic system. The first compound derived from Chinese herbal remedies to enter the western market was ephedrine, an amphetamine like stimulant from ma huang (*Ephedra sinica*). The next was artemisinin, a potent antimalarial from qinghao (*Artemisia annua*). In 2003, Chinese researchers launched a phase II trial to test the efficacy of a drug called kanglaite from iijen (*Coixlachryma-jobi*) for treating non-small-cell lung cancer. This is the first drug from TCM to enter clinical trials in the United States.

India has progressive research institutes like the Central Drug Research Institute (CDRI), Central Institute of Medicinal and Aromatic Plants and National Botanical Research Institute at Lucknow, Regional Research Laboratories (RRL), at Jammu, Bhubaneshwar and Jorhat, National Chemical Laboratory at Pune, which routinely undertake research on medicinal plants. Most of them are involved in standardizing the herbal medicines and isolating active compounds. Few selected crops *rauwolfia* (producing chemical compound reserpine for antihypertensive), *turmeric* (producing curcumin for anti-inflammation) and *ashwagandha* (withaferin A for anti-inflammation) have been taken for improvement yet there is a need for research on quality planting materials for farmers, conservation of endangered species and to prevent

exploitation of the natural resources.

Apart from China and India, the same effort to diffuse technological innovations among small farmers has also taken place in Bolivia. The Bolivian Government through the Bolivian Agriculture Technology System provides funding to promote applied research and technology transfer agricultural development. The foundation promotes innovation through a network of technology providers, farmers and private sector agents.

### **Innovations Exploiting Traditional Knowledge**

This part refers to the use of traditional knowledge by non-traditional knowledge holders to create new products based on the traditional knowledge. It has been acknowledged that traditional knowledge and genetic resources have often been the targets of pharmaceutical companies.

Biogenetic materials are not only found in the rainforest but also in the marine and coastal environment, hence the wider exposure of traditional knowledge to the modern sectors including the pharmaceutical industry. It has been suggested that a growing number of molecules found in the coastal areas demonstrate interesting pharmaceutical properties have been identified and some of which are already at the clinical trial stage. Examples include anti-cancer compounds, antivirals, antibiotics, antifungals and hormonal modulators. It has also been acknowledged that coastal genetic resources have yielded cosmetics and products such as enzymes, toxins and microbes for industrial and biotechnology use. There are many discoveries based on natural resources that have been transformed into medicines. Some examples include anticancer drugs from the Pacific Yew Bark Tree marketed as Taxol, anti-Malaria product COARTEM by Novartis, Aspirin from Salix SPP and diabetes treatment from venom of lizards.

There are many incidents where traditional knowledge has been exploited and patented without proper acknowledgement and benefit sharing arrangements with the holder of the traditional knowledge. One of the famous examples is the patent on turmeric, which was granted to two Indian Nationals at the University of Mississippi Medical Centre on “use of turmeric in wound healing” in 1995. This patent received an objection from the Indian Council of Scientific and Industrial Research which argued that turmeric has been used for thousands of years for healing wounds and therefore the medicinal use was not novel. The United States Patent and Trademark Office upheld the objection.

Another example is the European Patent granted to WR Grace and USDA for ‘a method for controlling fungi on plants by the aid of hydrophobic extracted neem oil’. Neem is a tree normally found in South and Southeast Asia and has properties as natural medicine, pesticide and fertilizer. The European Patent received several objections on the ground that the fungicidal effect of extracts of neem seeds had been known for centuries in Indian agricultural to protect crops. The patent was revoked in 2000 by the EPO for want of novelty and prior disclosure, on the ground that ‘all features of the present claim have been disclosed to the public prior to the patent application.’

The third example which relates to the failure to offer benefit sharing is the beneficial use of hoodia cactus. Hoodia cactus has been used by San people in the Kalahari Desert in South Africa to stave off hunger and thirst on long hunting trips. Scientists at the South African Council for Scientific and Industrial Research studied an earlier report and this resulted in the patent on Hoodia’s appetite suppressing element P57 which was then licensed out to Phytopharm. Phytopharm was later acquired by Pfizer. The San people protested this and later reached an agreement with the South African scientists for a share in the royalty.

## **4. TK in agriculture**

Interplay between biological variation and selection make crop and natural evolution similar to one another, but the two differ by virtue of the role of “conscious” selection by humans in crop evolution. Conscious selection implies knowledge systems about the crop and its environment, which are subsets of the more general traditional knowledge and indigenous knowledge (e.g., Ellen et al. 2000). While “traditional knowledge” and “indigenous knowledge” are not synonymous, they share many attributes, such as being unwritten, customary, pragmatic, experiential, and holistic. The terms are frequently used in the same context to distinguish the knowledge of traditional and indigenous communities from other types of knowledge, such as the knowledge of scientific and industrial communities (Ellen et al. 2000). Indeed, the primary distinction between traditional and indigenous knowledge pertains to the holders rather than the knowledge per se. Traditional knowledge is a broader category that includes indigenous knowledge as a

type of traditional knowledge held by indigenous communities (Mugabe 1999). While traditional knowledge has emerged in international discourse on new legal mechanisms (Wendland 2002), indigenous knowledge is a term long in use by anthropologists and other investigators of non-industrialized societies (Ellen et al. 2000), and because of this history, indigenous knowledge enjoys a more elaborated discussion and definition than the more inclusive term. While Kongolo (2001, 357) observes that “(t)raditional knowledge is rarely defined within the national, regional, and international frameworks,” indigenous knowledge has been extensively analyzed by ethnobotanists and others (e.g., Berlin 1992), so it behooves us to utilize the analysis of indigenous knowledge to grapple with traditional knowledge.

Traditional knowledge is associated with folk nomenclatures and taxonomies of plants (Berlin 1992) and the environment (Ellen et al. 2000) and in practical domains such as 11 disease etiology (Berlin and Berlin 1996), and agricultural practices (Brush 1992). Distinguishing between indigenous knowledge and other knowledge systems has proven to be problematic (Agrawal 1995), but anthropologists and others have argued that a number of criteria can be used to differentiate the two forms. Indigenous knowledge’s characteristics include (1) localness, (2) oral transmission, (3) origin in practical experience, (4) emphasis on the empirical rather than theoretical, (5) repetitiveness, (6) changeability, (7) being widely shared, (8) fragmentary distribution, (9) orientation to practical performance, and (10) holism (Ellen and Harris 2000).

### **These same characteristics apply to traditional knowledge**

The primary development of crops and cropping systems occurred with traditional knowledge before the relatively recent discoveries of agricultural chemistry and crop biology, and most of the world’s farmers still rely on traditional knowledge. The current hyperbolic growth of agricultural production may rely on formal science, but it is built on foundations developed by traditional farmers. While the accomplishments of traditional knowledge are unquestioned, its characteristics pose severe obstacles for its valuation and protection by indigenous people and outside interests such as conservationists, indigenous rights activists, and rural development agencies. Indeed, outside efforts to value, promote, and protect traditional knowledge appear inevitably to distort it and its social context (Dove 1996).

A severe obstacle to valuation and protection is the disarticulation of different types of knowledge when that information is local, orally transmitted, practical, and fragmentary in distribution. Agricultural knowledge is comprised of numerous substantive domains - soil types, pests, pathogens, environmental conditions such as rainfall and temperature patterns, and crop genotypes – as well as management domains – irrigation techniques, soil amendments, planting patterns, pest control, weed control, and, crop selection to name a few. Brookfield (2001) adds organization as a third domain that includes tenure arrangements, resource allocation, and dependency on alternative production spheres. These domains are demarcated by distinct lexicons and nomenclatures such as crop variety names or terminology for management practices. Traditional knowledge is rife with “covert categories” (Berlin 1992) and unlabeled, intermediate domains (Brush 1992) that may link substantive and management domains but require intensive research to understand. The fact that traditional knowledge is orally transmitted and changeable creates problems in identifying truly local and autochthonous knowledge (Dove 2000).

The fact that traditional knowledge is local, empirical, and holistic suggests that indigenous people don’t have to worry about consistency over wider areas, as plant collectors and geneticists must. Since variety names are orally transmitted, repetitive, widely shared, and fragmentary, name lists cannot be used directly to estimate genetic diversity or population structure above the farm level (Quiros et al. 1990). Capturing the knowledge in a single domain by collecting its nomenclature, such as crop variety names, is relatively easy but of limited use. Linking nomenclatures of substantive domains to one another and to management domains is complicated by the inherent qualities of localness, oral transmission, and fragmented distribution. The best studies showing linkage between different domains (e.g., crop diversity and local ecological conditions) are executed in single communities or micro-regions (e.g., Bellon and Taylor 1993). Linking multiple domains, such as crop type, soils, and plant diseases, or showing how domains are linked across regions is daunting and generally not attempted in research on traditional agricultural systems.

Awareness of indigenous/local knowledge (IK/ LK) has been steadily gaining ground in the academic world, both within the social as well as in the natural sciences. “A growing number of scientists and policy makers are aware of the contribution indigenous knowledge (IK) can make to a more sustainable development” (Viergever 1999: 341). IK also seems to be relevant to the scientific world for a number of reasons including issues of protection of biodiversity (Iwanaga 1998), the effects of Intellectual Property Rights (IPR) over the rural communities (RAFI 2000, RAFI/ UNDP 1995), and the fact that IK could be



used as the starting point in the construction of a truly alternative agriculture (Flora 1992, Kloppenburg 1991). Due to these reasons, research and development institutions (R&D) started to include in their agendas not only the term, but also all its implications.

Some centers have become involved in looking at IK as a key component of sustainable agricultural practices; others have been in charge of researching and cataloguing existing IK. The Center for Indigenous Knowledge for Agriculture and Rural Development (CIKARD), established in 1987 at Iowa State University, is an example of the latter. CIKARD “focuses its activities on documenting and preserving the indigenous knowledge of farmers and other rural people around the globe” (Warren and McKiernan 1995:426). Inside of the Consultative Group on International Agricultural Research Centers (CGIAR), the incorporation of local/indigenous knowledge in the generation of technology started when some technologists from the International Potato Center (CIP) in Peru, worked with local farmers to develop storage technologies for potato seed (Fujisaka 1995). IUCN (The World Conservation Union) “concludes that indigenous people who live in intimate contact with their major resources could provide much of the intellectual raw material for a shift to sustainable societies” (McNeely 1995:448). This “raw material” cited by McNeely is nothing different than indigenous knowledge, 13 the knowledge resulting from the co evolution -”intimate contact” in the author’s words between human beings and their resources.

Some authors remark that it is important to pay attention to the fact that: “Actually existing science is bound to capitalism ideologically, epistemologically and financially” (Kloppenburger 1992:104). This “science” bound to capitalism in different forms could threaten the survival of the local/indigenous knowledge. In this paper, i will use the definition of indigenous knowledge as the knowledge that is inside of the agricultural workers and that is related to a given locality (Kloppenburger 1991, Maurial 1999, Warren and McKiernan 1999). As Viergever (1999:333) states “some of the knowledge held by indigenous peoples may lead to commercial applications.” Many authors argue that indigenous/local knowledge is the starting point in the “construction” of an alternative agricultural science. “Material resources for the reconstruction of a “successor science” are to be found in the “local knowledge” that is continually produced and reproduced by farmers and agricultural workers” (Kloppenburger 1991:519). Kloppenburg (1991) also argues that there must be a “deconstructive” process in the “reconstruction” of an alternative science applied to the agricultural process. A truly alternative agriculture “would move farmers into knowledge creators” (Flora 1992:95). In order to achieve a “truly just and sustainable agriculture”, it is necessary to recognize that knowledge has multiple sources (Flora 1992, Kloppenburg 1992). Prakash (1999) proposes the “deconstruction” of modern knowledge system or “modern Science” and the inclusion not only of the well-known “science for the people” term, but “science by the people” which includes the traditional or indigenous systems of knowledge. Mwadime (1999) devotes attention to terms such as “reconstruction” and “deconstruction” of knowledge. He argues that the only way to curb the crisis in food production in Africa is through the deconstruction of the current “education systems” and the reconstruction including local knowledge systems and farmers in the whole knowledge generation system. In Latin America, biodiversity fairs are evidence that IK not only maintain an important level of biodiversity but assure food security and sustainability of farmers’ agriculture (Scurrah et al., 1999).

## **5. Traditional societies depend on it for their food and healthcare needs**

The World Intellectual Property Organization (WIPO):

The World Intellectual Property Organization (WIPO) Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (the IGC), which met for the first time in 2001, is in discussions about draft provisions for the enhanced protection of traditional knowledge and traditional cultural expressions against misappropriation and misuse. WIPO’s work in these areas involves close cooperation with other international organizations and NGOs, as well as the organization of a wide range of capacity building activities. Capacity-building resources include practical guidelines for indigenous and local communities on developing intellectual property protocols, and information technology tools for managing intellectual property issues when digitizing intangible cultural heritage. In 2000, the WIPO General Assembly established forum for the discussion of intellectual property issues in relation to access to genetic resources and benefit sharing, the protection of traditional knowledge and expressions of folklore. The work program has produced an impressive number of discussion papers, surveys of national laws and data obtained by means of surveys, consultations and fact-finding missions. The technical dimensions of the issues have received a thorough exploration in a number of papers prepared by the Secretariat. The work program also has produced a number of practical outcomes as: A toolkit for the management of intellectual property in the context of documenting traditional knowledge

and genetic resources; a practical guide for the protection of traditional cultural expressions and a database of contractual provisions relating to intellectual property and access to genetic resources.

Discussions of WIPO to date have considered the following issues:

- Human rights treaties and other existing or emerging instruments that are applicable to traditional knowledge and genetic resources.
- Elements of customary law that are vested in traditional knowledge protection and transmission.
- Analysis of indigenous participation, including the levels and roles in decision-making, including measures to ensure compliance with free, prior and informed consent.
- Options and opportunities in the proposed certificate of origin, source or legal provenance from genetic resources.
- Role of customary law in the protection of traditional knowledge and development of regimes on access to genetic resources and benefit sharing.

In applying these principles at the domestic and national level, it is envisaged that an international access and benefit-sharing regime would be supported by national legislation that addresses a sui-generis protection of indigenous traditional knowledge, innovation and practices, ensuring compliance.

### **Food and Agriculture Organization (FAO)**

The FAO addresses traditional knowledge in the context of Farmers' Rights. According to its Article 43 9.2 (a), the protection of traditional knowledge relevant to plant genetic resources for food and agriculture is one possible measure to protect and promote Farmers' Rights. Because the responsibility to realize Farmers' Rights rests with national governments and is subject to national legislation, needs and priorities, the Contracting Parties of the FAOIT enjoy great freedom when implementing the provisions of Article 9.2 (a) on the protection of traditional knowledge. National mechanisms realized for this protection may thus take the form of existing and sui generis forms of IPRs or any other legal form the Contracting Parties.

### **The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)**

The FAO has produced a treaty in the form of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) (adopted by FAO Member countries in November 2001). The treaty recognizes the contribution of "local and indigenous communities and farmers of all regions in the world" to the conservation and development of plant genetic resources. The implementation of farmers' rights requires the "protection of traditional knowledge that is relevant to plant genetic resources for food and agriculture", as well as the rights of participation in the benefits and decision-making related to PGR. In essence, the treaty establishes a principle of farmers' rights and provides some guidance as to the areas in which contracting parties should act, but it does not provide detailed standards for these areas. It is not even clear if contracting parties are necessarily obliged to act in these areas since the provision simply says that contracting parties "should" act in this area rather than "shall". The provisions of the treaty are also circumscribed by the scope of the treaty. This treaty is aimed at preventing the loss of agro-biodiversity rather than biodiversity in general. One main difference between the idea behind the CBD and the ITPGRFA is that benefit sharing under the ITPGRFA is linked to a specifically defined trigger point for when benefit sharing shall take place. Consequently, benefit sharing is detached from the individual access situation and provider. Also ITPGRFA provides a standardized means by which countries can exercise their sovereign rights to a specific and limited selection of plant genetic resources for specific uses. It also implies a standardized approach to gaining prior informed consent and mutually agreed terms.

### **Permanent Forum on Indigenous Issues (Permanent Forum)**

The Permanent Forum is an advisory body to the Economic and Social Council established by resolution 2000/22 on 28 July 2000. The Forum has the mandate to discuss indigenous issues related to economic and social development, culture, the environment, education, health and human rights. The Permanent Forum was the outcome of a resolution by the Commission of Human Rights in 2000 that was adopted by the Economic and Social Council. The Permanent Forum has a mandate to "discuss indigenous issues within the mandate of the Council relating to economic and social development, culture, the environment, education, health and human rights". One of its specific tasks is "to promote the integration and coordination of activities relating to indigenous issues within the United Nations system". Many indigenous representatives expressed grave concern over bio-piracy and genetic engineering, and called for the protection of genetic resources and a moratorium on bio-prospecting. The protection of traditional

knowledge and indigenous intellectual property was a high priority for indigenous peoples and could be coupled with free, informed and prior consent. The objectives of Permanent Forum are:

- Provide expert advice and recommendations on indigenous issues to the Council, as well as to programs, funds and agencies of the United Nations, through ECOSOC;
- Raise awareness and promote the integration and coordination of activities related to indigenous issues within the UN system;
- Prepare and disseminate information on indigenous issues The Permanent Forum holds annual two-week sessions.

### **The United Nations University (UNU) Centre on Traditional Knowledge**

The UNU TKI aims to promote and strengthen research on traditional knowledge of indigenous and local communities conducted from a global perspective, grounded in local experience. In particular, the Institute seeks to contribute to:

- Change mindsets and paradigms about the role of traditional knowledge in our society and in key sectors such as academia, government and business.
- Increasing the recognition and importance of traditional knowledge.
- Developing the application of traditional knowledge in a broad range of contexts (e.g. ecosystem management and biotechnology).
- Developing strategies for the preservation and maintenance of traditional knowledge.
- Facilitating the development of the capacity of indigenous communities to conserve and apply their knowledge in an increasingly globalized economy.

The UNU TKI will investigate the threats to traditional knowledge, methods to maintain traditional knowledge, and the resilience of traditional knowledge systems. It will also consider the links between conventional and indigenous scientific systems while addressing some of the important questions this raises both in terms of research and capacity development, including:

- *f*Traditional knowledge and climate change
- *f*Traditional knowledge and water management
- *f*Traditional knowledge and biological resources
- *f*Traditional knowledge and marine management
- *f*Traditional knowledge and forestry
- *f*Traditional knowledge and international policy making.

The Traditional Knowledge Initiative was established in 2007 with the generous support of the Christensen Fund, a leading US based foundation active in the areas of cultural and biological diversity. The pilot program is an important step in the process towards the establishment of a permanent UNU TKI.

### **Key pilot activities include:**

- *f*Climate change and indigenous peoples
- *f*A book on the role of traditional knowledge
- *f*Water management and traditional knowledge
- *f*Traditional knowledge Bulletin
- *f*Pacific Islands Programme.

## **6. Management of biodiversity**

In recent years, India is becoming one of the important countries for involving non-governmental initiatives for resource management, environmental and developmental capacity building in order to achieve sustainable development.

Many government programmes are facilitating linkages between Environmental Non-Governmental Organizations (ENGOS) and Developmental Non-governmental Organization (DNGOs) and development decision-making.

This attracted a greater attention after 73rd and 74th amendment to the Indian Constitution, encouraging participatory decision-making and empowerment of the people.

Such organizations respond to social problem fast with more focused approach and often with better success. Several NGOs have been involved in programmes and service delivery for environmental decision-making.

It has been suggested that with the help of the mass media, traditional knowledge and community education programmes a greater awareness and sensitivity needs to be built in the public and the communities. Such awareness, it is hoped, will contribute to a greater participation by people in programmes and services (Prasad et al., 1999; Siddique, 2001; Phutego and Chanda, 2004, Kunwar and Kachhawah, 2001).

The Indian Forest Act, 1927, The Wildlife Act, 1972, The National Forest Policy, 1988, The Environment Protection Act, 1986 and Biodiversity Act, 2002 provided legal basis for conservation and management. Biodiversity Act, 2002 and Biodiversity Rules, 2004 focus on conservation and sustainable use of components of biodiversity and fair and equitable sharing of benefits.

A National Biodiversity Authority has been set up at Chennai under the Biological Diversity Act, 2002. These Acts initiated establishment of Biodiversity Management Committees (BMC) at local village level. State Biodiversity Boards at state level and a National Biodiversity Authority. Various types of protected areas are included (Government of India, 2007).

#### **Biosphere Reserves:**

1. Biosphere reserve has been set up to protect representative ecosystems and also serve as laboratories for evolving alternative models of development.
2. Three biosphere reserves from India are now included in the World Network of Biosphere Reserves. These are Sundarbans (West Bengal), Gulf of Mannar (Tamil Nadu) and Nilgiri (Kerala, Karnataka and Tamil Nadu).

#### **Wetlands, Mangroves and Coral Reefs:**

1. For 22 Wetlands Management Action Plans have been prepared.
2. Calimer from Tamil Nadu and East Kolkata from West Bengal have been added to the wetland list of the country.
3. Nineteen sites have already been declared as Ramsar sites of international importance in India.
4. A Directory of Wetlands, covering 2,107 natural and 65,253 man-made wetlands, occupying an area of 4.1 million hectares and information on the status of 183 wetlands of national/international importance, was prepared.
5. Twenty-four wetlands, 35 mangrove and four coral reef areas in the country have been identified by the Government of India for conservation and management (Munyati et al., 1999).

#### **National Afforestation and Eco-Development Board:**

1. A total of 515 projects in 23 states have been operationalized for treating an area of 0.8 million hectares for the afforestation programme with people's involvement for the sustainable management of the country's forests.
2. The NAEB has seven regional centres located in universities/national level institutions. During the year, these regional centres have conducted a number of training programmes on Joint Forest Management (JFM), interactive workshop on forestry programmes, micro-planning exercise, etc.

In India, Environmental Impact Assessment (EIA) is emerging as a measure tool for ensuring that environmental quality is fully taken into account in the decision-making processes of any developmental programme (Singh and Parijat, 2001; Singh, 2002). This technique will help the development planners in to identify environmental impacts and minimize degradation of environment as well.

Geographers may evolve consensus and resolve conflict coming from different interest group. Different stages of environmental assessment, i.e., objectives, scoping, policy alternatives, prediction, significance assessment, evaluation, public participation, plan implementation, mitigation and monitoring will be accurately understood by the geographical communities.

With different domains such as environmental, economic, social, developmental, structural-functional, institutional, organizational, regional and geo-political, the geography can bridge the gap between physical and social sciences. Under ecological change research, environmental and social approaches should be linked and established for better understanding of Indian environment (Singh, 2000).

The National Environment Policy, 2006 also focuses to conserve the biodiversity, inter-generational and intra-generational equity, sustainable utilization of biodiversity, integration of environmental, social and economic concerns and principles of good environmental governance.

## **7. Food security of the country and protection of TK**

Food security is a measure of the availability of food and individuals' ability to access it. According to the United Nations' Committee on World Food Security, food security is defined as the means that all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life. The availability of food irrespective of class, gender or region is another one. There is evidence of food security being a concern many thousands of years ago, with central authorities in ancient China and ancient Egypt being known to release food from storage in times of famine. At the 1974 World Food Conference the term "food security" was defined with an emphasis on supply; food security is defined as the "availability at all times of adequate, nourishing, diverse, balanced and moderate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices". Later definitions added demand and access issues to the definition. The final report of the 1996 World Food Summit states that food security "exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life."

Household food security exists when all members, at all times, have access to enough food for an active, healthy life. Individuals who are food secure do not live in hunger or fear of starvation. Food insecurity, on the other hand, is defined by the United States Department of Agriculture (USDA) as a situation of "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways". Food security incorporates a measure of resilience to future disruption or unavailability of critical food supply due to various risk factors including droughts, shipping disruptions, fuel shortages, economic instability, and wars. In the years 2011–2013, an estimated 842 million people were suffering from chronic hunger. The Food and Agriculture Organization of the United Nations, or FAO, identified the four pillars of food security as availability, access, utilization, and stability. The United Nations (UN) recognized the Right to Food in the Declaration of Human Rights in 1948, and has since said that it is vital for the enjoyment of all other rights.

The 1996 World Summit on Food Security declared that "food should not be used as an instrument for political and economic pressure". Since multiple different international agreements and mechanisms have been developed to address food security. The main global policy to reduce hunger and poverty is in the Sustainable Development Goals. In particular Goal 2: Zero Hunger sets globally agreed on targets to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture by 2030.

### **The National Food Security Act 2013 (also 'Right to Food Act')**

It is an Act of the Parliament which aims to provide subsidized food grains to approximately two thirds of India's 1.2 billion people. It was signed into law on 12 September 2013, retroactive to 5 July 2013.

The National Food Security Act, 2013 (NFSA 2013) converts into legal entitlements for existing food security programmes of the Government of India. It includes the Midday Meal Scheme, Integrated Child Development Services scheme and the Public Distribution System. Further, the NFSA 2013 recognizes maternity entitlements. The Midday Meal Scheme and the Integrated Child Development Services Scheme are universal in nature whereas the PDS will reach about two-thirds of the population (75% in rural areas

and 50% in urban areas).

Under the provisions of the bill, beneficiaries of the Public Distribution System (or, PDS) are entitled to 5 kilograms (11 lb) per person per month of cereals at the following prices:

- Rice at ₹3 (4.2¢ US) per kg
- Wheat at ₹2 (2.8¢ US) per kg
- Coarse grains (millet) at ₹1 (1.4¢ US) per kg.

Pregnant women, lactating mothers, and certain categories of children are eligible for daily free cereals.

The bill has been highly controversial. It was introduced into India's parliament on 22 December 2011, promulgated as a presidential ordinance on 5 July 2013, and enacted into law on 12 September 2013.

Odisha government implemented food security bill in 14 districts from 17 November 2015

Assam government implemented Act on 24 December 2015. Total 67% (rural 75% and urban 50%)