

Nirmal Sengupta

Traditional Knowledge in Modern India

Preservation, Promotion, Ethical Access
and Benefit Sharing Mechanisms



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Preface

As an energetic professional planner in the newly formed State Planning Board, I was traveling through the State of Bihar to find matters that needed attention in the ensuing Five-Year Economic Plan. On one of these trips by jeep, someone told me, ‘That’s an *ahar*’. Just an earthen embankment on ground, it was nothing impressive. Ahars and pynes were used for irrigation, I learnt. However, after being trained to notice them, I slowly realized that there were hundreds of ahars in and around Gaya District. They must be irrigating a lot, I thought. But there was no mention of it in the State irrigation statistics. There should be some data somewhere—I went through all possible data sources. Ultimately, I found some information in Hunter’s Statistical Account of Bengal, written in the 1870s. Hunter mentioned *ahar* and made some funny connection with famines. Intrigued, I went through the Famine Commission’s and many related reports. I could not believe what I found. By all accounts, Gaya District, the seat of *ahar*–pyne irrigation, was ‘immune to famine’ when the rest of India was being ravaged by repeated famines. How old are these? I read a couple of history books, as novels, to satisfy my curiosity. *Ahar* and related terms were mentioned in *Arthashastra* and *Jataka* stories. I wrote a letter to a top historian hoping that he would find it exciting. There was no reply. Nor was there any from my younger historian friends, who would rather laugh at all these. But I felt it was too important a matter to be forgotten. I, a statistician, became a reluctant historian. With a bit of archival work, I published an article in a reputed journal (Sengupta 1980). It created a sensation. In 1985, I published a compilation of neglected traditional/indigenous irrigation systems from all over India. And then, I washed my hands off of history and went back to planning. Ahars are worth supporting, I felt as a development planner. If we understand how they survived and functioned so well in the absence of any support from the authority, they may be revitalized. With a little digression, I may inform that at that time similar questions bothered several others all over the world after finding that there were many interesting old techniques that are surviving without any support from the government. Over time, these inquiries developed into theories of common property and self-organization. In 2009, Elinor Ostrom was given the Nobel Prize for her works in this field.

Going back to the 1980s, soon I learnt that I was not the only one to notice continuing importance of traditional knowledge. There were many others. Ashok Jhunjhunwala, Professor of electrical engineering at the Indian Institute of Technology Madras, was curious how local carpenters calculated their material requirements for a job faster than any qualified engineer. His inquiries led him to learn about the traditional Indian mathematical techniques that work faster for numerical calculation. Ashok realized that it will have a good use for economizing time in machine computation. K. V. Chandramouli, a chemist, traveled all over India to learn about the wide variety of natural dyes in use. He conducted thousands of experiments at his laboratory in Bangalore to standardize the application of natural dyes. Natural dyes are now widely used in textiles, leather goods, and children's toys. There were many others with similar interests, in India, in other developing countries, even in the West. Once I was taken on a hike into Dutch countryside by my friend Linden Vincent, a reputed engineer. Her purpose was to introduce me to the tastes of the Netherlands through wild berries before they vanish in a few more years. In a few years, local berries began to reappear as varieties of jams in Walmarts of USA, but not in Europe.

Since then, interest is growing in India and abroad. Because of the vast range of the subjects it touched, almost anywhere I worked, I found some use of traditional knowledge-related issues. I was happy to prepare a compilation of valuable traditional knowledge (Sengupta 2007) when the Indian Economic Association asked me to do so. But at no stage was traditional knowledge my major work. After retirement, when the Indian Institute of Advanced Study, Shimla, offered me this opportunity to write a book on a topic of my choice, I felt this would be worth writing about. Today, traditional knowledge is being discussed in WHO, WTO, and UNESCO. In 2015, at the age of eighty-four, a little-known pharmacologist Youyou Tu received the Nobel Prize for her pathbreaking discovery of malaria drug based on the Chinese traditional knowledge. In India too, interest has been steadily increasing, and along with that, many questions. In this book, I introduce to the readers the topic, its importance, recent developments in India and abroad, and what are being done now for Indian traditional knowledge. It is a travelogue in the fourth dimension. I narrate what I have seen changing in the last fifty years. Like a good travel writer, I have tried to go beyond the surface.

Different people comprehend traditional knowledge differently. Some of them think it is the knowledge of good old days that are now forgotten. A Nobel Prize was awarded to a discovery based on such a piece of ancient Chinese knowledge. At the same time, countries are discussing traditional knowledge in WTO because of its importance in current international trade. Global agencies often club together traditional knowledge and indigenous knowledge. Anthropologists know that knowledge of tribes evolve, and in their own ways, are just as modern as the rest. To many Indians, all those and only those written in Sanskrit are traditional knowledge. Are not the texts written in ancient Peruvian or Persian too traditional knowledge? I have used a generalized notion of traditional knowledge that includes these partial ones and some more. Also, throughout the text, the origins of several different perceptions of 'traditional knowledge' have been discussed. A compelling

stance that has emerged lately sees traditional knowledge not only as worthless and against progress but also as valuable and worth developing at times. This is the aspect that impressed us and also brought in the global and national agencies. In this book, I have discussed only this positive dimension of traditional knowledge.

Not all aspects of tradition are worth preserving and promoting. There exist several obnoxious practices in Indian tradition that make many of us ashamed, not proud. But those alone are not our tradition. Rejecting the positive and seeing only the dirt is also a blunder. Knowledge and respect are closely related. Slighting one's knowledge is the prerequisite for demeaning one. Fortunately, in the last 50 years, both the Left and the Right, at least some sections of them, have come to realize the need to preserve and promote the positive aspects, and only the positive aspects of Indian tradition. While working in different fields with admirable zeal, they are facing a variety of problems. This book is an account of these cutting-edge issues as well as the different ways people are trying to cope with these issues. It may even help them in their efforts by assisting them to learn from each other and helping one another.

During all these years, I received not just information but also guidance, assistance, criticism, appreciation, encouragement, and support from many people. I cannot mention individually all the numerous persons and organizations to whom I owe a debt of gratitude for the material of this book. It would have been difficult to write such a book without the intense multi-disciplinary interactions, characteristic of Indian Institute of Advanced Study, Shimla. I am thankful to the management and the director at that time, Chetan Singh, for inviting me to work here, and to the staff at the Institute for making it possible with their services. For specific sections of this manuscript, I consulted several subject experts in and out of this Institute. They are A. V. Balasubramanian, Radhika Borde, Keshab Das, Jagdish Lal Dawar, Prachi Dublay, Meghali Goswami, Aarti Kawlra, Amba Kulkarni, Ajay Kumar, P. Madhavan, Arpita Mitra, Anindita Mukhopadhyay, P. Pushpangadan, B. Ravichandran, Aromar Revi, Mira Sadgopal, Makarand Sathe, R. Seenivasan, Darshan Shankar, Navjyoti Singh, Jyoti Sinha, Swapna Sundar, K. L. Tuteja, and Vijaya Shankar Varma. I thank all of them for the diverse kinds of help and absolve them from the mistakes that are still there in the book. I also thank Anushree, Mike, and Buddhadeb for their subject comments and editing assistance.

Kolkata, India

Nirmal Sengupta

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About the Author

Nirmal Sengupta, who studied at the Indian Statistical Institute, was until recently National Fellow at the Indian Institute of Advanced Study, Shimla. He has been Consultant to the Ministry of Commerce and Industries (Government of India); Chairperson to the Working Group on Flood Management for the Twelfth Five-Year Plan; Expert to the Netherlands Minister for Development Cooperation; and a consultant to the UNDP, FAO, etc. He has authored and edited several books, including *Managing Common Property—Irrigation in India and the Philippines* (Sage 1991) and *The Economics of Trade Facilitation* (Oxford 2007).

Abbreviations

ABS	Access and Benefit Sharing
AI	Artificial Intelligence
APEDA	Agricultural and Processed Food Products Export Development Authority
ASHA	Accredited Social Health Activists
ASI	Archaeological Survey of India
ATC	Agreement on Textiles and Clothing
AVP	Arya Vaidya Pharmacy
AYUSH	Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy
BGA	Basmati Rice Growers Association (of Pakistan)
billion	1000 million or 100 crores
CAM	Complementary and Alternative Medicine
CAZRI	Central Arid Zone Research Institute
CBD	Convention on Biological Diversity
CBR	Case-Based Reasoning
CFDA	China Food and Drugs Administration
CGIAR	Consultative Group of International Agricultural Research
CIKS	Centre for Indigenous Knowledge Systems
CISAC	International Confederation of Authors and Composers Societies
crore	100 lakh or 10 million
CSE	Centre for Science and Environment
CSIR	Council of Scientific and Industrial Research
CSIR-SA	Council of Scientific and Industrial Research (of South Africa)
CTST	Congress of Traditional Science and Technology
EI Company	British East India Company
EWC	Eudafano Women's Cooperative
FAC	Forest Advisory Committee
FDA	Food and Drugs Administration

FMIS	Farmer Managed Irrigation Systems
Forest Rights Act	Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act in 2006
FRLHT	Foundation for Revitalisation of Local Health Traditions
GDP	Gross Domestic Product
GI	Geographical Indication
GI Registry	The Administrative Office of the Geographical Indication Act
GMCL	Gram Mooligai Company Limited
GMP	Good Manufacturing Practices
HUDCO	Housing and Urban Development Corporation
ICAR	Indian Council of Agricultural Research
ICBG	International Cooperative Biodiversity Group
ICMR	Indian Council of Medical Research
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IGRMS	Indira Gandhi Rashtriya Manav Sangrahalaya
IIT	Indian Institute of Technology
INTACH	Indian National Trust for Art and Cultural Heritage
IP	Intellectual property
IPAB	Intellectual Property Appellate Board
IPC	International Patent Classification
IPO	Indian Patent Office
IPR	Intellectual Property Right
IPRS	Indian Performing Rights Society
ISM	Indian Systems of Medicines
ISRA	Indian Singers' Rights Association
ITDP	Integrated Tribal Development Programme
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
IWMI	International Water Management Institute
JFM	Joint Forest Management
JSY	Janani Suraksha Yojana
lakh	100 thousand
LSPSS	Lok Swasthya Parampara Samvardhan Samiti
M.P.	Madhya Pradesh
MDG	Millennium Development Goals
MFA	Multi-Fibre Agreement
MFN	Most Favored Nations
MFP	Minor forest produce
million	1000 thousand or 10 lakh
MoEF	Ministry of Environment, Forest and Climate Change
MPCA	Medicinal Plants Conservation Area
MSME	Micro, Small and Medium Enterprises
MSSRF	M. S. Swaminathan Research Foundation
MT	Metric tonnes

NBA	National Biodiversity Authority
NCE	New Chemical Entity
NIF	National Innovation Foundation
NME	New Molecular Entity
NRHM	National Rural Health Mission
NTP	New Textile Policy
PBR	People's Biodiversity Registers
PCT	Patent Cooperation Treaty
PESA Act	Panchayat (Extension to Scheduled Areas) Act, 1996
PHC	Primary Health Centre
PIC	Prior Informed Consent
PIL	Public Interest Litigation
PPL	Phonographic Performance Limited
PPST	Patriotic and People-oriented Science and Technology Foundation
PPV&FR	Protection of Plant Varieties and Farmers' Rights Act
PSM	Peoples Science Movements
PWD	Public Works Department
RBES	Rule-Based Expert Systems
RCH	Reproductive and Child Health Programme
S&T	Science and Technology
SBA	Skilled Birth Attendants
SBB	State Biodiversity Board
ST	Scheduled Tribe
TBA	Traditional Birth Attendant
TBGRI	Tropical Botanic Garden Research Institute
TBT	Technical Barriers to Trade
TCE	Traditional Cultural Expressions
TFD	Traditional Forest Dwellers
TK	Traditional Knowledge
TKDL	Traditional Knowledge Digital Library
TM	Traditional Medicine
TRIPS	Trade Related Aspects of Intellectual Property Rights
U.P.	Uttar Pradesh
UEBT	Union for Ethical BioTrade
UNCCD	UN Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme
UNFCCC	UN Framework Convention on Climate Change
USPTO	United States Patent and Trademark Office
WIPO	World Intellectual Property Organization

Chapter 1

The Manufacture of the ‘Traditional’



Abstract The scientific revolution was triggered by revival of ancient Greek philosophy in Europe, after a gap of more than a thousand years. But Greek knowledge was never labeled traditional. Pre-colonial Indian kings sent missions to Europe to learn about the scientific revolution. European traders and missionaries wrote highly about Indian knowledge. Later, both of them were trying to learn and benefit from each other. Knowledge was valued, whatever be its origin. This chapter depicts how from such a position human knowledge was partitioned in a couple of centuries into traditional and modern, and why in the last few decades efforts are being made to integrate the two. The integration process going on in India is the subject matter of this book. In this chapter, we explain our approach and the plan of the book.

1.1 Two Worlds of Knowledge

What is ‘traditional knowledge’? In popular perception, it is the old, unscientific knowledge that hinders progress and breeds superstition. Those who have a positive opinion identify it as ancient wisdom, sometimes going to the extent of idolizing the past. Traditional is understood in juxtaposition to modern. There is no second opinion about what is modern knowledge. It is the quintessential Western knowledge that began its glorious journey in the European Renaissance of the fifteenth and sixteenth century. The pioneers named it scientific, not modern. They were writing in Latin, where the word ‘scientia’ meant knowledge. They might have perceived scientific attitude as true knowledge. A category ‘traditional knowledge’ cannot be created from such a position. Indeed, the scientific revolution in Europe was triggered by revival of ancient Greek philosophy in Europe, after a gap of more than a thousand years.

Ancient Greece flourished a couple of centuries after Gautam Buddha was born in India. Aristotle and Chanakya, the two great scholars in two continents, were contemporaries. But once that era came to an end, Greek knowledge went into oblivion in Europe. The Romans and the Byzantines knew little about Aristotle or Euclid. Nor were they interested. At the most, a few copies of ancient manuscripts were

made by men of learning. The Greek knowledge survived because of the Islamic Golden Age of knowledge. Several Arab and Persian scholars were appreciative of the ancient world scholarships, those of the Chinese, Hindus, and the Greeks. They preserved and developed those further. Islam reached the west of Europe through its imperial expanse over northern Africa. It was here, in Spain, that ancient Greek thoughts reappeared in Europe in later half of the twelfth century. A Muslim scholar of southern Spain named Ibn Rushd (in Arabic; Averroes in Latin) made western Europe (Latin Europe) aware of ancient Greek philosophy through his influential Latin language commentaries on Aristotle. The intellectuals of western Europe were yearning for just this. Suddenly, a new way of thinking was opened up to them. Soon, commentaries on Greek philosophy by other Islamic scholars like Ibn Sina (Avicenna, c. 980–1037) were translated in Latin. Scholars in the newly established Paris University collected around Averroes's approach. Pioneers of scientific revolution like René Descartes or Francis Bacon located their exposition in relation to Aristotle's philosophy. Renaissance was triggered after Greek scientific tradition was revived in Europe.

What exactly was there in the ancient Greek philosophy? I won't risk my neck trying to answer this question. None of these Renaissance philosophers considered those to be the ultimate knowledge. In fact, the contributions of some of them were critical appraisals of one or the other aspects of the Greek works. That such questions can be raised and debated on was just not known without the exposure to Greek epistemology. Western intellectuals began to dwell on questions like the empirical foundations of knowledge, experimentation, reasoning, and so on. In the process, they also refuted many of their own findings. More recent philosophers of science like Karl Popper or Thomas Kuhn have tried in vain to develop a commonly agreed definition of the scientific revolution. All that we can say today is that there was something that opened up a new way of thinking that would, in due course, vastly expand the boundaries of human knowledge and application.

The Roman Catholic Church was alarmed by the rising tide of nonconformism. In the past, the Catholic Church had sanctioned or imprisoned heretics. But now, they were panicky and retaliated with stringent measures like tortures. The Catholic Church established the infamous Inquisitions. Scientific writings were burnt. Scientists were harassed. Copernicus had to abandon his scientific claim because it went against the preachings of the Church. Muslim rulers too abandoned their openness. Ibn Rushd ceased to be acceptable to orthodox Islam. He was banished from Marrakesh. Orders were issued to burn his writings. Once patrons of human knowledge, both Islam and Christianity, gradually became orthodox and suppressive of the new ideas. At this juncture of history, Latin Europe came in touch with India.

1.1.1 Phase of Explorers

Indian products especially spices were in great demand in Europe. But Arab traders had monopolized trade with India by using their control over the land route. Spain

and Portugal were the two major maritime powers of that period. Both of them were trying to find an alternative route. By sailing to the west, in 1492 Columbus found a new land, which he thought was India. Six years later, in 1498, Vasco da Gama actually reached India by sailing to the east. It turned out to be one of the greatest successes of trade facilitation. Imported spices became sixty to one hundred-folds cheaper in European markets. Importing many other items became viable. Traders from the countries of west Europe rushed in to avail the opportunity. There was intense competition between them. The British East India Company (hereafter ‘EI Company’) was formed in 1600. In 1612, it received permission from the Mughal emperor Jehangir to establish trading posts and factories in India. Only in 1765, after it was granted Diwani of Bengal by the Mughal emperor, the EI Company was in a position to understand the importance of revenue earning in this fertile country. Yet, for several more decades, the traders did not indulge in administration. Thus, for about three centuries after the first contact, European traders, soldiers, and missionaries were at the most, curious observers of Indian knowledge and its applications. There were a handful among these visitors who wrote down what they saw or learnt. In the past, there were just a few travelogues, like those of Al Biruni, Ibn Batuta or Marco Polo. Following the rise in the number of Europeans visiting India, there were many more short accounts by persons with moderate scholarship. In one of his books, Dharampal (1971) has brought together a collection of some of these accounts of Indian knowledge of science and technology as it existed around 1750 A.D. In some areas of mathematics and astronomy, the observers felt Indians were impressive; their techniques of agriculture, ways of making iron, paper, and mortar were quite advanced. In comparison to the rudimentary technology back at home, the Indian situation did not appear to be poor. By then printing press, barometer, microscope, and telescope were invented in Europe. But such inventions do not impact rural life. Revolution in European science that would change lives of people had just begun. Newton’s *Principia* was published in 1687, Oxygen discovered in 1772. In 1781, a new planet Uranus was discovered, and in another corner of Europe, James Watt patented his steam engine. Edward Jenner announced his discovery of smallpox vaccine in 1798.

The knowledge exchange facilitated by cheaper travel was not one-sided. India too had its share of curious learners. From the fortune seekers and missionaries, they learnt about the discoveries being made in that distant land. Maharajah Sawai Jai Singh (1688–1743) of Jaipur arranged to have European works on trigonometry, logarithms, and Euclid translated into Sanskrit. Some translations were into *khari boli*, a local dialect, so that the builders, technicians, and artisans could use those books. In 1727, he sent a delegation to Europe to collect scientific books and instruments (Sharma 1995: 234–303). The Mission went to Portugal, the best-known place for Indians because of being the country of Vasco da Gama. Unknown to them, the king of Portugal was a leading figure in the inquisition. He had banished all scientific works from his territory. The Mission returned without any work of Newton, Galileo, Kepler, or Copernicus. Another ‘technology buff’ (Narasimha 1985) was Tipu Sultan (1750–1799). He was keenly interested in European inventions like barometer and thermometer. Industrial Revolution in England began in 1760. The interest in India

increased manifold as the news of rapid rate of discoveries percolated in. As early as in 1817, the first modern institution of higher learning was established by a group of influential people in Calcutta (now Kolkata). Besides, the new technology of printing drastically changed the form of social reform movements. Social reform movements were not new in India. Only a couple of centuries earlier, *Bhakti* movements had swept through the country. But in the past, the reformers had to be wanderers as well to spread their messages. The new technology of printing enabled the reformers like Rammohan Roy or Vidyasagar to conduct the debate in print. It is interesting to note that both the debates were waged on what actually was Hindu tradition. The reformers cited ancient shastras and slokas to reject the notorious practices of sati and rejection of widow remarriage as later inventions.

By the end of the eighteenth century, European trade interest had diversified to include cotton, silk, spices, indigo, opium, tea, and saltpeter. But traders have no use of the ways of making iron. After they received Diwani, the revenue collection rights over a large country, the EI Company auctioned it every year to the highest bidders. The temporary right holders made best use of their fortunes extracting as much as they could in a year. The peasants were ruined, famines swept the country, and after a few years there were not many bidders. Realizing the problem, in 1793, the EI Company opted to settle the estates for a hundred years. The Permanent Settlement of Bengal succeeded. Soon the ravaged country began to prosper again. Thereafter, the EI Company began to address one after another, matters of governance. One of the major additions was large-scale information collection. Systematic information collection replaced the travelers' accounts. The scale of work increased manifold. In 1800, Buchanan was appointed by the Governor General to travel and collect information about the state of agriculture, arts, commerce, religion, manners, customs, and other important subjects for reporting to the EI Company Directors in London. Asiatic Society was established in 1784 by William Jones, an Oxford scholar.

Actual engagement with indigenous knowledge began from around this time for meeting certain contingencies. We will describe two such cases from this period and two others from the latter half of the nineteenth century.

1.1.2 Sir Arthur Cotton and Irrigation

In south India, several powers were competing for territorial control. The British and the French were lending their supports to one or the other. In this process, the British got its first foothold in 1766 when the Nawab of Arcot ceded part of his territory to the East India Company. Since then, their territorial control went on increasing. The Kaveri delta came under the possession of the East India Company in the year 1779. In India, irrigation was one such technology that was astounding to the Europeans from the beginning, so much so that later they produced grand theories like *Asiatic mode of production or oriental despotism*. There are thousands of big and small irrigation works that are *lifelines to Indian agriculture*. Later, in Chap. 3, we will introduce some of these systems and their management methods in some details. In

zamindari settlements, the local management survived under the zamindars. In most parts of South India, annexed quite late, problems cropped up. Within a few years of the takeover by the British, the irrigation systems of this highly prosperous land were in shambles. By the end of the eighteenth century, the area was largely depopulated. The legendary engineer, Sir Arthur Cotton, succinctly described the situation (Cotton 1874: 27) as:

When I first arrived in India, the contempt with which the natives justly spoke of us on account of this neglect of material improvement was very striking: they used to say we were kind of civilised savages, wonderfully expert about fighting, but so inferior to their great men that we would not even keep in repair the works they had constructed, much less even imitate them in extending the system.

The biggest of all these irrigation structures was Grand Anicut, a centuries-old structure on the river Kaveri. The topographical conditions of the Kaveri delta were such that the natural flow preferred an alternative course and river Kaveri tended to dry up fast. The Anicut was strategically built to prevent this diversion. Within a year or two after their ascendancy, the East India Company officials noted that the prosperous Kaveri delta would be completely ruined in a couple of years because of the drying of the river bed. But the members of the Board of Control of East India Company sitting in London could not comprehend the danger. They were not willing to sanction any fund for maintenance of some exotic structures. As the situation worsened rapidly and revenue collection fell from year to year, the Board members finally realized the importance of this contingency. A paltry fund was sanctioned in 1784 for remedial measures. Thereafter, civil engineers of the EI Company army began the maintenance work. First efforts were to use brute force against nature—to stop the diversion by raising the embankment level. But this was of little help. The deterioration was only temporarily checked. Every year the rising level of river bed brought new danger. For nearly a quarter century, an incessant struggle was on between the river and the engineers. In 1832, Major Arthur Cotton, then just a Captain, was given the charge of Kaveri river irrigation. He decided to try using the indigenous technique as an alternative. It was a bold step. If he failed, the Board would have charged him for misutilization of fund, an ordeal he had to face before the English Parliament at a ripe age. He studied the structure closely and then applied the indigenous technology. It turned out to be a viable plan. Grand Anicut was renovated in 1838 and proved to be a great success. Later Cotton (1874: 23–26) paid his tribute in the following words:

It was from them we learnt how to secure a foundation in loose sand of unmeasured depth. In fact, what we learnt from them made the difference between financial success and failure, for the Madras river irrigations executed by our engineers have been the greatest financial successes of any engineering works in the world

Thereafter, Cotton used this knowledge to construct several new weirs, including the 4 km-long Godavari anicut. This was a challenge that the indigenous construction technology could not accomplish. The engineering achievement was a great leap also for the Western construction technology. As Cotton explained in 1878 in a letter to the House of Commons, ‘one day’s flow in the Godavari River during high floods is equal to one whole year’s flow in the Thames of London.’ The anicut irrigated

one million acres and turned a rugged country to a prosperous one. Even today, the people of that area venerate him as the 'other Bhagiratha' (*Apara Bhagiratha*).

Not everyone was as courteous as Cotton. Nor were the colonial rulers eager to use modern technology for developing India. Consequent upon increasing trade opportunities, as the importance of land revenue earning decreased, the attitude of the government changed. Development of railways became more important than extending irrigation. Cotton still argued that for the welfare of Indian people it is necessary to build many more irrigation projects. To the colonial government, trade was more important than welfare of colonized people. At his old age Cotton was criticized in the House of Commons for his projects.

1.1.3 *Smallpox Vaccination*

In those days, there were not many Europeans doctors traveling to India. European medicines too were not easily available. Hence, the Europeans arriving in India had to depend greatly on local medicines and local doctors. Acceptance was easier when a practice seemed familiar (Patterson 2001). Smallpox inoculation was one such practice. In China, India, Turkey, and parts of Africa, a type of inoculation against smallpox was known from the ancient time. The inoculation method, now called 'variolation,' was the process of injecting an infective agent in a healthy person. This might lead to mild disease but prevented serious attack in future (Lahariya 2014). In 1721, variolation practice was introduced to Europe from Constantinople (Brimnes 2004) although its acceptance was limited.

During its territorial expansion between 1749 and 1778, the troop strength of the East India Company reached 67,000 from a mere 3000 (Bryant 1978: 203). In the face of such an explosive growth, it was not easy to arrange for healthy living conditions. An infectious disease, quickly turning into an epidemic, could do havoc in the army. There were no preventive measures for epidemics, with one possible exception—a 'disgusting' oriental practice might work against smallpox. Faced with the danger of a virulent outbreak of smallpox, the Govt. of Madras passed an order for compulsory variolation, first in the army, and then to the whole population. In September 1800, the Madras government launched a campaign to encourage variolation. This might be the earliest mandatory immunization program in the world. This was a bold step. Variolation practice for smallpox prevention was well established in regions like Bengal but was practically unknown in south India (Brimnes 2004). To most Europeans and south Indians, it must have been a repulsive practice. Even Jenner's vaccine, introduced later in Europe, was not accepted easily. England witnessed a strong Anti-Vaccination Movement during European vaccination campaign in 1853–1907. Parents were not at ease with the fearsome practice of scouring the flesh on a child's arm and inserting lymph from the blister of another person. Some others considered the vaccine was 'unchristian' because it came from an animal. The government making vaccination mandatory was seen as an agency violating personal liberty, one's right to control one's body (Durbach 2004). Traditional Indian variola-

tion practice was even more crude. Yet, the Europeans rulers of south India decided to make it compulsory at such an early date.

One does not know how the people of Madras Presidency viewed the directive. In just two years, Madras government had to backtrack. In 1798, Edward Jenner announced his discovery of smallpox vaccine obtained from cowpox. Within four years, the vaccine reached India. In 1802, the cowpox vaccine reached Madras (now Chennai) and the government immediately redirected its campaign to promote vaccination instead of variolation. For this round, however, it is known that the population was reluctant to accept vaccination. This is often seen as an indication of the unscientific mind-set of the Indians. But there is little difference in the responses of people in India and Europe. Jenner's ideas were too novel for both England and India. The procedure was not very sophisticated in the early years of vaccination. Reluctance to accept was therefore common to both the countries. Over the years, the deficiencies of the original process that discouraged people everywhere were remedied. Thereafter, popular reluctance reduced in both India and the West.

1.1.4 Late Nineteenth Century

The new way of thinking that once threatened the authority of church now turned against the colonial masters. What could be a legitimate reason for a trading agency like the East India Company, from a distant land, to rule India? The leading philosophers of England, championing liberalism and democracy, were at a risk of losing credibility. They must find a justification and save their face. English philosophers came out with an argument that barbarian India embroiled in internal strife and ruled by despotic rulers needed the British to help them enter into civilization. Toward this end, Indian history was rewritten with such stories like invasion by Aryans, oppression of Hindus by Muslim rulers etc. The English people in Europe were assured that the British EI Company was only a benevolent patriarch unable to leave the common Indians to their miserable fates. The facade was blown off by the revolt of 1857. Its intensity and extent shattered the image of a benevolent master. The Hindus fought under the banner of the Mughal emperor against a common enemy. After the rebellion, the country was brought under direct rule by the Queen of England. The process of transition was already initiated.

The change coincides with the end of the Industrial Revolution in Europe. By the middle of the nineteenth century, the scientific knowledge of the West had reached a stage that has no parallel in history. Besides, globalization began to evolve at a much faster rate. Transport and communication methods began to increase very fast. Steam railways began to spread from around 1820s. The first telegraph was sent in 1844. Photographic camera began being commercially produced allowing cultural information to be transmitted over large distances. Justification of the British rule was sought in the scientific supremacy of the West. Its corollary was to depict Indian knowledge as of low grade compared to the European knowledge. In 1835, in his famous Minutes that shaped colonial education policy Macaulay wrote: 'The question

now before us is simply whether, ... when we can teach European science, we shall teach systems which, by universal confession, wherever they differ from those of Europe differ for the worse, and whether, when we can patronize sound philosophy and true history, we shall countenance, at the public expense, medical doctrines which would disgrace an English farrier, astronomy which would move laughter in girls at an English boarding school, history abounding with kings thirty feet high and reigns thirty thousand years long, and geography made of seas of treacle and seas of butter.' In this section, we include two cases from late nineteenth century that show the colonial effort of belittling Indian knowledge as well as the English scientists' and scholars' rejection of imperial politics.

1.1.5 Voelcker, Howard and Agriculture

In 1889, John Augustus Voelcker, the Consulting Chemist to the Royal Agricultural Society of England, was appointed by the British government to suggest how to improve Indian agriculture. Voelcker toured the country extensively for over one year and submitted his report. In the abstract of the report, Voelcker (1889: vi) wrote:

I do not share the opinions which have been expressed as to Indian Agriculture being, as a whole, primitive and backward, but I believe that in many parts there is little or nothing that can be improved, whilst where agriculture is manifestly inferior, it is more generally the result of the absence of facilities which exist in the better districts than from inherent bad systems of cultivation.....

I express my opinion that improvements of agriculture will consist mainly in the modification of the difference which exist, and that this will proceed in two directions; (1) by transference of a better indigenous method from one part where it is practiced, to another where it is not; (2) by the modification of the differences which result from physical causes affecting agriculture.

Voelcker did not mince words in his appreciation. Such a report was not palpable to the imperial government. But they could not summarily reject a report by a leading scientist of England engaged by the government. The report was shelved without implementing a single recommendation. Technologically, implementation was easy since the indigenous techniques were alive and Voelcker's recommendations were simple. But implementation would have been a political blunder. So there was no further mention of it hoping that the concerned parties would forget the politically damaging study. Thirty years later, a new commission, the Royal Commission on Agriculture, was appointed for writing another report. Methodically, the new report should begin by discussing the previous report. The Royal Commission did not consider any point mentioned in Voelcker's report. They added just a single line stating that Voelcker's study was still an important work for 'students of agriculture'.

Voelcker was not the only scientist to reach such a conclusion. Another scientist, Albert Howard, who worked for 25 years (1905–1931) in India, first as an Imperial Economic Botanist and then as the Director of the Institute of Plant Industry at Indore, reached similar conclusion. 'Howard felt that trying to reform Indian agriculture on

Western lines was a 'fundamental mistake'. The agricultural practices of India were 'worthy of respect', however 'strange and primitive' they might at first appear to Westerners (Arnold 2000: 152).

After returning to England in 1931, Sir Albert Howard wrote a series of books explaining the logic of the Indian agricultural system and its superiority over what is known as modern agriculture. He is now considered to be the founder of the organic farming movement.

1.1.6 *Havell and Indian Art*

As the industrial revolution progressed its unpleasant sides became evident. Being disenchanted by the ugliness of industrial products and pillage of beautiful landscapes influential critics like John Ruskin had begun the English Arts and Crafts Movement of the 1850s. Soon it was followed by the American Aesthetic Movement. By coincidence, the imperial government decided to showcase its world domination by organizing an exhibition of the art and culture of people it ruled. The Great Exhibition of 1851 in London, the first exhibition of this kind, exposed the residents of England to the excellence of Indian crafts. There were exhibits from other regions including the American continent and China. Exhibition organizers, critics, and members of the media found the Indian section most impressive (Mathur 2007: 15). Suddenly, there was huge demand of Indian handicraft products, from handkerchiefs to furniture, in European and American markets. Several other exhibitions in both Europe and America followed. Indian art and handicraft were added to many museums (Mathur 2007). Realizing the commercial importance of Indian designs and decorative arts the colonial government started a support program. Four art and crafts schools in India (one is now in Pakistan) were opened. Havell came to India in 1884 to work as Superintendent of School of Art, Madras. In 1896, he moved to Calcutta to join the Govt. School of Art as its Superintendent. Havell became a great connoisseur of Indian art.

Implicit in colonial policy was a categorization scheme where 'fine arts', an area of special talent and aptitude, was seen as a European domain and the 'decorative arts' as an Indian domain (Guha-Thakurta 1992: 152). The teaching programs of the art schools designed by the existing teachers were to introduce the students to 'superior' art forms of Europe. Immediately after joining the Calcutta school, Havell began to reorganize the curricula by 'making Indian art the basis of all instruction.' He persuaded the grandson of the Court Painter of the vanquished Nawab of Murshidabad to teach painting in the Calcutta school (Havell 1912: 56). Havell also introduced Calcutta Art School students to Mughal miniature paintings. This became a controversial issue both among students and in press; the art schools were started to preserve Indian crafts and designs. To his side Havell found the Bengal School artists like Abanindranath and art critics like Modern Review journal, Sister Nivedita, Coomarswamy, and Rabindranath. The stream got identified with the rising nationalism.

Havell tried hard to bring the younger artisans to the art school, even by providing stipends to artisan students of the school (Mitter 1994: 58). But all the efforts failed because the plan of the government was improper. The vocational training was not linked to any kind of employment prospect. Havell understood the crucial role of marketing in the preservation and promotion of crafts. Writing on handloom weaving he opined, (Havell 1912: 178–9), 'India requires somewhat less of the keen-witted political lawyer, and a great deal more of the level-headed organizer and man of business, to help to solve her artistic and industrial problems. If Bengali politicians had used the funds they collected for their propaganda in financing model weaving villages in fifty suitable centers of Bengal they would have done a great deal more than the boycott has done to put the Swadeshi movement on a sound economic footing.'

Havell had no alternative to offer, but someone else had. In 1879, Lockwood de Forest, a key figure in the American Aesthetic Movement, established Ahmedabad Wood Carving Company in collaboration with the Hutheesing family of Gujarat. Railroad had reached Ahmedabad in 1864 bringing in an influx of less-expensive goods (Mayer 1996). The artisans had lost the old country markets but not their skills. By opening a new market in America Lockwood de Forest provided the much needed timely support for the artisans. The prosperity brought about by industrial revolution had created a new group of clientele for arts and crafts. European and American middle class, whose parents and grandparents had all along seen art objects only at royal palaces and churches, found that they too could have a piece of their own with the purchasing power they now have. Indian craftworks sold well. Lockwood's efforts have been criticized for lack of authenticity. But by creating, and catering to an upcoming market, Ahmedabad Wood Carving Company rehabilitated the endangered crafts. In the next few years, Lockwood extended his catchment to other parts of western India. In Bengal, in contrasts, as Calcutta Art School turned more and more to fine arts, mass marketing of art began to be despised. The Bengal school rejected Raja Ravi Varma's popular works, the works that brought art to the common men of streets. Another commercially successful group of artists, the *patuas* of Kalighat, too were not approved by the Bengal school.

1.2 Indians at the Encounter

The contact with the Europeans made the Indians in touch aware of the scientific revolution in Europe. Acknowledging its importance, Maharajah of Jaipur had sent a Mission to Europe to collect scientific literature. As more and more news percolated about the discoveries being made in Europe interest in learning about European knowledge increased. After British ascendancy, Calcutta had become a center of rich Indians. In 1817, a group of influential persons of Calcutta, like Radhakanta Deb, a scholar and the leader of the Hindu conservatives, established the Hindoo Col-

lege.¹ This was the first modern institution of higher learning in India. The subjects taught at the College were English, Bengali, Sanskrit, history, geography, mathematics, and chemistry. No less important than the science curricula was the language subjects. Till then, higher education in India was imparted in Sanskrit or Persian. The Hindoo College introduced vernacular (Bengali) and English in higher learning. Sure, there were some English teaching schools for elementary education of Anglo Indian children. Christian missionaries had printed the Bible in Bengali and other local languages. Hindu College went much beyond integrating vernacular language and English with science teaching in India. No wonder the Hindoo College group supported Macaulay in education policy debate. But their agenda was their own. Other institutions of higher learning that followed adapted the educational model of Hindu school. It was from them, the English knowing science educated Indians that the rejection of Macaulay's misrepresentation of Indian knowledge came up. For example, famous scientist P. C. Ray (1902) brought out a well-researched history of ancient Hindu chemistry knowledge. In this section, we include a few examples from different fields to show how the Indians integrated Indian and Western knowledge in their own terms. But before that, let us introduce another fundamental change brought about by the confluence of the two streams of knowledge.

Hindu religion was witnessing a revival. It was not a revival through consolidation of the conservatives. This group of reformers discovered that Hinduism also has a very sound scientific basis, submerged under a plethora of rituals, superstition, and discrimination. 'The belief in the indivisibility of science and religion pervaded powerful movements of Hindu Reform' writes Gyan Prakash (1999: 76). In 1896, in a speech on 'Reason and Religion' Vivekananda (1896) went all the way to declare:

Is religion to justify itself by the discoveries of reason, through which every other science justifies itself? Are the same methods of investigation, which we apply to sciences and knowledge outside, to be applied to the science of religion? In my opinion, this must be so, and I am also of opinion that the sooner it is done it is better. If a religion is destroyed by such investigation, it was then all the time useless, unworthy superstition; and the sooner it goes, the better. I am thoroughly convinced that its destruction would be the best thing that could happen.

Indeed, the reformers could satisfy themselves and their numerous admirers about the congruence between science and religion. Their explanation revived the pragmatic and philosophical basis of Hinduism. Comparable may be the rediscovery of Christianity through Protestantism. Max Weber suggested that religious ethics have significant impact on economic pursuits. Vivekananda too actively promoted ways of modern science. When Jagadish Bose was not able to meet the cost for renewal of his patent, Vivekananda arranged with his American followers to renew the patent (Bondyopadhyay and Banerjee 2008). In an accidental meeting on a ship in 1893 Vivekananda inspired Jamshedji Tata to start an institute of higher research. In 1909, the Tata family established the Indian Institute of Science.

¹Later renamed Presidency College, Kolkata. Now it is a University.

1.2.1 Gaekwad of Baroda and Technical Education

After the introduction of the railways, the Public Works Department was in need of a large number of skilled technicians to assist European engineers. Several technical schools were established in the country primarily to meet this requirement. Reformatory institutions too functioned as technical schools. A few more were opened by the missionaries. In 1886, there were 45 industrial schools with an average number of students 30 per school (Dhar 2013: 259). One of these was in Lucknow, a town known for the excellence of its artisans and craftsmen. Following the increase in interest in reviving Indian arts and crafts, an attempt was made to make this school a support center for artisanal works.

One of the officials in charge of organizing the Colonial and Indian Exhibition of 1886, Edward Charles Buck, an influential colonial administrator, was appointed in 1901 to inquire into the prospects of technical and practical education in the country. He recommended a market-oriented, mass production of the artisan products (Dhar 2013: 268). It had a big impact on the functioning of the Lucknow Industrial School. The school surveyed the major artisanal workshops in Lucknow: chikan embroidery, calico printing, manufacture of silverware, bidari (inlaid work), etc. Several different incentives, as understood by the British, were offered for a program to teach them mechanical skill and advise on the improvement of their products. But only three artisans turned up. As the orientation changed, the overall student strength too began to reduce. Ultimately, after 1907, the program was dropped. The school was transformed into a purely technical school (Dhar 2013: 268–269).

This initiative of the imperial government is worth comparing with an indigenous effort for improvement specifically meant for the artisans. The enlightened king of Baroda, Sayyaji Rao Gaekwad had set up Baroda College in 1881. When he was approached by T. K. Gajjar with a proposal to open a school for artisans, he readily accepted it. A graduate in chemistry, Gajjar, was born to a carpenter caste. His father was a civil engineer and author of a book on architecture written in Gujarati language. Kala Bhavan was established in 1890 with the objective of producing skilled artisans and apprentices by imparting instruction in local language. By 1909, the school was offering diploma in six subjects: civil, mechanical, and electrical engineering, drawing and printing, architecture and photoengraving, textile chemistry including dyeing. Other courses such as textile technology (weaving), furniture making, and fine arts were started later. Kala Bhavan was fitted with the latest machinery from Britain and Germany along with some that was manufactured indigenously. The school received assistance of German experts and foreign-trained teachers (Mehta 1992; Raina and Habib 2004). Kala Bhavan students developed a Turkish red dye whose composition was a trade secret. By 1911, the school was producing dye chemists for most of the textile industries springing up all over India (Raina and Habib 2004: 191).

In contrast to the cases of Lucknow Industrial School or Calcutta Government School of Art under Havell, the Kala Bhavan actually succeeded in attracting artisans. In 1896, about 83 of the 204 students there came from artisan castes and families of

farmers and cultivators (Raina and Habib 2004: 184). It seems that the major reason was the course orientation of the school. Dhar informs (Dhar 2013: 269) that the students of Lucknow Industrial School petitioned the school management to provide them training to be skilled workmen worth being employed as foremen, mechanics, and fitters in the railways or be able to qualify for the mechanical apprentice class in College of Engineering at Roorkee. Their training was inadequate for even the entrance examination of Roorkee. The request was not granted. In contrast, the Kala Bhavan students, from the beginning, were given such training that they were able to appear for the engineer certificate examinations of Universities.

1.2.2 Science Education and Modern Industries

After the Hindoo College of Calcutta, several more colleges were established in different parts of the country. There were 27 colleges before 1857 when a university system was superimposed on them. Facilities for learning science were limited. After receiving his BSc. degree in 1879 from the St Xavier's College, Calcutta, Jagadish Bose had to go to England for higher studies. Around the same time, P. C. Ray went to Edinburgh University for learning science. In 1894, Bose gave the first of his famous demonstrations at the Calcutta Town Hall. This was the first incidence showing proficiency of Indians in pure sciences. Once again, the Indians came up to facilitate advanced science learning. In private efforts, two science clubs were formed in 1860s, at Aligarh and Patna (Kumar ed., 1991: 139–160). In 1876, Doctor Mahendra Lal Sircar, the second M.D. from Calcutta University, established the Indian Association for the Cultivation of Science. This organization helped development of some world-famous scientists like C. V. Raman, Satyendranath Bose, K. S. Krishnan, and Meghnad Saha. In 1909, Tata established the Indian Institute of Science. U. N. Brahmachari was a nominee for the Nobel Prize in 1929 in the category of physiology and medicine. The science and English education introduced was paying back rich dividends. Science educated Indians had also started showing entrepreneurship. P. C. Ray, a world-famous chemist and a Professor at Presidency College at that time, founded the Bengal Chemical Works in 1900. T. K. Gajjar, the man behind the Kala Bhavan of Baroda, founded Alembic Chemical in 1907. Pramatha Nath Bose was the first Indian graduate in science from a British University. Realizing the possibility of an economically viable steel plant, he wrote a letter to Jamshedji Tata. His suggestion led to the establishment of the Tata Iron and Steel Company at Jamshedpur. Laxmanrao Kirloskar studied mechanical drawing at the J J School of Art in Bombay (now Mumbai). With this knowledge, he opened his factory in 1910 and pioneered modern engineering industry.

OECD estimates (Maddison 2001, Table 1.1) show that in 1820 the GDP of India was 9 times more than that of the USA. In 1950, USA economy became 6 times the size of India in terms of GDP. It happened primarily because free USA could reap full benefits of the industrial revolution, which the colonial India could not. Immediately after they became independent in 1776, USA broke away from the British patenting

Table 1.1 GDP (in million 1990 international \$)

Year	1700	1820	1950
India	90,750	111,417	222,222
United Kingdom	10,709	36,232	347,850
US	527	12,548	1,455,916

Source Table B–18. World GDP, 20 Countries and Regional Totals, 0–1998 A.D., Maddison (2001: p. 261)

system that was effective in its colonies. The first American Patent Act was passed by the Congress in 1790. The Act allowed only the US citizens and residents to patent in USA (Commission on IPR 2002: 18) effectively making any invention in any other part of the world open access to Americans. Thus, during the Industrial Revolution, USA freely took away every invention in a way that they now term piracy of intellectual property. The Act was amended in 1836 making the discriminatory practice just a little less. Patenting by foreigners was allowed but at an exorbitant price that very few could afford. After another 25 years, this discriminatory policy was removed. But by then, USA had collected most of the European advancement and has itself become a center of invention. Indians had no such option. They had to find their own ways from among the limited opportunities open to them. For example, in 1827, John Walker invented modern matches. But he refused to get it patented, in spite of requests from his friends, making the invention available to all. In the Swadeshi phase, matchbox industry flourished in India. In spite of such problems, Indians established chemical, mechanical, and steel industries. Besides, they also made good use of the limited opening to modernize India’s own knowledge. We describe here three such cases.

1.2.3 *Hakim Ajmal Khan and Ayurveda*

In the earlier years, when they were largely dependent on local medicines and local doctors, the Europeans had even promoted indigenous medical systems. In 1781, the East India Company government established Calcutta Madrasa² where Arabic medical texts too were taught. To meet the needs of helping hands as junior doctors and hospital staff they established Native Medical Institutions for training local Indians (Alavi 2007). In the wake of Macaulayan reform, indigenous medicine lost favor. The EI Company government set up the first medical school of allopathy in Madras in 1835, followed by a few others. However, Indian systems remained popular for various reasons and began to modernize by the effort of some leading practitioners, like Vaidya P. S. Warriar in Kerala and Hakims Abdul Majeed Khan and his younger brother Ajmal Khan in Delhi. Seeing this trend, the allopathic doctors became appre-

²Now it is Aliah University.

hensive. In 1910, the Bombay Medical Association called upon the government to secure Registration Acts at provincial levels so as to legally prohibit the practices of Hakims and Vaid. In 1911, the Bombay Legislative Council brought such a bill. Soon similar moves were made by other provincial governments. Ajmal Khan had already started teaching Ayurveda at Madrasa Tibbia. He was working to bring Hakims and Vaid to one medical platform for steering modernization programs. Faced with the new crisis, he began to mobilize public opinion against the Bill. In 1910, along with Pandit Madan Mohan Malaviya, Ajmal Khan organized the All India Ayurvedic and Unani Tibbi Conference to oppose the Bill. After several years of intense resistance, the government agreed to their point of view. More significantly, realizing the importance of Indian systems of medicine, in 1920, Indian National Congress passed the first of its resolutions in favor of indigenous medicine. It is to the effort of Ajmal Khan that indigenous Indian systems of medicine enjoy a position of importance in present-day India.

Ajmal Khan was born to a reputed Unani Hakim family that once served the Mughal court. After establishing Madrasa Tibbia (Tibb—medicine in Arabic) in 1889, the elder of the two brothers expired leaving the task to Ajmal Khan. The Madrasa, run as a formal school with paid staff and itemized syllabi, replaced traditional teaching system consisting of personalized training and apprenticeship at home. The school introduced a three-year course at the end of which formal degrees were given. In addition to Unani method, the students were required to study pharmacology and work at hospitals for practical training in anatomy and surgery. Instead of Arabic, the medium of teaching was a vernacular language, Urdu. The school also taught Ayurveda, to which the purists of Unani medicine were not in favor (Alavi 2007: 325–6). Ajmal Khan went further and supplemented the Tibbia school by opening a Female Midwifery School and Hospital in 1909 and the Ayurvedic and Unani Tibbi Research Institute in 1926. His contribution to modernization of Indian system of medicine cannot be understood without discussing the works of Salimuzzaman Siddiqui, the first director of the Tibbi Research Institute.

Siddiqui was born to a respected family of U. P. Because of their involvement in nationalist politics the family was known to Ajmal Khan. After doing his Ph.D. in Chemistry from Germany, Siddiqui returned to India in 1927 to take up the challenging task of setting up a modern research Institute for Indian medicines. Siddiqui was not a Hakim himself. He began by closely observing the materials used by the Hakim and Vaid. He identified a few and began to apply his expertise in chemistry on these materials. He isolated several constituent chemicals of *sarpagandha*, an important Ayurvedic herb used for treatment of mental disorder and heart problems. He named these compounds Ajmaline, Ajmalanine, Ajmalacine, etc., in honor of Ajmal Khan. Research facilities at Tibbia laboratory was limited, as were in other institutions established by the Indians using their limited resources. In 1933, several scientists, including Nobel laureate C. V. Raman requested the government, in vain, to create a body for supporting scientific research. Thereafter, the scientists started on their own, the Indian Academy of Sciences. Finally, in 1941, the Council of Scientific & Industrial Research (CSIR) was formed. The formation of the CSIR was a blessing for Indian scientists like Siddiqui. He joined as a Director at CSIR and immedi-

ately began to work on *neem* (*Azadirachta indica*). In 1942, he extracted three bitter compounds from Neem oil, which he named as Nimbin, Nimbinin, and Nimbidin, respectively. From 1942, to the end of his career, he was able to identify and isolate 50 chemical compounds. Following his lead, as many as 135 chemical compounds have been isolated from different parts of neem which are now extensively used in neem- based products (Biswas et al. 2002: 1336).

In 1948, the Prime Minister of Pakistan invited him to be his science adviser. Siddiqui consulted Nehru, who advised him to take up the responsibility for the neighbor (Yusuf 2013). In 1951, he moved to Pakistan and built some excellent research institutes in Pakistan, and also in that part of the country which is now Bangladesh. Later, he led Pakistan’s National Commission for Indigenous Medicine.

1.2.4 R. N. Chopra and Indigenous Drugs

Sir Leonard Rogers came to India in 1893 as a young member of the Indian Medical Service. When he left, he was the president of the Indian Science Congress in its 1919 session. A dedicated research worker Rogers used every single opportunity to pursue his interest. Although he is best known for introduction of saline treatment in cholera, he worked also on amoebic dysentery, kala-azar, leprosy, and snake venom. In 1914, while a Professor of Pathology at Calcutta Medical College, he took the initiative to establish and find endowments for a School of Tropical Medicine. During his service in India, Rogers had noted the efficacy of many Indian indigenous methods of treatment, like the use of *chaulmoogra* (*Hydnocarpus wightianus*) oil in leprosy. Under his guidance, the constitution of the Calcutta School of Tropical Medicine included a clause for promoting research work on the Indian indigenous drugs. A post of Professor of pharmacology and indigenous drugs was created. The position was offered to Col. R. N. Chopra, who joined in 1921. He was a visionary. Chopra pioneered systematic studies of indigenous drugs. He also became a promoter of Indian systems of medicine (Singh 2008).

Ram Nath Chopra was born in 1882 to a respectable Dogra family of Jammu and Kashmir. After receiving M.D. degree from Cambridge he served for ten years in the Indian Medical Service. In 1921, he joined the School of Tropical Medicine as Professor of Pharmacology. Simultaneously, he was appointed a Professor at the Calcutta Medical College. Later, he became the Director of the School of Tropical Medicine at Calcutta. Chopra’s varied achievements in the Calcutta School and later engagements (Singh 2008) remain out of our discussion. He is regarded as the father of pharmacology in India, a patron of pharmacy, architect of Indian Drug Policy and so on.

Initiating works on indigenous drugs at the School, Chopra outlined a fourfold objective:

1. To make Indian pharmacology self-supporting by enabling her to utilize the locally produced drugs economically, under standardized laboratory conditions.

2. To discover remedies from the claims of Ayurvedic, Tibbi, and other indigenous systems, suitable to be employed by the exponents of Western medicine.
3. To discover the means of affecting economy, so that these remedies might fall within the means of the great masses in India whose economic condition is very low.
4. Eventually to prepare an Indian Pharmacopoeia.

At the Calcutta School, Chopra, along with his students and collaborators, carried out extensive studies on drugs used by indigenous systems of medicine. The enquiries, employing modern methods of chemical, pharmacological, and therapeutic research, showed that certain drugs, e.g., ispaghula, kurchi, rauwolfia, psoralea, cobra venom, deserved pharmacopoeial recognition. These and several other indigenous drugs became official entries in the Indian Pharmacopoeial List (1946) and Pharmacopoeia of India (1955).

Chopra's research on the indigenous drugs was funded by the Indian Council of Medical Research (ICMR) and its parent organization. On ICMR's request, he published in 1939 a review of the work done on indigenous drugs till then by his team. It was enlarged later, in 1955, again on ICMR's request, to include review of research done on the subject by other independent investigators. Inspired by the Calcutta group's work, investigations had started in various universities and colleges in centers such as at Calcutta, Bombay, Dacca, Patna, Allahabad, Lahore, Madras, and Trivandrum (now Thiruvananthapuram). This, and his other books, *Indigenous Drugs of India*, *Glossary of Medicinal Plants of India*, and *Poisonous Plants of India*, became the most enduring and popular encyclopedia of Indian medicinal plants. Thus, systematic studies of the drugs of Indian origin by Chopra and his associates led to endorsement of the validity of the Indian medical systems (Singh 2008).

During his tenure at the School of Tropical Medicine and later, Chopra was involved in many other organizations concerned with indigenous medicinal knowledge. As the Professor of Pharmacology, Chopra had to work also as the Secretary of Ayurvedic Committee and Member of the Tibbi Committee, of the Govt. of Bengal. As the Chairman of the Drugs Enquiry Committee (1930–31) of Indian Govt., Chopra also reported on indigenous drugs. He recommended introduction of a uniform curriculum for the instruction and training of indigenous practitioners and restricting the practice of Indian medicine to properly trained, qualified, and registered practitioners. The Committee suggested encouraging the production, cultivation, and manufacture of local drugs in a systematic manner. The Committee on Indigenous Systems of Medicine was set up by the Govt. of India in 1946 with him as the Chairman. The Committee submitted the report in July 1948 containing elaborate study on education and medical institutions, organization of medical relief, State control, research, drugs and medicinal preparations, and finance as related to indigenous systems of medicine. The Committee was of the opinion that the integration of Indian and Western Systems of medicine leading to synthesis was not only possible but also practicable and recommended that immediate steps should be taken in this direction (Singh 2008).

In his Presidential Address at the Indian Science Congress, Patna Session, 1948, titled 'Rationalisation of Medicine in India', Chopra outlined a thoughtful program for indigenous medicine. Chopra passed away in 1973 at his own home at Srinagar. Since his pioneering effort the government set up several other committees from time to time (Chandra 2013: 9–14). Most of these committees recommended integration and scientific validation of indigenous systems.

1.2.5 *Gauhar Jaan and Indian Classical Music*

In the past, many different styles of music, sung in uncultivated voices were popular and widespread. Some of these, like *thumri*, originally a regional folk music, were elevated to classical forms under the patronage of kings and Nawabs (Rao 1990: WS-31). This rich heritage was threatened at the turn of the twentieth century. Royal and temple patronage that supported the classical forms for so long had ceased to exist. Hindu reform movements were targeting the popular musical styles one after one (Banerjee 1989; Subramanyam 2001). At this difficult juncture, there came a handful of greats who could turn the tide and rejuvenate the classical music tradition. Under the colonial rule, a new urban elite had emerged who could be potential patrons of music. But they needed some orientation to appreciate classical music. Using the lead of Subbarama Dikshitar, Vishnu Digambar Paluskar, and Vishnu Narayan Bhatkhande developed modern musical notations that helped the interested public identify the *ragas*. Bhatkhande also compiled *lakshan geets*. These were very useful to support the upcoming middle class to become moderately good connoisseurs of Indian classical music. Folk theater and other popular folk media were using classical based music. But popularization of the actual classical form was done by classical singers using gramophone. The first All India Music Conference was organized at Baroda in 1916, thirteen years after Gauhar Jaan's first record was released.

Born in 1873 to a well-to-do family of Azamgarh, Gauhar went through several reversals of fortune, ultimately reaching Calcutta in 1883. By then, her mother had become a singer and poetess of repute. For her talent, she received the title *Jaan*, an honorific title for a social rank higher than the *baijis*. At that time, Calcutta was a great center of classical music. Wajid Ali Shah, patron of poetry, fine arts, music, and dance had settled in Calcutta after being banished from his kingdom. With him came the courtesans of Awadh, who were hounded and harassed by the British because they liked the great patron king who supported the Sepoys in the 1857 revolt (Oldenburgh 1990: 259–60). Tagore and Chanda (1963: 57–59) describe how the women of Tagore family were eager to listen to these gifted singers, now reduced to penury. In Calcutta, young Gauhar received training in classical music and for her talent soon became the best known *tawaif* (Sampath 2010). When she was 30 years old, a new opportunity came up. Gramophones had just been invented. The Gramophone Company of England arrived in India, a 'dark continent' of music (Farrell 1993: 59). They were in need of a talented artist. Gauhar Jaan, the doyen of Calcutta music world, was just the perfect. In 1903, her first gramophone record

was released, with immediate success. There was no looking back. Gauhar recorded prolifically from 1902 to 1920, singing a total of over 600 songs in more than ten languages. She was the first superstar of the audio era.

The task was challenging. Singing for a bizarre equipment instead of a live audience was enough to intimidate many singers. But Gauhar was not intimidated. Frederick Gaisberg, the American recording engineer of the British Company, did not have high opinion about the Indian music, a musical style very different from Western music. But he felt, when Gauhar came to record, that her suite of musicians and attendants were even more imposing than those used to accompany the legendary opera Soprano singers Nellie Melba of Australia or Emma Calvé of France. 'As the proud heiress of immemorial folk she bore herself with becoming dignity. She knew her own market value, as we found to our cost when we negotiated with her' (cited in Farrell 1993: 62–63). Jealous male spread rumors that the gramophone was 'evil' and ruined one's voice. But Gauhar dismissed these ideas (Sampath 2010).

A gramophone record at that time had to be less than 3 min in duration. All forms of Indian classical music rendition require much longer time. Because of this time constraint, many great classical artists failed or refused to record before the long-playing records came in. Gauhar accepted the challenge and compressed the music so well that the authorities of classical music could not dispute the authenticity of these renditions. At that time, there was apprehension that complete reliance on the notation system goes against the Indian musical styles. The records, once again, brought virtual gurus to the pupil. Gaisberg wrote years later: 'new artists were learning their repertoire from gramophone records' (cited in Farrell 1993: 47). Sampath (2010: 146–7) informs that Bhatkhande once remarked about Gauhar that she was the greatest singer of khayal and thumri among women in India those days. Besides, Gauhar established Indian music at par with Western classical music. Once Gaisberg played a difficult Western song by a famous artist and challenged Gauhar to sing such a song. Next day, she amazed him by recording a Hindustani song set in Malhar raga that had to be sung in that same breathless style (Sampath 2010: 86). In compressing khayal and thumri to the 3 min allotted duration, she created a style that became a guide for the hundreds of other singers entering gramophone. An easier way to meet the stipulated time limit would have been to sing lighter songs. Gauhar knew such songs. In fact, she sang poems of her neighbor, Rabindranath when the term 'Rabindrasangeet' was not even invented (Sampath 2010: 151–2). But thankfully, she did not and instead reached the Indian classical music to middle-class homes.

1.3 Linking Science and the Rural

Voelcker, Howard, Siddiqui, and Chopra were leading scientists of their time. In their respective areas of expertise, they found the knowledge then existing in India were scientific and worth emulating. On the other hand, the claims of superiority of Western science were not just a colonial ploy. Leading Indian thinkers like Vivekananda and practitioners like Ajmal Khan upheld the merit of the Western scientific method.

Also, its success was evident. By 1900, per capita income³ of UK increased to reach 7.5 times that of India (Maddison, 2001: p. 267). What then, was the real position? Who was correct—those claiming richness of Indian knowledge rich, or those calling the Western science superior? In his masterpiece on Hindu Chemistry, the famous scientist P. C. Ray brought the two positions together in an excellent synthesis (Ray 1902: 106–7).

In this land of intellectual torpor and stagnation the artisan classes, left very much to themselves and guided solely by their mother wit and sound commonsense, which is their heritage in this world, have kept up the old traditions. In their own way they display marvellous skill.

Since early twentieth century, some leading Indian thinkers began to feel the need to connect the village artisans and peasants to modern science. They made some experimental efforts. We discuss the outlook of three village development efforts undertaken in the three decades just before independence. By the very nature of these programs, they had to assess how good was the existing knowledge of the Indian peasants and artisans? Were they skilled even though left to themselves? What position should be taken with respect to existing indigenous knowledge?

1.3.1 Tagore's Sriniketan Experiment

As European products began to flood India after the Industrial Revolution the idea of Swadeshi, a movement for use of Indian products instead of imported ones, was born. The first incidence can be traced back to 1849 in Maharashtra (Chandra 1966: 123). Calcutta had a Hindu Mela, a Swadeshi themed fair in Bengal, that started in 1867. Tagore family was a patron of this fair. So even as a boy, Rabindranath used to visit this Mela. He remained fairly active in contemporary nationalist politics till 1917. However, his views had begun to change when his father sent him to take over the management of family estates in East Bengal and Odisha. By then, he was nearing thirty. For the first time, he came face to face with the depressing reality of the villages in his estate. He started talking of a different kind of Swadeshi, one of serving the country by serving the villages. In 1908, when he was close to fifty, Tagore initiated a program to apply his notion of village development. The site was a 200 km² area of his estate, at Potisar, Kaligram, now in Bangladesh. In this first effort, his emphasis was organizational, to develop village self-governance. Potisar villagers repaired roads, cleaned up tanks, established schools and dispensaries. He eliminated moneylenders from Potisar by establishing an Agricultural Bank. Some efforts were made to develop agriculture. But this was not a great success. After a few years, he realized the importance of developing artisanal skills as a secondary source of livelihood (Tagore 1961). When in 1917 he established Sriniketan, an Institute of Rural Reconstruction at Shantiniketan, he could use the experience he gathered at Potisar. Debotosh Sinha (Sinha 2017) informs that in the *Visva-Bharati Bulletin* Tagore wrote:

³Estimate of per capita GDP.

The object of Sriniketan is to bring back life in its completeness into the villages making them self-reliant and self-respectful, acquainted with the cultural tradition of their own country and competent to make an efficient use of modern resources for the improvement of their physical, intellectual and economic conditions.

The striking positive feature was the very idea of initiating village development with an institute for supporting and developing locally available skills. Revival of handicrafts through cooperatives and cottage industries was an important program of Sriniketan. These included crafts such as leatherwork, tailoring, carpentry, lacquer work, raw silk production, pottery, tile making, cane work, embroidery, bookbinding. The revival and improvement in the techniques of lacquering was one of the very significant achievements. Chrome tanning experiment was abandoned in favor of traditional bark tanning. Through the small tannery, the Institute taught some of the traditionally ‘untouchable caste’ leather workers improved methods of tanning and shoemaking. Tagore’s daughter-in-law, Pratima Devi established Shilpa Bhavan and Palli Karukari Kendra (village artisans’ association) to provide part-time employment to village women. To teach designing the renowned artist Nandalal Bose added a handicraft cooperative to the art school of Shantiniketan. Within their limited means this private initiative carried on training of apprentices in weaving, leatherwork, durrie, carpet and mat making, cardboard work, dyeing and printing, bookbinding, batik work, goldsmithy and enameling, embroidery, carpentry, lacquer work, and metal work. Bipasha Raha informs (Raha 2017) that by 1928, one hundred and sixty-two persons had received training in weaving, carpet and durrie making, dyeing and calico printing. As many as twenty-three training centers were being run by Sriniketan teams in and around the district. These were no mean achievements in malaria prone villages. Craft revival was preceded by rejuvenation of village economy and society. Modernization of agriculture was the major focus. Another important feature was the annual mela. Tagore started celebrating the foundation day of Sriniketan every year as an open fair (mela) giving an opportunity to the neighboring villagers to exhibit and sell their products, and to interact with the residents of the school (Raha 2017; Sinha 2017).

1.3.2 *Marthandam, the YMCA Model*

During the formative years of the Indian National Congress, the Christians in India were its enthusiastic members. When the nationalist movement turned into armed challenge against British officials, mostly Christians, the Christian missionaries were faced with a tough choice. In 1905, some of them made their national identity clear. They formed the National Missionary Society and explained their position in an editorial (Harper 2000: 45) in the 1907 issue of *The Young Men of India* magazine:

Every true citizen of India rejoices at the growing national spirit..... The Association of India play a great part in promoting the national spirit..... No organisation is so closely in touch with great numbers of young men in all provinces.... let the Association members realise that the Association is a national movement.

Kanakarayan Tiruselvam Paul or K. T Paul was one of these young nationalist missionaries. In 1916, he became the National General Secretary of YMCA, the first Indian to occupy that position. Paul argued that in India, a land of villages, the expansion of the activities of YMCA should target villages, and the rural development should be given a central place in the agenda of the YMCA. He started a Centre of Rural Work at Marthandam, in old Travancore State, now in Kanyakumari district of Tamil Nadu. The center was to work for simultaneous development of spiritual, mental, physical, economic, and social faculties (Hatch 1949). Duane Spencer Hatch, who studied agriculture, rural sociology, and economics at Yale and Cornell Universities, came to lead the center. Under his guidance, the center developed into an effective technology dissemination point over a large area. In his later years, Hatch was internationally acclaimed as a pioneer in rural reconstruction and community development. The activities for which the center is better known were closely linked to the then-existing occupations in that area. Marthandam, however, introduced better techniques. Inside the Demonstration Centre at Marthandam there were equipments like honey extractors, health charts and the items needed for other cottage vocations. The center kept prize bulls and goats, model beehives, demonstration plots for improving grain and vegetable seeds, poultry run with prize laying hens, and a weaving shed. The Marthandam project drew a lot of attention, at both national and global levels. Gaekwad of Baroda invited Hatch to help him in setting up a similar center in Baroda State. The advanced techniques of honey collection (modern apiary) that the Marthandam team introduced are now widespread in rural India.

1.3.3 Gandhi's Thoughts on Development

Gandhi's constructive ideas began early in his South Africa days, from reading John Ruskin's criticism of industrial society and practicing self-support at Tolstoy Farm. Ruskin favored returning to a world of crafts and artisans manufacturing. Even in the ideas of a mature Gandhi, one finds a semblance of the philosophy of English Arts and Crafts movement. He learnt leatherwork in South Africa and spinning and weaving during the Champaran satyagraha, 1917. Next year, he started his movement for khadi, which became the core of the constructive activities recommended by him. In 1934, Gandhi established the All India Village Industries Association and in 1936, Sevagram or 'village of service'. His plan for India's future development was based on village development, the villages being self-contained, manufacturing mainly for use. This might be a reflection of his aversion for the ugliness of industrial civilization.

Gandhi proposed a different plan to integrate modern skills to village population. Instead of promoting modern school structure, his plan of education was to link up organically, with the indigenous skill pool. He opined that the modern schools alienate the children from their families, the artisans, craftsmen, and farmers, because the parents and the children have nothing to share from the school curricula. The core of his proposal was for making the learning of a craft the axis of the entire teaching program. Such a program would change the structure that left the artisan classes very

much to themselves to perpetuate their ‘marvellous skill’. In an incisive analysis, Kumar (1993) shows that the proposal to bring craft teaching at the core of basic education was implicitly far more fundamental than just a proposal for vocational education. It sought to alter the symbolic meaning of ‘education’ and thereby, to change the established structure of opportunities for education. However, he could expand and experiment his ideas only at the primary education level. He did not write much on secondary and higher education.

Integral to this plan was Gandhi’s thoughts on universal education. In a lecture at Chatham House, London, on October 20, 1931, he said:

Today India is more illiterate than it was fifty or a hundred years ago The village schools were not good enough for the British administrator, so he came out with his program. Every school must have so much paraphernalia, building, and so forth. This very poor country of mine is ill able to sustain such an expensive method of education.

Many would feel that Gandhi’s claim of extensive education in the past was exaggerated. But Nehru too had the same thing to say. Once again, Dharampal (1983) did an excellent service by collecting together some of the old reports by colonial administrators that confirm the positions of Gandhi and Nehru.

By comparing the three experiments, Tagore’s approach was more holistic, not just economic. In collaboration with Shantiniketan, the village development effort centered around Sriniketan could establish an organic link with the existing cultural milieu, both traditional and modern. But technology induction process in Sriniketan was rather arbitrary, personality based. In contrast, Marthandam excelled in establishing a technology input channel between modern laboratories and dissemination centers, though there is no such information as their being aware of cultural activity. Gandhi did not discuss the cultural dimension, nor did he talk much about technology infusion. Instead, he addressed some fundamental issues, like attitudes, values, and discrimination practiced by the Indian population.

1.3.4 Nehru’s View of Growth

After the Constitutional reforms of the 1930s, the leaders began to envisage a free India in near future. The discussions on what should be the right course of development attained seriousness. At that time, there were a few possible alternatives. The examples of capitalist democracy and the Soviet model of socialism were available. It is in the 1930s, that Gandhi began to formulate his ideas of development and models of education. In 1938, the Congress president Subhash Bose set the tone declaring that ‘India needed ‘an industrial revolution’. Would it be gradual, on British lines, or a ‘forced march’ as in the USSR? I am afraid that it has to be a forced march in this country’ (Lockwood 2012: 100). The Congress party set up a National Planning Committee for the future Indian economy. Jawaharlal Nehru was appointed the leader of the Committee. In his *The Discovery of India*, Nehru introduced the model of development envisaged during these days. In 1944, the essentials

of Nehruvian policy of planned development for industrialization were endorsed by Indian industrialists through the Bombay Plan. Ultimately, India opted for the USSR type of planned development with several modifications to accommodate most other suggestions. The capitalist path was accommodated through the mixed economy principle. Both Sriniketan and Marthandam experiences were used to design the Community Development Program after independence. Parts of Gandhi’s proposals too were included (Jaitly 2001: 33–34). However, Nehru began to qualify Gandhi’s reflections on the pre-colonial education system with derogatory implications. In his *Discovery of India*, Nehru wrote: ‘There was more literacy in India then than in England or the rest of Europe, though the education was strictly traditional’ (Nehru 1946: 287). He went on writing:

“Free education was well-known in India from the most ancient times. That education was traditional, not very good or profitable, but it was available to poor students without any payment, except some personal service to the teacher. In this respect both the Hindu and Moslem traditions were similar” (Nehru 1946: p. 317).

One does not know which source did Nehru consult to arrive at these qualifying remarks. Dharampal’s (1983) collection of documents depicts a very different picture. One may also remember Voelcker’s and Howard’s assessments about the advanced nature of Indian agriculture just half a century earlier. Nehru’s views are symptomatic of another trend among leading Indian intellectuals—a trend that subscribes to the Macaulayan image of Indian traditional knowledge.

1.4 Post-Independence Era

1.4.1 *Modernization and Traditional Knowledge*

During the days of US-Soviet rivalry, known as the cold-war era, the USA was badly in need of a model of economic construction that can be presented to the newly independent countries as an alternative to the Soviet model. Several American writers contributed to build up what is now known as modernization theory; several Third-World scholars were lured by various means, like publications and scholarships, to accept this hypothetical model of development. The modernization paradigm systematically promoted its own brand of scientific methodology to serve its interests. For example, Lerner (1958) named his book on modernization, *The Passing of Traditional Society*, claiming that his statistical arguments established the necessity of subversion of ancient ways. Another famous proponent was economist W. W. Rostow (1960), the author of a book subtitled *A Non-Communist Manifesto*. He suggested that there exists a fast track runway for a traditional society to take off like an aeroplane and quickly reach high level of Western economic development. To Rostow, Westernization was ‘modern’ and the runway was implicitly, US State Department guidance. The results of such arguments, Banuri argued later (Banuri 1990: 96), was ‘technocratizing’ the notion of progress, simplifying and quantifying it in ‘such a fashion that anyone equipped with a handy and simple tool-kit could pronounce

judgement on the desirability of a course of action or a set of policies for any group of people.’ Not all scholars were so disparaging. Singer (1959) for example, felt that traditionalism in India was not opposed to innovation and modernity. A little later, European scholar Jan Breman (1974) wrote about the smooth transition but drew attention to the social opportunism and workers’ exploitation as its prime reason. But they too show no awareness about the possibility of depressed working people possessing some valuable knowledge and skill.

The First Five-Year Plan declared: ‘In the planned economy of a country, science must necessarily play a specially important role’ (Chapter 28). Emphasis was on modern Western science. But traditional knowledge was not summarily rejected as unscientific and antithetical to modernity. Chopra’s suggestions at the Indian Science Congress were not pursued at the organizational level. But Indian System of Medicine retained popularity and received government support. Gandhians, mostly Congress socialists, like Kamaladevi Chattopadhyay, L. C. Jain, Pupul Jayakar, remained active and actually developed handicrafts using the changed situations. The First Five Year Plan included sectoral plans for village industries and small industries and handicrafts. There were some remarkable successes in certain village industries like khadi, gur and khandsari, beekeeping. Along with its emphasis on industrialization, the Model of the Second Five-Year Plan by Mahalanobis included a cottage industries sector. The Plan also put restrictions on the growth of factory sector leaving some room for the small-scale and cottage industries to develop. Over the years, the emphasis of the government on the traditional activities lessened. But then, there was a turn. Among the numerous young scientist and technologist produced after independence, there were some Siddiquis and Chopras, who realized the importance of one or the other aspect of traditional knowledge. The extent of this phenomenon was clear when in 1993 a NGO named Patriotic and People-oriented Science and Technology (PPST) Foundation, in collaboration with IIT Mumbai, organized a Congress of Traditional Science and Technology (CTST). In the six-day long congress, about 300 papers were presented on themes like agriculture, architecture and house building, forestry, health care and nutrition, metals and materials, social organization, textiles, theoretical sciences, traditional industries, vermiculture and water management. ‘A very interesting spectacle of informed debates’ commented Venugopal Rao (1994). PPST followed it up with two more congresses (CTST), in 1993 and 1998, with similar number of contributions. Most of the contributors were people working on their own. PPST brought them together on a platform. The aim of the CTSTs, the organizers explained, ‘is projecting to the modern audience, only a cross section of the traditional science and technology (since the extent is too large), specifically those areas which are still there in existence and thriving, those that are just about existing but not thriving and those that are not existing but have a potential to come back’ (PPST, 1992).

Because of their scale and quality, the CTSTs had some major impact. In 1995, a Department of Indian Medicine (renamed AYUSH in 2003) was established. In 2002, CSIR brought out a quarterly journal, titled *Indian Journal of Traditional Knowledge*.

1.4.2 Social Roots of Traditional Knowledge Activism

During the colonial rule, Indians had made significant progress in science by passionate activism contesting colonial suppression. True to this tradition, the first generation of scientists born after independence became involved in varieties of science-related activities. Some of these groups constituting the peoples' science movement (PSM) were: All India People's Science Network, Application of Science and Technology for Rural Areas (ASTRA), Bharat Gyan Vigyan Samiti, Centre for Science and Environment (CSE), Delhi Science Forum, Eklavya, Friends of Rural Society, Kerala Sasra Sahitya Parishad (KSSP), Kishore Bharati, Medico Friends Circle, Navadhanya, Peoples Science Institute, Vigyan Siksha Kendra, etc. PPST was one such group. PSM is a phenomenon unique to India. The vast people's network served diverse needs, from popularization of science, and science teaching, critiquing science policies including environmental critics, alternate science and technology efforts like appropriate technology, indigenous science and technology, seed and biodiversity preservation, organic agriculture, broadening access to literacy, education, health and self-help programs for sustainable livelihoods (Abrol, 2014). This is something that Gandhi did not envisage while proposing his education plan. Modern schools certainly alienated the children from their families, from the artisans, craftsmen, and farmers. The parents and the children had nothing to share from school curricula. But a generation later, a section of the educated youth returned to their roots with a mission to communicate.

In the Preface of this book, we narrated a few cases showing how personal experiences led these modern educated youth to notice potentials of some existing traditional science and technology. One of them explained their general understanding as: Even today, it is a fact, that in very many crucial and basic sectors, the vast majority of the Indian population is sustained by the knowledge, skills and material resources of the traditional sector. However, these systems have received very little by way of attention and even less by way of financial support or institutional help from the government (CIKS, u.d.). The traditional knowledge activists brought out possible modern use of many aspects of the knowledge of craftsmen, fisher folk, artisans, and leather workers, the knowledge of the villagers of India, that of its tribal and dalit population. PPST beautifully explained the orientation of this group of activists.

Even enlightened discourses on traditional knowledge in India did not go beyond Vedas and Upanishads, Aryabhatta, Panini and Charaka, or peaks of excellence such as the invention of zero. Those who spoke high of Indian traditional knowledge spoke only of Sanskrit sources. Rarely was it realized that material knowledge has continued to develop and flourish in India and elsewhere, uninterrupted over the centuries. There is very little understanding or appreciation of the achievements of traditional Indian sciences and technologies in meeting the current material needs of our people.

1.4.3 Global Recognition for Traditional Knowledge

Two Pharmacy professors from Illinois University, Norman Farnsworth and D. D. Soejarto, estimated from the perspective of drug making, the total value of useful plants that may become extinct in near future. They collected data for several years of new and refilled prescriptions dispensed from community pharmacies in the USA. From these, they selected the prescriptions containing crude plant extracts, semi-purified mixtures of active principles, single active principles, or active principles that had been chemically modified. They found that over the period 1959–1973, an average of 25.36% of all prescriptions encountered in the survey contained one or more active principles still derived from higher or flowering plants. From this data, they estimated that by 2000 AD, the plants that will be extinct in the USA alone could produce drugs worth \$3.248 billion per year in 1980 dollars (Farnsworth and Soejarto 1985).

All drugs used by humans are derived by synthesis, from inorganic chemicals, or from living organisms. Those obtained from living organisms are derived from plants, microorganisms, or animals. Scientists estimate that 150–200 species of plant, insect, bird, and mammal become extinct every 24 h. This is nearly 1000 times the natural rate of extinction, meaning that most of it is due to human intervention. The estimates like that of Farnsworth and Soejarto show how much damage the human beings are doing to themselves. In this background, the United Nations Conference on Environment and Development (UNCED), popularly known as the Rio Earth Summit, was held in Rio de Janeiro from 3 to 14 June 1992. The parties in the conference introduced three important legally binding agreements. One of these, the Convention on Biological Diversity (CBD), includes a section that addresses the importance of traditional knowledge for species preservation. Section 8(j) of Article 8 on in situ conservation of biodiversity says that

Each Contracting Party shall, as far as possible and as appropriate: ... subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations, and practices.

In addition to biodiversity, there are many other subjects where traditional knowledge is of interest. So many people were working in India on traditional agriculture, healthcare, architecture, water management, metals and materials, traditional industries, textiles, and theoretical sciences that PPST decided to organize separate sessions at CTST for each of these topics. People in other countries too noted importance of traditional knowledge in several spheres. CBD formulation is not the only one relevant, not even the first global recognition of traditional knowledge. There are global policy initiatives comparable to the CBD, on many of these topics. We have introduced some of these policies and instruments in the next chapter.

1.4.4 Plan of the Book

The compilations by the global agencies show that the initiatives pertaining to traditional knowledge may be categorized roughly as of preservation, promotion, accessibility to outsiders, and sharing of benefits between the custodians and the outsiders. In this book, we make an effort to introduce the readers to recent developments in all these spheres, with reference to India. In the first chapter, we discussed how such a distinct category of knowledge appeared and how it is being dealt with at present. The second chapter carries on the discussion by introducing global mechanisms that are also relevant for Indian initiatives. Current initiatives regarding traditional knowledge in different activity spheres in India have been arranged in five chapters: traditional knowledge on basic needs (Chap. 3), biodiversity and genetic resources (Chap. 4), manufacturing and industry (Chap. 5), arts and crafts (Chap. 6) and miscellaneous others (Chap. 7). For in-depth understanding, we have followed a case study approach. There are eighteen case studies describing what is happening at present. These are not isolated cases. They explain variations in contexts and multiple ways of application of legal and policy instruments for conservation, promotion, globalization, research and development, marketing, intellectual property rights, quality control, etc. In the final chapter (Chap. 8), we have brought out certain important features as the conclusion.

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Chapter 2

Global Mechanisms of Protection and Sharing



Abstract People in other countries too noted importance of traditional knowledge in several spheres. By now, country efforts have been systematized into global policy initiatives. As a preparatory to the main text, we introduce traditional knowledge-related activities of some of these global, mostly UN organizations. They have introduced definition and classification, and proposed integration mechanisms that provide frameworks for case analyses. This chapter consists of three sections on (i) recognition, protection, and promotion of traditional knowledge, (ii) norms of knowledge sharing, and (iii) access conditions including intellectual property rights over this kind of knowledge.

In this chapter, we briefly introduce traditional knowledge (hereafter TK)-related activities of some major global organizations. This is not an exhaustive list. We have included only some of those, mostly UN bodies, just to give an idea of the kind of evolution they are going through with increasing interest in TK. Biodiversity is only one of the many reasons for which TK became important in recent period. Some other UN organizations recognized its importance even before CBD formulation. The earlier instruments and statements were concerned primarily with protection of TK, or what the Article 8(j) of the CBD describes as ‘respect, preserve, and maintain.’ The later ones dwell mostly upon promotion and wider application, along with the ethical issues like consent of TK owners and sharing of benefits with them. While introducing global policies, we tried to follow this order. However, the division is not strictly maintained. Many organizations are involved in both types of works with considerable emphasis.

2.1 For Recognition and Protection

Protection may apply:

- directly to TK itself as an object of protection,
- to the preservation of the social and cultural context in which TK is developed and maintained, or
- to the distinctive forms and expressions in which TK is communicated and transmitted, e.g., distinctive signs, symbols, and reputations associated with a community's TK.

Applicable legal mechanisms range from contracts and licenses, to National Laws governing such issues as environmental protection, cultural heritage, or the interests of indigenous people or use of intellectual property legislations.

2.1.1 *United Nations Educational, Scientific and Cultural Organization (UNESCO)*

Cultural heritages of nations are threatened by wars, vandalism, theft, and increasing threat from economic progress. Over the years, UNESCO has developed several instruments for protection and preservation of tangible and intangible cultural heritages from these varieties of danger. The program was initiated even before the formation of the UN. Pained to see the destruction caused by the First World War, a famous Russian poet, Nicola Roerich, started a campaign for the protection of cultural property of nations. Along with others, he prepared a draft of an international treaty and submitted it to the League of Nations in 1932. The scheme was to be a cultural analogue to the Red Cross for medical neutrality (Wikipedia, u.d.) Several countries of the American continent including the USA approved it. In 1935, through a radio speech, President Roosevelt requested other countries to sign the pact. But no further progress could be made since the Second World War (1939–1945) broke out. The War caused an even greater scale of destruction increasing the urge of world leaders to act in unison. UNESCO was formed within a month after the formation of the UN in 1945. In its fourth session in 1949, UNESCO resolved to introduce an international binding regulation on cultural heritage. *The Convention for the Protection of Cultural Property in the Event of Armed Conflict* was adopted by the UNESCO at The Hague in May 1954. It covers immovable and movable cultural heritage like monuments of architecture, art or history, archaeological sites, works of art, manuscripts, books, and other objects of artistic, historical, or archaeological interest, as well as scientific collections of all kinds regardless of their origin or ownership. Explaining what led the UNESCO to propose the Convention the text said: being convinced that damage to cultural property belonging to any people whatsoever means damage to the cultural heritage of all mankind, since each people makes its contribution to the culture of the world. Being of the opinion that such protection cannot be effective unless

both national and international measures have been taken to organize it in time of peace; the provisions of the Convention are being made.

In the following years, UNESCO introduced a few additions for contingencies not covered by the Hague Convention, 1954. After the tragic destruction of the massive Bamiyan Buddhas by the Taliban in 2001, the UNESCO noted that there was no legal provision to condemn such acts of intentional destruction of cultural heritage. In 2003, the organization issued a non-binding Declaration to check intentional destruction of cultural heritage. Another important UNESCO Convention in this area concerns wrongful acquisition of cultural property. Thefts were increasing both in museums and at archaeological sites. Private collectors and even official institutions were happily paying for these objects that had been fraudulently imported or were of unidentified origin. In this context, and to address such situations, the Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property was created in 1970.

UNESCO entered into another field after events led the organization to initiate a program for protections of some sites that require international cooperation. As Egypt planned to harness the water resources of Nile by building the Aswan High Dam, they also realized that the dam would flood the valley containing the Abu Simbel temples, one of the greatest architectural site of ancient Pharaonic civilization. They did not know what to do within their limited means. In 1959, the Governments of Egypt and Sudan appealed to the United Nations for help. UNESCO initiated an international campaign. In response, a White House Conference called for establishing a 'World Heritage Trust.' The International Union for Conservation of Nature (IUCN) developed similar proposals for its Members. Eventually, a single text was agreed upon by all parties concerned. *The Convention Concerning the Protection of World Cultural and Natural Heritage* was adopted by the General Conference of UNESCO in November 1972. This was the first of UNESCO's Heritage Conventions. It was followed by Conventions on the Protection of the Underwater Cultural Heritage (2001), for the Safeguarding of the Intangible Cultural Heritage (2003) and on the Protection and Promotion of the Diversity of Cultural Expressions (2005).

UNESCO's efforts for protection of intangible cultural heritages began in 1973, following a request by the Government of Bolivia to add a Protocol for the protection of folklore to the Universal Copyright Convention. UNESCO undertook detailed examination of the problem in different parts of the world and existing safeguarding provisions. After sixteen years of laborious analysis and debate among experts and government representatives, the Recommendation on the Safeguarding of Traditional Culture and Folklore was adopted in 1989 by the General Conference. By then, UNESCO had drawn World Intellectual Property Organization (WIPO) to frame Model Provisions for National Laws on the Protection of Expressions of Folklore Against Illicit Exploitation and other Forms of Prejudicial Action. The 1989 Recommendations defined folklore as—folklore (or traditional and popular culture) is the totality of tradition-based creations of a cultural community, expressed by a group or individuals and recognized as reflecting the expectations of a community in so far as they reflect its cultural and social identity; its standards and values are transmitted orally, by imitation or by other means. Its forms are, among others, language,

literature, music, dance, games, mythology, rituals, customs, handicrafts, architecture and other arts.

Following the proliferation of trade agreements and market liberalization, several countries perceived rapid increase in threats to their cultural industries like folk music, craft, design. These are or can be protected by IPR. While WIPO and national governments design the intellectual property legislations, UNESCO provided the forum for countries to prepare general guidelines. The first step was taken in 2001 with the pronouncement of the *Universal Declaration on Cultural Diversity*. It was followed by the Convention for the Safeguarding of the Intangible Cultural Heritage, 2003, related to intangible cultural heritage like oral traditions and their expressions, languages supporting intangible cultural heritage, and traditional craftsmanship. In 2005 followed the Convention on the Protection and Promotion of the Diversity of Cultural Expressions, a legally binding international agreement to ensure that artists, cultural professionals, practitioners, and citizens worldwide can create, produce, disseminate, and enjoy a broad range of cultural goods, services, and activities, including their own. The 2005 Convention specifies beneficiary groups as women, indigenous peoples, minorities, and artists and practitioners of developing nations, and arranged provisions for the needy nations to extend financial assistance for the artists and practitioners of cultural expressions.

2.1.2 World Health Organization (WHO)

WHO was established in 1948. But only after PRC China became a Member in 1971, replacing Taiwan, the TK issue was raised in the forum. Though many of the member countries, including India, had extended domestic recognition to their indigenous medicines, they did not consider it worth raising in WHO. Marxism tends to be highly pro-science and against tradition. It is a matter of surprise therefore that the Communists, of all the people, came to champion traditional knowledge. During their protracted guerrilla war in Chinese countryside in the 1940s, when they had very few doctors and very little modern medicine, the Communists had to depend on traditional Chinese remedies to keep their troops moving. There was a lot of hesitation and strong opposition, particularly after the Communist Party came to power. How, instead of condemning this kind of ‘unscientific, traditional practices’ the communists would continue to favor those? But some leaders, led by Mao Zedong, continued to favor their promotion and improvement even after winning the war in 1949. The argument was that these remedies were cheap, acceptable to the Chinese peasants, and utilized the skills already available in the countryside (Croizier 1968: 151–188), the same set of arguments that Col. Chopra used for explaining his interest in ISM.

After it began attending WHO meetings, in 1975 China called for harmonization of services organized by the governments with those traditionally available to people, such as traditional birth attendants and herbalists. Once it was raised, almost all the countries were in support. It was found that all of them use alternative medicine, in

one form or the other. A meeting held of expert representatives of the major systems of traditional medicine in 1977 recommended that WHO should ‘use all the possible resources at its command to continue to promote and develop traditional medicine.’ Specifically, it should promote the formulation and declaration of national policies in Member States for legal recognition of traditional medicine and its integration into comprehensive national healthcare systems, including primary health care (WHO 2008: 126–127). It was followed by the Alma Ata (now Almaty) conference on primary health care which was attended by all the member nations of the World Health Organization (WHO) and the UNICEF. The Alma-Ata Declaration in 1978 was the first recognition of the role of traditional medicine (TM) and its practitioners in primary health care by WHO and its Member States.

International recognition dramatically changed the acceptance of TM not only in developing but also in many developed countries, where it was termed Complementary or Alternative Medicine (CAM). WHO launched its first ever comprehensive traditional medicine strategy in 2002. National health authorities were asked to consider how to integrate TM/CAM into their national health systems. After some progress in implementation, in 2008, on the occasion of its 60th anniversary and the 30th anniversary of the Alma-Ata Declaration, WHO organized the First Congress on Traditional Medicine, in Beijing, China. Next year, the World Health Assembly passed a resolution for promoting traditional medicine. Accordingly, WHO prepared and launched Traditional Medicine Strategy 2014–2023 aiming to support Member States in developing proactive policies and implementing action plans. While China, Korea, and Vietnam have fully integrated traditional medicine into their health care systems, many countries are yet to collect and integrate standardized evidence on this type of health care. In February 2013, India and some other Asian countries adopted Delhi Declaration on Traditional Medicine, for cooperation, collaboration, and mutual support.

2.1.3 International Labour Organization (ILO)

In 1957, ILO adopted Indigenous and Tribal Populations Convention (C107) calling for social, economic, and cultural developments of tribal and indigenous people and to respect their cultural and religious values and the forms of social control. It was the first such Convention of ILO. It was followed by Indigenous and Tribal Peoples Convention, 1989 (known as C169). The provisions of the revised Convention are based on respect for the cultures and ways of life of indigenous and tribal peoples. The Convention covers a wide range of issues pertaining to indigenous and tribal peoples, like consultations with them, their participation, rights to land, customary law, and traditional institutions.

2.1.4 *UN Working Group on Indigenous Populations*

In December 1948, the United Nations General Assembly adopted the Universal Declaration of Human Rights, a common standard of achievement for all peoples and all nations. The Working Group on Indigenous Populations (WGIP) is one of its subsidiary bodies constituted in 1982 for promotion and protection of Human Rights. WGIP is required to develop international standards concerning the rights of indigenous peoples. In furtherance of this task, the organization prepared the *United Nations Declaration on the Rights of Indigenous Peoples*, (UNDRIP), which contains several clauses related to TK, e.g., Article 31.1. Indigenous peoples have the right to maintain, control, protect, and develop their cultural heritage, traditional knowledge, and traditional cultural expressions, as well as the manifestations of their sciences, technologies, and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literatures, designs, sports and traditional games and visual and performing arts. They also have the right to maintain, control, protect, and develop their intellectual property over such cultural heritage, traditional knowledge, and traditional cultural expressions.

The Declaration was adopted by the UN General Assembly in September 2007.

2.1.5 *Evolution of Other Organizations*

As the awareness of importance of TK grew in recent years, almost all the organizations began to include TK in their works. As examples, we include the evolution of two such organizations—the World Bank and the FAO.

2.1.5.1 **World Bank**

The World Bank (Bank) was created in 1944 originally to assist the economic reconstruction of the War ravaged European economies. After 1970, the organization decided to put emphasis on the reduction of rural and urban poverty. The Bank provides low-interest loans and grants to developing countries. Through such works, the Bank came across some local technologies that may be considered TK based. In the past, these were rarely considered for Bank assistance. As global awareness about TK increased, the Bank also began to support many such TK-based works.¹

¹India is the largest recipient of loans from the World Bank. Irrigation sector accounts for a large chunk. Till the year 2000, the Bank had sanctioned financial assistance for just two projects which had some component of traditional knowledge. These were the Drought Prone Areas Project and Karnataka Tank Irrigation Project. Since 2002, the Bank has come to support five State projects on tank irrigation: Karnataka Community-Based Tank Management Project, Tamil Nadu Irrigated Agriculture Modernization and Water-Bodies Restoration and Management Project, Andhra Pradesh and Telangana State Community-Based Tank Management Projects, and Orissa (Odisha) Community Tank Management Project.

In 1997, the World Bank co-hosted with Canada the Conference on Knowledge for Development in the Information Age (Global Knowledge 97) for turning the information revolution into a force for economic development. At the Conference, government leaders and civil society groups urged the donors to learn from local communities. The Conference emphasized the urgent need to learn, preserve, and exchange indigenous knowledge. Thereafter, the World Bank started (World Bank 1998) an Indigenous Knowledge Initiative for disseminating information, supporting the exchange of information and the establishment of partnerships.

2.1.5.2 Food and Agriculture Organization (FAO)

Created in 1945, FAO has three main goals: (i) eradication of hunger, food insecurity, and malnutrition (ii) elimination of poverty along with economic and social progress for all, and (iii) sustainable management and utilization of natural resources, including land, water, air, climate, and genetic resources. These objectives encompass agricultural and food production, crop diversity, scarcity management, traditional farming, fishing, pastoralism, herding, foraging and forestry activities that are often based on long established local and indigenous knowledge and practices. Some of the old FAO documents on specific local practices are important sources for traditional knowledge. But the organization was repeatedly criticized (e.g., Ecologist 1991) for promoting disastrous modern technologies undermining sustainable (traditional) knowledge. FAO was accused of promoting green revolution and biotechnology industry, both of which were destructive to existing TK. Lately, the organization has been trying to change.

Quite early, through its involvements, FAO became concerned about the protection of traditional knowledge relevant to plant genetic resources for food and agriculture. In 1983, FAO adopted the International Undertaking on Plant Genetic Resources, a non-binding instrument. This led to the establishment of the Commission on Genetic Resources for Food and Agriculture. After the accession of CBD, the undertaking was renegotiated to bring it in harmony with the CBD. It was elevated to a treaty: International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA 2001), popularly known as the *International Seed Treaty*. The treaty entered into force in 2004.

The treaty regulates the uses of genetic material of several important cultivated plants that together account for about four-fifth of the food base derived from plants. The treaty makes the global pool of these genetic resources accessible for research and breeding new varieties while retaining the sovereign rights of the owner States on these genetic materials. Thus, patents are not allowed. Anyone using the material is required to pay to a benefit-sharing fund, on the basis of a standard material transfer agreement established through multilateral agreements. The Fund is used for projects supporting farmers in developing countries trying to conserve crop diversity in their fields. The Seed Treaty also brought under the control of its parties and secretariat the Consultative Group of International Agricultural Research (CGIAR) research institutions like the International Rice Research Institute or the ICRISAT

at Hyderabad. Also, the seed bank of a country that ratified the Seed Treaty is under the control of the treaty. Thus, it ensures that these research institutions honor the CBD commitments operationalized through the Seed Treaty.

2.2 Norms of Sharing

In 1914, the colonial government planned to divert water from Ganga River at Har Ki Paudi to a canal at Bhimgoda. The Ganga Sabha formed by young Madan Mohan Malaviya organized a massive public protest and compelled the British to abandon the plan. He did not stop there. In 1916, he brought the British government to sign an Agreement with the locals that ‘in future, the unchecked flow of Ganga will never be stopped. No decision on Ganga will be taken without the consent of the Hindu community’ (Tripathi 2012). One of the oldest ecological resource sharing arrangements, the Agreement was honored throughout the colonial rule. It was violated by the government of free India.

In 1962, Rachel Carson’s path breaking book *Silent Spring* alerted the people about the devastating effects of pesticides. It led to the creation of the United States Environmental Protection Agency. The UN General Assembly convened the First UN Conference on Human Environment in Stockholm in 1972. The conference decided to create a permanent place for international agenda on environment issues. This led to the establishment of the United Nations Environment Programme (UNEP) in 1972. No other world leader from outside Sweden considered the topic sufficiently important so as to attend the conference. The only exception was Indira Gandhi, then the Prime Minister of India. In her address at the Plenary Session on June 14, 1972, Ms. Gandhi forcefully presented the concerns of the developing countries about the environment agenda:

In the meantime, the ecological crises should not add to the burdens of the weaker nations by introducing new considerations in the political and trade policies of rich nations. It would be ironic if the fight against pollution were to be converted into another business, out of which a few companies, corporations, or nations would make profits at the cost of the many. Here is a branch of experimentation and discovery in which scientist of all nations should take interest.

She laid the basis of developing country perspectives, including the fairness in benefit sharing, for all future global environmental agenda.

2.2.1 *United Nations Environment Programme (UNEP)*

As decided by the Stockholm Conference 1972, UNEP was established as the overall coordinating environmental organization of the United Nations system. In 1983, the UN General Assembly set up the World Commission on Environment and Development, known popularly as the Brundtland Commission. The Brundtland report,

published in 1987 as *Our Common Future*, declared that the need of the day is a marriage between the environment and the economy and used the term ‘sustainable development’ as the way to ensure that economic development would not endanger the ability of future generations to enjoy the fruits of the earth. The Report also brought out (p. 115) the importance of traditional knowledge to sustainable development: ‘These communities are the repositories of vast accumulations of traditional knowledge and experience that link humanity with its ancient origins. Their disappearance is a loss for the larger society which could learn a great deal from their traditional skills in sustainably managing very complex ecological systems.’

On the 20th anniversary of the Stockholm Conference on the Human Environment, representatives from 178 nations, non-governmental agencies (NGOs), and other interested parties met in Rio de Janeiro to discuss global environmental issues. The meeting, United Nations Conference on Environment and Development (UNCED), the Rio Earth Summit in brief, was held from 3 to 14 June 1992. The Summit introduced three legally binding agreements. These are:

UN Convention on Biological Diversity (CBD)

UN Framework Convention on Climate Change (UNFCCC)

UN Convention to Combat Desertification. (UNCCD)

Though the CBD is best known for its content about TK, the other two Conventions too have some relevance. We discuss all three.

2.2.1.1 Convention on Biological Diversity

In addition to Article 8(j) introduced earlier, CBD contains several other provisions, which deal with the interests of indigenous and local communities. These are:

Article 10(c): Each Contracting Party shall, as far as possible and as appropriate: Protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements.

Article 15.5: Access to genetic resources shall be subject to prior informed consent of the Contracting Party providing such resources, unless otherwise determined by that Party.

Article 17.2: Exchange of information shall include exchange of results of technical, scientific and socio-economic research, as well as information on training and surveying programmes, specialized knowledge, indigenous and traditional knowledge as such and in combination with the technologies referred to in Article 16, Paragraph 1. It shall also, where feasible, include repatriation of information.

Article 18.4: The Contracting Parties shall, in accordance with national legislation and policies, encourage and develop methods of cooperation for the development and use of technologies, including indigenous and traditional technologies, in pursuance of the objectives of this Convention. For this purpose, the Contracting Parties shall also promote cooperation in the training of personnel and exchange of experts.

Many subsequent works for the implementation of CBD have addressed traditional knowledge issues, including access and benefit sharing (ABS). In October 2010, a supplementary agreement to the CBD providing a transparent legal framework for

the effective implementation of the fair and equitable sharing of benefits was adopted. It is called the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity.

2.2.1.2 Convention on Climate Change (UNFCCC)

Traditional knowledge was not mentioned in the 1992 UNFCCC or in the 1997 Kyoto Protocol. The position began to change from the discussions in meetings from 2010 onwards. In 2015 Paris Agreement, there is clear recognition of the importance of traditional knowledge as a means to address climate change. The Paris Agreement also aims to strengthen the ability of countries to deal with the impacts of climate change. There are several references to traditional knowledge. The Agreement (Article 7.5) specifically mentions:

Parties acknowledge that adaptation action ... should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems, with a view to integrating adaptation into relevant socioeconomic and environmental policies and actions, where appropriate.

2.2.1.3 Convention to Combat Desertification (UNCCD)

At its first session (1997), the Conference of the Parties of the UNCCD encouraged Parties to provide reports on TK and requested the secretariat to prepare a synopsis of these reports (decision 20/COP.1). Since then, emphasis on TK is increasing. A Conference in Mexico in 2015 made important recommendations for enhancing the contribution of traditional knowledge and practices along with science and technology, in addressing the vulnerability of biophysical systems and human livelihoods due to the combined impacts of land degradation and climate change.

2.2.2 World Intellectual Property Organization (WIPO)

Intellectual property (IP) refers to creations of the mind: inventions; literary and artistic works; and symbols, names, and images used in commerce. Like any other property right, they allow creators or owners to benefit from their own work or investment in a creation. Property rights of this nature are necessary to encourage innovations or artistic creations by making imitations illegal. The notion of intellectual property, like patents and copyrights, may be traced back to the fifteenth-century Europe. Gradually, different countries consolidated the local practices into Acts of law. But one country's intellectual property rights (IPR) had no use in another country. Thus, during the Industrial Revolution, US freely took away many European inventions. Finally in 1883, the first multilateral IPR agreement was made. Eleven countries

joined to adopt the Paris Convention for the Protection of Industrial Property. The membership list expanded fast. Three years later, in 1886 the Berne Convention for the Protection of Literary and Artistic Works was established. The two secretariats set up to administer the Paris and Berne Conventions combined to form the United International Bureaux for the Protection of Intellectual Property (1893). After eighty years, this Bureaux became the World Intellectual Property Organization (WIPO). In 1974, WIPO became an organ of the UN. All Member States of the UN are entitled, though not obliged, to become Members of the WIPO.

One of the first task WIPO did was to introduce the Patent Cooperation Treaty (PCT), an international patent system. Each country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country, in accordance with the requirements of that country. The PCT streamlined the process of filing one patent application in a single window in any one of the designated offices. The four patent offices in India are recognized for PCT filing and can concurrently seek protection in up to 143 countries.

WIPO became involved in traditional knowledge sphere right from its inception when UNESCO sought its cooperation for framing the Model Provisions for National Laws on the Protection of Expressions of Folklore Against Illicit Exploitation and other Forms of Prejudicial Action. After a decade, its involvement in TK issues increased manifold. The introduction of CBD at the Rio conference had opened up the possibility of legitimately acquiring global biodiversity resources. Immediately after its passage, USA began its moves for availing the bioprospecting opportunity. In 1993 USAID, US National Science Foundation and National Institute of Health established a program to promote biodiversity resource utilization from biodiversity hotspots all over the world. The program was named International Cooperative Biodiversity Group (ICBG). But the compensations offered to the custodians of traditional bio-resources were very poor. Noting this, a pro-Farmer group named RAFI (Rural Advancement Fund International²) characterized such efforts as 'biopiracy,' not bioprospecting. In another case, in 1998 the ICBG initiative began a project aimed to collect, document, patent, produce, and market medicines based on the ethnobotanical knowledge of the Maya peoples of Chiapas, one of the world's biodiversity hotspots. The terms of this project too faced harsh criticism domestically and internationally. It was abandoned in 2001.

Following Rachel Carson's exposure, people began to wonder what might be the alternatives to harmful pesticides. Being aware of the use of neem for this purpose, in 1971 a US timber merchant began importing neem seeds from India. In 1985, one of his pesticidal extracts received clearance from the US Environmental Protection Agency. This triggered a rush among American and Japanese companies for acquiring patents on neem extracts. Equipped with four of these US patents and the EPA clearance sold to them by the timber merchant, a company named WR Grace approached several manufacturers in India to buy their technology. Most of

²RAFI was established during the Great Depression by some leading activists like Frank Porter Graham, Eleanor Roosevelt, and others, for fair treatments of sharecroppers including black tenants. The group is now known as ETC Group (action group on Erosion, Technology and Concentration).

them refused, for the whole project was unethical. Finding a method for synthesis of Azadirachtin, the source of pesticidal qualities of neem would be a real innovation. But Azadirachtin is a complex chemical compound; till today, neither this nor any of its active principles have been synthesized in laboratories. Since it continues to be a natural product extracted from neem seed Azadirachtin is not patented by anyone (Vijayalakshmi et al. 1995). In such cases, patenting is permissible for finding (i) an unknown property of the natural product or (ii) an innovative extraction method. Grace company applied for and was granted by the US Patent Office a patent for a technique of extraction. But they actually did a daylight robbery; the extraction technique was in use in India for thousands of years. The company could still get the process accepted as their innovation because the Patent laws of USA may ignore claims of old and existing knowledge and practices if they are not recorded in some specific manner. Eventually, Grace found one collaborator in India to extract neem-based pesticide. The Indian company would procure neem seeds, produce the extract, and profit by selling it, while paying royalty to Grace for the traditional extraction technique of India misappropriated by Grace. For example, in 1994, the European patent office granted a patent to the US Department of Agriculture and WR Grace on methods of controlling fungal infections in plants using a composition that included extracts from the neem tree. This property of neem is well known in India for a long time. But the global patent systems enable the American company to extract profit from European commoners willing to use a pesticide based on old Indian wisdom. As global opposition mounted the European patent office retracted. WR Grace appealed but lost that appeal in 2005. In another case, in March 1995, two expatriate Indians at the University of Mississippi Medical Center, Jackson, were granted a US patent for turmeric to be used to heal wounds. This too was successfully contested. Another famous case of this kind was that of hoodia cactus, of the San people of Kalahari Desert, South Africa.

As a result of these disputes, the question of intellectual property and protection of traditional knowledge became an important international issue. WIPO began to work with the formation of a fact-finding mission in 1999. Thereafter, it established an Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore, for negotiations to reach an agreement. The objective is to develop international legal instruments which will ensure effective protection of traditional knowledge (TK), traditional cultural expressions (TCEs), and for governance over access to and equitable benefit-sharing of genetic resources. The negotiations are ongoing; the Member States are yet to reach an agreement.

2.2.3 World Trade Organization (WTO)

In reality, IPR does not only reward innovations but also are used frequently to extract undue advantages. Exercise of monopoly rights to curtail competition, high prices to make excessive profits, etc., are quite common occurrences. There are strong arguments that IPR systems conspire against the interest of developing nations

(Commission on Intellectual Property Rights 2002). The growth of pharmaceutical industry in India is a case in point. India's Patent Act of 1970 was quite liberal. The Act recognized only process patents and allowed a maximum of seven years life of a patent after which there was no restriction on its use. This was a sore point for the global pharmaceutical companies. But the provisions helped the nascent Indian pharma sector to learn to stand on its feet and challenge the global giants. In 2001, the Indian company Cipla³ rattled them by offering a drug for AIDS treatment at less than one US dollar a day. The drug majors were selling this medicine in Western markets at price thirty to forty times more (Reddy 2001). In its Web site, Cipla informs that Mahatma Gandhi visited the newly found company in 1939 and told them to make essential medicines for the nation.

Before technological advances like digitization in the 1990s, technology for copying software and entertainment media were costly and of poor quality. So large-scale pirating, as to significantly affect the profits of the original product, was rare. In the 1980s therefore, the complaints of the US companies about loss they were suffering due to piracy and misuse of their intellectual property were largely about pharmaceutical products. To them the liberal IPR policy of the Indian government was infringement of their intellectual property. As the Uruguay Round negotiations for the formation of the WTO progressed, medicine companies like Pfizer invented a devious plan to use the upcoming platform for their gain. At a very late stage of the negotiation, the Pfizer company could persuade the US government to propose inclusion of intellectual property in WTO agenda. Developing countries strongly opposed the proposal, rightly showing that there already existed the WIPO for this work. GATT was primarily concerned with trade in goods and not personal rights of property in intangibles. Even the other developed countries were not in favor of the US proposal. Drahos (1999: 419–432) tells the story how the USA exerted its influence and rampantly used penal provisions in its armory to force more than a hundred countries to sign the inclusion of TRIPS Agreement in WTO. The only concession made in the TRIPS Agreement was to include a statement that the WTO desires a mutually supportive relationship with WIPO.

RAFI, the US–Canada-based whistleblower organization, came out once again to challenge the US claim. In a booklet released in 1994, RAFI referred to the US concern about loss of its royalties due to piracy and compared that to the loss the South suffered due to the 'reverse piracy' by the North in the form of their use of seeds and medicines from the biodiversity of the South without paying any compensation (RAFI 1994). RAFI established that the countries in the global South were losing far more due to biopiracy, mostly by the USA. The intellectual property of the South, the developing and the less developed countries, should also be protected by the WTO. There was no way to deny the point. By then, countries like India were already engaged in a series of costly contests against repeated efforts by the west to patent away their indigenous knowledge. A restriction under TRIPS Agreement would relieve them of these costly legal contestations. The Uruguay round discussion came to a conclusion before the complex matter could be decided. TRIPS Agreement

³Founded as The Chemical, Industrial and Pharmaceutical Laboratories.

provided for review after four years. From 1999, the issue of the relationship between the TRIPS Agreement and the Convention on Biological Diversity was raised in the review. After many years of debate, it was included in the mandate given in the 2001 Doha Declaration of the WTO. Thereafter, work began on two separate tracks, both of which are still ongoing.

TRIPS Agreement states that any invention can be patented, whether a product or process, in all fields of technology, provided that they are new, involve an inventive step, and are capable of industrial application. According to Article 27.3(b), however, Members may exclude from patentability (b) plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes. This is where the concern of the south may be included. In the ongoing review of the Article 27.3(b), the major difference between the developed and the developing countries is over the proposals on disclosing the source of biological material and associated traditional knowledge. India and other developing countries want the WTO to incorporate a new provision in the TRIPS Agreement, making disclosure of source or origin of the biological resource, evidence of prior informed consent, and benefit-sharing arrangements mandatory before granting any patent to a company. The Western countries are vehemently opposed to this clause.

2.3 IPR and Traditional Knowledge

2.3.1 *Theoretical Background*

TK is protected using many different legal instruments like contracts and licenses, environmental protection law, cultural heritage related law, reserved areas. Use of suitable intellectual property legislations is one of these many instruments. Unlike tangible goods, knowledge and creative works are public goods in the sense that their use is non-rival: One agent's use does not limit another agent's use. In its natural state, knowledge is also 'non-excludable'; many products, including those incorporating new knowledge, can be easily copied. From the point of view of society, more and more people using the knowledge is better because each user gains something from it at low or no cost, and society is better off. Indeed, the patent rights are also meant for disclosure; after the expiry of patent life, the knowledge is freely available to all. IP protection of TK grants a party for a limited period, the rights to restrain others (not authorized by the right-holder) from using the protected knowledge, thus enabling the innovator to recover the cost of innovation through license fees. A general problem that the economic theory faces is that its competitive market formulation cannot support an efficient level of innovation. In a competitive economy, profits will be driven to zero, not accounting for sunk costs like R&D or costs of authorship. From an *ex post* point of view, this is a good outcome, as it keeps prices low for consumers and avoids deadweight loss. But from an *ex ante* point of view, it produces a sub-

optimal level of investment in R&D (viz. Menell and Scotchmer 2007). Most firms would not invest in developing new technologies, and potential creators might not spend their time on creative works, if rivals could enter the market and dissipate the profit.

Since investment for developing what is now ‘traditional’ must have been made in some distant past, ideally the knowledge should now be freely accessible. In case of further restriction, the welfare loss argument alone remains in force and may lead one to question the propriety of IPR in TK (Munzer and Raustiala 2009; Munzer 2012). Other legal mechanisms for protecting traditional knowledge like reservation of territories or preservation of monuments would be made welcome, but not protection through IPR. The fallacy of this argument is that it sees only one part of reality. If all that were truly ‘traditional’ were regarded as traditional in the IPR world, there would not have been any need to go for IPR on TK. The need arises because the domains of this kind of knowledge are often depicted as void, making grounds for granting of fresh IPR even on the existing knowledge. This is what encouraged rampant biopiracy and theft of creative works of indigenous and local people. Thus, the IPR provisions on TK that are being considered are not the conventional types, but adaptations of standard IPR system to certain reality. It is directed essentially, to delineate what is existing knowledge and hence not eligible for new patents. It addresses reforms of regular IPR frameworks that are required in certain areas like the assessments of novelty and disclosure rules. Besides, it proposes to reward conservation of such old knowledge by the custodian communities, who remained poor essentially by dedicating their services to conservation. Thus, the IPR on TK also address the ethics of benefit sharing. The existing literature (e.g., IGC 2003) makes a distinction between two types of intellectual property protection of TK: positive and defensive. Positive protections are those that are active exercises of the rights over the TK. Defensive protections are a set of strategies to prevent others from asserting or acquiring IP rights over TK subject matter. For convenience of presentation, we will follow this grouping. Understandably, the division is not very sharp or not always clear.

2.3.2 Positive Protections of TK

Protection to TK can be given to the content and substance of TK (like medicinal use of a plant), to the form, expression, or representation (like song or design), or to reputation and distinctive character like those of signs, symbols. Also, the same TK may be protected by different legislations. Handicrafts, for example, may be protected through the protection of the expressions of culture they represent, through the protection of the technical ideas they embody, or through the protection of the distinctive characteristics of signs or marks associated with them. How does one define TK inevitably depends on the prior question of what form of protection is intended (IGC 2003). All three major IPR forms: patent, copyright, trademark, and some minor ones may be used for TK protection by using different descriptions of

TK. However, some of these are used rarely. Since the global architecture has not emerged as yet, we introduce the emerging Indian policy and through that, the global debate.

While amending the Patents Act, 1970, to make it TRIPS compliant, India added TK as a significant new item to the list of items that are not inventions within the meaning of the Act (Sengupta 2009). In other clauses in its domestic patent law, due precautions were added for effecting this exclusion. The amendments made in 2002 and 2005 provide for mandatory disclosure in patent applications of the source and geographical origin of biological material, and traditional knowledge used in the invention. In substantive/technical examination of claims of novelty over prior art, examination of TK component is made explicit. The objects of examination are specified as: any publication in India or elsewhere in any document and prior publication including traditional knowledge in any form. Even oral forms are to be taken into account. If the claims made in a patent application were anticipated having regard to the knowledge, oral or otherwise, available within any local or indigenous community in India or elsewhere, it would fail the test of novelty. This is the kind of provision that India and several other countries are trying to include in the TRIPS amendment. The amended Patent Act provides for pre- and post-grant opposition of applications and revocation of granted patents on grounds of non-disclosure or wrongful disclosure of source or geographical origin of biological resources and traditional knowledge.

In India, there are numerous cases of misuses of TCE/folklore expressions of traditional communities by companies and individuals. But till recently, there was no remedy. Copyrights, and in some limited cases, industrial designs can be used effectively and have been used elsewhere, for protection of TK. But Indian law was very poor in this respect. Very recently, some important steps have been taken in Indian Copyright matters. We will discuss those later, particularly in the section on music and folklore. But they provide little relief for TK and TCE. The Indian Copyright Act does not contain any provisions for the protection of folklore or expressions of folklore. There is also no separate legislation of Model Provisions for this purpose (Kutty 2002). There is no obligation for those who utilize or exploit expressions of folklore for commercial benefit to provide any compensation to the owner communities. The traditional communities may form copyright association for this purpose, though there is none as yet. Lately, the Geographical Indication tag has provided some relief for crafts. But for other expressions of folklore like performances there is little improvement.

Trademarks have been used in some cases in India for TK protection. It will appear again and again in our case studies. In some cases, India opposed misappropriation of Indian TK by foreign companies through use of trademark registrations. India has been requesting WTO for international protection of expressions of folklore and preparation of international register for the official insignia of local communities. India is the only country that has made such a request to WTO.

Instead of trademarks, a similar IP, that of Geographical Indications, is in use and has become increasingly popular instrument for TK protection. In fact, there is an explosion of GI form of protection all over the world (Raustiala and Munzer 2007).

The Geographical Indications of Goods (Registration and Protection) Act, 1999, has a very wide scope. The application procedure is cheap and simple; a registration can be renewed again and again after a validity of 10 years. Like in Trademark and Copyright Acts, offenses under the GI Act are punishable with imprisonment and fine. Even though a name is not the name of a country, region, or a locality, the GI Act of India permits registration of the name as a GI if it relates to a specific geographical area and is used upon or in relation to particular goods originating from that country, region, or locality. Instead of copyrights or trademarks, GI has turned out to be the major instrument for protecting arts and crafts. By now, there are more than 500 registered GI's in India, most of which are on products of India. Some foreign countries have used this avenue to protect their imports to India. Italy has registered its famous Prosciutto di Parma ham and three other products. Peru was granted registration for its famous drink Pisco. The claim was later contested by Chile, after which it is called Peruvian Pisco in India's GI list. Besides, the list also includes Scotch whisky and Champagne, as were mandated under the TRIPS.

2.3.2.1 Sui Generis Protections

The Latin origin term 'sui generis' means 'one of a kind' or unique. In IPR parlance, the term generally means national legislations. Thus, the GI granted to Scotch whisky and Champagne are not sui generis since these are mandated by a global Agreement. But all other registered GI's in India and elsewhere are sui generis. The additions in Indian Patent Act, like the disclosure obligations, are sui generis elements until these get included in the WTO or WIPO agreements. When the TK issue came up, the concerned countries found that those issues could not be accommodated by minor modifications of the regular IPR Acts and Rules. Many of them therefore have additional IPR legislations or TK-related measures introduced in existing IPR Acts. These are the sui generis positive protection for TK.

The TRIPS Agreement required that all countries introduce patents or some alternative system for plant variety protection. In compliance, India enacted Protection of Plant Varieties and Farmers' Rights Act (PPV&FR) in 2001 with several imaginative extensions (sui generis clauses), including one on 'Farmers' Rights' (Sengupta 2009). The Act allows four types of varieties to be registered: new (transgenic) variety, extant variety, essentially derived variety, and farmers variety. Farmers' variety is a variety which has been traditionally cultivated and evolved by the farmers in their fields or is a wild relative or land race of a variety of which farmers possess the common knowledge. Under the Act, the Indian farmers have rights to save, use, sow, re-sow, exchange, share, and sell their farm produce including seed and protected variety. The Act requires that the applications for registration of a new plant variety should disclose information regarding the use of the genetic material conserved by any tribal or rural families in the breeding or development of such variety. Willful non-disclosure of such information would lead to rejection of the application. Interestingly, the Act has a compulsory licensing provision for registered varieties if are not adequately available.

The PPV&FR Authority was established in 2005. Since then, it has granted plant breeders rights to thousands of indigenous varieties developed by farmers/communities. The Act provides for recognition and rewards, from the National Gene Fund, for farmers engaged in conservation of genetic resources. For the last few years, Plant Genome Savior Community Award (PGSC Award) is being awarded for works like conservation and preservation of traditional rice varieties.

Another sui generis provision is the Biological Diversity Act, 2002, introduced for implementation of the CBD. This Act provides for registration of relevant knowledge at the local, State, or national levels and constitution of a National Biodiversity Authority (NBA), State Biodiversity Boards, and local management committees. Obtaining of any knowledge, pertaining to biological resources occurring in India for the purpose of research, commercial utilization, bio-survey, or bio utilization, is subject to previous approval of the NBA. However, collaborative research projects approved by the Central Government are exempt from this restriction. The NBA also has the powers to take necessary measures for contravention of the provisions of this Act. The Act expressly prohibits foreign nationals taking any bioresource without due permission of the NBA. Following the Nagoya protocol, in 2014, the NBA issued an access and benefit-sharing guidelines.

The national authority, NBA was established in 2003, as an autonomous body of the Union Ministry of Environment, Forest and Climate Change (MoEF). By now, most of the State Biodiversity Boards (SBB) have been constituted. But just about one-fifth of the local bodies have been formed. Further, most of them have not prepared the people's biodiversity registers (PBRs). In absence of these registers, the NBA cannot be very effective in its functioning. The Act considers that biological resources are included in sovereign rights of the States. The companies willing to use biodiversity apply to the concerned SBB. By now, the State Boards have dealt with hundreds of access and benefit-sharing applications and have entered into ABS agreements for some of those. Under these agreements, the SBB's collect the royalty, which they are required to distribute among the concerned Biodiversity Management Committees. Many SBB's have sued agencies and companies for non-compliance of the Biodiversity Act. The NBA has powers to take necessary measures on behalf of the Central Government to oppose the grant of intellectual property rights in any country outside India on biological resource or associated traditional knowledge obtained from India. But this provision has not come to much use.

2.3.3 Defensive Strategies

The litigations for revocation of the neem patent lasted 10 years. The legal cost for the turmeric case was US \$10 000. Researchers in the CSIR noted that every year around 2000 patents were being granted internationally relating to the Indian systems of medicine. Contesting even a few of these involve formidable cost in time and money. As a meaningful alternative, defensive strategies were devised at this juncture. In 1999, Indian government decided to develop an easily navigable

computerized database of codified TK on Indian systems of medicines (ISM) and making that available to patent and trademark examiners in other countries so that they do not grant IP rights on Indian TK. This is how the Traditional Knowledge Digital Library (TKDL) was born.

Using information technology tools and an innovative classification system, two hundred researchers in eight years of efforts have converted and structured 150 books on Ayurveda, yoga, Unani and Siddha, written in languages like Sanskrit, Hindi, Arabic, Persian, and Urdu, into a searchable database. It has 340 lakh A-4 sized pages of information containing 0.29 lakh medicinal formulations in five international languages (English, Japanese, French, German, and Spanish), in specially designed classification system for TK. TKDL has concluded agreements with the patent offices of EU, USA, Canada, Germany, UK, Australia, Japan, Malaysia, Chile, and India. These offices now accept citations of TKDL references as prior art. As per the terms and conditions of the Access agreements, examiners of patent offices can utilize TKDL for search and examination purposes only but cannot reveal the contents of TKDL to any third party unless it is necessary for the purpose of citation.

According to CSIR, beginning since July 2009, TKDL team identified 1155 patent applications of biopiracy efforts at International Patent Offices. Till August 2014, India filed at pre-grant stage prior art evidences for 1120 cases. In 206 cases, patent applications have either been withdrawn/canceled/declared dead/terminated or have the claims amended by applicants. Similar outcome was expected in the remaining cases. Also, it is claimed that there was a sharp decline in the filing of patent applications related to Indian Systems of Medicine in the EPO. But back at home, the Indian Patent Office was caught napping. Since its inception, the Indian patent office awarded several patents that were based on biopiracy of ISM. The Patent Controller General set up an internal committee to review patents granted since 2005 (Jaipuria and Das 2012). In October 2012, the government revoked a patent granted to Avestha-gen Company by the Indian Patents Office for a diabetes medicine. Thereafter, TKDL signed an agreement with the Indian Patent Office too.

The TKDL has developed a novel Traditional Knowledge Resource Classification System (TKRC) for data entry that has prompted reform of the WIPO's International Patent Classification (IPC). 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 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, EU, India, Japan, and the USA—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.

2.3.4 IPR Facilitation for TK

The challenge of linking a modern sector like the intellectual property system to a traditional entity is not merely that of modifying the modern component. Enabling the actual traditional knowledge holders to deal with the IPR set up is an equally challenging task. In the year 2000, the Department of Science and Technology, Govt. of India established the National Innovation Foundation (NIF) for this purpose. Its origin may be traced back to 1980s, when Anil Gupta, a young Professor of Agriculture Management at IIM, Ahmedabad, was taking his students to the countryside to create awareness about common peoples' knowledge and creativity. Being familiar with the contemporary issues, he asked the scouts to look also for traditional knowledge. In a few years, it evolved into a network of volunteers, student or not, and was named Honey Bee Network. The name was chosen to constantly remind the members about their ethical responsibility—to work like honey bees, collecting nectar and connecting one to another, but never harming the flowers. After a few years of work they felt something more must be done. In 1993, they began a discussion network Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI) to explore ways to help the local innovators and TK holders. Years of close contact soon led them to identify areas of meaningful and ethical intervention and thus began the unique facilitation program that soon received government attention. In the year 2000, the Department of Science and Technology, Govt. of India established the National Innovation Foundation (NIF) for this purpose. Like the TKDL, this is another pioneering contribution of India.

NIF scouts, nurtures, and promotes outstanding traditional knowledge, along with grassroot technological innovations. It maintains a team of Intellectual Property Management (IPM) who are actively engaged in conducting prior art searches and drafting and filing of patent applications on behalf of the grassroot innovators and the proprietors of traditional knowledge. For this, they coordinate with various IP firms and attorneys globally for mobilizing pro bono or paid support in filing application for patents, trademarks, industrial designs, and PPV&FR registration as applicable. Till 2015, NIF helped to file over 800 patents, including 8 filed in the USA and 27 under Patent Cooperation Treaty (PCT). From time to time, IPM team also provides legal assistance to the innovators in negotiating and drafting licensing arrangements, and dealing with issues of infringement of their IP rights.

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Chapter 3

Traditional Knowledge for Basic Needs



Abstract Every living being must first meet their basic needs. Human beings are no different. Although modern knowledge has made great strides in this area, traditional knowledge is still important for meeting certain basic needs. In this chapter, we discuss four such areas. The first is about the possible role of traditional birth attendants in modern India. The second is a neglected but still very important indigenous irrigation technology. The third is about certain aspects of traditional housing-related knowledge that have drawn attention. The fourth is about the recent conflicts at Niyamgiri hills region over priorities in resource utilization. All the case studies in this chapter show how national development policy and institutional reforms are slowly changing to accommodate increasing awareness about valuable tradition knowledge.

In the post-war years, as the newly independent countries embarked on road to progress, they defined their targets in terms of growth rates, per capita income, or industrialization. As a reaction to this kind of economism, I.L.O. in 1976 proposed the 'basic needs strategy' for development, giving priority to meeting minimum human needs and essential public services. Minimum needs may include—(1) minimum requirements for private consumption, adequate food, shelter, clothing, household equipment, and furniture; (2) essential community services such as safe drinking water, sanitation, public transport, health, and education; and (3) citizen participation in decision making (Long 1978). Every living being must first meet their basic needs. Human beings are no different. Although modern knowledge has made great strides in this area, TK is still important for meeting certain basic needs. TK exists in traditional fishing, hunting and food gathering skills, in farming and agricultural knowledge, knowledge of weather patterns, soil characteristics, landscape and seascape management, traditional appliances, traditional water and soil managements. TK exists as knowledge of domesticated and wild species, knowledge relating to the conservation and sustainable use of genetic resources, traditional ecological knowledge, as medicinal knowledge and knowledge related to the use of plants, herbs, minerals, animals; traditional birthing methods; traditional bone setting techniques, even spiritual healing; for food preservation, processing and conservation

methods, traditional methods of preparing food and drinks, traditional recipes, and so on. Some of these are still valuable. In this chapter, we discuss four such possibilities. The first is about the possible role of ‘the Dais,’ the traditional birth attendants in modern India. The second is the forgotten but important indigenous irrigation technology that I mentioned in the preface in connection with my personal experiences. The third is about certain aspects of traditional housing-related knowledge. We show why they are still important. The fourth is about the land rights at Niyamgiri hills region, which is in news for last few years because of conflicts between indigenous people and a bauxite mining company. This is an important case that brings out the emerging TK policies in national arena.

3.1 Indian Midwifery Tradition—The Dai System

UN organizations prefer to call them traditional birth attendants (TBA) instead of midwives. WHO defines a TBA as a person who assists the mother during childbirth and who initially acquired her skills by delivering babies herself or through apprenticeship to other traditional birth attendants (WHO 1992). The term evokes a stereotype of a dirty, uneducated, unskilled, old or middle aged woman, in sharp contrast with the skilled birth attendants (SBA). Also, the definition subtly conveys a meaning that the TBA’s did not receive any medical education and training and learnt whatever they could, through apprenticeship. But there is nothing unusual; this was the traditional system of learning of Ayurveda and Unani. Just like the old Vaid and Hakims, some of these *dais* were knowledgeable and highly skilled. Mira Sadgopal, herself a doctor, with experience of many years of working with dais in many parts of India, summarized several such cases, including many of her personal experiences with the knowledge and skill of traditional dais. ‘From all these reports’ she wrote, ‘it appears that indigenous midwives in India, like in many other parts of the world, have developed and carried a technique for saving newborns’ lives over countless millennia that is virtually unknown to medical science’ (Sadgopal 2012: 217–224). In her valuable book, Mukhopadhyay (u.d.) shows that ancient texts like Charaka and Sushruta discussed in details, midwifery as a prestigious occupation. From an extensive study of popular books, magazines, and newspapers, she shows the existence of in-depth and extensive knowledge and skill among the traditional dais in nineteenth and early twentieth century. According to her, it was the missionaries in the first half of the nineteenth century who began to depict the native dais as dangerous and illiterate, responsible for high maternal and child death. Lang (2012) and Naono (2012) went a step further arguing that not only the missionaries but also the apparently humanitarian support from Lady Dufferin and the colonial government had the same agenda.

If so, the history of dai profession may not be different from that of the traditional Vaid and Hakims, except that there was a gendered viewpoint on the part of the Indians too. Additionally, many of them belonged to low-ranking castes. While reformers came out with old Indian texts to contest colonial efforts at defaming Ayurveda and

Unani knowledge, there was, to the best of my knowledge, no parallel effort to establish the richness of textual or similar source of knowledge of traditional midwives. Nor were there any known effort to have parallels like Ayurveda college (Bala 2012: 1–12) for Indian tradition of midwifery. Both Ajmal Khan and the Lucknow Hakims (Alavi 2007: 297–298) supplemented their modern Unani teaching schools with female midwifery schools. But from their close association with Lady Dufferin in these initiatives for training dais, it appears that their understanding might not be very different from the colonial perspective. As the story goes, being moved by the pitiable plight of women in her colonial possession, Queen Victoria deputed Lady Dufferin to be the savior of the suffering Indian women. Lady Dufferin established a fund in 1885 for educating Indians in women's health and medicine, a Fund that is often described as the first ever effort in India for betterment of women's health. Naono (2012: 98–99) categorically informs that the Dufferin Fund was actively engaged in criticizing and demonizing the dais.

This is not to say that everything was fine with the traditional dais. Not only did the practices suffer from the limitations of knowledge but also from traditional social stigma and oppression of Indian social systems (Jeffery et al. 1989). Improvements were needed, but not like the one that occurred through the colonial intervention. After decades of pampered work, the Dufferin Fund did not produce more than a few dozens of qualified persons in Western system of women's health and midwifery. But it legitimized government intervention, apart from discrediting the traditional midwifery practice. So, after we became independent, the government readily took up the responsibility, and in a big way. Since 1951, India started building the primary health (PHC) networks to reach modern health services to all. India also became the first country in the world to introduce a family planning program. In 1961, the Department of Family Planning was created. Between 1975–77 period, coercive measures were used on a large scale to attain the target of performance in sterilization. This resulted in widespread discontent following which the coercive measures were stopped and the program was renamed 'Family Welfare.' From around this time, there was a change in attitudes towards the services of the TBAs. The Alma Ata Declaration (1978) brought WHO fully in support of training of TBAs to extend the reach of PHC services. WHO recommended that trained TBAs work side-by-side in 'articulation' with the modern health system (Sibley and Sipe 2006).

During 1985, WHO and UNFPA initiated the first community studies on levels of maternal mortality in developing countries. Based on these studies, and whatever available other sources, WHO produced the first estimates of the extent of the problem. As per this estimate, 500,000 women die every year as a consequence of pregnancy and childbirth, 99% of them in developing countries (AbouZahr 2003). Nearly 13 million children in the world did not survive till their fifth birthday. Most of these deaths were preventable. In the USA in 1900, there were about 700 maternal deaths for every 100,000 births, the same order of magnitude as in many developing countries today. One hundred years later, maternal mortality had fallen to less than 10 maternal deaths per 100,000 births (AbouZahr 2003). So was the fall in other developed countries. It was believed that the scientific knowledge and technical solution for achieving the success levels of the developed countries were known. The

problem was organizational—in making that solution available to the needy. Around 1990 about 60–80% of births in developing countries occurred outside modern health care facilities, mostly with the assistance of the TBAs. Some 80 countries adopted TBA-training programs hoping to reach the modern knowledge, thereby to pregnant and birthing women. In 1992, in a statement (WHO 1992) addressed to national and global policy makers WHO outlined tasks to promote training of the traditional birth attendants as an interim solution.

Meanwhile, another set of developments were happening in the global arena that came to influence the maternity program. The decade 1976–1985 was declared as the United Nations Decade for Women. The activities conducted during this decade increased awareness about women's rights and issues. Predominance of family planning programs was severely criticized by grassroot movements. Women's health agenda was broadened to address previously neglected problems such as female genital mutilation, violence, and trafficking. Health advocates argued that women's health is important in its own right; maternal mortality is not determined by biology but by a social system based on the power of sex and class. Increasingly, it began being understood that maternal mortality is more a social injustice and human rights problem than technical. International Treaties and national Constitutions concerned with basic human rights are expected to advocate for safe motherhood and to hold governments accountable for their actions and inaction (AbouZahr 2003). In February 1987 WHO, UNFPA and the World Bank jointly sponsored the first international Safe Motherhood Conference in Nairobi. WHO determined that World Health Day 1998 would be devoted to safe motherhood. In the year 2000, Millennium Development Goals (MDGs) were announced. Two of the eight goals were from this area: the targets set for reduction of infant and maternal mortalities.

These movements were not against TBA. They rightly deflected the rising tendency to see skilling of TBA's as panacea of all evils. As they made the UN and the national governments admit their responsibilities for reducing maternal and child mortality, more and more political and financial support became available. In turn, that encouraged planners and advocates to consider, for the first time, some more resource intensive measures. It was pointed out that the time between complication and death in pregnancy was very short, just about two hours in postpartum hemorrhage. Therefore, mortality reduction may also be achieved by making health facilities readily available to all women during the maternal period, especially during childbirth (Subha Sri and Khanna 2012). In, the changed atmosphere the global and national bodies could not ignore such suggestions. With increased resource availability and political will in support, for the first time plans began to be made to reach skilled medical care to all pregnant women. In India, the Reproductive and Child Health (RCH) Programme launched in 1997 was aimed at cent percent institutional deliveries. The targets of the Millennium Development Goals (MDGs) were set at reducing the infant mortality by two-third and to bring down maternal mortality by three-fourth. To attain these targets, the National Rural Health Mission (NRHM) was launched in 2005. NRHM improved the reach by creating sub-centers below the PHCs and arranged for better transport between home and hospital. Each sub-center was to get one auxiliary nurse midwife and one male health worker.

One of the major arguments in favor of continuing the traditional midwives was non-availability of health workers in the village/neighborhood. As its key strategy, NRHM introduced a new category of community health workers, called Accredited Social Health Activists (ASHA), to be engaged at the rate of one per a thousand population. An ASHA is a volunteer health activist selected from the woman resident of the village. Her task is to create awareness on health and mobilize the community toward the existing public health services, including maternal care centers. Though they are generally literate woman with some formal education, they are not SBAs. They are given some training to act as promoters and communicators, in between the Anganwadi workers and Auxiliary Nurse Midwives. Replying to a question in the Lok Sabha on February 3, 2017, the Minister informed that there were 945,794 ASHA workers in the country, as per information sent by the States. That would be about one per 1,400 population. NRHM also aims to promote institutional deliveries through Janani Suraksha Yojana (JSY) scheme. Under the JSY, eligible pregnant women are entitled to cash assistance, irrespective of the age of mother and number of children, for giving birth in a government or accredited private health facility. The scheme also provides performance-based incentives to ASHA activists for promoting institutional delivery among pregnant women (GoI 2015).

Over the years, the situation has improved considerably. The World Bank data shows (World Bank u.d.) that in India infant mortality rate, per 1,000 live births, fell from 165 to 38 between 1960 and 2015. Maternal mortality ratio, which was 556 per 100,000 live births in 1990, came down to 174 in 2015. But will it be right to claim that the improvement is due to increased institutional delivery under NRHM and JRY? Though NRHM was introduced only in 2005, institutionalization programs started earlier, on a modest scale. Simultaneously, there has occurred considerable general improvement: in health awareness, healthcare situations, and availability of better medicines. Compiling a large number of assessment studies, Subha Sri and Khanna (2012: 10–14) conclude that the evidence is not encouraging to suggest that the rise in institutional deliveries has actually resulted in improvements in maternal health outcomes. Dadhich (2009) noted that “there are states, like Tamil Nadu, which has achieved high institutional deliveries, still the neonatal mortality hovers around 30/1000 live births. At the same time there are states like Nagaland and Manipur, which have majority of deliveries taking place at home and achieving a neonatal mortality rate about 29/1000 live births.” Besides, the official statistics about the extent of coverage is open to doubts. Devasenapathy et al. (2014) found in a study of 17 clusters of urban poor settlements in Delhi that of the 824 women who gave birth in the previous year, 53% had given birth at home.

From around 1997, the need for dais was reduced by creating ASHA, a new category of community health workers. This was in accordance with the changing priority of the funding agencies. In the background, there was a general distrust about the TBAs. Although some argue that the shortage of skilled health workers means traditional birth attendants have a valuable place, some others believe that they do more harm than good (Ana and Harrison 2011). According to Bergström and Goodburn (2001), it is beyond doubt that TBAs impact is significant when it comes to empathy, cultural competence, and psychosocial support at birth. But there seems

to be consensus that TBAs are generally not able to handle most potentially fatal complications and that many other factors are important, in particular the accessibility and quality of obstetric services. Sadgopal (2013) feels that TBA attended birth at home was seen as a dangerous anachronism and was declared hazardous, despite there being no solid evidence to hold them responsible for high maternal and neonatal mortalities. She is of the opinion that the NRHM has certainly been a great help by providing transport from home to hospital. But she also feels that changes of this nature could be made even within the existing home delivery and dai system. But it was not even thought of in those days of serious resource constraint. In the present model, the government has replaced the dais by unskilled communicators. “The exclusion of Dais, along with their traditional skills and understanding in childbirth, has had deep effects. At the community level, it has devalued and denied an age-old skilled tradition that is a part of community life. Very few young women still wish to learn through apprenticeship with experienced Dais. The health system itself, which could benefit from the Dais’ skills and outlook, is deprived of input to develop childbirth care in a more positive and natural way” (Sadgopal 2013).

The brief period of welcome given to TBA in the two decades between the Alma Ata Conference and the MDG pronouncement resulted in a very significant contribution towards learning about the TBA professionals. For the first time there was willingness to appreciate any knowledge or skill shown by the TBAs. This period produced a series of findings that show the TBA’s actually having such untapped knowledge. We have already referred to some. Although the schemes like JSY have no room for them, some other aspects of Indian government policy provided some space for the dais. Mainstreaming of dai profession along with the Ayurveda, Yoga, Unani, Siddha, and Homoeopathy, (AYUSH) was suggested in both the Tenth and Eleventh Five-Year Plans. More recently, the AYUSH Department is working with NGOs to develop ways of including dais in regular health workers. One of these NGOs, the Jeeva Study group has undertaken a study in four sites in Jharkhand, Karnataka, Maharashtra, and Himachal Pradesh. The study collects qualitative and quantitative information by looking at the dais in their local contexts, their traditional practices in normal and complicated situations, and at the utilization of their care, especially by the poorest. The team argues that the dais still deserve to have a place between home and hospital (Sadgopal 2013).

International agencies accepted TBAs for some time ‘under duress,’ never acknowledging that modern institutions are also in need to learn something from them. But there are critics of these modern setup who feel: today’s institutions are characterized by overuse of drugs and technologies, disregard for scientific evidence that demonstrates better outcomes from humanistic, women-centered birth techniques, the technocratic and patriarchal ideology that assumes women’s bodies are dysfunctional machines, and that birth is a problematic and risky procedure, justifying the overuse of practitioners’ minds (Davis-Floyd et al. 2009: 2–3). They argue that we learn from the traditional birth attendant the attitude that treats birth as a natural process that has to be lived with intelligence and skill not with a paranoid. On the basis of her fieldwork in rural and urban north India, Patel (2012) felt that views about the body, its care and healing during birthing were not uniform within

a given culture, let alone across cultures. There were internal variations in birthing experiences and thinking related to birthing. One of her informants had support at home. She produced her baby at home never ever feeling herself to be a passive being in the drama of birth enacted upon her body. Another one had to agree to the hospital birth. But in the process she suffered the notion of ‘shame’ and pollution which, in Indian culture, has kept birthing world away from male obstetricians and gynecologists.

Even now one-third of Dutch women continue to choose home environment to deliver their babies. In Dutch culture, childbirth is seen as a family event that is enjoyed with warmth, affection, sociability, and security by all. It is a natural process that usually happens in normal way. Enough precaution is taken at home to avoid risk, and institutional help is accessed quickly when there is complication. But mere apprehension of risk is not used as an excuse to deny comfortable and cozy environment of home and constant care of family. This stands sharply in contrast with the sterile hospital room filled with high-tech devices and medical experts (De Vries 2005).

3.2 Surface Flow Irrigation Tanks

Anyone traveling through the rural areas of Magadh region (south Bihar) would find hundreds of earthen embankment on ground, called *ahars*. These are simple but ingeniously made structures used for irrigation. The area between Chota Nagpur Plateau and Ganga River has gentle gradient. After each shower, water escapes rapidly down the sloping terrain. The flows are stopped at thousands of locations by constructing small dams across the lines of drainage. Side embankments are added to these main embankments leaving the fourth side open, for drainage water to enter. Thus, the structures look like three-sided (or semi-circular) above surface water storage. From outlets on main embankments, water is drawn out, as required, and is led to irrigate land down the slope of the terrain. Many ahars are also fed by channels drawn from adjacent rivulets. These channels are called *pynes*. The system is of ancient origin. The name ‘ahar’ and related water management systems are found in *Arthashastra* and Buddhist *Jataka* stories (Sengupta 1980: 164–165).

Identical structures are found all over peninsular India and its foreland. Being a part of the millennia old Gondwana plate, this area is an eroded old plateau with gentle gradient all around. The area is semi-arid. Irrigation is therefore essential for rice cultivation. The characteristic feature of the terrain and the monsoonal pattern of rainfall were ingeniously used to build these irrigation structures that are rarely found outside India and Sri Lanka. The local names differ from one place to the other. In South India, ahars are called *eris* or *kulams*, and in Jharkhand, those are *hirs* or *bandhs*. The irrigation departments of South Indian States call it ‘tanks.’ The term is misleading and the colonial officials knew it. The early publications of the Agricultural Statistics of India used to record clearly (GoI 1924: 58) that “The term ‘tank’ refers to a particular kind of dammed reservoir. These reservoirs are formed

by enclosing depressions or throwing dams across the valleys of small rivulets and streams to intercept water during rains.” After a few years, this footnote was omitted. Thereafter, people think ‘tanks’ are the common name for lakes, ponds or roof-water storages, or are simply unaware of their existence.

Though both of them have millennia old traditions behind them, canals are now known as modern and tanks as traditional irrigation systems. Surprising it may seem today, but the work of integration of both canals and tanks began at the same time. In Chap. 1, we described how the need of maintaining the land revenue earnings had forced the British officials to take up Grand Anicut renovation work. Similar need arose also for tanks of South India. In Ryotwari settlement in South India, the colonial government had directly settled land with the ryots (farmer). But common property like the tank beds, benefitting many people, could not be settled with any ryot. Hence by default, the government became the owner and responsible for the upkeep of tanks. Proper maintenance was necessary for success of irrigation and regular flow of the land revenue to government coffer. In 1804, one superintendent of tank repair was appointed. It was soon made two and gradually developed into a whole Department of Public Works (PWD) including irrigation (Sengupta 2001: 111). It was the PWD that created the label ‘tank,’ categorizing local systems like *eris* and *kulams* by their identical features. After Arthur Cotton led the learning and improvement of the indigenous technology at Grand Anicut, the colonial engineers constructed several other anicuts in South India. One of these was the eighth anicut at Srivaikuntam on Thamirabarani River, commissioned in 1869. This anicut was used to enrich more than a hundred local tanks, just as the design of traditional tank irrigation system (Sengupta 1991: 123). There were other similar structures renovated and extended during the colonial period. It is surprising therefore that they now seem to be forgotten. That needs an explanation.

Being simple earthwork embankments, irrigation tanks are often described as small, simple, local rain water harvesting systems, easy to construct and maintain. But this is far from the truth. Nineteenth-century engineers like W. L. Strange, the author of the tank manual, and administrators like Thomas Munro, the chief architect of Ryotwari System, who actually worked with tanks and in tank-fed areas, realized that tanks were complex and dynamic systems requiring a deep understanding (for details see Seenivasan, 2014: 9–10). Maintenance of tanks require simple tasks like cleaning the sluices and their opening and closing, to more and more complex works like repair of parts after a breach, strengthening of the embankments after each season, occasional desilting of water-spread area, clearing of supply channels and feeder channels if any. Starting from 1880, a benchmark survey of individual tanks began, recording the standard to be maintained in future renovations. Restoration works too began, on a nominal scale, for adequate fund and expertise were not available. By then, the land revenue earnings were not an important source of fund for the colonial government. Hence, restoration works were never taken up with seriousness. The work of preparation of tank manuals of the thousands of tanks lasted for about a hundred years. After 1947, a process of standardization of these tank memoirs began. By then, it was of little use. Seenivasan (2014: 102 fn. 9), a scholar with experience of tank rehabilitation projects in tank-intensive districts

of Tamil Nadu, Andhra Pradesh, and Karnataka during 1997–2005, found that the manuscripts were rotting in the departmental record rooms. Young engineers did not even know about their existence. Seenivasan explains how it could happen after so much of work. Over time, the engineering circles dealing with the tanks received smaller and smaller budgets within an increasingly cash rich PWD dealing with massive budgets of modern irrigation works. Posting in tanks related offices thus, acquired a sort of undesirability within the PWD. That is how tanks became neglected again, re-acquiring the label ‘traditional’.

In eastern India, the reasons were different. Zamindari settlement was made by the colonial government in 1793 without any demarcation of boundaries, without any survey of land, without any attempt to value the land in detail or to record the rights of the tenants. The government had no need to know the details of resources within the domains of the zamindars as long as they were paying the land revenues. Thus, the modern information system starting from the days of the colonial government have always remained oblivious about the indigenous irrigation systems of Magadh. Behind the zamindars, the indigenous community management system survived, so much so that the area was ‘immune to famines’ (Sengupta 2001: 107–133). The prosperity that followed the hundred years settlement in Bengal enriched the zamindars but brought nothing to the Company coffers. By the very nature of the fixed settlement for a hundred years, the colonial power had no share of the increased benefits from the settled estates. The experience led to a revision of policy, to the introduction of the Ryotwari Settlement in 1801–07.

Only for a short period, in the Survey and Settlement operations undertaken between 1907 and 1919, some information were collected in zamindari areas. But it was of little use since by the end of the operation nationalist peasant movement swept through the area. After independence, the old ignorance returned. In 1966, an irrigation team appointed by the Planning Commission for reviewing minor irrigation works in the country declared that ‘In the alluvial region of Punjab and Uttar Pradesh as also in Bihar there are not many irrigation tanks’. Surprisingly, the team claimed that its report was based on state-wise field studies (cited in Sengupta 2001: 256–257).

Thus, around the time of independence the South Indian tanks, ahar-pynes of Bihar, and similar structures elsewhere in India, were forgotten in policy circuits. But they survived, though certainly not in very good conditions. In the late 1970s, I found that the ‘traditional’ ahar system of Bihar had made the area it served ‘immune to famine’—a term coined by the official reports. During the second half of the nineteenth century, when the whole of colonial India was being ravaged by repeated famines, the districts of Magadh remained unaffected (Sengupta 1980: 164). In another part of the country, the scientists of Central Arid Zone Research Institute (CAZRI), Jodhpur, Rajasthan brought out that an unknown irrigation system called *khadin*, in the midst of the Thar Desert, still prevents crop failure during a severe drought (Kolarkar et al. 1980). From south of India, the policy scientists of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) brought out the importance of tank irrigation in low rainfall regions (von Oppen and Subba Rao 1980). In fact, similar findings about surviving indigenous irrigation systems (not

tanks) were being reported from many other parts of the developing world (Coward 1980). There were some variations in technologies, depending on the local conditions. But they shared a common characteristic. All of those were well-managed functioning systems in spite of limited or no government support. These were community managed systems. Later, International Water Management Institute (IWMI) named those Farmer Managed Irrigation Systems (FMIS), a name used also for new phenomenon of water users' associations in canal and tubewell irrigation.

By around 1980s, a sizable number of large-scale irrigation systems were built by the newly independent countries. But those were functioning poorly. Efforts to improve their performance drew attention to the efficient management systems of the FMIS. Towards this end, IWMI (originally IIMI) was formed in 1985. A FMIS program was one of the original programs of IWMI (Merry 1997: 131–134). However, the impact of studies about efficient management by communities was far more profound. Similar successes were noted in many other spheres like in traditional forest management. The efforts to understand their organizational methods led to the formulation of theories of common property and self-governance. In 2009, Elinor Ostrom received Nobel Prize for this theory. The IWMI studies of that period brought out that in many countries the area irrigated by FMIS accounted for a significant percentage of the total area irrigated. FMIS provided 67% of irrigation in Nepal (Merry 1997: 131–132). Its mandate being irrigation and water resource management, IWMI could not make much use of the technology aspect of indigenous knowledge. But in general, from 1980s global support agencies began to consider that projects based on FMIS are also worth supporting.

The interest generated in the 1980s also brought a wide variety of traditional irrigation systems found in India suitable for different ecologies. Compilations may be found in two collections, one by me (Sengupta 1985, 1993) and another by the Centre for Science and Environment (CSE; Agarwal and Narain 1997). The two set of studies followed two different types of categorization with different developmental implications. CSE introduced the wide variety of indigenous systems by their local names enabling local people to identify those. On the one hand, it brought local peoples' initiatives and involvement of NGOs. On the other hand, the irrigation departments and global institutions considered them as simple local structures that do not need attention of modern irrigation engineering. The other system of classification, which I used, was developed by the public works and irrigation departments during the colonial period. In post-independence period, when one after one canal systems were being constructed, the policy makers were concerned with two categories: major and minor, later to be modified by inclusion of a medium irrigation category. Tanks were included in minor irrigation category. Those who know of South Indian tanks can tell that there are numerous small tanks that are indeed minor. But tank construction is a technology that may be used to create large tanks in suitable topography. For example, the tank manual of 1906 inform (cited in Seenivasan 2014: 106) that the embankment of the Cumbum tank in the Guntur District in Andhra Pradesh is over 30 m high. As per the international irrigation engineering classification, an embankment higher than 15 m is a 'large dam'. Chembarambakkam tank near Chennai had an embankment 4.8 km long supporting a water spread of 23 km². This too is a large

dam by another set of criteria. The engineers and policy makers from the north may not know such details. Their counterparts from the south too were trained modern engineers with little interest to rectify such minor matters.

Thus, after the formation of the rural development department, tanks were shifted to them. Their fates were determined to be minor with moderate finance and no technological input. Considering them as small structures, many NGOs came in. Some of them had to experience their constructions crumble, because tanks actually are not simple technology, as the colonial engineers had found. For a group name, CSE (1997) introduced source-based taxonomy like ‘rainwater harvesting,’ a term that is in use also for household scale roof top harvesting for drinking water. This went well with minor term. Globally, another term, ‘waterbodies,’ became increasingly popular. This is related to ecology and is not necessarily ‘minor’.

In the late colonial period, source-wise irrigation data were collected under four heads: canals, tanks, wells, and others. After independence, this classification was imbibed by official categories for agriculture statistics. I (Sengupta 1993) used this scheme with some additions. The official categories were not enough, and I had to make some additions and modifications. Even that was not enough, as the Minor Irrigation Census (MI Census) found. They started with these categories and went on improving the categorization from one MI Census to another. The Fourth MI Census (2006–2007) made five broad categories: 1. dug wells, 2. shallow tube wells, 3. deep tube wells, 4. surface flow schemes, and 5. water distribution devices. The surface flow schemes were divided into:

4.1 Storage schemes

Three types of storage schemes were identified:

4.1.1 Reservoir

4.1.2 Tanks

4.1.3 Other storage

4.2 Diversion schemes

4.3 Water conservation-cum groundwater recharging schemes

4.4 Surface lift irrigation schemes.

Following this classification, I have titled this section as ‘Surface Flow Irrigation Tanks.’ Table 4.1 of the MI Census (2006–2007) shows that in the country there are 2,39,216 tanks. The actual number will be more because the classification scheme has not as yet reached perfection. Ahars and khadins are not classified as tanks but are included in MI Census under head 4.3 Water conservation-cum groundwater recharging schemes.

However, the census has a fundamental flaw. All these systems are considered as minor irrigation ignoring such facts that some tanks are indeed ‘large dams.’ There are other shortcomings of the Fourth MI Census categories. Their current classification cannot fit anywhere the Thamirabarani River system and the similar structures. Seenivasan (2014: 8) remarks that “the larger hydrological context in which tank networks are placed is often forgotten.” He favors another scheme. During the heyday

of tank maintenance, the southern PWD's developed a more useful nomenclature and classification. For example, the Thamirabarani River tank system was called 'system tanks,' where several tanks received their water supply from a feeder channel drawn from river. These were different from 'tank cascades,' where tanks at lower levels received their supply from the surplus flow of tanks at upper levels. In addition, in some matters other terms are used in global comparison. Thus, system tanks are known as 'melons on a vine design' (Coward 1980: 211; Boyce 1988; Sengupta 1993) and the tanks in the system as 'auxiliary storage.'

After East India Company became the owner of irrigation systems in South India, the only officials in charge of those were the revenue officials, collecting land revenues. When they realized it was imperative to maintain tanks, the post of superintendent of tank repair was created. The nearest they could imagine as a suitable expert from the British side was a civil engineer of Company army. That is how irrigation became a civil engineering subject in modern India. The civil engineers understood the complex engineering structures like the spillway constructions, protective structures. The PWD engineers of South India actually improved those traditional structures using modern knowledge. But still there are several aspects that need discovery. The indigenous understanding of irrigation in India was much wider. Thus, the studies of CAZRI scientists show that the khadins of Thar Desert, whose structures resemble tanks provided irrigation in somewhat different ways, suitable for that eco-system. In years with good rainfall, khadins were used for surface irrigation. But in drought year the community stopped flow irrigation. Instead, they cultivated the tank bed, using the subsoil moisture enriched by the scanty volume of stored water. In fact, such a system still survives in some drier corners of South India. The MI Census rightly classified khadins as conservation and groundwater recharging scheme. In addition, khadins also removed salinity from water used for irrigation, by ingeniously using hydrostatic pressure (Singh and Kolarkar 1983). In, this eco-region salinity is a serious problem. Another important aspect of traditional knowledge was in land use management. In permanent settlement areas in Bihar and Tamil Nadu, tank bed cultivation survived for long, even till post-independence period. Following some ingenious land management system (Sengupta 2006), over this large area tank beds were cultivated along with the regular command areas of the tanks even in normal years. After the zamindari abolition, the modern administrators began to explain this practice as encroachment and forcibly stopped those. Encroachment actually occurred, at least in later period, because the modern bureaucracy could not sustain that complex management system.

The newly developed interest in indigenous technologies in 1980s led to renewed emphasis on the importance of South Indian tanks. In 1982, an International Workshop on Modernisation of Tank Irrigation System was organized at Anna University, Chennai. However, the modernizations works did not go beyond construction of new sluices and lining of field channels. The series of programs that followed, like the European Economic Community funded Tank Modernisation Programme, World Bank funded National Hydrology Project as well as the central and State government works were more comprehensive, reflecting on the better understanding of the tank system. A Minor Irrigation Census of India began in 1986, which was followed by

several more rounds of Census. In the Tenth Five-Year Plan (2002–2007), a program for “Repair, Renovation and Restoration (RRR) of Water Bodies directly linked to Agriculture” was launched. The program continued through the subsequent plans. However, all these works were of limited extent compared to the scale of tank irrigation. For example, the Twelfth Five-Year Plan took up just 10,000 waterbodies, not all of which are irrigation tanks. Only recently, some exhaustive efforts have begun. Just after Telangana became a separate State in June 2014, the government led by K. Chandrashekar Rao started a five-year program to desilt, revive, and restore all 46,531 tanks there. The flagship program of the State government is named ‘Mission Kakatiya’. The brochure introduces the Mission beginning as:

Tanks have been the lifeline of Telangana The topography and rainfall pattern in Telangana have made tank irrigation an ideal type of irrigation by storing and regulating water flow for agricultural use.... The A.P. irrigation policy,... emphasized on the major irrigation, whereas the alluvial plains irrigated by the tanks have remained largely insignificant.... The successive Governments successfully ignored the maintenance and development of tanks and allowed them to face extinction by way of siltation, breaches, encroachments etc. With the extinction of tank system, the self-sufficient villages of Telangana have become drought prone areas.

After two centuries of wait, the crucial importance of tank irrigation in India has been realized by one modern State government.

3.3 Housing—A Human Right

Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, *housing* and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control (italics ours).

This is the Article 25.1 of the Universal Declaration of Human Right. UN brings housing as a human rights issue. Subsequent documents explain that housing must be adequate and that adequate housing is more than just four walls and a roof. In this section, we discuss some of the traditional housing-related knowledge that is still important. Beginning with Subramanyam (1938) several scholars (e.g., Cooper and Dawson 1998) have documented traditional house styles in India. During the nationalist movement interest in traditional Indian art, craft and architecture increased. Both Tagore and Gandhi did some architectural experiments. These were eclectic in nature. But systematic analysis for application began after independence.

Laurie Baker was an English origin Gandhian architect. Born in England in 1917, he studied at the Birmingham School of Architecture, and on completion became an Associate of the Royal Institute of British Architects. The next year saw the beginning of the Second World War. Being against violence, he joined an ambulance unit to serve the wounded and in the process, spent four years in a war ravaged leper colony in a remote corner of China. After the war, he came to India with a missionary

group serving lepers. The Mission had been in dire need of an architect. For the first time, Baker found a chance to use his architectural skills to help some people in need. While waiting for a home visit, he met Mahatma Gandhi and expressed his willingness to work in India. Those were the years of Quit India Movement and Baker was a British. Still, Gandhi encouraged him to return to India. He did so, married and settled here, becoming an Indian citizen. Laurie Baker initiated discussion on traditional housing-related knowledge in India.

During his initial years in India with the leprosy mission, Baker saw with fascination the skills of the ordinary village people who made useful everyday buildings using the ‘most unpromising and crude materials’ and with almost no recognizable tools. In a booklet (Baker 1999), he explains his notion of tradition and modern in housing architecture. In India, he wrote, “there is no such thing as ONE traditional INDIAN Architecture.” Every district has its own traditions and, by trial and error, over thousands of years, people have learned how to use, and to cope with, all the many factors which are involved in Architecture—the site, topography, geology, the climate and vegetation, available local materials, the religious and cultural patterns of living, and the local occupants. Unsatisfactory items have long since been discarded and alternatives have been tried until a satisfactory solution has been found. *It seems foolish, therefore, to abandon the tested findings of centuries of “Science & Technology”* (italics ours, from Laurie Baker 1999).

Interest in housing-related traditional knowledge was revived by another stream. In early twentieth century, when architecture as a profession had not yet appeared in Indian technical education curricula, Reverend J. E. Padfield in his descriptive account of ‘The Hindu at Home’ informed that “There are regular professional persons called the Vaastu Shastris” (cited in Chakrabarti 1998: 30). Within the last hundred years, it has been established that texts were written about the Shilpa (and Vaastu) shastra knowledge. Several books have been found and translated. In 1957, a doyen of traditional architecture (*sthapati*) established the Govt. College of Architecture and Sculpture at Mamallapuram, near Chennai. His son, late Ganapati Sthapati worked all his life to propagate and practice traditional architectural knowledge. Born to a renowned sthapati (architect) family and educated also in the modern education system, Ganapati Sthapati excelled in finding deeper meanings in the texts. He suggested that Vaastu is not only an architectural science of construction of temples and the creation of deities within it but a science of cosmology. This concept applies equally to temples and buildings and opened up the use of Vaastu architecture for factories, offices, and residential buildings. By now, Vaastu Shastra has become a widely applied system of knowledge, and inevitably, brought in quacks to exploit the market. “Unhappy customer drags vastu agency to consumer forum” reports a daily newspaper (Rozinda 2016). This reinforces the suspicion about traditional knowledge in general including Vaastu Shastra.

In the hands of some quacks and crooks, Vaastu has become a hoax profession. The unconventional cosmological interpretation is believed to be at the root of it. However, Charles Correa, one of the greatest of modern Indian architects, explains (Correa 2010: 26–45) that the realm of human existence is not just public and private, but also a sacred. Different cultures have different understanding of what is

sacred. The cosmological fundamentals like Vaastu Purush Mandala are indeed, the conceptualization of the sacred in Hindu philosophy. If so, proper use of it will evoke the notion of being sacred. Leading modern architects like Charles Correa and B. V. Doshi are also strong proponents of Vaastu Shastra. But I did not find them suggesting anywhere that Vaastu has effect on financial losses, litigation, theft, high blood pressure, or skin disease.

If Vaastu is related to Veda and Hindu philosophy can it be called the traditional form for multi-religious multi-ethnic India? Scholars of Islamic era are unanimous (Nath 2004; Rezavi 2013) that many traditional Indian architects and craftsmen contributed to construction of Islamic mosques and monuments. They defined a distinctly Indian architectural tradition where both ancient Indian and Persian style combined to make an Indian traditional style. In fact, Mughal emperors like Akbar used the local symbolism to make powerful statements. Correa provides a Vaastu cosmological explanation about the location of Akbar's seat in Diwan-i-khas at Fatehpur-Sikri. It was not only an extraordinary piece of architecture but also an incredibly powerful political statement. Akbar was using the old myths to tell us that a new order has arrived. But he did it with finesse not with a gigantic structure.

How far was Vaastu applied to popular housing? In an incisive analysis Correa (2010: 26–45) explains: "In fact, just when one begins to suspect that in a modern city like Bombay, all this rehashing of Vedic mythology is a lot of elitist cant, one suddenly realizes that less than a hundred yards away, in a hovel of a shanty town, a squatter family is actually re-enacting their version of those very myths in the real crunch of everyday life. Our habitat is not created in a vacuum; it is the compulsive expression of beliefs and aspirations (implicit or explicit) that are central to our lives." When they share a common heritage, the Shastra makers and the hut builder for village poor may still share similar notions, just as folk music in India often expresses deep philosophy of Upanishad.

Architects may differ whether Baker's works are based on traditional architecture or vernacular or folk architecture. Some of the Vaastu shastra proponents claim that Laurie Baker's works were endorsement of Vaastu. I do not know. The land and its people, with the beliefs and aspirations as described by Correa, enlightened Baker's ideas and the compendium of information from ordinary people enriched his vision. He discovered a hidden heritage in local indigenous style of architecture, the result of thousands and thousands of years of research and collective experience of many generations on how to use only immediately available, local materials to make structurally stable buildings that could cope with local climatic conditions, with the local geography and topography, with all the hazards of nature, with possible hostile neighbors, houses that could accommodate all the requirements of local religious, social and cultural patterns of living. He learnt about more and more local materials and devised new patterns using burnt bricks, stone, mud, tiles, and timber and applied new kinds of mortar and plaster in his works (from Baker 1999). Baker's mission was to make houses at cost as low as possible so that even poor can afford it.

After independence, along with the land reforms agenda, many State governments introduced programs to allot land to the poor for house site. Otherwise, housing was accorded low priority during the earlier days of development planning. In 1970,

the central government established the Housing and Urban Development Corporation (HUDCO) under the Companies Act 1956. Over the years, the facilitation role increased, in ensuring access to developed land, basic services, building materials, technology, construction skills, and finance so that housing could be undertaken as a private initiative. But there was an implicit acceptance that the government cannot provide housing for all. Taking cue from the UN Declaration in 1986 individual advocates and groups began a National Campaign for Housing Rights. Following the campaign, the first National Housing Policy was promulgated in 1994 and was followed by the National Housing and Habitat Policy, 1998. Aromar Revi, who played a key role in the change, later wrote (Revi et al. 2007) that the National Housing Policy (1994) failed to internalize the spirit of its declaration in the accompanying plans and policies. For that, Revi argued, the rural house building activity should have been made more affordable by removing constraints to the supply of building resources, materials, skills, and technologies. But instead, the use of traditional building technologies and decentralized labor intensive and biomass-based housing production and maintenance processes were dismissed as undesirable *kutch*a or substandard, although Laurie Baker demonstrated that both in terms of technical efficiency of resources and their use these technologies perform quite well. Revi also points out that the natural resource base for rural housing has been reducing. Deforestation, reduced availability of clay, scarcity of biomass fuels and deskilling of artisans are on the increase. That necessitates adaptation to the new conditions. In 1976, HUDCO organized the first low-cost housing design ideas competition. In 2011, the Twelfth Five Year Plan Working Group on Rural Housing recommended that proven alternatives and indigenous technologies that are cost effective and environment-friendly need to be standardized and included in schedule of rates for construction.

A recent World Bank study says (Jha et al. 2010: 146–147) that “Rural housing styles have evolved in harmony with local cultural and climatic conditions. Vernacular designs and techniques are often optimal because of their cost-effectiveness, local availability, and minimal environmental impact. There is increasing support for using local, environment-friendly housing materials in reconstruction (e.g., stone, mud brick, wood, and slate), especially in rural areas.” The writer also informs that a false perception about environmental impacts is known to have discouraged the use of local materials. But this makes reconstruction more difficult for homeowners who may be unfamiliar with new building materials and construction methods. In a valuable book published recently, Tipnis (2012) shows, from essays written by several contemporary architects, the different ways in which vernacular traditions have been integrated into contemporary building practices. She argues that the vernacular architecture of India is inherently sustainable, environmentally, ecologically, culturally, and from socioeconomic considerations. She says that the principles deduced from the vernacular can provide valuable lessons for contemporary architectural practices.

After Garhwal earthquake in 1991, the reports about the nature of the damage and destruction were conflicting. Some felt that the indigenous building structures were essentially, faulty. Some others felt that there was no basic problem; some nominal refabrication would make old houses safer. The Department of Science and Technology, Govt. of India, required a clear position. They requested Laurie Baker

to go and investigate. On return, the team reported that houses with traditional stone-in-mud walls and slate or wood roofs fared no better and no worse than ‘modern’ reinforced concrete structures. A ‘concrete house’ was just as liable to destruction or damage from the earthquake as was the old-fashioned wood, mud, and slate-roofed house. The components of the traditional roof can be salvaged and reused, whereas only the steel of the broken concrete slab can be reused, after a lot of hard labor and difficulty. The team did not spare traditional houses from criticism: ‘people of former generations knew nothing of our present concern about ecology. Timber was plentiful so it was used lavishly.’ The team concluded, “We mainly believe that if walls were properly constructed with the same local materials but better bonding, 99.9% of all reconstructed work would not need any special ‘earthquake proofing’! Nevertheless, we think this is a suitable time and opportunity to make one or two demonstration houses, with local material, which would help withstand a major earthquake” (Chandra et al. 1992).

In 13th World Conference on Earthquake Engineering at Vancouver, Sinha et al. (2004) brought out the remarkable achievements of ancient cultures in development of several earthquake-resistant construction technologies. They said that the effectiveness of these traditional technologies has been clearly brought out again and again, during earthquake disasters. For example, during the Bhuj earthquake in India in 2001, a large number of traditional constructions experienced low level of damage while their neighboring modern buildings suffered extensive damage and loss of life. Similar experiences have also been repeated in the Marmara earthquakes in Turkey in 1999, the Killari earthquake in India in 1993 and several other earthquakes. They argue that these facts clearly show that the local traditional construction practice had adapted earthquake-resistant technologies, which are now being lost due to the induction of modern materials and construction techniques in these areas without addressing the seismic safety of modern constructions.

Koti Banal is a village in Uttarkashi district of Uttarakhand. In 1991, Uttarkashi was rocked by an earthquake of 6.6 magnitude. Though the epicenter was barely 30 km away, the Koti Banal buildings remained unharmed while several new concrete ones collapsed. The whole region is sprinkled with a large number of intact four and five storied traditional houses (Rautela and Joshi 2008). Radiocarbon dating of wood samples collected from panels used in the buildings show that the region had evolved a distinct and elaborate earthquake-safe construction style a thousand years before present. This is known as the Koti Banal architecture. Rautela and Joshi (2008) report that its procedures for site selection, platform preparation for raising the structure, and the construction principles of the structure resemble that of framed structures of the present times. Locally and then abundantly, available wood was judiciously used in these structures. The structural detailing suggests that those responsible for designing these buildings had a fairly good idea about the forces likely to act upon the structure during an earthquake. From similar such studies, Sinha et al. (2004) suggest that the indigenous earthquake-resistant technologies can be proposed for the use of economically weaker sections. Their construction costs are significantly lower than their modern counterparts. The local skilled, semi-skilled, and unskilled workers, who constructed these structures, can be suitably trained to ensure that the

buildings provide the minimum level of seismic safety. They provide an excellent opportunity for large-scale construction of cheap earthquake-resistant housing in developing countries at relatively low cost.

A World Bank study (Jha et al. 2010: 166) summarized the current understanding as that there is considerable debate in the development community concerning the promotion of vernacular technologies in reconstruction. Vernacular technologies are often appropriate solutions in terms of cost, environmental impact, climate, and cultural and architectural suitability and should generally be given priority. However, these technologies are not always optimal due to such concerns as their vulnerability to hazards and durability and often need to be improved through the introduction of modern technology or components. They recommend a careful approach of assessing the vulnerability of the traditional technology and undertaking proper improvement before applying it on a large scale. One of the editors of a recently published book (Patel and Revi 2010: 11–12) about the experiences of post disaster reconstruction makes a very valuable suggestion. After these years of stray experiments by individuals and groups showing the merit, “An effort need to be made in our engineering colleges ... to learn about traditional technologies, to understand what is wrong with them and what is right about them. From this we can move on to strengthen the methods, principles and practices of construction.” Patel hopes for a day when the engineers from such colleges interact with the local skilled and semi-skilled house-builders, helping them to improve on their otherwise good enough structures. Such a process will combine best of both types of knowledge and bring improvements on a large scale.

3.4 Changing Priorities—Niyamgiri

The Niyamgiri hill range is spread over a 250 km² area in the districts of Rayagada and Kalahandi in Odisha. It is part of an important biodiversity-rich landscape. Some 20 species of orchids are found in and around the area. The rich biodiversity of the hill region is the source of livelihood resources for the indigenous people living here. They use these plants as medicines to treat different ailments like scorpion and snake bites, stomach disorders, arthritis, tuberculosis, paralysis, cholera, acidity, eczema, tumors, menstrual disorders, wounds and sores, diarrhea, dysentery, bone fractures, rheumatism, asthma, and malaria (Saxena et al. 2010). No wonder that Niyamgiri hill is of religious significance to the tribals and their neighboring communities residing here.

One such tribal community, namely Dongaria Kondh, lives in the upper reaches of the Niyamgiri hills. Their total population, of about 8,000, is found only here. In general, the so-called tribes of India (scheduled tribes) are not really as backward as the term ‘tribe’ implies. To indicate their relative positions, India government uses a kind of gradation. In this scale, Dongaria Kondhs are included among the Particularly Vulnerable Tribal Groups (Primitive Tribal Groups till 2006), who are eligible for special protection. The hilly habitat is also occupied by a few families belonging to

the Domb community, a scheduled caste. The adjoining foothills are the habitat of Kutia Kondh, Desia Kondh, and some scheduled caste communities (Saxena et al. 2010; Tatpati et al. 2016). Kutia Kondhs too are included in the list of Particularly Vulnerable Tribal Groups.

Several perennial springs originate from the plateau. The hill links the forests and wildlife sanctuaries around the region making it a single corridor. Such corridors are particularly important for the conservation of wildlife species like elephant and tiger found in this region. Thus, traditionally, the ecosystem was important to the local communities for their livelihood, cultural, and religious activities. It became significant as a forest, biodiversity, and ecological resources. To this list, another interest was added when the hill was found to have rich bauxite deposits, enough to attract Aluminium industry. Recent developments in Niyamgiri hill region show the evolving priorities between these different uses of a resource in modern India.

Vedanta Resources, a London-based mining conglomerate signed a Memorandum of Understanding with the Odisha government to set up a one million tonne alumina refinery at the foothills. They began preliminary works in 1997 giving rise to a lot of expectations for good rehabilitation. Some people were rehabilitated at the model township, got jobs at the company or in shops springing up around the township, and could send their children to the high profile school. Some others were disgruntled for reasons like strong arm methods used by the company in settling compensations, pollution caused by the refinery affecting water and air quality, and several others. The displaced and affected persons residing around the refinery site started an agitation. Soon the local students came out in their support. In 2004, an agreement was signed between the Govt. of Odisha and Vedanta Resources for mining of the Niyamgiri deposit. Although the proposed mine was to be located about 10 km away from the peak the entire neighborhood was to be affected. Niyamgiri hills were at the verge of a major ecological catastrophe. Their habitat threatened, the Dongaria Kondhs entered the protest movement against Vedanta. Subsequent to their involvement, the movement began being perceived increasingly as a struggle of a particularly vulnerable tribal community for survival. Reputed global agencies began to distance themselves from the project. Norwegian government's pension fund and Church of England exited from Vedanta's shareholding on ethical grounds. In 2010, the concerned Ministry (MoEF) appointed a Committee (Saxena Committee), which submitted its report (Saxena et al. 2010) showing that Vedanta has consistently violated the Forest Rights Act, Forest Conservation Act, Odisha Forest Act, and the Environmental Protection Act. There were other lacunae like that the Environmental Impact Assessments were based on false information. The report was a scathing indictment of the collusion between the Odisha State Government and the MNC. The MoEF placed the Saxena Committee report to a Forest Advisory Committee (FAC). Instead of differing, the FAC added that the Primitive Tribal Groups were not consulted in the process of seeking project clearance. The FAC opined that it was a fit case for applying the precautionary principle to obviate the irreparable damage to the affected people and recommended for temporary withdrawal of the approval accorded. In August 2010, the MoEF forbade further forest clearance on the Niyam-

giri hills. The irregularities in environmental clearance were questioned and show cause notices were served to the company.

Dissatisfied with this order the Odisha State Government approached the Supreme Court with a Writ petition for quashing of the MoEF order. In a landmark judgment in April 2013, the Supreme Court acknowledged the right of the State over mines or minerals lying underneath the forest land adding that procedural propriety should be maintained for exercising this right. “State holds the natural resources as a trustee for the people” and has the power to reserve any particular area for Bauxite mining for a Public Sector Corporation. However, the Forest Rights Act empowered the *gram sabhas*¹ to make decisions about the way the resources in their jurisdictions may be used, after complete consideration of customary cultural, religious, community, and individual rights of the forest dwellers of the region. The Supreme Court directed the State of Odisha to place their plan before the gram sabha and directed the empowered gram sabhas to take a decision within three months. The process was initiated. By September 2013, all 12 gram sabhas concerned unanimously rejected the mining proposal. In January 2014, the Ministry (MoEF) rejected forest clearance for Vedanta’s mining project in Niyamgiri hills. In subsequent years, Odisha government tried to bypass the order by different means, like mining the bauxite independently or to reconvene the gram sabhas. In May 2016, the Supreme Court admonished Odisha government for such attempts.

In a careful study, Borde (2017) documented the spread of the movement. Reports of students’ protest in the Odisha State legislative assembly brought involvement of Amnesty International. Along with some other NGOs like Action Aid, London Mining Network, BankTrack, Survival International, and a British M.P., they brought Vedanta’s human rights and environmental record under public scrutiny at the company’s Annual General Meeting in London on July 28, 2010. The NGOs also organized public protest outside the meeting venue. Hollywood blockbuster *Avatar* was released a few months earlier. Its politically committed director, James Cameron, had donated a part of his sale proceeds to reforestation projects in South America. Some protesters were quick to notice the similarity between *Avatar* story and the ongoing struggles at Niyamgiri hills (Jagger 2010). They marched in front of Vedanta’s offices in London holding placards reading ‘Save the Real Avatar Tribe’. The scene became an international media favorite and was very successful in sensitizing general public.

Relevance of several global norms was discussed as the dispute reached courts and offices (Borde 2017). The lawyer representing the affected people explained the imports of the Convention on Biological Diversity in this case and referred to the CBD approved Akwé: Kon Guidelines about Impact Assessment. In their meetings, the shareholders and bankers of Vedanta considered possible violation of two other international norms: the Equator Principles and the OECD Guidelines for Multinational Enterprises. The first one suggests the way the banks need to manage environmental and social issues in project financing.

Particularly, instructive is the interpretation of Indian law that came out in the intense contestations over Niyamgiri mining. Common belief is that the extraction

¹Literally, village assembly.

of valuable resources like minerals is of paramount interest for development. It must override other interest in land use. Bartering compensations, rehabilitations, and employment guarantee against eviction is regarded as fair. In their judgment in Niyamgiri dispute, the three judge bench of the Supreme Court affirmed that Indian policies have evolved into a higher stage by responding to changes in Constitutional rights of indigenous and local people and also to India's commitments to two international conventions:

... the STs and other Traditional Forest Dwellers (TFDs) ... have a vital role to play in the environmental management and development because of their knowledge and traditional practices. State has got a duty to recognize and duly support their identity, culture and interest so that they can effectively participate in achieving sustainable development. (Paragraph 39)

Of late, we have realized that forests have the best chance to survive if communities participate in their conservation and regeneration measures. The Legislature also has addressed the long standing and genuine felt need of granting a secure and inalienable right to those communities whose right to life depends on right to forests. (Paragraph 42)

The 73rd Amendment of the Constitution provided Constitutional support for devolving 29 State subjects to Panchayats if the State so desires (11th schedule). But no State used this provision of transferring some of their decision-making power to Panchayats. Instead, some States misused the 73rd Amendment to undermine the limited governance power granted to the Scheduled Areas and Scheduled Tribes under Article 244(1) of the Constitution of India. Bhuria Committee was appointed to look into the matter. Following the Committee's recommendations, the Panchayat (extension to scheduled areas) Act better known as 'PESA Act' was enacted by the Parliament in the year 1996. Roughly speaking, under the 73rd Amendment the States *may* transfer the 11th schedule subjects to local governments. In PESA Act, they *must* transfer these rights where PESA is applicable. The PESA Act stipulates that the State legislation on panchayats shall be made in consonance with the customary law, social, and religious practices and traditional management practices of community resources. Every gram sabha shall be competent to safeguard and preserve the traditions and customs of the people, their cultural identity, community resources, and the customary mode of dispute resolution and that the gram sabha or the panchayats at the appropriate level shall be consulted before making any acquisition of land in the scheduled areas for development projects.

India has also signed two international conventions pertaining to indigenous and local people's rights—the Indigenous and Tribal Populations Convention of the ILO (C107) and the Convention on the Biological Diversity. The bench of judges observed that all these developments led to the passing of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act in 2006. Popularly known as the Forest Rights Act, this Act protects a wide range of rights of STs and TFDs including their customary rights. The Act also assigns to gram sabha such tasks like considering the resettlement or alternative packages prepared by the State governments and preserving the habitat of STs and TFDs from any form of destructive practices affecting their cultural and natural heritage. The Act grants same set of rights to tribals (i.e., STs) and local non-tribals (TFDs). In Western countries, a

law granting equal right to tribals and non-tribals in an indigenous peoples' reserve is infringement. West-centric understandings rule international fora and scholarly writings. In clear contrast with this, the Forest Rights Act treats non-tribal TFDs at par with tribals. To the residents of Niyamgiri and its surrounding, this is natural, not unjust. Unable to understand this baffling phenomenon, global reports and discussions about Niyamgiri remain silent about the TFD's. FRA captures Indian reality. In American continent and Australia, the term 'indigenous' is used to identify all the people living there before the arrival of Europeans. In India, the STs account for only a small part of all the pre-European occupants, who are literally indigenous. The application of terms like tribe, scheduled tribe, indigenous, autochthones, adivasis creates very serious confusion for Indian reality. The divisions have been questioned again and again for about a hundred years (see Sengupta 1988). Some recent movements of STs in some 'tribal regions' are against the indigenous and the adivasis (Hussain 1992; Sengupta 2015). It is important to note that the Indian Forest Rights Act of 2006 is applicable to both Scheduled Tribes and Other Traditional Forest Dwellers. This is in agreement with the relevant CBD principle: respect, preserve, and maintain knowledge, innovations, and practices of *indigenous* and *local communities* embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity (emphasis ours).

Being passed by the Parliament, the judges explained the Forest Rights Act has greater sanctity than a Policy Statement like the National Forest Policy, 1988. This interpretation of the Forest Rights Act by the Court is now binding on every High Court and every Supreme Court bench of less than three judges, as well as on the government. It is also notable that there is not a single word anywhere in the judgment, about "the national interest in mining," "development projects," or the "need" to mine (Vasundhara n.d.). An alternate global model of modernization that emerged in the last few decades has successfully challenged the two centuries-old model of modernization through emphasis on mineral resource extraction. But this is only one step in that direction. The judgement does not destine Niyamgiri residents to conservation forever. Instead, it draws attention to an appropriate procedure laid down in the Forest Rights Act. In CBD vocabulary, this is Prior Informed Consent (PIC). The gram sabhas in Niyamgiri may, in future, decide to accept another development project, even a project that is destructive to biodiversity, if it improves their livelihood and social situation. Both CBD and the Indian Act are clear that such a choice is within the rights of the locals. The global community should not think of promoting wider application of traditional knowledge and sharing the received benefits as a token gesture. They need to share benefits to the extent that the custodian local communities extend their prior informed consent for conservation. Already, there are several such efforts. In the next chapter, we discuss some of these efforts.

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Chapter 4

Biodiversity and Genetic Resources



Abstract While modern notion of progress was destructive to nature, the rich biodiversity materials and knowledge have been preserved by people practicing traditional lifestyle. Today, efforts are being made to preserve, promote, and ethically share their knowledge. In this chapter, we describe four different cases to bring out varieties of challenges these efforts meet. The first is a celebrated case of scientists approaching with due respect the Kani scheduled tribe community to learn and share their indigenous knowledge. The second is an organized effort to preserve, maintain, and promote application of traditional medicinal knowledge, innovations, and practices of local communities. The third case is that of protection, production, and marketing of basmati rice after the infamous dispute between India and USA in the 1990s was settled. The fourth is a case of application and marketing of traditional knowledge of biodiversity processing in the form of cosmetics and perfumes. The case studies in this chapter bring out the merits and limits of the legal and institutional structures adopted by India.

With only 2.4% of the land area, India accounts for 7–8% of the recorded species of the world. As of now, 46,000 species of plants and 91,000 species of animals have been recorded in the country. India is home to 8.58% of the mammalian species, 13.66% of avian species, 7.91% of reptiles, 4.66% of amphibians, and 11.80% of all plants. So far, Zoological Survey of India has recorded 3,022 fish species, which constitute about 9.41% of the known fish species of the world. India is one of the 17 mega biodiversity countries of the world. Considering the outstanding universal values and exceptionally high levels of endemism in the Western Ghats, 39 sites have been included in the UNESCO World Cultural and Natural Heritage List (GoI 2014).

Any material found in plant, animal, microbial, or other origin containing functional units of heredity is genetic material. Genetic resources refer to the genetic materials of actual or potential value. India is an acknowledged center of crop diversity and a center of origin of cultivated plants. It is considered to be a primary center of origin of rice. Till now, a total number of 811 cultivated plants and 902 of their wild relatives have been documented here. These include hundreds of varieties of crop plants such as rice, maize, millets. India also has a vast and rich repository of

farm animals, represented by a broad spectrum of native breeds of cattle (34), buffalo (12), goat (21), sheep (39), and chicken (15). India has one of the richest and oldest medicinal plant cultures of the world. An estimated number of 6,560 species of medicinal plants have been found so far in India. These constitute India's genetic wealth.

How to take care of these resources and promote their wider application? CBD made some recommendations. So did many of its later interpretations. Their implementation requires domestic law and procedures, suitable administrative setup, supporting science and technology organizations along with technically and organizationally competent leadership. In this chapter, we describe four different cases to bring out varieties of challenges. The first is a celebrated case of scientists approaching with due respect the Kani scheduled tribe community to learn and share their indigenous knowledge. The second is an organized effort to preserve, maintain, and promote application of traditional medicinal knowledge, innovations, and practices of local communities. The third case is that of basmati rice. In this section, we discuss the complexities of preservation and marketing of the traditional innovation. The fourth case is a case of promotion and wider application of traditional knowledge of biodiversity processing in the form of cosmetics. In this section, we bring out the economic potential of traditional knowledge in just one sphere as well as the merits and limits of the legal and institutional structure adopted by India.

4.1 Jeevani—The Wonder Herb of Kanis

In 1976, Indian Council of Agricultural Research (ICAR) proposed to undertake an ethnobiological study of the tribals to record their fast disappearing knowledge. Accordingly, All India Coordinated Research Project on Ethnobiology was launched in 1982, within the Man and Biosphere Program of UNESCO. The headquarter of the project was located at the Regional Research Laboratory, Jammu, and one of its senior scientists, P. Pushpangadan, was appointed the Chief Coordinator of the project. In 1987, the team reached Agasthyar hills of the Western Ghats in Thiruvananthapuram district of Kerala. Like the Dongaria Kondhs of Niyamgiri hills, there was Kanikar (Kani) scheduled tribe in Agasthyar hill region. The team included three men from Kani community as their guide. Within two days, the team members found that their guides were never tired while the scientists were exhausted. Kani guides were constantly munching some black fruits of a plant. At one stage, the guides offered some of these fruits to the exhausted scientists. After eating the fruits the team members were instantly rejuvenated. Though they were sharing many other information with the scientists, in this case the Kani guides were reluctant to divulge the identity of the fruit. They said that the knowledge about the fruits was sacred and not to be revealed to outsiders. After much persuasion, the guides identified the plant as *arogyapacha*, which translates roughly to 'Green health'. Its scientific name is *Trichopus zeylanicus* travancoricus. Though the main species, *Trichopus zeylanicus*, is found in Sri Lanka and Thailand, only the Indian variety has medicinal qualities.

The Kani people (Kanikar or Kanikkarn in ST list) live in the Western Ghat region of Kerala and Tamil Nadu. Their population is about 25,000 of whom three-fourths live on the Kerala side and the rest in Tamil Nadu. Scientist of Tropical Botanic Garden Research Institute (TBGRI), Thiruvananthapuram, succeeded in teaming up with Kani tribe of Kerala side to share their ethno-botanic knowledge. The scientists collected some specimens of the plant to study its properties. Detailed investigation of physical, chemical and pharmacological properties of the plant and identification of the active principles were done. In 1990, Pushpangadan moved to TBGRI as its Director. The research on arogyapacha also moved to the TBGRI. Realizing that the TBGRI did not have all the expertise needed to handle such a comprehensive research project, he hired services of people from other fields, like pharmacology, phytochemistry, biochemistry, and Ayurveda. As the research progressed, two of the three original Kani guides were included in the team as consultants (Chaturvedi 2007). The efforts paid. Researchers discovered the anti-stress and immuno-stimulating property of the plant. Later, they also identified other properties such as tumor control, anti-fatigue, stamina boosting properties. Finally, in 1994, TBGRI prepared a drug, called Jeevani, containing arogyapacha leaves and three other herbs. TBGRI conducted clinical trials of Jeevani for eight months on 100 human subjects in different Indian cities. It was also evaluated on the basis of Ayurvedic *dravya guna* (Materia medica and Pharmacology). Results of these open clinical trials were highly significant. A drug was ready to be marketed.

In its original form the Drugs and Cosmetics Act, 1940, did not include Ayurvedic or Unani products as legitimate drugs. Following stringent criticisms by leading scientists like R. N. Chopra, an Amendment in 1964 brought traditional medicine systems under the purview of this Act. But local or folk knowledge of tribes was still not recognized by the Act. That implies that a drug developed on the basis of this knowledge cannot be commercialized legally. No mention of arogyapacha was found in the Ayurvedic texts. Ultimately, the TBGRI scientists claimed that in his classification of various medicinal herbs, the ancient Ayurvedic authority, Sushruta included a plant named *Varahi*, whose description fits arogyapacha. This cleared the legal hassle for marketing. In late 1995, TBGRI entered into a know-how transfer Agreement with Arya Vaidya Pharmacy (AVP) of Coimbatore, for manufacturing and marketing of Jeevani. The know-how was for processing the three herbs to produce Jeevani as developed by the TBGRI. At that time, India allowed only process patents. The license given to AVP was for a limited period of seven years against a license fee of Rs. 10 lakhs and royalty at the rate of 2% of the ex-factory sale price of the product made by AVP for a period of ten years from the date of commercial production. To assure supply of the plant to AVP, the TBGRI scientists tried to develop a protocol for cultivating this plant. The scientists also tried fast multiplication through tissue culture methods. But it was found that the medicinal qualities of the plant were lost, unless grown in the natural forest habitat. So in 1994–96, TBGRI organized a pilot project to cultivate the plant in some of the Kani settlements, in forest areas. Integrated Tribal Development Programme (ITDP) gave fifty families Rs. 1,000 each for cultivating the plant. TBGRI agreed to buy the leaves harvested from the families. These were then supplied to AVP for the pilot phase production of Jeevani.

Within a few months, in 1996, the TBGRI team filed patent application for 'A process for the preparation of a novel immunoenhancing, anti-fatigue, anti-stress and hepatoprotective herbal drug (Jeevani)'. This was the second; the first patent on arogyapacha was awarded in 1994 to the first research team based in the Jammu laboratory. Steps were taken for further research and intellectual property protection. In due course, TBGRI isolated five compounds but could not undertake detailed characterization of these compounds owing to lack of adequate technology and equipment. The success of the clinical trials had created considerable interest worldwide. So, for pursuing research on the other compounds TBGRI entered into collaboration agreements with Danish government and the Singapore University. Altogether, there were five Indian patents for different research processes based on arogyapacha. Apart from the two already mentioned, the team also received a patent on an anti-diabetic herbal drug, a herbal sports medicine, and a patent for herbal medicinal compositions for cancer treatment (Chaturvedi 2007). TBGRI made no attempt to get either a trademark for the brand 'Jeevani', or a product patent for the US market, or an international patent under PCT. A suggestion for external product patent by the Director was turned down by the administrative authorities.

None of the five patent applications refers to the tribe's name anywhere. However, this appears to be a procedural mistake in the absence of precedence. The scientists concerned had no intention to deny their contribution and share. In 1995, when the product was ready for marketing, Pushpangadan proposed that the proceeds be shared with the tribal community showing due respect for the knowledge and contributions of this indigenous people. This was unheard of in modern science establishments. Executive Committee of the TBGRI could not accept it completely. They decided to abide by the CSIR model of benefit sharing, but accepted the Director's proposal for benefit sharing within the TBGRI. The fact that by then, India had signed the CBD helped the Executive Committee to agree to the Director's proposal. In CSIR model 60% goes to the scientists and 40% to the institutions. The scientists decided to forego half of their share in favor of the tribal community (Bijoy 2007; Chaturvedi 2007). However the 'Access and Benefit-Sharing' arrangement was simply a voluntary initiative of primarily the scientists involved and TBGRI, which was not legally obligatory or mandatory. The IPR of Kanis or their contribution to the formulation was not attempted to be formally accorded due recognition (Bijoy 2007).

Indeed, designing a benefit-sharing mechanism turned out to be a daunting task. This is an issue that will return again and again in our case studies. We will also describe the different ways the issue was approached in different cases. In this case, a formal representative of the Kani community was created for shouldering the responsibilities and receiving the reward. Kerala Kani Samudaya Kshema Trust (KKSS) was registered in 1997 with nine members. Over the years, its membership increased to about 1000. Between 1999 and 2007, about Rs. 650,000 was transferred by TBGRI to the Trust. In its first meeting, the Executive Committee of the KKSS decided to invest a half of this amount to a fixed deposit and pay Rs. 20,000 each to the individual Kani informers accompanying the bio-prospecting team. Subsequently, KKSS also constructed a community hall-cum-office for itself (Bijoy 2007).

Almost immediately, several questions were raised about the legitimacy of the Trust as a representative of the community, and the decisions and actions it has taken on behalf of the whole community. Many Kani elders felt that their traditional knowledge was sacred and should have remained exclusive. Those who were consulted and who passed the information had no right to divulge this sacred knowledge for monetary consideration. The knowledge sharers, who themselves were members of the Kanis, violated CBD by not obtaining prior informed consent from other members or the headmen (Bijoy 2007). Even before the Trust was formed, a group of nine Kani healers wrote a letter to the Chief Minister opposing the sale of their knowledge to a private firm. The criticisms prompted alternative approaches. In 1995, Kerala Environment and Human Rights Research Centre, a department of the State government, drafted a State-level bill, seeking from government power to screen all IPR affairs about the traditional knowledge of the tribals of Kerala. The effort did not succeed.

Many of these criticisms might have settled if the project could proceed. Apparently, Kanis, who are generally poor and are gradually becoming marginalized, were supportive. They saw some hope of betterment of their conditions. It is corroborated by the fact that the ITDP sponsored pilot phase for cultivation of the plant near the reserved forest succeeded. But the biggest blow to the project came up from an unexpected side. When Kanis took arogyapacha leaves out of their settlements for sale, they were stopped at the forest check-post because arogyapacha was not included in the list of minor forest produce (MFP). In contexts like this, one may appreciate the importance Niyamgiri judgment. During the Jeevani episode, the Forest Department exercised almost complete control over forests. The PESA Act came up only in 1996. Till then, the only concession that was extended in post-colonial legislations was to permit forest dwelling tribals to gather minor forest products (MFP) for their livelihood. Even there, they faced regular harassment from the department personnel. Forest officials confiscated each consignment of arogyapacha going out of the forest. It was a big blow. Once the marketing started, Jeevani was an instant success. It was sold at Rs. 160 for a 75-g jar, was successfully marketed in India and abroad, including countries such as USA and Japan. The Arya Vaidya Pharmacy wrote to the Kerala Forest Department for supply, but in vain (Gupta 2004). After several years of lobbying by the scientists of TBGRI, in 2000, the Forest Department agreed to make arogyapacha a MFP (Unnikrishnan 2000: 11). But then, it was too late. On finding that despite there being a good market for the Jeevani drug, there was no raw material to manufacture it AVP had lost interest.

As Forest Department stopped legitimate production and marketing, the arogyapacha plant went into black market. It was in great demand in several countries. Mainly through illegal trade, arogyapacha plants started appearing in city nurseries of Kerala State. On seeing this, the Forest Department prohibited collection of saplings from the wild. In 1996, as many as 10,500 arogyapacha plants were confiscated from a private nursery in Thiruvananthapuram (Down to Earth 1998; Unnikrishnan 2000: 7). Several companies, particularly Chinese and American, were selling Jeevani, which if were not fake, must have received the raw material supply in black market. In 2000, NutriScience Innovations, a US-based supplier of nutritional and functional food ingredients, run by a group of Indians, acquired a trademark on Jeevani. AVP

saw no reason to incur additional cost for a product that cannot be produced. They did not contest this infringement nor did they attempt to register Jeevani as a trademark in the USA. The process patent on Jeevani expired in 2002. India moved to product patent system in 2005. But no effort was made by TBGRI to get a product patent on Jeevani.

The traditional and customary practice of collection and use of arogyapacha by Kanis hitherto ignored by forest officials, became severely restricted and more significantly, 'criminalized' and punishable under law. In 2001, most part of ancestral domain of the Kanikars was declared as the Agasthyamala Biosphere Reserve. Access to these areas is now severely restricted. Many thousands of Kanis have been evicted, and the remaining faces the threat of eviction. In addition, large tracts of the Kani tribe's habitat are classified as forests in both the States (Bijoy 2007). The sad plight of the Kanis and their knowledge vindicate the merit of the Supreme Court Award for the tribes of Niyamgiri hills.

The Indian experience may be assessed better by comparing it with another such early attempt, that of the hoodia plant. Hoodia plants, indigenous to southern countries of Africa, have long been used by the indigenous San people to stave off hunger and thirst. After it was published by botanists, the Council for Scientific and Industrial Research of South Africa (CSIR-SA) included hoodia in a 1963 project on edible wild plants of the region. In 1995, after a lengthy period of development, the CSIR-SA patented the use of the active constituents of the plant responsible for suppressing appetite (known as P57). Like that of Jeevani, no prior informed consent was taken from the San people. CSIR-SA then granted a license to the UK-based company Phytopharm for further development and commercialization of the patent. Phytopharm then licensed it to Pfizer for developing a weight-loss drug. But unlike TBGRI sharing their benefits with the custodian tribe, in hoodia commercialization, no benefits were earmarked for the San people. After it was challenged by the tribe, the first benefit-sharing agreements was made in 2002 (Laird and Wynberg 2008; Wynberg et al. 2009), five years after TBGRI entered into such an arrangement.

Similar to Jeevani, the marketing opportunities generated led to a frenzied interest in hoodia among plant traders. By 2006 trade, mostly illegal, had escalated many times. The CSIR-SA patent was focused on the hoodia extract, and nothing prevented other companies from simply selling the raw material for incorporation into herbal supplements. In North America, dozens of hoodia products were sold as diet bars, pills, drinks, and juice, traded by a myriad of companies. Most products were of dubious authenticity contained unsubstantiated quantities of hoodia, made unfounded claims, and in many cases implied association with the San, who received no benefits. In South Africa and Namibia, illegal trade and harvesting of hoodia resulted in a number of prosecutions and arrests; the high prices commanded for the dry product of up to USD200 per kg had led to the incorporation of the plant into a global underground network of diamonds and drugs (Laird and Wynberg 2008).

The Jeevani project was much better designed. If only the Forest Department had moved fast, making arogyapacha a MFP in time, the whole project would have been a brilliant success. Some other issues, like legalizing the claim of the Kanis, their proper representations could be taken care of by suitable amendments. Recent reports

suggest that new and promising efforts have started for Jeevani. An agreement has been made, involving Kerala Forest Department as a stakeholder, in addition to the counterparts of the three old parties—the Kani tribals, a State public sector pharmaceuticals manufacturer named Oushadhi, and Jawaharlal Nehru Tropical Botanic Garden and Research Institute (former TBGRI). As per the agreement, the Kanis will cultivate the endangered plant near their hamlets, and sell it to Oushadhi for Rs. 500 per kg. Royalty from the annual turnover on sales of Jeevani will be shared between the JNTBGRI and the Kani Trust.

4.2 A Holistic Approach—FRLHT

The 1985 paper of Farnsworth and Soejarto warned that by 2000 AD several billion dollars per year worth of medicinal plants would be extinct. This had created worldwide a sense of urgency to preserve the valuable heritage. In India too, several experimental efforts to preserve the plant resources used in traditional medicines began at different levels. One such effort was by Darshan Shankar, a statistics graduate, later seen as a civil society activist with twelve years experience of social work in a tribal block in Maharashtra. During this work, he noted that traditional medicinal systems were still functional and were used regularly by a vast number of tribal people for primary health care. Nor were they worthless. One of his colleagues suffering from severe jaundice was promptly cured by a local medicine man. Darshan began to inquire whether there ever was any effort to validate these remedies. Scientists in reputed institutions whom he approached informed him that in a few cases the chemistry of a plant or the biological activity of a compound was studied. But there was no clinical data on the application of these materials. The massive investment required for validation of this kind of knowledge was not forthcoming (Darshan Shankar 2001). Around this time, he was invited to join Lok Swasthya Parampara Samvardhan Samiti (LSPSS) as its Honorary Executive Chairman. LSPSS, established in 1984, was a network of individuals and organizations involved in strengthening traditional systems of medicine, particularly the non-institutionalized or folk traditions (*lok parampara*). The network was organizing training programs for folk healers, holding conventions of Vaidyas at the community level, and producing publications. LSPSS brought out several important monographs on Ayurvedic principles of food and nutrition and local health traditions. Soon the network structure appeared to be inadequate for pursuing the work of revitalization of Indian medical traditions. In 1991, LSPSS transformed itself into Foundation for Revitalisation of Local Health Traditions (FRLHT), a registered public trust located in Bangalore (Unnikrishnan and Hariramamurthi 2012). Sam Pitroda, then heading the Technology Missions, became the Chairman and Darshan Shankar the Director of FRLHT. FRLHT identified that three different types of tasks need to be done for a revitalization mission. These are:

1. Conservation of natural resources used by Indian systems of medicine.

2. Revitalization of social processes for transmission of India's medical heritage.
3. High quality medical practices and research in Indian systems of medicine.

In 1993, the same year when USAID and US National Science Foundation initiated ICBG, in India FRLHT led the State Forest Departments of Karnataka, Kerala, and Tamil Nadu to start a major medicinal plant conservation project. With support received from DANIDA 34 Medicinal Plants Conservation Areas (MPCAs) were established by the Forest Departments under the guidance of FRLHT. These are in situ conservation of wild medicinal plant genetic resources. Using this as the core conservation area, FRLHT designed an ingenious production and distribution scheme. The LSPSS network provided the support for these widely scattered locations. FRLHT did not make the mistake TBGRI did. From the beginning, FRLHT's project was designed to abide by the utilization provisions existing under forest laws and regulations.

Over the years, several more MPCAs have been added above the original 34. Currently, there are 110 MPCAs in 13 States. The sites have an average area of 200 ha with wide ecological and altitudinal variations. Most of the medicinal plant diversity of the region, including red-listed species, may be found in these MPCAs. The MPCAs are also used as sources of germplasm for developing cultivation system by local communities and for breeding new crop varieties. Planting material supplied by MPCAs has led to the establishment of nearly 20 district-level ethnobotanical gardens and more than 150,000 home medicinal plant gardens (Hamilton and Hamilton 2006: 211).

The totality of the conservation plan was designed to include a network (MPCN) consisting of three kinds of organization: MPCA, MPDA, and MPCP. For developing the degraded forest land, Indian forest department has introduced Joint Forest Management (JFM) system of sharing benefits with the people. FRLHT dovetailed to this facility by planting the locally available indigenous species of medicinal plants and trees at JFM sites near the MPCAs. These are called Medicinal Plant Development Areas (MPDAs). The MPCAs are no-harvest zones and are fully protected by the Forest Departments. But villagers can collect whatever medicinal plants they need for their use from the MPDAs. Besides, MPDAs also provide monetary return to the participants from the sale of surplus medicinal plants marketed. Eighteen MPDAs have been established. They receive planting materials from Medicinal Plant Conservation Parks (MPCPs). These are in situ conservation sites for protection, propagation, and utilization of medicinal plants located on sites owned by NGOs and are outside the control of the Forest Departments. Some of these parks also include herbariums and seed and raw drug centers. They engage in training, local enterprise development, education, and community outreach programs (Hariramamurthi u.d.). To conduct these activities, a Medicinal Plant Conservation Network (MPCN) was formed between research institutes involved, the NGOs and the Forest Departments who established MPCPs, MPCAs, and MPDAs.

From the MPDAs and home gardens, many participating villagers were having marketable medicinal herbs. In 2000, an IRMA graduate organized the members into a marketing cooperative named Gram Mooligai (Tamil for 'Village Herbs')

Company Limited (GMCL). The company started functioning in 2000 to supply medicinal herbs to the pharmaceutical enterprises like Himalaya Drug Company, Natural Remedies. They also commercialized Ayurvedic medicines produced by local communities in the neighborhood under the brand of ‘Village Herbs.’ FRLHT readily extended facilitation services for quality control at every stage. Indian Ayurvedic market is characterized by a large number of small companies and other unlicensed manufacturing units, where quality is not assured. Often, quality standards do not exist for ISM products. FRLHT prepared a ‘Good Collection Practices’ methodology and training manuals in Tamil and English, helped companies like GMCL to follow Good Manufacturing Practices (GMP), and developed quality control parameters for the final product. Currently, there is no agency in India certifying that a product is ‘labeled correctly’. Equipped with a laboratory, FRLHT is able to conduct methodical identification of plants and assure consumers whether the right plant is used (Torri and Herrmann 2011: 169).

After ensuring conservation, production, and supply FRLHT could turn to its second objective, revitalization of social process for transmission. It is generally argued that in India, people turn to ISM, including local health tradition, because the PHC system is inadequate, costly, and frequently run short of drugs. But recently, scholars like Sujatha and Abraham (2012: 28–29), Sujatha (2014: 241–244) have come out with strong evidence-based arguments that the preference for traditional medicines and folk remedies is not just because of cost and non-availability of modern medicine. Though modern science is all praise for validation by controlled trials within laboratories, people apparently have their own empirical ways of efficacy assessment. They judge from lived experiences, whether in some known cases the alternative had met some of their expectations. An example may be the story we told at the beginning, of Darshan’s increased curiosity after he saw his friend actually recovering from jaundice. This raises a basic question about medical pluralism in India. For 90% of common ailments, there are local solutions based on local health traditions that use locally available medicinal plants (Hariramamurthi u.d). But those knowledge are being eroded and the materials and methods for treatment are fast disappearing. Therefore, FRLHT took up a two-pronged program. After considerable research, FRLHT enlisted sets of ecosystem specific plants that can be used to treat quite effectively a range of common ailments. It has also published a manual for the users, ‘User’s Guide to Medicinal Plants for Primary Health Care,’ as part of its herbal-garden campaign. The package, however, differs from ecoregion to ecoregion. Herbs growing in one area may not necessarily flourish in another. But local plants can be examined, researched, and used as substitutes. Ayurveda and folk health traditions together have an intimate knowledge of approximately 6500 medicinal plant species that can provide every locality locally available low-cost solutions for innovative ‘green health’ programs promoting both self-reliance and health security of rural households.

Knowledge is of no use unless the materials are available. In 1998, FRLHT started its Green Health Campaign, with a slogan, ‘Medicinal Plants in Every Backyard—Primary Health Care in Every Home’. The Campaign has motivated many households involved in the program to have their own small home garden where

plants such as tulsi, aloe vera, lemongrass, and various herbs are grown, mostly for household consumption (Krishnakumar and Katakam 2002). FRLHT launched a training program on the use of medicinal plants by self-help methods. The household herbal gardens, community herbal gardens, farm herbal gardens, and sacred herbal gardens were promoted as individual and collective initiatives by the local communities. Between 1998 and 2009, the Green Health Campaign for reviving community-based health traditions facilitated establishment of 200,000 home herbal gardens and dozens of community herbal gardens. It has also supported the creation of a network of over 250 Taluka-based folk healer association across seven States of India. FRLHT suggests that the idea of herbal gardens maintained by villagers, for producing herbs for sale to PHCs, should be supported, especially where allopathy-based pharmaceuticals are simply unavailable. Later, pressures should be increased for re-orienting the public health system as a whole to rely more on tried and tested indigenous medical knowledge systems and decrease the health system's dependence on allopathy (UNDP u.d).

Outstanding physicians of folk, Ayurvedic and other indigenous systems are not sufficiently respected and honored in their society. To encourage continuation of their rich tradition, it is necessary to recognize their contributions. FRLHT started an award for folk healers in recognition of their services. In 2003, the National Medicinal Plant Board of Govt. of India instituted the Vanaushadhi Pandit Award. Besides, they have arranged healer exchange visits within country.

In addition, efforts began for modernization of dissemination process. From the beginning, FRLHT started acquiring materials for a National Herbarium and Raw Drug Repository—a repository of plant specimens or vegetative parts of plants that are processed, dried, mounted, labeled, and housed as per a definite botanical classification scheme. Currently, it holds about 45,000 accessions pertaining to more than 3,200 medicinal plants and more than 1,000 raw drugs collected from botanical sources and from various markets. The repository is supported with an image library that currently possesses over 20,000 images. It is the only medicinal plants herbarium in the country. Following Sam Pitroda's advise FRLHT started computerization of botanical and associated TK in order to generate reliable multi-disciplinary information on identity, distribution, threat, and conservation status, trade data and agro-technology and Ayurvedic pharmacology of medicinal plants in India. By now, the database has 150,000 vernacular plant names in 32 languages and over 20,000 plant images of medicinal botanicals. It is being constantly expanded and updated. This database is planned in such a way as to cater to the information needs of sectors like forestry, conservation science, agriculture, drug development, and trade. The databases also serve toward the protection of community Intellectual Property Rights. Along with NBA and other community organizations FRLHT has also pioneered the preparation of Community Health Traditions Registers in different States. In 2005, they started cataloguing of Ayurvedic medical manuscripts and research. Soon it developed into a Centre for ISM Informatics and Theoretical Foundation supported by the National Manuscript Mission and the AYUSH Ministry. This and other research activities of FRLHT could be brought under the university system when, in 2013, a Karnataka Legislature Act helped to establish the Institute of

Transdisciplinary Health Sciences and Technology, Transdisciplinary University (TDU). The university is the research wing of FRLHT, fulfilling its third objective.

Toward meeting its third objective, FRLHT established a R&D unit on Ayurveda biology that was later brought under the TDU university. The unit, equipped with modern facilities for applied biological research, conducts research, testing, consultancy, and training. It has active collaboration with renowned institutes like Indian Institute of Science, Bangalore, National Center for Biological Research, Bangalore, and several others. The Centre also takes up important public health problems. For example, Ayurveda recommends many simple methods for enhancing the quality of drinking water, e.g., storing drinking water in copper vessels overnight. How scientific is this method? FRLHT confirmed it in the laboratories and by field trials carried out in India and Kenya. This Centre of FRLHT is accredited as a certifying body by the Department of AYUSH of Govt. of India. It is also a certified ISO 9001: 2000 unit.

Research linking Ayurveda and modern system date back to works of R. N. Chopra, S. Siddiqui and the likes. Their approach was to validate Ayurvedic knowledge by modern scientific methods. To promote evidence-based research in Ayurveda, the University of Pune established in 1989 an Interdisciplinary School of Ayurvedic Medicine under the Faculty of Science. Over the years, scholars began to realize that in modern validation method Ayurvedic knowledge was not being given a fair treatment. Village folk follow a method of validation while judging efficacies of medicines from their own experiences. When it is established empirically that a folk medicine worked at least in some cases, it should not be rejected just because it is not validated under an alien system. In fact, the same method of validation is used in modern establishments like hospitals for judging continuing efficacy of marketed modern drugs. The difference between Ayurvedic and modern methods of empirical validation is not merely in use of sophisticated statistical methods but more profound. Both folk medicinal knowledge and Ayurvedic knowledge systems consist of plants and materials applied in different ways. Modern pharmacology, in contrast, is built in terms of extracts and chemical compound. The people around FRLHT also suggest that the difference is epistemological. For example, anemia may be seen both as problem of iron deficiency and also as one of poor metabolism of iron from consumed food. Modern medicine treats the first and prescribes iron tablets. Ayurveda solution is on improving metabolism rather than iron supplement, except in acute conditions. TDU is trying to develop intercultural quality standards for traditional medicine by mutual understanding between scientists and traditional experts in cooperation between the two streams (Darshan Shankar et al. 2007). FRLHT suggests (Darshan Shankar and Unnikrishna 2004) that an appropriate method for validation is exploring the correspondence between Ayurvedic parameters with biological parameters. They expect that such exercise would reveal surprising features of biological parameters.

The Ayurvedic physician diagnoses, treats and dispenses medicine to improve the function of the body. But in their method a single size does not fit all, Ayurveda classifies the whole human population in terms of three major constitutions (*prakriti*). Their recommendations are therefore more personalized. Recently, scientists have

noted that this principle of Ayurvedic differentiation of individuals in distinct phenotypes has strong genetic connotations. Preliminary studies demonstrated a probable genomic basis for metabolic differences attributable to prakriti, possibly providing a new approach to pharmacogenomics. These results needed to be validated using genome-wide association studies on larger and diverse sample size. A collaborative project between the Indian Institute of Science, Bangalore; the Centre for Cellular and Molecular Biology, Hyderabad, the Institute of Ayurveda and Integrative Medicine of FRLHT, Manipal University, and ISHS at the University of Pune on ‘Genomic variation analysis and gene expression profiling of human dosha prakriti based on principles of Ayurveda’ started in 2006 (Patwardhan 2012). This line of research has created considerable interest outside. The question of a genetic basis for traditional medicine is of interest, not only to Indian but also to Chinese, Korean, and other scientists, where approaches similar to prakriti are part of the therapeutics. CSIR has recently established a new line of research named Ayurgenomics, which is an integrative approach of Ayurveda and genomics for the discovery of predictive markers for preventive and personalized medicine (Patwardhan 2012).

4.3 Basmati—In the New Millennium

Basmati means ‘the one containing aroma’. It is a variety of rice grown in a unique agro-climatic condition. Though it appears to be a nature’s gift, it is not exactly so. Nature might have blessed the region with some wild variety of rice. Today’s naturally perfumed varieties have been developed by local farmers over centuries of observation, experimentation, and selection. The whole process is comparable to modern-day genetic engineering. Today, there are 27 documented varieties of basmati grown in India (Shiva 2005: 147). Farmers’ innovations were not limited to seed selection but extended to methods of production in the sowing, harvesting, and processing of basmati rice. Together they describe the knowledge that is now known as basmati rice. Today’s basmati rice has unique and delicately balanced combination of a number of characteristics such as long slender kernels with high length to breadth ratio, an exquisite aroma, sweet taste, soft texture, delicate curvature, intermediate amylase content, high integrity of grain on cooking, and linear kernel elongation with least breadth wise swelling on cooking (APEDA 2015: 7). These characteristics get enhanced when basmati rice is aged and pre-soaked before cooking.

This knowledge, accumulated over generations of work by the basmati growers, were at stake when RiceTec, a Texas-based company, tried to appropriate it through a patent. The company was trying to enter the international basmati market by introducing brands named ‘Kasmati’ and ‘Texmati’. They claimed to have made technological advancement producing a new strain of aromatic rice by interbreeding basmati with another variety. As is required in US patent laws, in a journal issue in May 1997, RiceTec announced its ‘work’ and its intention to license a patented variety of basmati. In September 1997, USA Patent and Trademark Office (USPTO) granted patent number 5663484 to RiceTec on basmati rice lines and grains. Here I

quote the abstract of the claims made by RiceTec in its patent to let readers note how they claimed well-known traditional knowledge of India as their novel invention:

Basmati rice lines and grains

US 5663484 A

ABSTRACT

The invention relates to novel rice lines and to plants and grains of these lines and to a method for breeding these lines. The invention also relates to a novel means for determining the cooking and starch properties of rice grains and its use in identifying desirable rice lines. Specifically, one aspect of the invention relates to novel rice lines whose plants are semi-dwarf in stature, substantially photoperiod insensitive and high yielding, and produce rice grains having characteristics similar or superior to those of good quality basmati rice. Another aspect of the invention relates to novel rice grains produced from novel rice lines. The invention provides a method for breeding these novel lines. A third aspect of the invention relates to the finding that the “starch index” (SI) of a rice grain can predict the grain’s cooking and starch properties, to a method based thereon for identifying grains that can be cooked to the firmness of traditional basmati rice preparations, and to the use of this method in selecting desirable segregants in rice breeding programs.

(www.google.com/patents/US5663484)

Two NGOs, the Centre for Food Safety (CFS), and the Research Foundation for Science, Technology and Ecology (RFSTE), learnt of this mischief through the publication. Since the patent included genes from farmers’ varieties, it allowed RiceTec to collect royalties from farmers growing varieties developed by the Indian farmers and their forefathers (Shiva 2005: 148). CFS and RFSTE filed legal petitions in the USA and started a campaign. CSIR of the Govt. of India too decided to object to the patent. The Indian government, after putting together the evidence, officially challenged the patent in June 2000 on the evidence that the above-mentioned plant varieties and grains already exist and thus cannot be patented. In the same year, RiceTec withdrew four key claims from its original patent application. In January 29, 2002, the USPTO issued a Re-examination Certificate changing the title of the RiceTec.’s claimed invention from ‘basmati rice lines and grains’ to Rice Lines of some other names.

Indian government realized that the respite might be temporary. There were reasons to believe the verdict was favorable because of mass support by Indian people following an intensive campaign. Another such claim may be made in future requiring India to master arguments, and spend considerable sum trying to defend its right. There is no guarantee of success. Thoughts began on appropriate defensive measure for protecting the nation’s intellectual property. The question was what kind of IPR protection. British law protected the use of the term basmati to refer to rice coming from India and Pakistan. RiceTec was careful and avoided calling its rice ‘basmati’. In addition to the patent, the company registered under trademark law two names: Texmati and Kasmati and sold their rice in Europe under these names with a description ‘Indian style Basmati rice’ (Marie-Vivien 2008). India could challenge the trademark, as it did in Malaysian court in 2008 against a trademark registered by a Malaysian company on Ponni rice, an aromatic variety grown in Tamil Nadu. But RiceTec. was not misusing the basmati name, like the Malaysian company. It

was using some close sounding names, and in that case, India would have to prove that Indian interest in basmati market was being harmed by inappropriate labeling by RiceTec. Instead India opted to question the novelty of the patent granted. Through the basmati case India realized the importance of IPR in the form of Geographical Indication (GI). Till then, this form was not known so well in India.

In Middle Ages, wine was France's premier export crop, just as basmati for India today. By 1900, wine production spread to North and South America, South Africa and elsewhere. France was having a tough competition. The wine producers of France began to think how to stop the competition. The first move was made by those from the Champagne region of France. Their quality wine was known as Champagne. Several other countries were using this name to sell their similar looking products. The French producers began to demand that the use of the name 'Champagne' be an exclusive right of theirs. In 1908, Champagne was the first region to be awarded an appellation for controlled delimitation by the French government (Trubek 2014: 307–308). Though the initial purpose was to ward off foreign competitors, it was soon followed by a spate of national legislations to keep away domestic competition. The example was soon followed by other European States to preserve their monopoly over trade of their coveted products. From there, the protectionist instrument entered European Union when EU was formed, and then to WTO. Thus, Champagne is the traditional knowledge of an old province of northeast France, now protected by the WTO as a GI. Similar is the story of Scotch Whisky. The basmati case made India aware of the utility of GI tag. Till then, there was no GI provision in Indian IPR system. Even today, there are countries without GI form of IPR.

In WTO, Geographical Indications were defined (Article 22) as 'which identify a good as originating in the territory of a Member, or a region or locality in that territory, where a given quality, reputation or other characteristic of the good is essentially attributable to its geographical origin.' WTO requires its member countries to provide the legal means to prevent a GI being 'falsely represents (-ed) to the public that the goods originate in another territory'. WTO Agreement provides for three different modalities of protection for products of this nature: (a) *sui generis* systems, which is followed by European Union as GI, (b) collective and certification marks used, like trademarks, and (c) modalities focusing on business practices. To comply with WTO regulation mandating GI protection (for Champagne and Scotch to start with), USA amended its trademark law forbidding GI products too as trademarks. Indian government quickly realized that if basmati earns a GI tag it can be protected even in US market. In the year 1999, apparently in compliance with its obligation under TRIPS Agreement, India, enacted the Geographical Indications of Goods (Registration and Protection) Act. In reality, it was the basmati case that prompted India to enact and put GI legislation to use. Unless a geographical indication is protected in the country of its origin, there is no obligation for other countries to award protection for the same product. Within a short time, the Geographical Indications of Goods (Registration and Protection) Rules, 2002 were framed. The GI Act of India came into effect in 2003.

Two other measures, necessary to bring basmati rice under the purview of the Act were undertaken in quick succession. In 1986, by an act of Parliament the Govt. of

India established the Agricultural and Processed Food Products Export Development Authority (APEDA). Immediately after GI came into effect, in January 2003, APEDA was assigned the task of quality control of basmati rice and the role of the legitimate applicant for registration of GI on basmati. Since WTO requires defining a GI by 'a given quality, reputation or other characteristic' the quality control issue was fundamental. The Export of Basmati Rice (Quality Control and Inspection) Rules, 2003 defined 'Basmati Rice (*Oryza sativa*)' as:

Basmati raw milled rice; parboiled rice; husked and unpolished (Brown) basmati rice; and parboiled brown basmati rice grown in the Indo Gangetic plains and having the following characteristics; namely:-

- a) It has an exceptional length of grain, which increases substantially on cooking;
- b) The cooked grain has high integrity and high discreteness and distinctive aroma, taste and mouth feel;
- c) It is a traditional variety or is an evolved variety.

Where, traditional variety shall mean land races or varieties of rice of uniform shape size and colour traditionally recognised as Basmati and evolved variety shall mean a variety whose one of two parent is a traditional variety and which has been recognised as a Basmati variety under any law for the time being in force.

Explanation 1: For the purpose of removal of doubts, it is declared that all varieties of Basmati Rice notified as Basmati Rice under the Seeds Act, 1966 (54 of 1966), namely Basmati 370, Basmati 386, Type 3, Taraori Basmati (HBC-19), Basmati 217, Ranbir Basmati (IET-11348), Pusa Basmati-I (IET-10364), Punjab Basmati-1 (Bauni Basmati), Haryana Basmati 1-(HKR228/IET-10367), Kasturi IET-8580 and Mahi Sugandha shall be construed as Basmati Rice for the purposes of these rules.

Explanation 2: For the purpose of removal of doubts, it is declared that traditional variety of Basmati Rice constitute only Basmati varieties Basmati 370, Basmati 386, Type-3, Taraori Basmati (HBC-19), Basmati 217 and Ranbir Basmati (IET-1 1348), which are selections from traditional land races and identified under the Seeds Act 1966 (54 of 1966).

The 2003 Rules also requires that an exporter intending to export a consignment of basmati rice shall register the contract with APEDA.

For the first few years, APEDA was engaged in effecting these Rules through notifications of varieties and establishing procedures for control based on varieties. Finally, on November 26, 2008, APEDA filed an application to register basmati as a GI. The GI Registry issued a formality check report after a year. A Consultative Group meeting was held. More information was asked from APEDA. APEDA filed its reply along with a revised application. Based on the reply, the GI application was accepted by the Registrar and it was notified in the *GI Journal* in May 2010. In its application, APEDA identified 77 districts of 7 States: Punjab, Haryana, Delhi, Himachal Pradesh, Uttarakhand, parts of western Uttar Pradesh, and Jammu and Kashmir as basmati growing States.

GI is one of the most stringent IPR provision. Award of this provision means that using 'basmati' name for the rice produced by using basmati seed but cultivated outside this region is illegal. No wonder that the adjacent regions feel cheated. After the application was published in the journal, it was opposed by the Basmati Rice Growers Association (BGA) Lahore, Pakistan and the Madhya Pradesh (MP)

government in India. We will discuss the BGA opposition later. MP submitted their claims supported by arguments. APEDA filed counter affidavits and the arguments on both sides were considered.

In 2013, the GI Registry asked the Centre whether Madhya Pradesh could be included in the definition of traditionally basmati-growing geography. The Union Commerce and Agriculture Ministry of which APEDA is a unit answered in the negative. MP government moved the Chennai-based Intellectual Property Appellate Board (IPAB). The case continued with arguments from both side. Finally, in February 2016, the judge declared that the inconclusive dispute has led to long delay in making decision on such an important matter. He ordered the Registry to issue GI certification to APEDA as claimed, and posted the MP case for hearing after a few months.

It is interesting to learn the types of evidence that are submitted and considered in GI- type IPR claim. MP had submitted results of DNA test from the Laboratory of Molecular Genetics in favor of their claim. The Centre argued that the presence of DNA does not imply that the hybrid retains the desired qualities. APEDA is in favor of awarding the tag to only the traditional basmati-growing areas claiming that is where the characteristics remain intact. MP was not a traditional basmati-growing area. In support of its claim APEDA filed the following documentary evidences:

1. Epic poem, *Heer-Ranjha* by Waris Shah (dated 1766). The poet had sung in praise of basmati rice at the wedding preparations of the heroine.
2. *Gazetteers of Kashmir, Punjab (Amritsar district)*, etc. published during the British rule (the earliest dating back to 1869).
3. Trade recognition of basmati-growing areas—packaging and trade literature of basmati rice sold in India and abroad. Food dictionaries, recipe books, encyclopedia, and other publications.
4. Affidavits of two renowned food critics.

There was no second opinion about the high quality of basmati rice produced in Pakistan. In 2003, after it was designated to represent Govt. of India on this matter, APEDA tried to get basmati jointly registered as a GI of both India and Pakistan. Several rounds of discussions were conducted. But even after five years, the two countries could not agree on a common position on issues like definition of basmati, areas for cultivation and means of dealing with misuse of 'Basmati' level by a third party or country. Thereafter Pakistan too initiated its protection program. In 2008, Basmati Rice Growers Association (BGA) applied to Pakistan Trademarks Office for registration of basmati as a collective mark in Pakistan. The claim was opposed by APEDA, the Rice Exporters Association of Pakistan, and four others. Pakistan Trademarks Office rejected all the six oppositions on various grounds and allowed registration against BGA's application. India was worried. Pakistan might use the trademark to prevent Indian produce being called Basmati. APEDA appealed before the Punjab and Sindh High Court against the order (GoI 2015). However, European Patent Office did not accept Pakistan's monopoly status. They continued to treat Basmati as a product of both Pakistan and India.

India was now free to proceed with GI registration independently. When in 2010 APEDA notified its GI application, BGA too filed an affidavit asking to reject the application. The Indian court admitted BGA's objection. APEDA filed a counter affidavit to BGA affidavit. In the usual procedure, BGA was given the counter affidavit and was asked to file its replies. But despite two extensions, BGA did not file any reply. Thereafter, while assigning GI registration to APEDA in a 2016 order, the judge declared that the BGA opposition shall be deemed to have been abandoned by the appellant.

The TRIPS Agreement of WTO provides for two types of protection—a general level of protection under Article 22, and a higher level of protection under Article 23. Protection under Article 23 requires WTO member countries to prevent misuse of GIs. Thus, USA had to pro-actively amend its trademark law to protect European Champagne and Scotch. The GI registration by India on basmati is entitled to protection under Article 22. Under this clause, Member countries are only obliged to enact legal means for protection of GIs against deceptive or misleading use and other acts of unfair competition. In the absence of higher level of protection of Article 23, the utility of a GI for protection and enforcement depends on the success of the GI holders to detect worldwide misappropriation and challenging those in foreign courts using large amount of resources. In the ongoing WTO negotiations, there is a sharp division between countries about what kind of protection is needed for new GIs. Countries like Australia, Canada, and the USA argue that the existing (Article 22) level of protection is adequate. Those advocating extension of Article 23 to more products include the EU, India, Sri Lanka, Switzerland, Thailand, Turkey.

Because of the limited protection under Article 22, India has to incur substantial financial resources annually for effective use of the GI on basmati rice. APEDA has appointed a worldwide watch agency to monitor the trademark registers across the globe for any third party attempted registration of the name of 'Basmati' or any deceptive variation. Indian government has taken legal actions in 40 countries against rival third parties for alleged attempt of infringement. Besides, the Basmati Export Development Foundation and a state-of-the-art laboratory at Modipuram, Uttar Pradesh, were formed to provide facilities for DNA profiling of basmati rice. The effects of these moves have paid well. In twenty years since 1996–97, basmati exports from India increased 9 times in weight and 12 times in value. In 2015–16, India exported basmati rice worth Rs. 22.7 thousand crores.

Although the term emphasizes territoriality, a GI is essentially a quality assurance. Sparkling wine produced in Champagne region or tea produced in Darjeeling is of very high quality. The GI for Champagne or Darjeeling Tea assures consumers a particular high quality product. In this way, GIs and trademarks are comparable; one guarantees high quality of a product by a company name and the other by geography where all the high quality producers are located. The Texas-based company was not barred from selling its rice line under a different name. If it was indeed 'superior to those of good quality basmati rice', as the company claimed in its patent application for Texmati name, the RiceTec product could easily replace basmati rice in global market. No such attempt was made, for the company knew that their product was no match for basmati.

Recognition as a GI does not forbid technological improvement provided the quality standards are not diluted. Improvement of basmati rice by pure line selection was initiated in 1926. In the Green Revolution era, efforts were made to cross-breed to produce high-yielding variety (HYV) basmati. As many as 25 such varieties were developed by late 1980s. But none of these matched the qualities of traditional basmati. Finally, in 1989, Pusa Basmati-1 was bred, which passed the quality check. It became the first high-yielding semi-dwarf basmati variety. Since then, many other high-yielding varieties with basmati quality were evolved using Pusa Basmati-1 as one of the parents. These were released for general cultivation. Some of these varieties had additional qualities like abilities to tolerate shorter day length, or variation in sunlight hours. That made it possible to extend basmati cultivation over a much larger area. Some say that basmati cultivation in States like M.P. became possible because of these hybrids (Damodaran 2016). A point of dispute is, whether they retain the desirable characteristics in these new habitats. Siddiq et al. (2012) identified some drawbacks of the hybrid variety, like low yield and susceptibility to diseases. They do not mention any quality difference in basmati cultivated in M.P. Some other scientists feel (cited in Damodaran 2016) that Pusa-1121 Basmati can well be grown in M.P. or Maharashtra. But the aroma, appearance, and milling quality of the grain produced from there cannot really match what one would get from the basmati grown in Amritsar, Karnal, Kathua, Kangra, or Dehradun. The court has the difficult task to judge which of these claims of scientists are right.

4.4 AYUSH-Based Cosmetics

Cosmetics include toiletry products, beauty products, and fragrances for personal use. Drugs & Cosmetics Act (1940) of India and most other parallel Acts elsewhere regulate both drugs and cosmetics by the same legislation, but differentiate between them for tax matters. As per the Indian Act, the word ‘cosmetic’ means any article intended to be rubbed, poured, sprinkled, or sprayed on, or introduced into, or otherwise applicated to, the human body, or any part thereof for cleansing, beautifying, promoting attractiveness, or altering the appearance, and includes any article intended for use as a component of cosmetic. Drug is something with medicinal value. Thus, soaps or shampoos are cosmetics. But a medicated soap or an anti-dandruff shampoo may be categorized as a drug. Except homeopathy, all four components of AYUSH are relevant for personal beauty. But their notions of beauty care actually go much beyond legal definition of cosmetics. Thus, Ayurveda discusses beauty care in terms of healthy diet, wake up time, levels of physical exertion, being happy and not worrying, etc., along with toiletries and fragrances. Yoga enhances natural beauty. But yoga is not a cosmetic. Industry experts say that the Ayurvedic personal care market has reached a size of Rs. 5,000 crore by 2016 (Pani 2015). This is only the domestic market. Cosmetic knowledge of India is also marketed outside, in various forms. And the market is fast growing. What should be our policy and perspective about our valuable traditional knowledge in this sphere?

Though cosmetics are in use in many countries for thousands of years, the modern cosmetic industry is a product of mass marketing in the early twentieth century. Rapid development of chemistry made many ingredients of cosmetics easily available. Varieties too, increased. Being cheap and ready for use, modern cosmetics made gradual inroad among common people. It is said that during the days of severe foreign exchange crisis immediately after independence, Prime Minister Nehru had personally requested JRD Tata to manufacture cosmetics in India and prevent Indian women spending foreign exchange on this item. In 1952, Tata started Lakmé cosmetics naming the brand after the Indian Goddess Lakshmi. But its products were inorganic based, as was the nature of the cosmetics industry at that time. It required a young Indian lady, Shahnaz Husain, to question this practice and initiate a change. She learnt modern cosmetology at leading institutes of the West. During this training, she noticed the rampant use of chemicals that may have harmful effects on skin and body. In contrast, many women in Indian families basked in glowing skin even at their old age. Her mother divulged to her that there was no great secret. She was only following some skin-care routines that passed in the family from generation to generation. The internationally trained cosmetician realized the significance and began her studies of India's rich heritage of natural beauty care. She read books on Ayurveda and visited Vaidas to learn ancient methods and formulation. In 1977, she set up her own herbal clinic at her residence in Delhi, formulating products for skin, hair, and body care, based on the Ayurvedic system. The world had just started realizing the harmful effect of chemicals on life forms. UNEP was established in 1972 following the publication of Rachel Carson's warning about pesticide. In 1980, Shahnaz Husain was given an opportunity to represent India at the Festival of India in London. Her herbal products, based on Ayurveda, created a sensation (Currimbhoy 2012). The rest is history. All along, she went on reminding that the product she sells in a jar is the contribution of a 5000-year old civilization. In 2006, she received Padma Shri for her contribution to Ayurveda. Earlier, she was warmly received by many Presidents and Prime Ministers, a rare honor for an owner of a cosmetic company. To the best of my knowledge, she was the first to bring to attention the adverse effects of chemical cosmetics. Since then it has become a trend. In 2014, global personal care industry size was \$465 billion, of which natural personal care was \$33 billion, or about 7% (Wynberg and Laird 2015). Husain established Ayurveda in a high pedestal among possible sources of herbal cosmetic knowledge.

Shahnaz Husain may not be the first to introduce Ayurvedic cosmetics. Ayurvedic laboratories in India began quite early. Zandu Bhattiji established Ras-shala in 1864 in Jamnagar, Gujarat; in Calcutta Daktar (doctor in folk saying), Burman established Dabur (Da-Bur) in 1884; Vaidyaratnam P. S. Varier established Arya Vaidya Sala at Kottakkal, Kerala, in 1902; four years later Hakeem Hafiz Abdul Majeed laid the foundation of Hamdard Dawakhana in Delhi; in 1917, Pandit Ram Dayal Joshi established Shree Baidyanath Ayurved Bhawan. Although they were manufacturing health products, some of the products, like hair oil, can be classified as cosmetics. Mysore Sandal Soap factory of Maharaja of Mysore and his Diwan, M. Visvesvaraya may be the oldest cosmetic factory. Established in 1916, the factory is a hundred years old. There were smaller concerns manufacturing cosmetics of common use

like kajal (surma, kanmai), kumkum (gulal), henna for mass production. Most of them happily replaced traditional natural ingredients by chemicals. After Shahnaz Husain's success some of them have entered herbal cosmetics sector in business. Thus, Dabur, Zandu, and Hamdard have recently entered the cosmetics sector. The leader in India, Himalaya Herbals was established in 1930s. But they entered the personal care segment only in 1999, under the brand name 'Ayurvedic Concepts'. Even the world leader in natural cosmetics, the Brazilian giant Natura, established in 1969, entered the herbal sector very late. By now there are several other Indian companies in Ayurvedic cosmetics sector, e.g., Lotus Herbals, Biotique, Blossom Kochhar, Forest Essentials, VLCC. Estée Lauder has a minority stake in Forest Essentials. Ayurveda name is used by several foreign companies too. After he learnt about the existence of Ayurveda in a visit to India in 1978, a gentleman founded Aveda in USA. The name has some vague connection to Vedas. Aveda is now owned by Estée Lauder. Another such entity is Sodashi, an Australian skin-care company founded in 1999. Sodashi is indeed, a Sanskrit word, and the company Web site rightly associates it with 'wholeness, purity, and radiance'.

The characteristic aroma of odorous plants is due to a variety of complex chemical compounds that evaporate when exposed to air at ordinary temperatures. Along with the fragrance generating substances, the plants possess balsam, wood, bark, stem, foliage, flower, and fruit. If distillation process is used to extract the active constituents of the odor in highly concentrated form the concentrate is termed *essential oil*. In some cases, distillation methods cannot be used because chemical compounds of fragrance are damaged by heat. In such cases, suitable solvents are used for extraction. The semi-solid extract is known as *concrete*. It contains several impurities which may be removed by dissolving in ethanol and evaporation. The extract obtained in this process is called *absolute*. Essential oils, concretes and absolutes are used as ingredients of perfumes, and also for products like soaps, agarbattis, disinfectants, deodorants, mosquito repellents, food flavoring agent, and pharmaceuticals. In India, we have two important regions producing commercially valuable traditional knowledge-based perfumes.

Attars are plainly used essential oils. Attar is a Persian/Arabic word meaning fragrance, scent, or essence. The history of attars is associated with the history of Kannauj. There is a legend in *Ain-I-Akbari* of Abul Fazl, about how the perfume industry of Kannauj was founded by Akbar (Pal 2016). But perfume trade of Kannauj (Koshambi region) probably goes back to at least the second century B.C. Banbhatt, the court poet of the Emperor Harshvardhan (606–647 A.D.), ruler of ancient Kanauj, mentioned use of *gandhika*. The details of these stories were submitted as evidence in the Application for the Registration of a Geographical Indication for Kannauj Attar. Even today, the centuries-old perfumeries of Kannauj produce Gulab, Keora, Hina, Champa, Bakul, Parijata, Chameli, Motia, Genda, Ratrani, Kadam, and Mitti attar (Pal 2016). In 1991, UNDP assisted India government to establish a Fragrance and Flavour Development Centre at Kannauj. Later, when Akhilesh Yadav was the Chief Minister UP State government entered into an agreement with the hometown at Grasse of world famous perfume brand Chanel No. 5 to help the local perfumers learn the art of branding. Perfumes of Kannauj have been awarded GI tag.

Fragrant flowers as source of perfume abound in Tamil epics like *Silappadikaram* and *Manimekhalai*. Even now South Indian women regularly wear fragrant flowers, particularly jasmine. Starting from 1970s Tamil Nadu Agricultural University has done valuable research leading to industrially viable process for extraction of concrete from a suitable jasmine variety produced here. More recently, JNTU Oil and Technological Research Institute, Anantapur, Andhra Pradesh, has begun to make important contributions. These successes led to commercial farming of flowers for modern perfumes. Beginning since 2007, the house of Christian Dior is using jasmine sambac and jasmine grandiflorum from Tamil Nadu as well as tuberose for certain brands of their best-selling perfume J'adore (Menon 2012). A family-owned company based in Chennai supply Christian Dior both concrete and absolute. The company owns small fields close to Coimbatore, where the flowers are grown organically (Menon 2012). In 2014, the company has signed a joint venture agreement with Firmenich, the world's largest privately owned fragrance and flavor company.

Who gets the compensation for our traditional knowledge? India does not raise this question for their knowledge in the cosmetics sector. But others do. Aveda was never scrutinized for utilizing Indian knowledge for corporate gain. But then, it approached Robby Romero, a famous Apache rock musician and indigenous rights activist, to negotiate with the indigenous people for sharing their knowledge. Considering that this might be a way to raise funds to support grassroot Native American organizations Romero agreed, and obtained for Aveda, consent of the Native American spiritual leaders. In 2006, Aveda launched a product line based on indigenous knowledge and products of North America. But when it came to benefit, sharing Aveda withheld compensations for its use of native plants. Romero went to court and won a lawsuit against Aveda in New York Supreme Court. Aveda discontinued the line under the name it was contracted to the indigenous knowledge owners. Then, by using the same knowledge and materials, they relaunched the product under a different name (Cultural Survival 2007; Goltermann 2012). Romero told the UN Permanent Forum on Indigenous Issues: 'Unfortunately, there are corporations ... that have been enriched from the use of indigenous peoples' natural resources, culture, philosophy, creativity, resources, intellectual property, traditional knowledge, images, names, and likeness. And often, those corporations manage to circumvent indigenous peoples' rights to free, prior, and informed consent and to benefit sharing.'

Not every company behaves in the same way. An excellent example of ethical sharing of traditional knowledge is the Namibian Marula tree case. The Marula tree (*Sclerocarya birrea*) is indigenous to southern countries of Africa. It belongs to family Anacardiaceae, of which some other members are mango and cashew. Its drought resistance property makes it ideally suited to Namibia, Botswana, Zambia, and Zimbabwe, where it is venerated because of its many uses. Marula harvesting involves gathering of ripe marula fruit from the ground followed by drying in the sun for a few months and then breaking the tough cell open to extract the kernels. From around 1980s, research on Marula revealed that oil derived from its fruit is an ideal ingredient for use in many cosmetic products. In 1999, a Namibian NGO, Eudafano Women's Cooperative (EWC) had the idea of producing marula oil of a higher quality and in larger volumes so that it could be sold as an export product for

the cosmetic industry. In 2000, EWC began to supply marula oil to Body Shop, one of the world's largest cosmetic companies, which uses it in products such as lipsticks, foundations, blush, and eye shadow. Today, over 140 of the Body Shop company's natural products and nearly all of its lipstick contain Namibian marula produced by the EWC (Ratcliffe 2016). The benefit-sharing agreements in the chain have been systematized over the years. At every point, the contracts were honored and the local women collecting marula fruits received regular benefits. In 2013, EWC comprised of 2,051 women from 24 associations, and produced 11 tonne of virgin oil, mostly for the Body Shop (Ratcliffe 2016).

As in the Jeevani case, EWC designed the logistics of benefit sharing with best intention. In this post-CBD era, several other ad hoc benefit-sharing arrangements appeared in different corners of the world. The governments had begun to realize the need to act as trade facilitator for these community-based natural product producers and traders. In 2001, six southern countries of Africa together formed PhytoTrade Africa, a trade association of the natural products industry in southern Africa. EWC is one of the many local producers' organizations represented by PhytoTrade. At the company level, France-based Aldivia, a specialized international R&D company developed a scientific method to filter semi-processed marula oil to pure form. Aldivia named it Maruline, and in 2006, filed a patent application with the international PCT system for the process used to create Maruline. The patent is co-owned by Aldivia and the primary African producers, making the proprietors of the traditional knowledge legitimate claimants of the benefits. PhytoTrade represents the primary African producers in the co-owned patent.

As a consequence of the CBD a clear division emerged between sustainable uses of global biodiversity resources and unsustainable uses. The term BioTrade began being used for sustainable collection, production, transformation, and commercialization of biodiversity. As demand of biodiversity-based products, earlier used locally by small communities, increased rapidly rogue traders entered in large number. Rare plants like arogyapacha and hoodia were threatened. A handful of enterprises in developing countries, who were working responsibly, impressed upon the UNDP to initiate a capacity building program for promoting BioTrade products in the market. In response, the Union for Ethical BioTrade (UEBT) was formed in 2007. One of its major tasks is to certify ethical use of ingredients that come from biodiversity. UEBT members are required to observe certain principles and criteria of ethical biotrade complying with existing global agreements. UEBT regularly improves those, like it is being done after the Nagoya Protocol entered into force in 2014. UEBT also carries out regular monitoring (M&E) of performance of its members, and in the past, has actually suspended members for non-compliance of its membership conditions. Aldivia became a *trading member*, and PhytoTrade an *affiliate member* of UEBT. Since then, UEBT regularly monitors whether these enterprises are continuing to observe each clause of CBD, including its later guidelines like the Nagoya protocol.

In cosmetics sector, patenting was not a common occurrence in the past. Use of trademark was and still is common. Shahnaz Husain company owns nearly fifty trademarks. Trade secret too is in use as a protection of process. While patenting accompanies a mandatory disclosure rule on expiration of patent life, trade secret

has no such clause and may be lost altogether after the death of a secretive owner. As cosmetic industry is moving more and more toward research-based products the incidences of patents are increasing. Wynberg and Laird (2015) inform that patents have become an increasingly important part in R&D strategies in cosmetic sector. Natural ingredients and extracts accounted for 49% of all patent activities in the personal care industry between 1990 and 2009, 34% attributed to plants. There is a common belief that India does not allow patenting of plant products. Hence, something like Maruline cannot be patented. There is no such flat diktat. An improvement that satisfies criteria like novelty is patentable. In 2012, the Indian Patent Office (IPO) announced a guideline for issuing patents based on traditional knowledge (GoI u.d.). The question is—is it desirable?

Patents result in loss in social welfare since they restrain others from using the protected knowledge. The point in their favor is that without some limited protection the innovators would not be able to recover the cost of innovation through license fees. But in reality, everyone is not in need to recover cost in that manner. Some scientists opt to leave their research findings open access after publishing those in reputed journals. In theory, the finding cannot be patented by someone else since it is already published. Unfortunately, the existing system provides little help for such a noble step. If someone else pilfers it by getting a patent in his name, the original author is required to engage in costly litigations to challenge the misappropriation. Texts of Indian systems of medicine are freely available. India retained Ayurvedic knowledge in public domain, making it available to anyone for free use. But like in the case of neem and turmeric, unscrupulous elements try to patent these knowledge as their findings. India is economizing the litigation cost by preparing and pushing TKDL. Essentially, the cost of TKDL preparation and maintenance is being incurred by India to retain the open access nature of the knowledge of Ayurveda and similar knowledge. In discussions in WIPO, several Western countries push for open access on TK in general, citing India and China's case. The representatives of indigenous peoples oppose this push for understandable reason. But the fact is, India follows both the systems, judging by the merits of the case. For Ayurveda and such traditional knowledge, where the owner is not identifiable, India has kept it in open access. The TKDL database is being pushed for protection against misappropriation. At the same time, India encourages community ownership of intellectual property for those folk and indigenous knowledge where the custodians are identifiable. For example, arogyapacha is acknowledged as the knowledge of the Kani tribe. For this group of knowledge, ethical benefit-sharing issues are pertinent and need careful implementation.

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Chapter 5

Traditional Knowledge in Manufacturing and Industry



Abstract Industry is the forte of modern knowledge. But here too, traditional knowledge-based products have a niche market, which is growing. Their market share is not very small either. This is not understood because the unit sizes are small and diverse. The first case we discuss is from the pharmaceuticals sector, of modern drug development using Ayurvedic medicinal knowledge. We introduce the initiatives that are on the road to success. Here, there is almost unlimited economic potential that awaits to be utilized. This is followed by three case studies from micro, small, and medium industries sector. These are a village agro industry of West Bengal, a distinctive design of gems and jewelery from Kerala, and from handicrafts sector a world famous toy making style of Karnataka. The case studies in this chapter deal with technology development, legal and administrative support, marketing, and role of leadership.

Industry is the forte of modern knowledge. But here too, traditional knowledge-based products have a niche market, and it is growing. The market size is not very small either. This is not understood because the unit sizes are small and diverse. People generally think of industries as massive factories producing for mass marketing. Such a possibility exists for pharmaceuticals producing drugs based on traditional knowledge. The industry sector also includes medium and small-scale industries, whose contributions account for a very large part of India's GDP, employment, and export earnings. Their produce ranges from making spare parts for space projects and defense to small toy production. This is where many applications of traditional knowledge are found. The gems and jewelery sector contributes above Rs. 1 lakh crore in value addition, or about 1% of the country's GDP. The sector provides employment to 25 lakhs directly and is highly export oriented (FICCI 2013: 11). India's competitive advantage in this sector comes from its large pool of skilled artisans with vast traditional knowledge and expertise in jewelery making. The value of khadi products sold in 2016–17 crossed Rs. 2,000 crores, about the same size as Bombay Dyeing or Raymonds. Of late, the sector is growing fast owing to rising interest of domestic and international fashion designers preferring to work with sustainable and natural fabrics (Sarkar and Siddharta 2017). Sales of village industries products

such as honey, soaps, cosmetics, furniture and organic food items, reached a figure of just under Rs. 50,000 crore, accounting for about 2.2% of India's manufacturing sector. Many of these units are run by women. On the other hand, there is tremendous potential that remains neglected. Outside the village industries, there are numerous handicrafts, many of which are the major support of the immediate local economy. Global market size of herbal medicines is estimated to be around \$70 billion. India is a powerhouse of pharmaceuticals among the countries exporting herbal medicine. But recently, replying to a question in the Lok Sabha, Minister of State for AYUSH said that India's share in global herbal medicinal market was a meager 0.5% (PTI 2016).

The selection of case studies for this chapter was a challenge. Finally, we decided to discuss two cases that are among the success stories and two cases where the potentials remain largely unutilized. These are one case each from the pharmaceuticals sector, village industries, gems and jewelery, and handicrafts sector. The first two are the cases where the potential remains unutilized. Germane to the pharmaceuticals sector is the process of new drug discovery based on Ayurvedic medicine.

5.1 Drug Discovery

Herbal painkillers are in use in all societies from time immemorial. One such herb in Europe is the bark of willow tree. In 1840s, its anti-inflammatory chemical component was identified. It was named salicin, from *Salix*, the Latin name of willow. By 1870, further studies revealed how salicin works in the body. It was converted to salicylic acid. Physicians began to recommend salicylic acid for pain relief. Though a mild one, swallowing the acid left an awful taste in mouth. The solution, the chemists thought, would be to convert the acid to a salt. But would it work? Another set of clinical trials confirmed that even the salt worked as a painkiller. But it still tasted bad, and in addition, led to vomiting when applied in large doses. It was clear that chemists have to find a different compound that would have the medicinal property intact but would not have the undesirable tastes and physical unease. By then, chemistry had made considerable progress toward understanding structures of chemicals. The chemists could explain that the actual painkiller was a part of the molecules (moiety) that was present in all three compounds: salicin, salicylic acid, and sodium salicylate. Such parts of molecules have a particular hand like feature (by then named valency) that combines with different other parts making it an acid, a salt, or a compound of some other group. Knowing this the promising line of inquiry was clear. They should develop another compound that would satisfy the free valency (or a similar bonding characteristic) of the moiety but would not have the undesirable properties.

The rapid growth of chemistry in this period had brought about chemical companies. The textile industry was growing rapidly in the wake of industrialization. Natural dyes that were being used for dyeing textiles were becoming scarce and expensive. The production of dyes from coal-tar derivatives was invented a few years earlier, opening up a new field of business for the still-young chemical industry. In Germany,

a company named Bayer was formed a year before Zandu Bhattiji established his Ras-shala. Bayer started manufacturing and marketing synthetic dyestuffs. In 1884, Bayer decided to try making inventions in chemistry. In 1897, a Bayer Chemist, Felix Hofmann succeeded in making a chemically modified version of salicylic acid that would have all the three desired features. It was named aspirin. Additionally, the product was found to have temperature reducing properties. Bayer manufactured the medicine and patented the process.

During World War I, the British could not get aspirin made by a German Company. So the British government offered a reward encouraging further research for a substitute. Subsequently, they came out with another tablet and named it Aspro (Lewis 2003). Successes like these led to an era of drug discovery. One after one insulin, penicillin, malaria drug chloroquine, kala-azar medicine urea stibamine (an organic antimony compound), etc., were found. Then in 1950, came in thalidomide, a drug marketed as a mild sleeping pill safe even for pregnant women. It was a catastrophic blunder. Thalidomide caused thousands of babies worldwide to be born with malformed limbs. The drug was withdrawn making way for stringent regulations and testing before drug approval. While cosmetics are, by definition, only for external application, drugs are administered internally. Hence is the greater precaution. A consequence of elaborate clinical trial is considerable increase in cost of a new drug discovery. Basing largely on the claims made by 10 pharmaceutical companies on 106 drugs that were first tested in human subjects anywhere in the world between 1995 and 2007 the Tufts Center for the Study of Drug Development (DiMasi et al. 2016) estimated in 2016 that average out-of-pocket costs for developing one approved compound was \$1.395 billion (Rs. 9,000 crores). This estimate includes expenses incurred for development efforts that did not reach fruition. Besides, drugs typically take 12 years from the initial discovery stage to reach the market. The expected return that investors forego during this period was estimated at \$1.163 billion (Rs. 7,500 crores). It has a couple of interesting implications. Firstly, the drug companies have to recover this kind of cost. Hence, each new drug will be very costly.¹ If failure rates increase, the cost of a successful new drug will increase. This makes traditional medicinal knowledge of efficacy of particular herbs against specific disease a highly promising starting point. Secondly, except for a pharmaceutical giant, it is not possible for others to enter into such high-cost ventures as drug discovery.

For about four centuries malaria was effectively treated and controlled by quinine and its derivatives, a drug that the world learnt from the indigenous people of Peru. Gradually, drug-resistant malaria began to appear. During the US–Vietnam war in the early 1960s, drug-resistant malaria became a severe problem for forces on both sides.

¹In a significant departure from other countries, Indian patent law requires patent holders to use their rights to benefit the public. India tries to strike a balance between the two motives through such instruments like judicious application of compulsory licensing of new drugs with prohibitive prices so as to make it affordable to the needy. India is discussing other methods to compensate the developers. For details, see Sundar (2014: 83–87). This is particularly important for discovery of drugs for disease related to poverty. Companies do not take up development of such drugs, for the poor cannot pay for costly drugs.

By 1965 five lakhs, a half of US military personnel in Vietnam, were affected. Known drugs were not effective. Fighting malaria became one of the top medical priorities for the US Army. A program was launched to search for new antimalarial drugs. By investing a vast amount of finance and involving numerous research institutes as many as 214,000, compounds were screened for a possible drug. But there was no breakthrough (Tu 2015).

Confidential antimalarial research was initiated within the Chinese military too after Ho Chi Minh, the Vietnamese leader, requested its communist ally to help. From 1964, several medical researchers in the Chinese army were given to research on novel antimalarial medicines as an important political assignment. In 1967, a national office for malaria control known as Project 523 was established for organizing and coordinating antimalarial drug research activities in seven provinces and cities across the country. Several thousand compounds were screened between 1967 and 1969. But no effective antimalarial drug was identified. Then, in 1969 a young researcher named Youyou Tu joined as the leader of Project 523. She had graduated from Beijing Medical College in modern pharmaceutical sciences and thereafter did a four-year long training course on theories and practices of traditional Chinese medicine.

Tu started her work by collecting information on the relevant traditional Chinese medicines from a review of traditional Chinese medical literatures and folk remedies. She also interviewed experienced Chinese medical practitioners for potential prescriptions and herbal recipes. Within three months, she gathered over two thousand herbal, animal, and mineral prescriptions for either internal or external uses. The team found that a herb named Qinghao (*Artemisia*) recurred in various recipes against fever. The team then tested over 100 different kinds of extracts of this herb on mice. Some of the malaria parasites died, but the effect varied. So Tu returned to the literature. In a 1700-year-old book, she found a hint suggesting to avoid heating during extraction in order to preserve the herb's activity. Subsequently, she redesigned the extraction process and repeated the experiments. The resulting extract was extremely potent and killed all the parasites. The active component was identified and was given the name Artemisinin.

Between August and October 1972, the team conducted their first clinical trial on humans—on thirty cases in two hospitals. The results were highly successful. Like in the case of Jeevani, the success of clinical trials created tremendous interest in the potential drug. Several other Chinese scientists joined hands. Further works moved in two directions. One was to ensure adequate supply of the bio-resource, just as it was in the Jeevani case. Scientists studied several varieties of the plant, different parts and origin of the plant, its harvest season, artemisinin contents in the plant, extraction, and purification processes. Ultimately, they found the right plant that produces more artemisinin and the way to obtain artemisinin in pure quality from that local plant (Guo 2016). Simultaneously, other teams took up studies of physicochemical properties, chemical structure, spectral behavior, and chemical reactions of artemisinin. They identified the functional groups (moiety) in the artemisinin molecule. In 1981, WHO, along with the World Bank and the UNDP organized the Fourth Joint Malaria Chemotherapy Science Working Group meeting in Beijing. Some of these findings about artemisinin were reported there. Immediately, it drew global attention. In 1983

Schmid and Hofheinz published a method for total synthesis of artemisinin. Other synthesis methods followed (Guo 2016). Artemisinin was approved and launched by China Food and Drugs Administration (CFDA) in 1985 but not by most other countries. Little was known about the clinical trials conducted in China. The enormity of the thalidomide disaster rightly made the drug approval authorities very careful.

Following the studies of physical properties, chemical structure and the mechanism of chemical action it became possible to change the active compound suitably so as to pave way for its industrial production. For example, artemisinin is insoluble in water, and poorly soluble in lipids making it difficult to administer. It is known that certain types of chemical compounds with specific molecular parts are water soluble. With some effort, the essential component (moiety) of artemisinin was combined with such a component, making the composite water soluble. In this way, meeting different shortcomings, two candidate drugs: Artemether and Artesunate were developed. In 1987, both Artemether and Artesunate were approved by CFDA as New Molecular Entities (NME) and launched in various formulations. A NME or a New Chemical Entity (NCE) is a drug or chemical that is not a version or derivative of an existing and previously investigated and approved substance. Being labeled as entirely 'new' dictates that certain types of clinical trials must be run and that particular attention must be paid to proving the drug's safety.

From this period on, China began to collaborate with global medicine companies. In 2005, the results of a large randomized trial in predominantly Asian adults of intravenous quinine versus intravenous artesunate were published in a reputed journal. This trial found a 34.7% lower mortality in patients who received artesunate rather than quinine. As a result, the 2006 WHO Guidelines were changed to include, for the first time, intravenous artesunate as the recommended first-line treatment for severe malaria. US Food and Drug Administration (FDA) approval was yet to come.

In 1990, Chinese officials came to an agreement with Novartis to work together to develop, test, and manufacture this artemisinin combination therapy, later called Coartem. Novartis assisted their Chinese partners to redesign local production facilities, upgrade their quality assurance systems, and construct new factories to ensure compliance with GMP standards. Novartis acquired the rights to market the therapy outside China, while Chinese companies continued to supply the raw material for the drug to Novartis. Besides, China continued to hold a domestic patent for the therapy. Today, Coartem is produced by Novartis in China and the USA and is the most widely used artemisinin combination worldwide. US FDA approval was given for use of artemether-lumefantrine in the United States in April 2009 (Maude et al. 2010). Six years later, in 2015, Youyou Tu was awarded Nobel Prize in Physiology and Medicine.

In general, a drug discovery process consists of (a) identification of a gap area in existing disease and drug situation, (b) search to discover a candidate (drug) followed by investigation of its characteristics and properties like preparation type, application method, etc., (c) laboratory tests about its effectiveness and adverse effects using chemical analysis and by administering on mice or other animals, (d) extensive clinical trials on human in several phases, using statistically valid designs. The clinical trials start with small groups and proceed in steps to larger scales. Permissions are

granted for the next stage after reviewing the results of each smaller stage. India has the capability to conduct clinical trials in all these stages, for which Indian pharmaceutical industry is recognized today as a global leader in the production of high quality generic drugs. But still, India cannot develop a new drug independently. The reason is financial. During the year 2013–14, the R&D budget of 25 leading Indian pharmaceutical companies increased by 20.6%, reaching a figure as high as Rs. 6,103 crore. But even this level of R&D budget is grossly inadequate for meeting the cost of developing a new drug independently. With higher R&D investments, Indian companies secured 81 generic drug approvals from US FDA during the first eight months, i.e., January–August 2014 (Pingle 2014). Instead, the success in generic drug production has earned Indian pharma companies a reputation for following GMP. This has opened up scope for collaboration. By now, Indian pharmaceutical and biotech companies have been able to pile up an impressive array of more than 120 new chemical entities (NCEs) currently progressing in various preclinical and clinical stages of developments. (Balganesh et al. 2014; Dikshit and Dikshit 2016).

With such capabilities, India should be able to utilize its rich traditional knowledge for developing modern drug. In October 2015, the CSIR launched BGR-34, a drug designed for Type 2 diabetes, claiming that this is the first successful Ayurvedic medicine. The marketing agent AIMIL Pharmaceuticals claim that BGR-34 was scientifically validated for its efficacy and safety and was ‘approved’ by the Ministry of AYUSH. More recently, claims have been made that it has become one of the top 20 anti-diabetic drugs and that its efficacy in keeping a check over diabetes has been found a spiraling 67% during clinical trials (Singh 2017). Very little evidence has surfaced till now supporting such claims. The Clinical Trial Registry of India did not have any record of diabetes clinical trials registered from CSIR, NBRI or CIMAP (Patwardhan 2016). Renowned scholars in this area feel that this is another of CSIR’s unfounded claims. Earlier, with a lot of fanfare CSIR had launched an antimalarial drug named Ayush 64, and two herbal products, one named Memory Plus and another named Asmon. Their scientific credentials still remain obscure. CSIR has good scientists but not many capable leaders for linking laboratories to fields. By making such amateurish claims, CSIR is discrediting a globally renowned pool of expertise.

Similarly, TKDL, an imaginative step that found global recognition as an excellent defensive strategy, faced an amateurish treatment in the domestic scene. CSIR did not notice, or did not know how to enter into an agreement with another domestic government agency, the Indian IPO. The result was that patent claims rejected by foreign IP offices after consulting TKDL database were being patented in Indian Patent Office. In 2007, Avesthagen had filed a patent application at Indian IPO for a diabetes drug made from three plants. The company also filed this particular composition for a patent in European Patent Office. In 2012, the European office declined to grant its request after consulting relevant TKDL information submitted by CSIR. But exactly at the same time Avesthagen was granted a patent by the Indian Patent Office. Only after such embarrassing episodes did CSIR initiate agreements with IPO.

Though started as a defensive instrument, the TKDL database can also have a positive role in new drug discovery. It can greatly simplify the search process and reduce the chances of failed attempts, thus considerably reducing cost. But TKDL was not accessible for research purpose even to CSIR scientists. Apparently, CSIR was not unwilling to share, but did not know how to. Nor could it be proactive to develop a framework for sharing knowledge. National IPR Policy, 2016 announced: ‘Public research institutions should be allowed access to TKDL for further R&D, while the possibility of using TKDL for further R&D by private sector may also be explored, provided necessary safeguards are in place to prevent misappropriation’ (pt. 2.20). Hopefully, efforts have begun to develop a framework for sharing. Even though WIPO discussion of TKDL are still inconclusive, other details like Nagoya Protocol have come out with specific terms of sharing. The country too has gained considerable experience. It is the lack of clarity and the resultant lack of initiative that has restrained drug development using India’s traditional knowledge. India’s scientists are doing imaginative scientific work like the starting of Ayurgenomics. To take it to industrial level, it requires facilitation by appropriate policy support.

5.2 A Sweetener of Bengal

This is the story of a jaggery cum sweetener that is passionately liked by most people who have ever been a resident of Bengal. Jaya Bachchan was born a Bengali but spent most of her life outside. When Oprah Winfrey visited Bachchans’ home to meet her granddaughter, she served the guest a rice delicacy made of this sweetener. Lakshmi Mittal, the Indian steel magnate based in London, had his education in Kolkata. As winter sets in, Mittal air freights from Kolkata to London Bengali sweets made of this sweetener (Basu 2011; Ray Goswami 2012). There are many varieties of sugars and sugar substitutes available in the world. But if this kind of craze is an indicator, there is no parallel in quality to this Bengal variety. This is called *khejur gur*, *nalén gur*, *patali*, etc. For the rest, we use the term ‘khejur gur’ or simply ‘gur’ as a generic name for all these varieties. Bengali literature is replete with references to this magical ingredient. Paintings and woodcuts often depict palm trees with clay pots suspended from their trunks. According to Charaka, an ancient medicinal authority, the old name of Bengal, *Gauda*, was derived from ‘gur’ (Banerji 2012).

This is an aromatic variety of molasses prepared from the sap of a particular type of date palm. Date palm is one of the most important crops in the development of human race. A FAO document (Barreveld 1993) describes its importance as:

Few plant species have developed into an agricultural crop so closely connected with human life as has the date palm. One could go as far as to say that, had the date palm not existed, the expansion of the human race into the hot and barren parts of the “old” world would have been much more restricted.

Date palm has been cultivated since ancient times. Dates were found in Harappan excavation, and in several other archaeological sites. The scientific name of the

variety yielding khejur gur is *Phoenix sylvestris* Roxb. This is one of the hundreds of varieties of date palm. In Latin, *sylvestris* means 'of the forest.' Therefore, this species is also called wild date plant. The local name is *khejur gachh*. *P. sylvestris* species is native to South Asia.

Though date palms are widely used in almost all countries of the drier tropics and over the years many different kinds of uses have been developed, extraction of sap for jaggery making is not a common process. In Africa, Middle East or in the countries of Southeast Asia date palms are tapped, if at all, for making liquor by fermentation. Tapped plants there do not survive after a couple of years. In many date producing countries in the past, tapping of date palm plant was banned either on religious grounds or to protect a national food source. Governments tried to regulate palm tapping by measures like imposition of tax, licensing, restrictions by age and health of the plant, limiting the tapping season, obligatory replacement etc. (Barreveld 1993). Voluntary self-restraint was not uncommon. Because of its importance in local economy throughout the ages, date palm was often a plant of reverence. Inflicting wound on a palm tree again and again for the sap to flow was a sentimental issue. Some people resented seeing a palm exploited in this way (Barreveld 1993). In South Asia however, there is no such restriction. Date palm plants are used primarily for sap extraction. This and other varieties of palms, like palmyra palm, coconut palm, and sago palm, are used in South Asia for sap collection for various purposes. Interestingly, specific regions specialize in jaggery making from specific variety of palm. Jaggery making from *P. sylvestris* species of palm is a specialty of Bengal region. Elsewhere in South Asia date palm saps are consumed as liquors. Only in West Bengal and Bangladesh, this is used for making an aromatic palm jaggery.

The fruits of date palm that grow in Bengal are of poor quality. The plant might have ended as a source of inferior food. Instead, using the sap the ancient Bengalis developed a food delicacy. The whole process of making khejur gur is an excellent piece of traditional knowledge perfected over centuries. The technique used for tapping of date palms in West Bengal and Bangladesh is a highly developed skill that does not affect the plants. They survive with their productive capacity intact. Where to cut is carefully chosen considering the plant health and healing possibility. To let the plants recover cutting is not done every day. Tapping normally begins when the tree is six or seven years old and continues every year for the next twenty to twenty-five years. Some trees remain productive for fifty years. The stem of the tapped plant, after a few years, takes a scruffy look with multiple permanent grooves. But the damage caused is just short of the stem losing its strength; tappers can climb the tree without the stem giving away. These traditional professionals are known as *Shiuli* or *Gachhi*.

Tapping begins in late October and lasts until late February, with the best quality sap being produced in coldest days of December and January. Quality of sap is graded by tappers from the time of collection. The sap starts fermenting with the rise of temperature. Hence, its utilization begins immediately. A part is consumed directly or is left to ferment for drinking as liquor. But the major part is converted to gur by heating. The need to start processing quickly necessitates ovens to be close to the tapping sites. Thus, khejur gur production is managed as a cottage industry

consisting of numerous small units run mostly by women. The process of gur making from the sap is a highly skilled job. Different varieties called nalen gur, jhola gur, patali gur, etc., are made using different types of processing. The quality, flavor, and color of the product depend on the cooking process. This is also confirmed by recent researches on sugar making from cane and palms (Rao et al. 2009). The high skill nature of the work was beautifully captured in a story named *Ras* by Nagendra Mitra, which was later filmed as *Saudagar*. The story was of a tapper and his wife, a skilled gur maker whose preparations were the most coveted gur in the market. The tapper divorced her to marry a younger woman. But when the winter season arrived, the new wife turned out to be an ordinary gur maker. Finally, at the end of the season, the tapper met his divorced wife begging her to make gur from his collection of sap for just one day, to let him sell it with pride at the market. The film was India's entry in 1973 to the category of Best Foreign Language Film at the Academy Awards.

Khejur plant grows everywhere in Bengal except the hill regions and wetlands. Southcentral West Bengal and the adjacent districts of Bangladesh are the major centers of commercial production. Only recently, after increase in commercial interest, some people are turning to orchard cultivation. In the past, planting of khejur gachh was unheard of. The plant grows naturally around homesteads, field ridges (*ails*), and in the marginal lands along roads, ponds, and canals (Chowdhury et al. 2008; Kamaluddin et al. 1998). Farmers lease out the date trees found on their holding to tappers or contractors. There are people who take lease of around 300 to 500 trees in a compact area. In the past, sections of Eastern Railways used to auction thousands of khejur plants. In a year, a tree produces 120–250 kg of sap from which 12–30 kg of gur is produced. By an estimate, the total value of khejur gur produced in West Bengal every year is around Rs. 100 crore (Riddhi Foundation and Business Brio 2015: 47). Bangladesh may be producing a similar amount. However, there is great scope for expansion. Commercial demand is rapidly increasing in recent years.

In the past, date palm was the major source of a flourishing sugar industry of Bengal. Jashore District (now in Bangladesh) alone had more than a hundred sugar mills, catering to domestic and export markets. Like many other goods, imported sugar arrived in India in late nineteenth century, leading to collapse of the date sugar industry of Bengal. Varieties of khejur gur continued to have limited use as edible sweets and as ingredients for homemade desserts and sweetmeat, called *petha* and *payas*. But soon, another stream of demand came up. As a part of commercialization there appeared the famous sweet shops of modern Bengal, competing with European confectionaries. They were inventing new forms of delicacies. Some of them lapped up khejur gur and introduced exotic gur sweets. One of these, Joynagarer Moa has already obtained a GI tag. More recently, ice creams and cakes have joined the bandwagon adding their gur using varieties. Sadly though, the industry is going through a very serious crisis at this juncture. Growing extensively on marginal land and needing no care, khejur plants are also easy prey. Brick kilns and similar units are chopping those off as cheap fuel. Also, the two highly developed traditional knowledge, that of the tree tappers and the gur makers, are being lost. Younger people do not like to enter into these poorly paid professions. Modern institutions do not show interest and initiative to learn from the depressed communities and women.

As demand increased and production decreased traders selling artificial flavors of khejur gur started doing brisk business. Those flavoring chemicals may pass food grade standard. But even under existing law deceiving customers by selling artificially flavored items as genuine patali gur or nalen gur sweets is illegal. If this practice is not checked quickly, customers will loose faith and the roaring demand will collapse.

Though the variety can be grown easily on the abundant wasteland of Bengal, existing programs for wasteland recovery do not distribute khejur seeds or saplings. Only recently, after increased interest, some forest officials of Bangladesh have started planting khejur on wasteland. A couple of prosperous cultivators have started orchard cultivation. Sap collection is a taxing work. I heard of one locality where tappers have connected the trees to a system of pipelines through which all of the sap flows to boiling vats. Traders are trying to find ways to preserve the gur for a longer period. The owner of a famous sweet shop of Kolkata claims (Ghosh 2014) that the gur can be preserved for about eight months at temperature -25°C . Several other experiments may be going on at individual levels. These are recent and by people themselves.

During the early plan period when significant efforts were made to develop cottage and small industries, production of palmyra palm jaggery was substantially modernized (Ravindra Babu 2012; Vengaiah et al. 2013). Later, research laboratories stepped in. Pune-based National Chemical Laboratory developed canning and preservation technique for palmyra palm sap (neera). Flavor chemistry of palmyra palm juice has been studied (Lasekan and Abbas 2010). Under Prevention of Food Adulteration rules, 1995 quality standards for palmyra palm jaggery were notified. But khejur gur was completely ignored. Only recently, after West Bengal government led by Mamata Banerjee took up on a mission mode promotion of micro-, small, and medium enterprises (MSME), there are signs of change. West Bengal Khadi and Village Industries Board approached the Indian Institute of Packaging, a Kolkata-based national research center of the Ministry of Commerce and Industry, for technology input. With their help, the Board introduced in 2016 nalen gur in test tube that has a much longer shelf life and easy to transport. The government also established a state-of-the-art common production center for gur makers, including women's cooperatives to get their produce tube-packed. The tubes are selling through different outlets including Biswa Bangla Haat, a new global marketing center. Since then, the Institute has developed packaging for many other cottage industries products, including one for Joynagarer Moa. The packaging technique, which increased the shelf life of Moa from 48 h to a month, opened up a vast export market. Though this is only one step forward, it shows what great role may traditional village industries play if only they receive some thoughtful assistance for realizing their potentials.

5.3 The Sacred Ring of Payyanur

When in Rome, do as the Romans do. Use urine donated by kind passer-by to clean your clothes and whiten your teeth. That is what the Romans did—Smithsonian Institute informs (Kumar 2013). Urine was so valuable that there was a regular

trade on it. National Geographic (Handwerk 2016) tells the story of a smart Roman Emperor Vespasian, who collected quite some amount by taxing urine trade. Today, public urinals in France are called *vespasiennes*, in Italy *vespasiani*. In 1828, German chemist Friedrich Wöhler succeeded in synthesizing for the first time, an organic substance from inorganic chemicals. It was urea, a constituent of urine. Today, Indian farmers eagerly wait for timely supply of urea. In the last few years, Indians have obtained several patents on the uses of cow's urine. There is nothing to dispute about the merit of the claim. Urine, of cows and humans alike, has many beneficial uses. But objections need to be raised against getting it patented in USA. The uses of cow's urine are well known in India and are mentioned in Hindu scriptures. Patenting Indian traditional knowledge in USA has repeatedly been challenged by India. TKDL database was prepared precisely to stop such practices. And now, CSIR is a collaborator in some of these patents in USA.

The Tirupati Temple Trust applied for GI registration of Tirupati Laddu in 2008 and received it next year. Some parties raised objections against the grant that allows such 'private appropriation of religious symbols.' Some others said that the GI tag hurts devotees since it reduces *Prasadam* to a commercial product. The Attukal Bhagavathy Temple in Thiruvananthapuram, one of the ancient temples of South India, is popularly described as the *Sabarimala of the Women*. The temple is renowned for the annual Attukal Pongala festival. The temple Trust obtained trademark registration for the picture of the deity and the title 'Sabarimala of Women.' The Missionaries of Charity obtained a trademark for the blue bordered saree that Mother Teresa used. A GI tag was granted to 'Hyderabadi Haleem,' often associated as a Ramadan food. The certificate does not bar anyone from preparing Haleem. But they cannot market it as 'Hyderabadi Haleem.' In India, objects of religious significance are now being brought under intellectual property provisions, in manners that need analytical understanding. We include one such case.

Payyanur is an ancient town in North Malabar region of Kerala. In the 1930s, it was a major venue of the Salt Satyagraha. Swami Anandatheertha, a disciple of Narayana Guru, started anti-untouchability movement in Payyanur in the 1930s. Later Payyanur became a center of communist movement. Payyanur is also a center of Kerala culture like Theyyam dance and its sacred (Pavithram) ring known as Payyanur Pavithra Mothiram. While performing religious rites and ceremonies, Hindu priests are required to wear on the ring finger of the right hand a ring made of *kusa* (*durva*, *durba*, *darva*) grass. This practice is still prevalent. Somewhere in the past, during the reconstruction days of Subramanya Swami Temple of Payyanur, there was a shortage of *durba* grass. In Hindu rituals, if an essential item is not available, coinage metals like gold or copper, regarded as auspicious, are used as alternatives. The chief priest of the temple asked a goldsmith family in Payyanur to make a similar type of ring in gold. Once the temple priests of the famous temple of Payyanur started using the gold made substitute as the sacred ring, it became very popular among people who visited the temple. Gradually, it spread as a symbol of sacredness in Kerala and abroad. The word *Pavithram* means 'pure,' and thus, it is believed that the ring imparts purity to the mind of people who wear this ring. Some people began to claim that the ring also provides material wealth and prosperity in life.

The piece is a uniquely crafted ring made of gold and silver. It is shaped like a grass knot and has three layers or curvy structural lines in the design representing three nerves on a human body—*Ida*, *Pingala*, and *Sushumna*. These three lines on the center and edges of the ring converge at a certain point and form a knot. There are many other intricacies in the design that symbolizes the lotus, human body parts, the sun and the planets, stars and galaxies. The intricate design, full of symbols, is very hard to make. Price of a single ring may reach Rs. one lakh. The ring combines high level of craftsmanship, religious symbolism and business acumen, not necessarily through single individuals. Success of commercialization has led to competition, where IPR claims are made for securing market shares. But who is entitled to get the intellectual property right? Is it the craftsman using his skill to make the ring? Should it be any skilled gold worker or only those from the Payyanur region? Is anyone from the region eligible to make the sacred ring if he is sufficiently skilled? Or is it someone deputed by the temple who has the right and can decide which goldsmith is permitted to make the sacred ring? Such hotly contested issues are now brought to modern dispute resolution institutions for mediation.

In 1994, a jewelry company applied for registration of Payyanur Pavithra ring as a trademark. A trademark was granted. The exact nature of the award was debated in the subsequent cases. It might be a conditional one restraining the applicant from using the mark without the name of his company. By the time, the trademark would come for renewal the GI Act came into force. From Payyanur another body, a registered society named Pavithra Ring Artisans Development society submitted an application in February 2004 for the registration of 'Payyanur Pavithra Ring' as a GI. The GI application was accepted, was brought to public notice, and was publicized as per the procedure, in the *GI Journal* (September 2005 issue) inviting objections and opposition. One jewelry company filed a notice of opposition which was dismissed on merit after hearing both the parties. Thereafter, the GI Registry granted the GI right over this ring. At this point, the original trademark holding company filed an objection claiming sole right to manufacture the Pavithra ring on grounds of lineage. The Writ was to quash the GI order and to restrain the GI Registry from proceeding further with the application. Following a series of court procedures, the dispute ultimately reached the Intellectual Property Appellate Board (IPAB) in 2011.

The case is significant not because of the complexity, but because of the way the IPAB ensured a judgement based on Prior Informed Consent (PIC). The IPAB felt that the artisans of Payyanur in the State of Kerala, seven hundred kilometers away, might not be aware of the proceedings at Chennai. Nor is it right to expect that they read the *GI Journal* regularly. They must be informed. The appellant was directed by the IPAB to publish the application content in a Daily Newspaper of Kerala State. Following this advertisement, several affidavits contesting the claim and a fresh GI application by another Trust were received by the IPAB. Seeing this, the IPAB decided not to quash the GI but to cancel the assignee's name in the GI order and ask the GI Registry to start fresh procedure to decide the appropriate agency (called proprietor) for assigning the GI. The proprietor of a GI is to play the role similar to APEDA for Basmati GI. In January 2014, the GI Registry started a field level inquiry at Payyanur. The field visit revealed that there were two different oral histories to

Payyanur Pavithra Ring. Both of them agreed that the making of golden ring started because durba grass was not available. But they differed on which goldsmith family was asked by the priest to make the ring. The skill was not in consideration. It was the religious sanction that became the matter of dispute.

In the field visit, the officials also found that one of the applicant parties making the GI claim was a private family trust formed with the objective of concluding festivals and for maintaining the properties of the temple. A minority of members of the trust were artisans of Payyanur Pavithra Ring. The other applicant, a society, was formed only for the purpose of applying for registration of the Ring as a GI. Most members of the society were traders of the ring. Only a few were artisans. The total number of artisans involved could not be identified. One of the respondents informed the officials that in addition to the old family members some of the other goldsmiths in Payyanur town had also learned the art of making Pavithra Ring. The inquiring officers reported that the entire artisan cluster was organized in four groups. They were opposed to the grant of a GI in favor of the others. They were making allegations against each other and were not ready to get together in a single conglomerate. Their tussle involved personal as well as local business issues. The GI Registry explained that the GI registration would be assigned only to the association which protected the rights of the artisans in entirety. All the artisans involved in the preparation were entitled to use GI tag, and it was not a private property. GI was a common right given to society and was not granted for the benefit of any particular individual as in the case of trademarks.

In terms of the GI Act, only an association or a group with legal status can be the Registered Proprietor of a GI, who would authorize legitimate users (ring maker artisans, traders etc.) of that good to use the label. The GI Registry and the consultative committee decided that at this juncture it was not possible to accept either of the applications. The GI registration remains, the assignee organization is yet to be formed. It was decided that the GI Registry should request the Govt. of Kerala State to intervene in this matter and to attempt to unite the producers so that the genuine artisans may reap the benefits of the GI status.

The sacred ring case brings to fore how objects of religious significance may be transformed under intellectual property provisions. If the sacred ring design is a representation of Hindu cosmological concepts then the right to replicate, it should be shared by Hindus everywhere. If the restraint imposed by IPR is to reward the creativity behind the design, it would favor the secular rationale of IPR system. But as a secular design without any religious significance, the ring would not have as high a demand as it has now. The spokespersons of Hindu religion tacitly approve privatization of the religious symbol as an IPR, for commercial purpose. The business model of Payyanur ingeniously combines modern marketing instruments and religious symbolism. The approach is comparable to other business models which combine marketing with Do-gooder brand, Green symbolism or patriotic advertisements. In terms of welfare criteria, the sacred ring business model, providing support for the artisans, may score well. Interestingly, the IPO neither opposed nor used any brand claim for arriving at its decision, but was concerned whether all the artisans

and traders were involved or not. The voices of ‘religion’ tacitly avoided conflicts with this modern norm of IPO and did not try to impose any caste-based control.

5.4 Channapatna Toys

In 2001, China was admitted to WTO, whereby it became one of the Most Favored Nations (MFN) to India and also entitled to get National Treatment. Operationally, the MFN status means that neither China nor India can restrict imports from each other by measures like additional customs charge or quota restrictions. National Treatment principle requires that goods once imported are treated at par with the domestic goods. Immediately after China’s entry in WTO, Chinese products began to flood Indian markets. There was suspicion that China was subsidizing their exports to sell cheap in India—a country cannot have comparative advantage in almost everything. The Govt. of India began to investigate whether WTO provisions like anti-dumping could be used to counter the ‘Chinese threat’ in many items, including the toy sector. But they found no evidence that was worth submitting to WTO. Then, in the summer of 2007, during a routine inspection in USA, high levels of lead were detected in toys like trucks, helicopters, and soldiers. The US Consumer Product Safety Commission issued a recall. This was the first ever case of recall for lead-contaminated toy. Eventually, many more toys were recalled. In the same year, a spate of warnings and recalls of pre-school toys, pet food, seafood, lunchboxes and other items began to appear in national and local newspapers, and television and radio news of the USA. Descriptions of the items recalled tended to have three common characteristics. First, they pointed to the dangers of lead intoxication as opposed to other toxins. Second, they emphasized the vulnerability of American children to this toxin. Third, they had a common point of origin: China, for decades a major supplier of consumer products to the USA (Chen 2007: 368).

Alarmed, the toy industry in the USA started intensive inspections for lead. It was found that high levels of lead were a lot more common than they had assumed. By the end of the year, 42 recalls involving nearly 6 million toys were issued because of excessive lead levels. It was shocking to think of children being poisoned while playing, and by lead no less, a toxic metal that consumers assumed had been purged from products long ago. Lead-contaminated toys became one of the biggest environmental health stories (Schmidt 2008: A71–A72). The news reached India and fed suspicion about China’s way of gaining comparative advantage. With a little digression, it may be noted that the lead-containing toys might actually be only a fraction of Chinese toy exports. The incidence, however, shows how a few bad apples may damage the image of the whole basket. Late in 2007, Maharashtra Pollution Control Board tested China-made toys in November and found substantial lead content in all of them. Learning about this test, a NGO filed a Public Interest Litigation (PIL) in Bombay High Court raising the issue of toxic toys. The Chief Justice observed that taking into account the magnitude of the contentions made in the PIL, the authorities needed to ‘wake up’ to the cause of the health and safety of children (Economic Times

2008). In January 2009 India imposed ban on Chinese toys. But China approached the WTO and argued there that India's ban was a discriminatory measure since it went against the WTO principles of National Treatment and MFN. Toys manufactured in India as well as those originating from other Members of WTO were not subject to the same requirements. India had to withdraw the ban at that time but became aware of a loophole in safety legislations in domestic market. In the past, the domestic and foreign toy manufacturers did not misutilize this weakness. But there would be traders as ruthless as the Chinese producers. India began to plug such loopholes.

Although the history of toy safety legislations in India dates back to 1920s, no further step was taken after independence (Editorial 2010). Following the EU restrictions on the sale of toys in 1999, the Bureau of Indian Standards adopted the international standards. But those were not mandatory in domestic market, including imports. After the setback at WTO in 2009, India realized that in WTO era, trade of inferior quality goods cannot be allowed in domestic market if the country wants to restrain substandard imports. India began to mandate international quality standards on mechanical and physical properties, flammability, toxicity, and heavy metals. Bureau of Indian Standards also proposed a compulsory registration for toys manufactured abroad. Raising procedural questions about this order, several other countries expressed their unease in the Committee on Technical Barriers to Trade (TBT) of the WTO.

That the traditional toys of India can be ideal for children burst into global media by a set of coincidences at this time. In 2010, US President Barack Obama made his first visit to India. When her husband was in a meeting with the Indian Prime Minister Michelle Obama visited National Handicrafts and Handloom Museum, Delhi. She was so impressed that she went on a shopping spree. Her purchases included wall hangings, bedspreads woven on Kantha, Manipuri shawls, multi-colored bangles, bead necklaces, elephant wood carvings, fans made of rice grains and stalks, and the most discussed of all, a traditional toy known as Channapatna toy. She said she wanted to give some of those toys to her children and gift a few to friends for Christmas (Deccan Herald 2010). In the recent history of Chinese toy withdrawal from the US market the First Lady's purchase of Channapatna toys made worldwide news. The traditional miniature toys are smooth, durable, and colored with natural dyes, making them ideal for children. They were worth the attention in an atmosphere vitiated by poisonous toys. Indian policy makers too woke up to the realization that traditional Indian toys are among the potential alternatives.

Like Channapatna, there are several other traditional toys and toy making clusters in India. Well known are Thanjavur dolls of Tamil Nadu; wooden toys of Kinhal and Gokak, Karnataka; Kondapalli Bommalu of Andhra; Nirmal toys of Telangana; terracotta horse of Bankura, West Bengal; leather toys of Indore, Madhya Pradesh; wooden crafts of Banaras, Uttar Pradesh; Kathputlis of Rajasthan. Other important clusters are like Dungarpali in Odisha, Sheopur in Madhya Pradesh, Udaipur in Rajasthan, Mathura, and Chitrakoot in Uttar Pradesh. This is not exhaustive. They were being rapidly replaced by fascinating and innovative modern toys of increasingly diverse varieties. Purchases of Michelle Obama therefore, signaled a change in the taste. To start with, safety was the reason. Since then, other arguments are being

added. For example, a research study recently published shows that traditional toys may beat electronic gadgets in language development of children (Belluck 2015).

Channapatna, a town in Karnataka State, is located at a distance of 50 km from Bangalore. As a result of the popularity of these toys, Channapatna is also known as *Gombegala Ooru*, meaning 'Toy town' in local language. Popular belief is that the toy making tradition of the town originated during Tipu Sultan's time. He brought Persian toy makers to teach the toy-making technique. It is possible that the story was an old marketing strategy, one of pedigree creation. The whole region around Channapatna has several other toy making villages. Tipu, the 'technology buff,' might have brought some Persian experts to his kingdom, if he had learnt about some skill worth teaching to his people. One possibility is that Tipu introduced wood-turnery from Persia, which did wonders when combined with the toy making tradition and the vast knowledge of natural dyes in India. A FAO study tells that from around 1892 hereditary artists called 'Chitragars' (*chitrakars*) were engaged in wood-turnery. But the toy-making industry in true sense owes its origin to the handicrafts development program of the government after independence. One of these artists went to study lacquerware in the northwestern State of Punjab. On return, he introduced the study of the toy making craft at the Industrial School at Channapatna established in 1960s. He also mechanized the craft through the power lathe. However, the Chitragars were hesitant in acceptance of these changes. Hence, admission was opened to students of other castes and religions. Many Muslims and scheduled caste members joined the course. Today, the majority of Channapatna craftspeople belong to these communities (FAO 1991). In, the last fifty years the industry has changed rapidly.

While some toys are easily manufactured by a single worker, some of those need the efforts of multiple workers, designing, and producing different parts of the toys and later assembling it together. The time taken to make these eco-friendly toys vary from one to four hours (Ahmed and Mani 2016). Many women are now involved in the craft. In 1960s, the Rural Crafts Development Organization brought Japanese consultants to teach design and other skills (FAO 1991). A Karnataka government initiative started in the year 2000 to mechanize and increase toy production. The Karnataka government provided residential facilities and set up a factory under various schemes for toymakers (Ahmed and Mani 2016). In the past, ivory wood was the main wood used in the making of these toys, though rosewood, sandalwood, rubber, sycamore, cedar, pine and teak were also occasionally used. Vegetable dyes are used in the coloring process to ensure that the toys and dolls are safe for use by children. These considerations are what earned Ms. Obama's endorsement. But how far can such qualities succeed in market?

An ASSOCHAM study in 2013 estimated that the Indian toy industry was worth around Rs. 8,000 crore as on March 2013. It was expected to grow at 30% by 2015 because of the rising demands of toys by the middle class population spending huge amounts for their children. During the survey period, the industry employed around 30 lakh people both in the organized and unorganized sector. With the industry growing, employment opportunities were also expected to accelerate. ASSOCHAM study anticipated that the employment would be around 50 lakh by 2015. In the period 2001–2012, total imports of the Indian toy industry increased at a rate of

25.21% per annum. China has the largest share, accounting for more than 45% in the world's toy market. India's toy Industry has a meager share of 0.51%. Only 20% of the Indian market is served by Indian manufacturers and rest by import of toys from different countries mainly from China and Italy. Chinese products offer a wide variety of toys to the people in India at cheaper prices. Faced with the competition nearly 40% of Indian toy companies have closed down in the last few years and another 20% were on the verge of collapse (ASSOCHAM 2013). The market size of Channapatna toys may be around 10–20 crores. Besides, competition from modern products, non-availability of basic natural raw materials, particularly forest-based materials is a crisis common in the craft sector. Channapatna toys too are not free from this problem. In 2006, more than 6,000 people in Channapatna, working in 254 home manufacturing units and 50 small factories, were engaged in the making of these toys (Belgaumkar and Sastry 2006). It appears from a newspaper report (Das 2014) that only about 2,000 of them remained in the craft after eight years.

However, the same report confirms that there are now signs of turnaround, thanks to the interests of a new generation of niche toymakers who want to make these toys contemporary and popular again. The State government has also played its part, with the Karnataka Handicrafts Development Corporation providing marketing support to the 2000 Channapatna artisans, still persisting in the trade. Artisans are now being trained on modern machines (Das 2014). A High Tech Crafts Park was established by the Govt. of Karnataka with financial support received from the Ministry of Commerce and Industry, Govt. of India. It includes a Common Facility Service Centre making available expensive tools and equipments that the artisans cannot afford themselves (Magoon et al. 2016). The past few years have also seen the emergence of e-commerce Web sites that are making the toys more easily available. One such is *Craftsvilla.com*, a marketplace for Indian products. There were ten sellers of Channapatna toys in this site (Das 2014). Simultaneously, the country is gearing up for acquiring a bigger share in international market. Products like Channapatna toys may have an important role to play in an international market with growing awareness about natural dyes. Channapatna toy sellers are advertising their use of natural dyes. In 2006 Channapatna Toys and Dolls obtained GI recognition that would enable India to contest imitations.

It may be worth introducing a few of these efforts using craft reports prepared by National Institute of Fashion Technology, Bangalore. Maya Organic, a nonprofit livelihood development initiative for the artisans, started exporting toys in 2004. It now sells about 80% of its toys outside India—in Japan, Europe, the USA, South Africa and parts of Asia (Das 2014). Maya Organic has initiated efforts to create a niche market for a new brand of wooden educational toys called *Moogli*. Varnam is a social enterprise that trains and employs women artisans of Channapatna. Most of Varnam's products have been handcrafted by women artisans. Besides, the organization has successfully blended traditional art with contemporary art and design, making it modern, unique and adaptable to current day scenario while keeping it aesthetically sound (Magoon et al. 2016). Varnam emphasize on constant discussion with their artisans on current market trends in terms of finish, utilitarian value, attention to detail, etc. In doing so, they hope to enhance the sense of pride among

master craftspeople for their skill and ensure that these crafts continue to thrive. Oodees is another such effort started by designers from National Institute of Design. They are introducing new contemporary designs. Oodees also excels in innovative marketing and packaging. In 2015, Oodees conducted a marketing campaign at the Bangalore airport along with raising of awareness about Channapatna toys (Magoon et al. 2016).

The new breed of Channapatna toymakers like Maya, Varnam, Aatike, Sri Kaveri Emporium, Shilpa produce their products meeting the additional international standards demanded for trading in domestic markets of several different foreign countries. They have also acquired compliance certificates acceptable to foreign buyers for standards like ASTM F963 and EN 71 (Misra and Gupta 2015; Palladwar et al. 2016). In addition, they also acquire certificates and marks like Fair trademark of World Fair Trade Organization that give them extra advantage in domestic markets. There are two Fair Trade Organizations based in Channapatna—Shilpa Trust and Maya Organic (Palladwar et al. 2016). Obtaining International certification is very expensive and that in turn limits export opportunities of smaller producers. A common testing facility for exports and imports has been established by Greater Noida Industrial Development Authority (Varghese et al. 2016: 9).

Before we conclude it may be worth having a look at traditional toys world over. German traditional wooden toy named after Erzgebirge region sank into a deep crisis in the nineteenth century following stiff competition from Japan. Germans often complained about imitations of their products by Japanese firms. In 1910, an organization that may be compared with modern NGOs took its first steps to support the Erzgebirge toy industry. Helps from other sources including the government followed. By 1970s and 1980s, the demand was so high that after meeting the external demand the GDR producers were unable to meet the domestic demand and a do-it-yourself kit had to be released (Schramm 2004). The history of American Indian doll Kokopelli, a hunchbacked flute player who represents the spirit of music and fertility deity, can be traced back to 1200 years old rock art in southwestern USA. Originally handmade, Kokopellis have become so popular among tourists in recent years that they are produced in huge numbers in large factories. Culturally offending elements were removed in order to have global acceptance (Ritzer 2003). The famous nesting doll of Russia, the Matryoshka dolls, were handmade and hand-painted in great details by skilled craftspeople. In order to supply the increasing demand from tourists and growing export, they are now far more likely to be machine-made: automatically painted; made of poor quality, unseasoned wood; and greatly reduced in detail (Ritzer 2003). A giant Matryoshka doll delaying the flight of the Russian Olympic team at Rio Olympics was in the news. Vietnamese traditional toy Tò He is made from glutinous rice powder and is edible. Wooden toys from Hrvatsko Zagorje of Croatia are included in UNESCO's List of Intangible Heritage (Craftattract 2013).

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Chapter 6

Traditional Cultural Expressions, Expressions of Folklore



Abstract Traditional cultural expressions or expressions of folklore include a very wide variety of subjects. As case studies for this chapter we include textiles and built heritage as traditional cultural materials; folk music and yoga as cases of cultural action. In the case of textiles, we could discuss in details, only one form of application, that of Banarasi saree. Textiles and music are also industries. But Banarasi saree and folk music have always been appreciated solely, for their artistic and aesthetic qualities. The challenges in their preservation and promotion are therefore, somewhat different from those discussed in the chapter on industries. For built heritage and yoga, we discuss the changing nature of intellectual actions in changing cultural milieu. Copyright form of IPR finds application in two of the case studies here.

Traditional cultural expressions (TCE) comprise of the dynamic forms which are created, expressed, or manifested in traditional cultures and are integral to the collective cultural and social identities of the indigenous and local communities. ‘Expressions of folklore’ was the term in use in UNESCO documents. Later, when negotiations began at WIPO, need arose for precise legal terms. The term ‘traditional cultural expressions’ was chosen as a suitable group name. TCE includes:

1. Materials—such as material expressions of art, handicrafts, durries, mats and carpets, ceremonial masks or dress, architecture, sacred places, and tangible spiritual forms.
2. Actions—such as dance, plays, other performances, ceremonies, rituals, rituals in sacred places, puppetry, sports and traditional games, martial arts, music and sound—such as songs, rhythms, instrumental music, the songs which are the expression of rituals.
3. Verbal—such as stories, epics, legends, popular stories, poetry, riddles, and other narratives; words, signs, names, and symbols.
4. Written and their adaptations.

TCEs are found in both tangible and intangible forms. Concrete expressions of intangible knowledge are tangible. These are then handed down from one generation to another. They are constantly evolving, developing, and being recreated. What makes knowledge or cultural expressions ‘traditional’ is not their antiquity: Much

TK and many TCEs are not ancient or inert, but a vital, dynamic part of the lives of many communities today. These are forms of knowledge or expressions which have a traditional link with a community (WIPO 2015: 17). In this chapter we include as case studies, textiles and built heritage as TCE materials, folk music, and yoga as cases of action. In the case of textiles, we could discuss in details, only one form of application, that of Banarasi saree. Textiles and music are just as much industries as Channapatna toys and Payyanur ring are cultural expression materials. Their inclusions in specific chapters were guided by the flavor of the discussions. Craftsmanship and artistry are not the determining factors for popular appreciation of Channapatna toys and Payyanur ring. But Banarasi saree and folk music have always been appreciated solely, for their artistic and aesthetic qualities. The challenges in their preservation and promotion are therefore different.

6.1 Banarasi Saree

Clothing is a basic need along with food and shelter. Textiles were among the major manufacturing activities in old societies. Textile clothing in India dates back to Harappan civilization. Following Champaran satyagraha in 1917, charkha and khadi became the core of Gandhian constructive activities. The art and aesthetic aspects of handloom textiles were not much in focus in his programs. In contrast, dyeing, calico printing, and chikan embroidery were being promoted by Kala Bhavan, Sriniketan and Lucknow school. While Hatch discussed the technological improvement needed for making charkha economically viable, Havell was worried that Indian motifs were being taken away by European textile designers. There were two different streams of thought. One perceived traditional knowledge was for meeting basic needs. The other upheld the cultural expressions, accompanying the technology, for meeting a basic need. We begin with an account of the changing textile policy in free India showing how the art and aesthetic qualities of traditional craftsmanship emerged as the more prominent dimension.

After independence, in the First Five-Year Plan a cess was levied on mill made cloth in order to assist the development of khadi and handloom. In each Plan, there was financial allocation for cottage and small-scale sector. The textile policy favored handlooms. The motivating factor behind these post-independence moves was economic. In the days, immediately after independence the employment potential of handloom was overriding. It was the second most important sector in terms of employment. Besides, industrialization does not bring instant growth. While laying emphasis on heavy industries, Mahalanobis four sector model for the Second Five-Year Plan also gave importance to cottage and small-scale industries. Argument was that this sector, characterized by a low input–output ratio, could still be promoted in a capital-short country. Besides, its short gestation period could help in continuing production of consumer goods during the difficult period of industrialization. But this formulation was only outwardly supportive of cottage industries. It could also mean that this was an interim measure. No wonder that this support policy

was relaxed as soon as the situation eased a bit. During the Fourth Five-Year Plan in 1964, a committee headed by Asoka Mehta laid emphasis on 'regulated transition of handlooms to powerlooms,' with steps to install 10,000 powerlooms in the handloom sector (Chatterjee 2014). Since then there is growing pressure for mechanization and effective dissolution of the handloom sector, to which the government has succumbed from time to time.

The Seventh Five-Year Plan (1985–90) corresponding to Rajiv Gandhi's regime initiated a new phase. As a part of liberalization, a New Textile Policy (NTP) was announced. In NTP, emphasis shifted on productivity from employment, weakening the supports for handloom textiles. But unwittingly, NTP also extended a favor while reflecting on the needs of the changed situation. The country has come a long way from the immediate post-independence days of misery. People have more money to buy some luxury items too. NTP proposed to preserve the distinctive and unique role of the handlooms to enable them to realize their full potential and ensure higher earnings to the weavers (Srinivasulu 1996: 3200). The change in perception, from poor peoples' cloth to quality production for everyone, was the result of sustained works of Kamaladevi Chattopadhyay and her associates. They brought out the richness of Indian textile designs, instituted Master Craftsmen awards and initiated several other programs. Later developments show the merit of this approach.

The 11 items still reserved for the handloom sector include:

1. Clothes—saree, dhoti, lungi, mekhla chadar, dress materials, angavastram
2. Warm clothes—shawl, muffler, kambal, woollen tweed
3. Bed and curtain materials—bedsheet, bedcover, khes, durries, tapestry, upholstery
4. Towel, gamcha.

Though the demands for a few of these are shrinking, several others, like saree, bed materials, and curtain materials are showing healthy signs. These items are surviving before competition because their artistry and aesthetic qualities can never be matched by machine productions. Besides, some of these find appreciation by the conscious consumers of today for their suitability in local climate, durability, and similar other reasons (Majestic MRSS 2016). Fashion materials often face drastically fluctuating market demand because of change of tastes. But products like Kancheepuram or Banarasi saree have an assured demand as bridal dress. Taj group has commissioned the weavers of an adapted village of Banaras to weave their magic on silk sarees for their front office and housekeeping staff at all its luxury and palace hotels in India. As per the Third Census of Handlooms (2009–10), there were 43.31 lakh handloom workers in the country. About 28% of them were into purely domestic production. Most of them were located in the northeastern States. Production purely for domestic use was rare in the rest of India. States leading in commercial production of handloom were Tamil Nadu, Karnataka, Andhra Pradesh, Odisha, West Bengal, Bihar, and Uttar Pradesh. Saree was the major product. Saree-producing households accounted for 41.36% of total handloom worker households. The richness of cultural expression is evident in that each center of saree weaving has developed its signature style. Kanchipuram, Pochampally, Banarasi, Shantipuri, Bomkai, Chanderi, Kota,

Table 6.1 Spread of powerloom in Banaras

Area	Handlooms	Powerlooms	Powerloom as % of total looms
Varanasi region	86,438	1,766	2.00
Azamgarh district	20,004	1,926	8.78
Whole of UP	224,010	70,802	24.02

Source Textiles Committee 2007: 75

Patola, Gadwal, and many other designs of sarees have attained iconic status. We will introduce in some details the specific case of Banarasi saree. Banaras region is the largest handloom cluster in the country.

Textiles of Varanasi (Banaras) were mentioned in the second century BC, in the writings of Patanjali, as Kasika textile (Das 1992: 11–12). According to the GI application, the bold geometric patterns scarved on the Saranath stupa were transferred from the textile designs of the Gupta period.

Government policy to promote powerlooms under NTP caused havoc over many other parts of the country. The number of powerlooms in India increased from a level of 6.38 lakhs in the year 1986 to more than 15.58 lakhs in 1997 (Press Information Bureau 1998). But certain handloom production proved to be resilient, showing the value of high aesthetic qualities. Banaras was not seriously affected by the onslaught from powerlooms. A government Report shows the limited extent of intrusion (Table 6.1).

There were other problems. For example, textile mills of Gujarat started on a large scale, imitation of Banarasi designs over cheap synthetic fibers. In 1995, the government banned imports of Chinese raw silk to promote Indian raw silk produced mainly in Karnataka region. Sericulture and reeling of silk in India is another cottage industry. Banaras weavers were required to buy Bangalore silk, which was more expensive. Smuggling of Chinese silk increased. But these were minor itch. Overall, there was no serious problem. Some technological improvements were made during this period. Screen and block printing were introduced. In her study, Raman (2013: 50–52) informs that the participants of the Banarasi saree industry described the period between 1970 and 2000 as the ‘golden period’ for them (Raman 2013: 50–52). The challenge came soon, after the formation of the WTO and the entry of China in it.

Two global trade phenomena in the WTO era have very important bearing on the Banarasi saree industry. One is the expiry of the multi-fiber agreement (MFA) and the other is China’s entry in WTO. The MFA of the GATTs, a system of country quotas put in place in 1974 to protect the textile industries in the USA and Europe, expired in 1994. It was expected that some countries will benefit, and some would suffer. India was one of the major producers of textiles who were likely to gain. But the change was not immediate. Although MFA expired, the quotas were continued in early WTO regime through the Agreement on Textiles and Clothing (ATC), ostensibly to let the industrialized countries adjust to the competition from developing countries. The ATC was a ten-year transitional agreement that expired only in January 2005

opening up a competitive textiles market at global level. China became a Member of the WTO in 2001. Along with other countries, it continued to face quantitative restrictions in two largest markets, the European Union (EU) and the USA. Therefore, China's attention was directed wholly to capturing markets of countries unprepared for the contingency, like India.

Considering that China will soon be entitled to get MFN status, the ban on imports of Chinese silk was withdrawn after three years. Instead, India imposed heavy duty on imported silk yarn from any source. Weavers were unhappy over the rising raw material cost. Soon, the duty on imported silk fabric was reduced from 30 to 10%. In consequence, Chinese crepe fabric became much cheaper, creating havoc. Gujarati traders had already begun imitating Banarasi design. But they could not make much dent while using synthetic fiber. Availability of cheaper Chinese silk solved this problem. Chinese traders too entered into imitation market. By use of computers, design imitation was easy. Chinese and Gujarati traders flooded the market by imitations of Banarasi silk saree. Between 2000–01 and 2004–05, Chinese silk fabrics imported to India grew from 14.5 to 964.9 lakh meters (Raman 2013: 51). By around 2009, the Banarasi saree industry was shattered. It is believed that tens of thousands of weavers either left the trade and became informal sector workers or migrated to weaving centers in Western India. Hunger and malnutrition deaths among children have been documented as have suicides due to debt and poverty (Basole 2015: 13–14).

During the Eleventh Plan period, which ended in 2011–12, silk production in India grew by 25%. Its quality too improved. The devalued Indian rupee made imported silk costlier. In a five-year period ending in 2012–13, the quantum of imported silk yarn declined substantially from 8,400 metric tonne (MT) to less than 5,000 MT (Khan 2013). But design imitation continued unabated. Though its fame has not diminished over the years and market demand has increased, the traders selling cheap imitations were the ones who were benefitting. Baffled weavers left their jobs and went to Gujarat textile mills. Some of them purchased powerlooms hoping to compete with the cheap rivals. Such was the context in which, in 2007 nine organizations together applied for GI Registry. After confirming that there was no challenger, the GI Registry in 2009 awarded them a GI, named 'Banaras brocades and sarees', for silk brocades, textile goods, silk saree, dress material, and silk embroidery produced only in Varanasi, Azamgarh, Mirzapur, and three other localities. These nine applicants, which include some government departments, are now the Registered Proprietor of the GI, like APEDA is for Basmati GI. By GI Act, any person making, trading, or dealing with Banarasi is a producer. A producer can apply for registration as an authorized user. Only authorized users have exclusive rights to use the GI. Thus, the functioning of a registered GI is crucially dependent on identification of the producers who deserve to be authorized users and on users approaching the proprietors for license. It appears that the industry leaders have not made much progress in this task of GI implementation.

For Banarasi saree, the potential users of GI tag are not aware that they must enlist with the proprietor organizations and obtain authorized user status. In the case of basmati rice, the export of basmati rice (quality control and inspection) rules require that an exporter intending to export a consignment of basmati rice shall register

the contract with APEDA. In case of Kancheepuram silk saree, the GI proprietors conducted sustained campaign for years to create awareness among the producers (Kawlra 2014). In Banaras there was no such effort. Doubts are being raised that to favor some of them, the proprietors are not enlisting many actual producers (Sharma and Kulhari 2015: p. 91–93). As of now, it is not clear if this is the case. Exclusion of many aspirants is imperative in the GI process. We have already discussed a similar dispute between the Madhya Pradesh State government and APEDA, the Registered Proprietor of Basmati rice GI. There APEDA made it clear that their objection was for maintaining the notified quality standard for Basmati label. Whether the chosen standards are just or not is under the purview of the judiciary. In the case of Kancheepuram Silk, the first set of criteria were revised, since a good many local producers considered the original quality specifications were too demanding and impractical (Kawlra 2014). In their GI application (IPR India 2007), the proprietors have listed certain points as the ‘uniqueness’ that distinguish Banarasi from other sarees. But there is no indication that these criteria are being used for licensing. Ghana characterizes textile designs by their composition, form, and material giving a special appearance. These are then protected by registering under ‘industrial design’ form of IPR (Nwauche 2017: 107). India may consider this approach for some products like Banarasi or Kancheepuram saree.

As another initiative, the India Handloom brand, for branding of high-quality handloom products with zero defects and zero effect on the environment, was launched in 2015. In the first year, only six weavers had registered under the brand in Banaras region (Chandra 2016).

Besides, merely a GI tag or a Handloom brand does not ensure protection against imitations. APEDA appointed a worldwide watch agency to monitor the trademark registers across the globe. On the basis of its findings, legal actions were initiated in 40 countries. The Tea Board, the proprietor of the GI on Darjeeling tea, hired the services of an international watch agency. Based on their findings the Board initiated several legal actions. The Chairman of the Tea Board informed that the total cost of protection of Darjeeling Tea came to about \$50,000 per year (Das 2003). Getting a GI mark is simple and cheap. Hence, there is a mad rush. But what is the use? Monitoring and enforcement is the major cost for making use of GI. Only a few GI holders are able to meet that kind of cost. Banarasi saree industry is one of the exceptions. The market size of Darjeeling tea is about \$30 million. Similar is the case for basmati rice. From stray information available, it seems that the market size of Banarasi saree is about twenty times more. For them, it should not be difficult to engage a watch agency and initiate legal actions.

One might hope that the industry would reorganize soon and recover the lost market by checking imitations. However, by the time we were completing our study, another set of wrong government policies hit the Banarasi saree industry. In quick succession, several Indian rupee notes were withdrawn and the GST system was introduced. The people engaged in this small-scale and cottage-based industry could not purchase raw materials, could not sell their produce, and could not pay wages because of the severe shortage of cash. Nor could these small traders cope with the complexities of GST regime.

In several case studies earlier, we came across rising consumer preference for natural and organic substances. Through his lifelong effort, K V Chandramouli cataloged (Mohanty et al. 1987), standardized, and popularized traditional natural dyes of India. He was inspired by Kamaladevi Chattopadhyaya. Kancheepuram weavers use only natural dyes (Sunder 2007; Kawlra 2016), for which Kawlra thanked Chandramouli's sustained campaign and teaching. Natural dyes were in use in Banaras in the past. Over the years, chemical dyes became common. There was no such campaign as that of Chandramouli in south. Even now the available works on natural dyes in India seem to be unknown in Banaras. However, recent reports suggest that the people are trying again to promote the use of natural dyes. They are motivated by their anxiety over increasing pollution of the sacred river Ganga from chemical dyes. For years, the country is trying to clean Ganga River. Several polluting industries in different States were warned and asked to shut down.

There are producer weavers who sell directly to the traders. But usually, the production of Banarasi saree is organized in several tiers. About 10 to 15 weavers (*bunker*) work under a supervisor (*karigar*, artists) in a workshop (*karkhana*). A master-weaver (*grihasta*), usually a skilled weaver and designer, engage twenty or more *karigars* working under him. He supplies raw materials and designs to the workshops and sells the products to *kothdar*, a wholesale dealer or stockist (Textiles Committee 2007: 52). A weaver first weaves a saree according to the sample, figures out the workload, and then negotiates the weaving charge. But even after negotiations the traders revise the charges downward arguing that the market conditions are poor. They also extract as penalties for defective work. The Textiles Committee (2007: 55–56) found that the earnings of the weavers varied from Rs. 18,000 to 30,000 per annum. What was more disturbing was that the earnings declined in absolute terms, by at least 30–40% in the previous ten years. This was the crisis period in the post-WTO years. The Third Textile Census estimated that the average annual income for handloom households in purely commercial production was Rs. 30,747, much lower than the national per capita income, which was Rs. 46,492 in 2009–10. Despite this, the weavers continue in this occupation because of lack of alternatives (Textiles Committee 2007: 57). The Committee also brought out their poor living condition, lack of basic amenities and health facilities. Without attending to the problems of benefit sharing with the actual producers, it is not possible to sustain the amazing traditional knowledge and skill.

6.2 Music (Folklore)

In this section, we discuss only the item 'music,' and only that kind of music which are TCE topics. The term 'folk music' may be fine provided it is not understood as distinct from tribal music. The sharp distinction between music and other forms of cultural expressions do not always exist in folklore. Awarding the Nobel Prize in literature to folk and pop singer Bob Dylan was a rare case of recognition of this

integral nature. In general, modernization tends to compartmentalize the traditional unitary cultural forms.

In the first chapter, we noted how the entry of gramophone signaled the modernization of Indian classical music. In 1903, the first gramophone record of Gauhar Jaan was released. It became hugely popular and was followed by a series of several more. Together with this, there appeared another modern phenomenon that of piracy. Piracy was unheard of in the musical world because it was impossible in the past. The technological invention, that of voice recording, for the first time, made it possible to duplicate and illegally copy others' voices. Following the success of the Gramophone company and immense popularity of Gauhar's voice, several other European recording companies began to duplicate and sell her popular records. In the early years, Gaisberg's recording company, the Gramophone and Typewriter Company, had to initiate several lawsuits. Then, in 1907 the company established a record factory in Calcutta, along with a recording studio and a record pressing plant. To check piracy, the company obtained the famous "His Master's Voice" trademark and the logo: a picture showing a dog listening to a gramophone, as exclusive rights of the Calcutta factory. The trademark secured proprietary right of the Gramophone company on the artist's creations. But the artist, Gauhar Jaan received no right and no further payment after that one time pay during each recording. She died in penury at sixty years of age when her records were still selling.

The situation remained the same even under the Copyright Act, 1957, and many subsequent amendments of it. Meanwhile, the Indian music recording industry grew from strength to strength. In 1999, a study sponsored by the government estimated that the aggregate size of Indian Music market was Rs. 1,102 crores (NPC 1999: 29). But this might be a gross underestimate. A little later, when the Indian music industry found itself battered and struggling against piracy, they produced another set of data. In 2008, a joint report by the US–India Business Council and the US Chamber's Global Intellectual Property Centre estimated that the industry lost 38% of total potential sales worth \$4 billion (Rs. 16,240 crores), as well as 820,000 jobs due to trades in illegal CDs, DVDs, music downloads, and cable television (Verjee 2008). Although this data is inclusive of film piracy, it gives an idea of the immense volume of profit generated through commercial exploitation of the works of artists. Such huge profits were garnered solely by the recording and other 'owner' companies. The musicians, music composers and lyricists received no share of the profit. Pandit Ravishankar could retain his rights as the performer in all the work he had done abroad, but was not able to assert similar right in any work he did in India because every time the record companies would silence him showing the Copyright Act (Forler 2017). The producers could also permit distortions, vulgarizations and 'remixes' of the original music. Artists were disgusted. The kind of popular music Ilaiyaraaja created in four decades of work should have placed him among the world's top ten wealthiest in the music world, like Mick Jagger (Forler 2017). Ustad Bismillah Khan, the legendary Indian classical musician, had to appeal to the Human Resources Minister for help since he did not have money to pay his rent (Stancati 2012). Finally, lyricist Javed Akhtar, a Rajya Sabha member, led a campaign for changes in the abysmally lopsided intellectual property rights under the Copyright Act. Leading

artists like Pandit Ravishankar and A. R. Rahman appealed to the Rajya Sabha Members for making overdue changes. When the Copyright Act was amended again in 2012, particular care was taken to do justice for all categories of contributors, including the musicians.

People generally associate music primarily with the singers and the lyricists. It is therefore surprising that these categories of people did not have any intellectual property on their creations. Of all the subjects, music is the most glaring example of the intrinsically exploitative nature of IPR systems. Commonly, IPR system used for protecting rights on music is copyright, which originated in the modern period after printing technology opened up the possibility of mass copying. Mass markets also made imitation of craft designs lucrative. Copyright system was devised out of the felt needs of protecting the interests of creative authors and crafts people over their creations. For music, there was no such need for a long time since there was no way to copy voices or sounds. Over the years, each country had designed its respective copyright system to serve its own economic interests. For example, in US books with foreign copyrights required that printings be done on US typesets. The Berne Convention for the Protection of Literary and Artistic Works, 1886, was adopted to bring in some homogeneity between the countries in their copyright laws. It was here that one finds the first notable mention of copyright on music. Berne Convention includes copyright provisions for certain music-related works, like musical notations or musical drama. These are essentially, extensions of creative writings, not vocal or instrumental music per se.

Recording technology was invented a few years earlier. By the time Berne Convention came into force, the technology became a commercial success. A recording company could now own an artist's voice through a rendition. Unlike patents, copyright protection does not require registration or other formalities. It accrues automatically to authors after publication of a work. There are different people involved in the production of music: people who 'invent' (the composers, lyricist and publishers), and people who create it (performers, artists and record companies). Who gets the copyright? Gradually, a notion of 'neighboring rights' emerged around the question of copyright of musical works. It is also called 'related rights' or 'secondary rights.' The copyright law covering and governing this kind of right is quite complex. For example, an artist is eligible for parts of the neighboring rights derived out of the fixation of a performance in a form like a recording. International guidelines on this issue were adopted as late as in 1961, with the Rome Convention for the Protection of Performers, Producers of Phonograms and Broadcasting Organizations.

Neighboring rights were not altogether absent in the 1957 Act of India, but were ill defined. Typically, artists were 'hired,' as 'bonded labors' in the words of Javed Akhtar (Shankar 2010). They would give all the rights to the producer. Producers were allowed to keep all the royalties to songs, lyrics, or other works of arts. The 2012 Amendment mandated that these rights were to be shared with the artist who created them. Even if an artist wants, he/she cannot give away the rights to producers, a thoughtful clause that would protect against young artists succumbing under pressure. The Amendment also made it compulsory for radio and broadcasters to pay royalties every time they air a recording. Similar protection is also extended to the lyricists and

composers of film music (Stancati 2012). However, the actual operations would be decided by future judicial interpretations and pronouncements and functioning of the supporting institutions. In a recent case, the Supreme Court affirmed that for playing a song in a public event, the organizers are required to pay royalty only to the music recording company and not to the lyricists and music composers of the particular song (Pooja Shree 2016). In general, Indian IPR framework is more pro-people, interpreting liberally the international guidelines. The copyright law amendment, 2012, extends better access rights to visually impaired. In another contentious issue, that of high cost of textbooks for students of poorer countries, a recent judgment of the Delhi High Court has created a worldwide interest. The Court dismissed the copyright infringement petition, initiated by three leading publishers, against a photocopy shop that catered to the needs of Delhi University students.

Only after 2012 Amendment, it is worth discussing special problems of folk music. Earlier, the Indian Copyright Act did not contain any provision for the protection of folklore or expressions of folklore. Those who utilized or exploited expressions of folklore for commercial benefit were not obliged to provide any compensation to the owner communities. In a joint effort, WIPO and UNESCO had prepared in 1982 a Model Provisions for National Laws on the Protection of Expressions of Folklore. Several African countries, as well as Sri Lanka, Indonesia, Philippines, and China framed their National Laws to regulate the use of folklore creations and to provide protection in the framework of their copyright laws. India did not make any such effort.

So theft of folk music continued brazenly in India. From the beginning, famous music composers of Hindi films have taken popular compositions, made or did not make even minor changes in notes, and claimed full credits as the composer and copyright holders. In music, borrowing of a folk music style and its incorporation into a musical work belonging to a completely different style is known as sampling. This too is common in Indian films world. Folklorist Komal Kothari, founder of Rupayan Sansthan in Jaipur, began suing music directors of Hindi films for infringement of copyrights. One of the famous cases was about the superhit *Nimbooda Nimbooda* song in the film *Hum Dil De Chuke Sanam* released in 1999. It was Ismail Darbar's debut composition. Kothari brought out that the song was actually composed by a little-known folk singer, Ghazni Khan Manganiyar. Its original Rajasthani version was even recorded in a private album. The worst part, Kothari said, was that the Manganiyar could not sing his song any more for he was required to take permission¹ and perhaps, even pay royalty to the music composer of the film, for singing his own song (Patil 2001). But nothing could be done. Hindi film music got automatically registered with the Indian Performing Rights Society (IPRS). It was expected to take care of protecting the intellectual property rights of the composers. IPRS was not required to take note of any prior art, nor was there any similar body to protect the rights of folk artistes.

¹This is not true. But people know so little about the working of IPR systems that such apprehensions are quite common. A similar case is discussed in Yoga case study.

As in other areas, in copyright of music too, rights are effective only to the extent encroachments are monitored, challenged, and checked. The copyright societies provide such specialized services, along with royalty collection and distribution on behalf of the client musicians. For music, there were two such societies in India, covering all different neighboring right holders: IPRS representing composers, lyricists, and publisher members and the Phonographic Performance Limited (PPL) for controlling public performance and broadcasting rights for its members. There were several allegations of mismanagement and corruption against these societies. IPRS had a miserable record of service to its members. Its annual income was hardly Rs. 40 crore. Similar organization in Brazil had an income of Rs. 1,825 crore (Forler 2017). The Amendment also addressed the issue of transparency of these societies. In 2014, the IPRS surrendered its license to operate as a legitimate copyright society when it came under investigation by two separate arms of the government. Thereafter, its bank accounts were seized by the Enforcement Directorate. The global system of royalties collection and distribution is regulated by the Paris-based nonprofit International Confederation of Authors and Composers Societies (CISAC). CISAC expelled the IPRS for one year for not meeting most of its Professional Rules (Forler 2017). However, there is some good news. By the time, this manuscript is finished IPRS seems to have reorganized, re-registered and is hoping to function again, and function better.

Under the 2012 Amendment, the performers are entitled to receive royalties in case of making of the performances for commercial use. Also, they can assign the right to receive royalties to either his/her legal heir or a Copyright Society for collection and distribution. This led leading artists including Lata Mangeshkar to form a copyright society, which could collect and distribute the royalties for them. The Indian Singers' Rights Association (ISRA) received recognition as a copyright society in June 2013. It is too early to know whether the ISRA or a revamped IPRS will extend their membership to folk musicians as well. If they do they have to consider a few additional points.

For some of the folk music, the artists can be identified. But there are certain musical forms that cannot be readily or rightly individualized. Tribal music may be a good example. Under the leadership of Ram Dayal Munda, former Vice Chancellor of Ranchi University who was also a leading regional music exponent and a political activist, the political self-governance movement also became a cultural emancipation movement. He declared *nachi se bachi*, meaning 'dance to survive,' which became a highly inspiring slogan for the people of that region. Dance in their understanding was also music, history, and many other heritage. In an interesting article, Babiracki (2000) captures Ram Dayal Munda's implicit differentiation between the community's own understanding of music and the idealized notion of external world about folk/tribal music. Analyzing Bhojpuri folk songs Sinha (2013) brings out that different sections of the society, like age- and gender-based groups, have different genre of folk songs. Assigning community rights as a whole may jeopardize this arrangement. Similar problems were faced by some other countries. In folklore of Ghana the author of a popular tune known as the 'spirit of voice' could not be identified. In their copyright law, the authorship in such cases vests with the Republic of Ghana.

This permitted the copyright office to sign an agreement to use the traditional music even though the author was unidentified (Lawal-Arowolo 2011).

What exactly do the folk singers themselves feel? There are different positions. In a field study in Malwa and Bikaner, Kumar et al. (2011) found that the folk music market was dominated by local individuals and businesses, who used low-cost recording devices to obtain recordings from live performances and sell them at low cost to interested listeners, almost always without permission from the musicians. As a result, well-known folk musicians whose audio cassettes and CDs were already in demand lost a substantial portion of their potential earnings. However, musicians were ambivalent in their opinions about piracy. Although they perceived it as unfair, they still considered that spreading the word of the great poets and saints from the folk traditions were important. In spite of being piracy, wider distribution of music extended the popularity and fame of many musicians. This could be an opportunity for increasing the remuneration for musicians through live performances—even for upcoming musicians who are not already well known (Kumar et al. 2011).

Several other studies made similar observations. Folk artistes that Patil interviewed (Patil 2001) felt that they did not consider it harmful if some of their music was popularized in films since they were all concerned about keeping the traditional arts alive. Athira (2015) found that the artistes were happy for the popularity gained. They were being invited to high-profile weddings and mega events. Some of them were collaborating with renowned musicians in India and abroad and have worked in movies as well. “I have worked with A. R. Rahman, Sivamani and Ghulam Ali. And then I also played at Abhishek Bachchan—Aishwarya Rai wedding ...,” said one of them. Evidently, even without a copyright, the folk musicians may find wider popularity through the modern media propagating their music. But this is possible only if they are acknowledged for their contributions. Athira rightly thanked the efforts of late Komal Kothari, since it was he, not the pirate film directors, who introduced the folk artists. But such stray attempt by individuals and small organizations are not enough.

The restrictions imposed by IPR in general and copyright in particular may breed very adverse results. Some of the extreme cases were noted by Allen (2011). Martin Luther King Jr.’s famous “I Have a Dream” speech delivered on August 28, 1963, has an iconic significance in civil rights movement. However, it is almost impossible to hear the record of that speech even after fifty years. King’s heirs have a long history of taking legal action against others who use the speech, including TV stations, newspapers, and documentaries, though not against the educators. In an anthology of modern Irish writings, pages devoted to James Joyce were removed because the Joyce estate demanded such a hefty fee that the publisher could not pay. Back at home, we experienced the Vishwa-Bharati University zealously guarding copyright of all Tagore publications for many years. One could not use a Tagore composition in a film without inviting the wrath of Vishwa Bharati. When its copyright was about to expire, the university lodged a FIR against two publishers for bringing out selected collections of Tagore’s works. In his lifetime, Tagore had assigned copyright of all his works to Vishwa Bharati to finance the university when it was a private effort. But after independence it was made a national university and was flooded with fund with

little need of earning from sale proceeds of Tagore's works. The copyright expired after December 31, 2001. Within a short time, there appeared in market several sets of Tagore's works at a much cheaper rate. Many scholars took up translations of Tagore's famous works. In a powerful critic, Hyde (2010) argues that IPR restrictions imposed on community-based knowledge endangers creativity.

While it is necessary to stop piracy, its use may go to the other extreme of eliminating creative use. Hyde did not reject copyright system altogether but asked for careful designing so that creativity too is supported. Summarizing the current state of the debate around copyright Klein et al. (2015: 128) suggest that open discussion to bring in perspectives of all stakeholders is necessary for formulating a meaningful copyright policy. Similarly, Seeger (2009) feels that even sampling may not be questionable provided the musicians do not behave indifferent to community value and dishonor the folk respect for that music. When Bob Dylan was accused of plagiarism it was dismissed on this ground. No doubt Dylan established American folk music to a position of pride. Among some of the finest example of combining creativity with respect for folk musicians is that of Tagore's treatment of Baul songs. He repeatedly used Baul music for tuning his songs, but with so much care that the Bauls themselves named him Rabi Baul, as one of them. At the same time, Tagore not only acknowledged but campaigned globally for the community which was at that time, considered lowly in social hierarchy. He wrote about this community:

The Baul cult is followed by householders as well as homeless wanderers, neither of whom acknowledge class or caste, special deities, temples or sacred places.... They never enter any temple. They do not set up any images of divinities, or religious symbols, in their own places of worship or mystic realization.... Devotees from the lowest strata of the Hindu and Moslem communities are welcomed into their ranks, hence the Bauls are looked down upon by both.... What need, say they, have we of other temples, is not this body of ours the temple where the Supreme Spirit has His abode? The human body, despised by most other religions, is thus for them the holy of holies, wherein the Divine is intimately enshrined as the Man of the Heart. And in this wise is the dignity of Man upheld by them. (Tagore 1931: 208–209)

Tagore identified Baul philosophy as that of Upanishad. He also promoted Baul mela, the annual fair of Bauls where the rustic Bauls came to interact with global visitors. Slowly, they learnt to interact with the wider society through their songs. Thanks to Tagore's efforts folk singers from the community are now welcome to many national and international gatherings.

Another exemplary use of folk music with respect for folk musicians is the works of legendary playwright Habib Tanvir. Tanvir used folk music extensively but also brought folk musicians to limelight. One of his great finds from within the crowd was young Teejan Bai. Years later, the Pandavani maestro was felicitated as a Padma Vibhushan.

I quote here at length a comprehensive account of the problem by Mudgal (2001), one of the passionate opponent of music piracy: "It is perhaps only in the shelves of music stores, or in the chapters of books on music that ... categories remain clearly demarcated. Elsewhere, in the actual practice of music, there is and has always been liberal give and take, borrowing, lending and adaptation. More than ever before, mixing, matching, sharing, blending, adapting, fusing, collaborating and experimenting

is the order of the day much to the chagrin of the purists and traditionalists who prefer to forget that the ability to adapt and absorb from diverse influences has always been a principal characteristic of Indian music.... (But) can a non-musician appropriate without due acknowledgment that which belongs to a community or a lesser-known musician and churn out an electronic version, rearranged or remixed in order to disguise the original, and pass it off as the original?"

Shalini Ayyagari, who recently studied the Manganiyars, made a very interesting observation. She found that a group of Manganiyar musicians visiting Berkeley were selling music cassettes of other Manganiyar musicians and using that proceeds for their personal expenses. In this, their behavior was no different from most other Indians, who do not realize that this is improper and unethical. But during their live performance in Berkeley, the same Manganiyars were showing very high ethical standard. They were careful to tell the audience when they were performing a non-Manganiyar song, or to name a Manganiyar musician who originally made a particular song well known (Ayyagari 2013). Theirs was in sharp contrast to the callous attitude shown by the music director of the Bombay. A website for tracking "Inspirations in Indian Film Songs!" (ItwoFS) argue that Darbar did not do a bad adaptation. He made the folk song Nimbooda an excellent dance number. "All he had to do was to add a note of credit to the original composer of the song, Rajasthani folk singer Ghazni Khan Manganiyar, ... Its a pity that he decided to pass it as his original composition" (ItwoFS u.d.).

Many young singers are also aware of this problem. Jyoti Sinha, a leading authority of Bhojpuri folk music, has built up a collection of 3,000 traditional Bhojpuri songs. She is hesitant to deposit the collection to an agency without being certain that those will not be misutilized. In 2015, All India Radio started a project for conserving India's folk legacy and heritage. A plan was made. AIR has organized a number of workshops (PTI 2015). But thereafter, little is heard of it. Officials do not seem to be well informed to assure the collectors of proper use. Rajnigandha Shekhawat, a young Rajasthani folk singer told, "The concept of picking up a folk song, using it in a film with minor changes in notes, and claiming composer credit and copyright, is exactly like a foreigner registering copyright for discovering medicinal properties of neem or haldi or yoga and then saying that anyone using these needs to pay him royalty! ... The right thing to do is to say 'traditional' in credits, but most composers are fairly shameless or brazen in admitting that their supposedly original composition is a popular folk song from Rajasthan, Uttar Pradesh, Bengal or is a thumri, raag, bandish or something else, that was composed ages ago by a talented unknown artist and has survived the test of time. The more I learn about Indian and Western classical music and folk music, the more I discover how composers of Bollywood, from the beginning, have taken popular compositions and added their own name instead of giving credit honestly" (Shekhawat 2014).

Way back in 1981 Rajasthani folk singer Rehana Mirza sang a song *Anjan Ki Siti*. In 1992, Anu Malik too had set the same folk song in Alka Yagnik's voice for the Jeetendra, Jaya Prada starrer, *Maa*. There was no mention of Rehana Mirza's record knowingly or unknowingly. Recently, poet and writer Ikraam Rajasthani rewrote this song for 2014 Sonam Kapur starrer *Khoobsurat*, sung by Sunidhi Chauhan and

Resmi Sateesh. Almost immediately, charges were levelled as that this new one was a copy of Anu Malik song. When asked, the Khoobsurat team informed that they not only knew about the 1981 record, they actually tried to get Rehana Mirza to sing a part of it. But she was too old. So the team bought the right to reproduce, which, in the conventional Bollywood mode was unheard of. Apparently, Sonam Kapur, the lead actress, too had checked the status of the song. She strongly resented the accusation (Shukla 2014; Bhattacharya 2014). Such healthy attitude shown by the younger generation of artists, directors, producers, and others makes one optimistic about the future of Indian folk music.

6.3 Built and Tangible Heritage

Lord Macaulay, the architect of English education in India was also a historian. In 1940, he popularized a ghastly crime supposedly committed by Siraj ud Daulah, the last independent Nawab of Bengal. In 1756, the Nawab had attacked the Fort William of Calcutta to teach the defiant merchants of the English East India Company a lesson. While the senior staff of the Company left the scene, an officer named Holwell remained in charge and was captured by the Nawab's men. Later, he wrote an account of his leadership qualities in the face of supposed brutal treatment of the prisoners. By his claim, 146 British prisoners were dumped by Nawab's men in a small cell of the Fort without food, water, and air. Only 23 of them survived. After a couple of years, when the Company came to rule, Holwell erected a monument on that site at his own expense to commemorate the 'Black Hole' incidence. But his story did not make much impression. There were many flaws. For example, the cell size was too small to hold as many people. No official record of the Company in that period had even a hint of such an incidence. In a few years, the monument was demolished, the story forgotten, until Macaulay revived it eighty years later. He was followed by a couple of other colonial historians, and soon the Calcutta Black Hole story was an integral part of all Western history texts on India. In 1902, Lord Curzon, the Viceroy of India, built another obelisk and named it Holwell Monument (Mukherjee 2006; Chatterjee 2012). It stood there for years justifying colonization of a barbarous country and crediting colonialists for ending the despotism of brutal rulers like the Nawab. Quite naturally, the nationalist movement raised strong objection to such derogatory image creation. In 1940, Subhash Bose led the agitation for the removal of Holwell Monument. It was removed to an obscure place.

Curzon was the infamous Viceroy who partitioned Bengal and the famous person who started modern conservation works in India. The importance of his contributions can be understood from the following story. Writing about Indian sculpture and painting Havell informed that in 1830s the Governor General Bentinck decided to demolish Taj Mahal and sale its marble. The plan failed because the first auction was not a success, after which all further sales were canceled (Spear 1949). The story depicts the sad state of affairs. Taj Mahal was one of the many architectural masterpieces that was uncared for, vandalized, and was about to crumble. In absence

of a clear policy, tangible heritages like Taj were always vulnerable. If not Bentinck, some other Viceroy might have made a comparable attempt and that would be the end of the architectural masterpiece. By consolidating the Archaeological Survey of India (ASI) in 1902, Lord Curzon established the practice of conservation as a definitive choice for such monuments. And at the same time, he excelled in advocacy of colonialism by suitably defining Calcutta black hole myth as an item of heritage. This is the unfortunate truth of modern heritage conservation practice in countries like India. It is, at the same time, essential for containing decay of old architecture and promotion of Western Civilizing Mission. The role of cultural heritage as a constitutive dimension of different civilizing missions has continued from the colonial era to the present. Colonial imperatives have now transformed into universal values that are promoted by global intergovernmental agencies like UNESCO through its programs like World Heritage agendas (Menon 2003; Falser 2015).

Western interest in Indian built architecture can be traced back to 1784 with the formation of the Asiatic Society in Calcutta. After the establishment of direct rule, in 1861 the Archaeological Survey of India (ASI) was established to undertake a systematic survey of monuments. Modern conservation in England began as a part of the Arts and Crafts Movement in the 1850s. Leading figures of the Movement like William Morris and Philip Webb propagated a culture of old building conservation and defined a notion of authenticity in preservation. In England, the Society for the Protection of Ancient Buildings was formed in 1877. The influence of the movement reached the colony. Curzon formalized conservation practice in India. John Marshall, who joined as the Director General of ASI in 1902, brought out in 1923 a Conservation Manual. Without their initiatives, old structures would not have remained intact either in England or in India. But they maintained some philosophical distinction in shaping of modern conservation for free England and for its Indian colony. If not as blatant as in the case of Holwell Monument, the colonial and even the later conservation works of global bodies like the UNESCO, unwittingly reflect how different politics and differential understanding of art and design taint the culture of heritage conservation in India and the West (Menon 2015). A less severe critic like Mitter (1992) suggests that the Western appreciation of Indian art and architecture was mediated through power relations as well as their own cultural and philosophical orientations.

For example, the restoration project of Taj Mahal by Lord Curzon did not stop at repair and maintenance. The heritage site was also modified as per Curzon's notion of beauty and heritage design. Being led by the stories of Arabian Nights, Curzon commissioned a large lamp in the interior chamber, modeled after one in a Cairo mosque. He also remodeled the garden of Taj Mahal going by the aesthetics of British landscape design (Herbert 2011: 197–226).

In his important study of 'Indian Muslim architectural heritage,' Ahmed (2014) shows that heritage sites were chosen to fit the dominant colonial notion of India's past—as a battleground of two religions. Muslims portrayed as foreign invaders were alleged to have targeted the Hindu religious places of worship. Monuments were to give credence to this characterization. So, in colonial depiction, cultural heritage became communal heritage; preserved structures with artistic and historical values became 'protected monuments'.

At present, the ASI has under its charge about 5,000 monuments and archaeological sites of national importance. State Departments of Archaeology look after another 4,000. But these numbers are too few in comparison with those in Britain. Britain has over 5,00,000 listed buildings, of which approximately 30,000 are considered Grade I. The State of Uttar Pradesh, which has roughly the same area as the UK, has only 863 ASI protected monuments and 91 State protected monuments (Menon 1989, 2003). The limited extent of heritage identification leads to a third kind of criticism. The British had only limited interest in preserving the heritage of the colony.

Realization of problems like these led to gradual reorientation of heritage-related activities in post-independence India. Initiatives for these came from unconventional sources. The ASI, the government agency in charge, intensified its works but made little change beyond the same old colonial era routine. There was not much addition on their list of heritage sites even after several decades of existence in free India. But peoples' understanding of their heritage was fast changing. On the one hand, movements like that against Calcutta Black Hole monument had begun to challenge the colonial concept of monuments. On the other, through the nationalist movement people began to identify their alternative heritage, both intangible and tangible. Article 51A was added to Indian Constitution in 1976 to accommodate some local concerns and global protocols in different fields. One of the tasks (point f) specified under Fundamental Duties is "to value and preserve the rich heritage of our composite culture." UNESCO's first Heritage Convention was adopted in 1972.

The Constitutional Amendment precipitated different initiatives outside the ASI. In 1977, Anthropological Survey of India established a 'National Museum of Man' in Delhi. Later, the museum was shifted to Bhopal and was renamed Indira Gandhi Rashtriya Manav Sangrahalaya (IGRMS). How does a country's past become its 'national heritage'? And whose history is counted as part of this heritage? This is the fundamental issue of heritage politics in race theory infested depiction of civilization in the era of imperialism (Littler and Naidoo 2005). IGRMS effectively began by addressing this fundamental question of heritage politics. They explained 'the rich heritage of our composite culture' began with first human settlements and their evolutions through the ages. But how can these be displayed with due regard for their values and ways of preservation? The museum refrained from designating 'experts' to pick up exhibits and started without any collection to display. Instead, they introduced an innovative method. Local communities and local people were drawn in to act as curators, narrators, and teachers of their own cultural heritage. The open air and indoor exhibitions of IGRMS were built with active involvement of traditional artisans and experts drawn from different community groups. The roles of museum professionals were restricted to supporting and mediating these activities (Bhatnagar 1999; Guzy 2016; Basa 2016: 478–479). Now the museum represents the evolution of Indian people and culture in different climatic zones through the earliest dwellings and cave paintings to lifestyle, technology, and cultures of folk and tribal communities, their beliefs and practices and so on. Along with the Indigenous Community Museums of Oaxaca, Mexico (Hoobler 2006) and post-Apartheid

community museums of South Africa (Corsane 2004), IGRMS, the initiative taken by the Anthropological Survey of India, stand at the forefront of new museum movement.

In 1984, a group of art lovers came together in New Delhi to establish the Indian National Trust for Art and Cultural Heritage (INTACH), a membership organization, with a desire to work for heritage awareness and conservation in India. They had a mission but no clear notion about how exactly to pursue the mission. Western countries had developed their own models for their own countries. Wisely, INTACH decided to learn from those but not to replicate the same. India needs her own concepts of heritage and conservation. They made a concerted effort to understand the indigenous practice that was used through the ages for taking care of the architectural heritage of the country (Menon 2003). Through their efforts at this stage, the professionals working for INTACH gradually developed a meaningful agenda. In 2004, INTACH released a Charter for the Conservation of Unprotected Architectural Heritage and Sites in India. They declared that INTACH would work toward integrating indigenous building and maintenance practice—as they exist in the ‘living’ heritages of India, with the modern practice of conservation (Menon 2015). This is a significant departure from colonial and global conservation philosophies, which accept that traditional customs and practices need modernization. INTACH Charter recognizes that the knowledge of Master Builders, called *Sthapatis*, *Sompuras*, *Raj Mistris*, etc., who continue to build and care for buildings following traditions of their ancestors, constitute a unique resource. The term ‘heritage’ as used by INTACH covers not only man made structures such as buildings and monuments but also craft and cultural heritage. They consider the symbiotic relationship binding the tangible and intangible architectural heritage of India as one of the traditional philosophies underpinning conservation practice.

Programs of INTACH are diverse. One of its main activities is listing—identification and documentation of the cultural heritage throughout the country. Till date, about 54,000 heritage resources in 150 cities and towns have been listed by INTACH by its 31 chapters spread across the country. Activities range from conservation of prehistoric monoliths in Cumbum Valley of Tamil Nadu, to restoration of the house of Madhusudan Das, the architect of modern Odisha, to conducting heritage walk for school children through an unfinished temple site in Chandrapur District of Maharashtra, or drawing a tourism development plan for Arunachal Pradesh. The organization involves people on an extensive scale to care for India’s common heritage. In 1998, the Heritage Education and Communication Service was established to create awareness among different target groups. In 2007, United Nations Economic and Social Council granted INTACH special consultative status.

Who should define the past? Kanshiram, the founder of Bahujan Samaj Party, initiated research on alternative accounts of national movement by unearthing the glorious contributions of persons from the untouchable castes and communities like Uda Devi, Jhalkari Bai, Lakhan Pasi, Bijali Pasi (Narayan 2014: 120–145). Wider recognition followed. The postal department issued a commemorative postage stamp on Jhalkari bai. During her party’s rule in the State of UP, a supportive Chief Minister, Mayawati built monuments and statues of dalit leaders. Many other parties criticized the work as wastage of public fund. But after coming to power, the BJP government

not only sanctioned fund for maintenance of these memorials but also decided to install alongside statues of great personalities belonging to other castes (Financial Express 2017). But wider acceptance is only one side of the story. Struggle for defining heritage is a long drawn process. A typical example is that of repeated vandalization of the statues of Narayana Guru, the great social reformer who opposed casteism and many other social evils of Hinduism. Even though a hundred years have passed since then, and Guru's ideas are now inscribed in Indian Constitution, the struggle is still on to establish such reformers as parts of India's heritage.

Efforts are also continuing to admit other uncomfortable historical truth in India's heritage list. Recently, in his Presidential lecture in the seminar on Museum Movement in South India organized by the IGRMS, Professor P. K. Misra emphasized the need to set up museums showcasing social evils such as untouchability, manual scavenging, gender inequities, and oppression of minorities. Describing the slave memorials in post-imperial Britain as "A memorial that conserves memory without being conservative" Rice (2012: 233) observes, "Such memorialisation is born out of the struggle with conservative forces that prefer to bury difficult histories and born through a guerrilla memorialisation that refuses to accept the status quo." Other such museums in the world are the Holocaust memorials of Germany, Slavery Museum of Liverpool, or Tuol Sleng Genocide Museum of Phnom Penh, Cambodia.

6.4 Modern Yoga

In general, the traditional and indigenous knowledge exists to this day by meeting the current material needs of villagers of India that of its tribal and dalit population, of fisher folk, craftsmen, artisans and leather workers, their agriculture, housing and irrigation methods, medicinal knowledge, drinking water collection, arts, and culture. This was the theme introduced in the first chapter. Yoga too survived through its use by practitioners, the saints in Indian tradition, the sadhus and sanyasis. It is possible that some, not all of them, were practicing yoga. But some did, and some of them were regarded as authorities in the knowledge. Even at the earliest stage, a handful of English educated intelligentsia learnt yoga from the existing sanyasi authorities of yoga. The task was not easy. Many of these ascetics lived in remote areas of Himalayas. The other source of ancient yoga knowledge was the ancient manuscripts, collected mainly by the Asiatic Society. Earliest Western educated yoga enthusiasts were like Keshab Chandra Sen of Brahmo Samaj, Mme Blavatsky of Theosophical Society, Swami Vivekananda, Dayanand Saraswati, founder of Arya Samaj, or Henry David Thoreau, a leading American transcendentalist.

Along with the linkage formation came up the task of integrating the knowledge into modern transmission systems. There were some sporadic efforts earlier, but Swami Vivekananda is the first major proponent of yoga for the masses. His teaching lessons of yoga in USA between December 1894 and July 1896 were the first well-known mass education of a subject that was once learnt mostly from ascetics residing in remote parts of Himalaya. His booklet on Karma Yoga, published in February

1896 in New York, was the first printed manual on yoga (Paranjape 2015: 22). Thereafter, there were several other luminaries who designed the ways to bring yoga to the modern institutional system. They are like Aurobindo, founder of Pondicherry Ashram; Paramahansa Yogananda the author of spiritual classic 'Autobiography of a Yogi'; Sri Yogendra, the founder of India's first modern yoga center followed by Swami Kuvalyananda, Swami Sivananda, T. Krishnamacharya, B. K. S. Iyengar, to name a few. Transmission systems have since then developed into missions, ashrams, camps, studios, and Internet-based dissemination modes. Recognizing its universal appeal, on 11 December 2014, the United Nations proclaimed June 21 as International Yoga Day. The draft resolution establishing the International Day of Yoga received overwhelming support and was co-sponsored by a record 175 Member States.

Unlike the other topics discussed in this book, yoga was not a neglected knowledge. So the issues that are worth discussing are somewhat different from the rest. We start with the question, how traditional is the modern day yoga. In their expositions, the different proponents of yoga, both ancient and modern, define it in different ways. The Vedas, the Gita, Patanjali, the Buddhist, Vedantic, Shaivite, Tantric, or Sufist explanations differ in many ways. Integral to Bengal stream of Sufism was Islamic adaptations of Tantric yoga practices (Hatley 2007). The modern proponents and interpreters, who often trace their expositions to one or the other school of ancient thoughts, differ. Today, yoga is seen predominantly as a spiritual act, a way of meditation, or a health and fitness culture. Though less common, yoga has also been expounded as an occult science, a science of increased sensuality, even a method of heightening sexual pleasure. While supporting the proposal on yoga, the President of the sixty-ninth session of UN General Assembly, Sam Kutesa emphasized, "For centuries, people from all walks of life have practiced yoga, recognizing its unique embodiment of unity between mind and body. Yoga brings thought and action together in harmony." However, the UN Secretary-General Ban Ki-moon described Yoga as: "Yoga is a sport that can contribute to development and peace. Yoga can even help people in emergency situations to find relief from stress."

Why yoga was so widely accepted all over the world? Let us review the explanations given by some analysts. Vivekananda's explanation of religion as scientific was well in agreement with his construction of yoga as the core of Hindu spirituality, devoid of temple worship and ascetic exercises to create supernatural powers. Vivekananda also sanitized yoga of its tantric sexuality and made it acceptable within Victorian morality (Veer 2014: 168–191). However, Sociologists like Alter (2006) argue that in spite of being a Hindu spiritual exercise, yoga is so widely accepted because yoga represents a paradigm shift in the historical development of religious consciousness. The role of god in yoga is 'comparatively small' if there is any. Yoga is thought to be the very antithesis of ritual. "It is that which is capable of taking one out of *samskara* (ritual), on the one hand, and *samsara* (the flow of phenomenal existence), on the other" (Alter 2006). While this is true, explanations may differ on which one is ritual and what is an exercise. Differences in subjective opinions become a controversial issue when yoga is conducted in groups, a form which is being more and more common. Recently, there was a debate in India whether the *Om* (*Aum*) chant should be dropped during the official celebration of International Yoga Day on June

21, 2015. The department of AYUSH decided to refrain from making any reference to the chant in the common yoga protocol it prepared for this occasion, in order to keep the event free of controversy (Vishnoi 2015). In another case, Mumbai Municipal Corporation made yoga along with *Surya Namaskar* mandatory during their morning prayers for students studying in the civic schools run by the local body. A municipal councilor filed a PIL in the Bombay High Court arguing that Surya Namaskar was opposed to the fundamental concept of Islam and was therefore a violation of the fundamental religious rights of students studying in Urdu medium schools. Mumbai High Court declined to grant an interim stay suggesting that this is just forms of exercise which is good for a healthy body and the move need not be communalized (Bhattacharya 2016).

A possible reason for yoga's global popularity is that there is no alternative form of physical exercise that can be done freehand, by young and old alike and in wide variety of locations. Modern gym, like its forerunner the Greek gymnasium, is not a freehand exercise. So is Kalaripayattu. Freehand physical fitness like wrestling, boxing, karate, taekwondo, tai chi, or muay Thai are primarily martial arts. Their mental and spiritual aspects are integral to martial arts training. Aerobic and zumba are late introductions. So yoga had no parallel. In an era where common masses too can aspire to have physical fitness, yoga along with aerobic and other fitness programs has become very popular. These are widely disseminated through modern mass media and are commercially successful. By creating AYUSH department in 1995, the Ministry of Health and Family Welfare categorized yoga as a health and physical fitness program. But depicting yoga as only a physical exercise undermines its intense spiritual side. The spiritual side of yoga too, is in great demand, particularly among managerial and entrepreneurial class. Yoga's global popularity is no less due to its exercise of mind. "Across America, students, stressed-out young professionals, CEOs and retirees are among those who have embraced yoga, fueling a \$27 billion industry with more than 20 million practitioners—83% of them women" (Gregoire 2013). While this statement shows its popularity due to its spiritual aspect here is another article that shows the popularity of yoga from fitness perspective. Painter (2015) informs that a survey, from the Sports & Fitness Industry Association, says more than 24 million US adults practiced yoga in 2013, up from 17 million in 2008. That makes it roughly as popular as golf. No wonder that such an extent of commercialization attracted opportunism and corruption. Its massive popularity makes it a happy hunting ground for the cheats.

Traditionally, yoga students had to undergo initiation (*diksha*) followed by extensive training under a guru, often in remote exclusiveness. Vivekananda did away with the formal initiation process for his lectures on yoga in USA in 1894. Today, yoga is learnt by masses using modern means. Guidance and teaching are as in modern education and training systems. More recently, IP instruments are being used widely. In the year 2006, in USA alone there were 2,315 trademarks on yoga, 150 yoga-related copyrights, and 135 patents on yoga accessories. Patent applications on yoga mats, devices, and other apparatus have been filed in many countries including Russia, Taiwan, Canada, and China (Srinivas 2007). Most of the yoga-related patents claim to be 'innovations' like that they make yoga easier to perform. Many books, CDs, and

DVDs on yoga are covered by copyrights (Srinivas 2007). Those have created a kind of scare. People wonder whether a patent or a copyright holder can seek royalties from another person for performing a traditional yoga asana in public or private. We conclude this section by describing one relevant case.

Bikram Choudhury, the founder of Bikram Yoga, was born in Kolkata, India, and moved to California in 1970s. He made a roaring business in yoga. Claiming that he has developed an improved form of yoga with special merit, he was demanding license fee for its use. In 1979, Bikram Choudhury wrote a book, *Bikram's Beginning Yoga Class*, wherein he described a sequence of 26 yoga poses and two breathing exercises arranged in a particular order, naming it 'Sequence'. In 2002, Choudhury filed for copyright for his sequence. He claimed that his sequence constituted a copyrightable compilation of material because he exerted specific skill and labor in the selection and assemblage of the *asanas* into a specific sequence (Duke University u.d.). As was in the case of Manganiyar folk music, claims like this make common people afraid of what may happen. Seeing this, in 2003 some yoga practitioners, yoga studios, instructors, and legal professionals challenged Choudhury's claims in court. But for some unknown reason, within two years they came to a mutually satisfying resolution of differences, letting Choudhury to persist on his claims. Whatever might be the undisclosed reason, this case reinforced the fear and made everyone else apprehensive. Several parties rushed to copyright their version of yoga, even for defensive reason. Indian government began to consider seriously whether entering yoga asanas in TKDL can prevent its misappropriation.

In 1994, Choudhury started his 'Bikram Yoga Teacher Training Course'. After completing the course successfully a husband-wife team floated their organization, which ran successfully in States like New York, Florida, and California. In 2011, Choudhury sued the six-year-old chain claiming that the set up was a "copy-cat yoga system" that plundered his intellectual property, accusing the defendants of copyright infringement. The US Circuit Court of Appeals in California ruled that yoga poses and breathing exercises are not entitled to copyright protection. The Judge said that Choudhury was stretching copyright protection too far. Because copyright protection is limited to the expression of ideas, and does not extend to the ideas themselves, the Bikram Yoga sequence is not a proper subject of copyright protection. Although there is no cause to dispute health, fitness, spiritual, and aesthetic benefits of yoga, including Bikram Yoga, they do not bring the Sequence into the realm of copyright protection (Gershman 2015). The verdict shattered Bikram's business model. Hundreds of Bikram franchise owners, who paid fees to use his sequence, noted that other studios will be able to utilize that process and teach the same classes without paying any fee. It may discourage others to try similar nefarious models for vandalizing the open access benefit-sharing model of yoga.

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Chapter 7

Miscellaneous Other Uses



Abstract There are many applications of traditional knowledge in various other fields. We discuss two examples from two most advanced spheres of modern knowledge. Many people in India believe that NASA scientists use Sanskrit for artificial intelligence studies. After explaining the source of this misinformation, we discuss in this case study, the actual state of affairs. Panini's rule-based Sanskrit grammar is indeed, being studied by several leading computational linguists as a valuable guide in linguistic research. The second is application of traditional knowledge is in climate change adaptation, a task recognized in the Paris Agreement. We list some important examples of ongoing works of this nature in India.

There are many application of traditional knowledge in various other fields, even to the most advanced spheres of modern knowledge. We discuss two of these. The first is the use of traditional knowledge in artificial intelligence studies. The second is its application in responses to climate change.

7.1 Sanskrit and Artificial Intelligence

In 1947, Isaac Asimov published a short story titled 'Little Lost Robot'. In a space laboratory, robots help scientists in their work. On one occasion, a pre-occupied researcher lost his temper and swore at robot Nestor, 'get lost'. Obeying the order literally, the robot got lost. In a space laboratory, the simple way to get lost is to hide one's identity among the identical looking other robots. Nestor, with its intelligence, reached this solution for getting lost. That did not create much problem for the scientists immediately. But then, the earth office traced that the batch of robots, which produced Nestor, was defective, so much so that they could become threats to human. So the space laboratory received a new lot of robots as replacement and was asked to deactivate the old ones. But Nestor had been instructed to get lost. So it began to imitate the new batch and made it impossible to find this old robot. The

story goes on to describe how the puzzle was solved by another scientist. But that is not relevant for us.

This is what is known as ambiguity of natural languages. A very common expression in natural language, 'get lost' has a completely different meaning for computers. Ambiguity is just one of these; natural languages have many other complexities. During the early days of artificial intelligence (AI) research, considerable effort was given to designing unambiguous representations of natural languages to make them accessible to computer processing. But the efforts were frustrated. That led to a widespread belief that natural languages were unsuitable for the transmission of many ideas unambiguously. Thereafter, AI researchers were focused on trying to construct artificial languages that could be used in AI so that computers would not have to deal with the ambiguities of real languages. In 1985, Rick Brigs of NASA Ames Research Center, California, wrote a paper titled 'Knowledge Representation in Sanskrit and Artificial Intelligence' for the Association for the Advancement of Artificial Intelligence. This article suggested that a highly structured natural language, Sanskrit might be useful. He substantiated his suggestion by using some examples from Panini's Sanskrit grammar and theories of verbal cognition (*shabdabodha*), showing their applications in artificial language (Brigs 1985).

In India, some people believe even now that NASA accepted Sanskrit as the ideal language for computer science. There is nothing even remotely right about this. Brigs proposed a hypothesis that was worth testing. Scientists make such intelligent conjectures discussing among themselves imaginative lines of future inquiry. Also, Brigs did it as an independent thinker, not as a spokesperson of NASA. Other scientists felt some alternative approaches were more promising, and Brigs' suggestion never became the official policy of NASA. That a scientist felt it may have application for robotics certainly speaks a lot about this ancient language. However, Brigs was not the only one to have a very high opinion about Sanskrit, and for definite reasons. It is better to learn about these and stop making incorrect claims that cause more harm than simple ignorance.

Panini might be one person or a whole school. He wrote or compiled a grammar for the type of Sanskrit language that existed a few centuries before the Christian era. The grammar consists of a little over 4000 rules and is known as *Astadhyayi*. It is surprising how such a fine work could be composed at that early date when the system of writing was not yet well developed. Panini's work became known in Europe through Franz Bopp, a nineteenth-century German linguist, who established the importance of Sanskrit in comparative studies of Indo-European languages. Thereafter, it influenced several leading modern linguists. In the Preface of his edited book Staal (1972: xi) wrote: 'Panini was ... treated even by linguists as an object of Indological investigation, not as a deceased colleague of great genius. This view has not always been predominant, however, and today, for reasons that will be sketched here, it is once again beginning to change. It is now generally recognized that Panini, despite his exclusive preoccupation with Sanskrit, was the greatest linguist of antiquity, if not of all times, and deserves to be treated as such. Accordingly, linguists, dissatisfied with mere lip service, are beginning to turn to him and to the Sanskrit grammarians, just as logicians turn to Aristotle.'

For example, European linguist Ferdinand de Saussure is considered to be one of the two most influential modern linguists. A professor of Sanskrit himself, Saussure acknowledged influence of Indian grammar on some of his ideas. Leonard Bloomfield, an American linguist, was one of the founders of structural linguistics in the 1930s. Bloomfield described Panini as ‘One of the greatest monuments of human intelligence’ (cited in Kiparsky 1994: 2923). In the Preface (p. v) of his pathbreaking book ‘Aspects of the Theory of Syntax’ Noam Chomsky acknowledged ‘Panini’s grammar can be interpreted as a fragment of such a ‘generative grammar,’ in essentially the contemporary sense of this term’ (Preface, v).

What is so interesting in Panini’s grammar that even Chomsky considered it as of significance? Noting that children acquire language skill by learning just a few uses Chomsky suggested that there are ‘generative principles’ of language that are innate to the human mind. Children learn these principles and then apply on a wide variety of situations. This means that there are generative rules for language that are common to all human languages. Such rules, therefore, would constitute ‘universal grammar’. Panini’s grammar was of this nature. In an interesting article, Subhash Kak (1987), a Professor of computer science, explained that Chomsky’s theory imply, ‘... that it should be possible to find Paninian grammars for English and other modern languages. A development of a Paninian-style grammar would then involve a search for generative rules and meta-rules.’ There are grammars in other languages too. But they do not show how to generate even simple sentences. There is some ‘unconscious knowledge’ that makes it possible for a speaker to ‘use his language.’ This unconscious knowledge is what generative grammar must render explicit (Krishnamachari 2015). Panini’s ancient grammar does exactly that. In their book introducing natural language processing, Bharati et al. (1995) compare Paninian grammar framework with Western computational grammar framework. Their work provides a good introduction to natural language processing for both Indian and non-Indian natural languages.

Like the human, machines too have their ‘innate’ language. They understand only binary signs like 1 and 0. Thus, in the first generation, or machine language, instructions were given in strings of 1s and 0s. In 1950s, the first languages faintly resembling English (e.g., ‘FOR’, ‘PRINT’, or ‘GOTO’) were developed. Soon they developed into the well-known FORTRAN, ALGOL, Lisp, and COBOL. These are called the third generation or high-level languages because they use English-like statements and symbols. Each high-level language was developed to fulfill some basic requirements for particular type of problems and have evolved into many other languages. At the first World Computer Congress in Paris, in 1959, John Backus presented the syntax and semantics of an international algebraic language which was later called ALGOL (Algorithmic Language). It was simplified by Naur and came to be known Backus–Naur form. In 1967, Ingberman claimed that the grammar of Backus–Naur form has significant similarities to Panini’s grammar rules (Nijholt 1988: 207) and should be called Panini-Backus form. However, Gérard Huet, an experienced computer scientist and a leading researcher in computational linguistics in Sanskrit, rejects the claim as unsubstantiated and misleading. He goes on to say that such claims ‘add confusion to the debate around the actual contribution of

Panini to formal computation and information theory besides linguistic modeling.’ ... ‘Actually, even if it is far-fetched to recognize a context-free grammar description in Panini’s grammar, it is a fact that many formal description mechanisms are explicit in the Astadhyayi. For instance, external sandhi operations are defined by sutras of a standardized form which may be unambiguously decoded as algebraic rewrite rules’ (Huet 2016: 53–54).

It is true that compound formation like *sandhi* operations may be unambiguously expressed in algebraic form. But such practices as sandhi actually make the language difficult to understand for people at present. Sanskrit scholars have always been aware of this. Thus, Staal (1972) goes on to write in the same preface that we mentioned earlier, ‘Panini’s insights about language are disguised in his metalinguistic analysis of Sanskrit in Sanskrit.’ Echoing the same feeling two recent scholars, Arjuna and Kulkarni (2016: 22) write that such expressions are typically exceptionally long, and people today find it difficult to understand these long expressions. The two scholars therefore prepared a semi-automatic computational tool to analyze and represent such linear strings in the form of diagrams. The conceptual graph brings in more clarity thereby helping in understanding the relations between various components of a composition.

The operationalization of ‘if-then’ statements of logic through computer languages, that guided computers to choose between two alternatives, was the first step toward enabling computers to emulate the decision-making ability of human beings. While early machines had only simple logical alternatives to choose from, later AI systems were designed to provide answers to more complex problems. These were called rule-based expert system (RBES), able to replace human experts. However, application of RBES required exhaustive details of the domain of decision situation, which were expensive, and often impossible to get. There was no learning facility built in. This led to an alternative reasoning paradigm and computational problem-solving method called case-based reasoning (CBR). CBR is a machine learning technique where the database used for reaching a solution is not exhaustive. The solution of a new problem (case) is attempted by using a database of old problems. The performed case is then added to the database (learnt). In many real-life problems, people are guided by their past experiences. They use a decision process for arriving at the solution of a new problem on the basis of the solutions of previously solved similar problems which are identical to CBR. Thus, here too AI emulates human decision-making process. Studying CBR by human mind, therefore, can lead to designing better AI. In his recent works Ganeri (2003, 2012: 30–39) shows that ancient Indian logic, as exemplified in Nyaya Sutra, is an informal logic of case-based reasoning.

The problem of ambiguity in a natural language was recognized long back in the Indian grammatical tradition. This led Indian logicians to develop Navya-Nyaya or New-Nyaya for expressing communications in an unambiguous way. ‘Ordinary Sanskrit is regarded by Navya-Nyaya as an imperfect vehicle for philosophical discourse’ (Ganeri 2008). The technical language developed by the Navya-Nyaya school rapidly became the standard idioms for academic works in Sanskrit. There are different types of ambiguities, e.g., lexical ambiguity, structural ambiguity, semantic ambiguity, and pragmatic ambiguity. In process automation, there is a need to auto-

matically generate the work-flow instructions without any ambiguity. A robot should be capable of understanding natural language instructions and should be able to differentiate whether the actions are to be done in an optional or concurrent manner. It should also be able to distinguish between the concurrent instructions and sequential ones. To address such needs, Srinivasan and Parthasarathy (2016) provide a classification scheme for natural language instructions following Mimamsa school of philosophy. Instructions that occur in day-to-day life were classified computationally into different types like negative injunction (*nisedha*), injunction setting forth result (*phalavidhi*), injunction enjoining reason (*hetu-hetumadbhava*), instruction indicating a sequence (*srutikrama*), mandatory (*samuccaya*), and optional instructions (*vikalpa*). The classification was done using natural language processing techniques for a set of 400 instructions concerning kitchen recipes and car maintenance. On comparing with other approaches of extracting procedural knowledge from instructional texts, they found that their Mimamsa-based approach was more exhaustive.

Panini's Sanskrit grammar deals with many dimensions of language: phonology, morphology, morpho-syntactic, semantic, etc. Here we introduced the current state of research on two types of issues. Scholars are working on several other issues (Huet et al. 2009). The theme of the 103rd Indian Science Congress held at the University of Mysore in January 2016 was 'Science and Technology for Indigenous Development in India'. The program included a Presidential lecture on indigenous and emerging technology for mitigation of India's water crisis; invited lectures on indigenous livestock uses in Nilgiri biosphere reserve, faunal biodiversity and its associated traditional knowledge of district Kannauj, and several papers like traditional technological knowledge in animal sciences, fisheries science during the Buddhist period, indigenous knowledge of the Kunabis of Kand with its relevance for sustainable development, etc. But then, there were two invited lectures. One was titled, 'Lord Shiva: As a Greatest Environmentalist in the World,' and the other 'Blowing of shankh—an indigenous tradition for fitness and wellness.' One speaker did not turn up. The other one began his presentation by blowing a conch for two minutes. He followed this up by claiming that the sound of the conch could eliminate key disorders afflicting humankind (Varma 2016). All hell broke loose. The newspapers made mincemeat of Indian scientists and Science Congress. This is the pattern of events that happen at almost all the meetings and discussions proposing to discuss India's traditional knowledge. Just a few aberrations draw widespread attention for negative reasons and discredit everyone associated. The Sanskrit grammar case is no different. It also shows that in spite of this danger of being ridiculed, a group of scholars are still working quietly and capably to bring out the current importance of traditional knowledge.

7.2 Climate Change and Traditional Knowledge

United Nations Framework Convention on Climate Change (UNFCCC) is one of the three legally binding conventions introduced at the Rio Earth Summit in 1992. The

original agreement was about procedure for further action to arrive at binding limits on greenhouse gas emissions. Till then, there was not much in-depth understanding of the details of climate change so as to negotiate a treaty about commitments. By 1995, countries launched negotiations and after two years of discussion, adopted the Kyoto Protocol, legally binding countries to emission reduction targets. Many developing countries including India and China were exempt from any binding target. Using this as a plea, USA refused to ratify Kyoto Protocol and was followed by Australia. In turn, the refusal by such major emitting countries hardened the stance of the developing countries. Being unable to bring USA to terms, the countries that had made binding commitments in Kyoto first round became increasingly piqued about the concessions made to the developing countries, particularly to India and China. At this point, the Eighth Session of Conference of the Parties was held in New Delhi in October 2002. In his inaugural speech, the Prime Minister Atal Bihari Vajpayee forcefully brought out the major lacunae of the orientation of climate change program. Reminding the members of the recent poverty reduction commitments made in the UN Millennium Summit and at the World Summit on Sustainable Development at Johannesburg, he asked the members not to overturn that agenda by insisting on reduction in greenhouse gas concentrations in the atmosphere by the countries whose actual contribution to creating climate problem are very little. Instead, he proposed an agenda of combining the two by paying adequate attention to the concerns of developing countries on vulnerability and adaptation issues in the convention process. He said,

Food and nutritional well being are priority issues for all of us. Agricultural sustainability is one of the key areas related to adaptation. Water conservation is another. Weather-related economic losses and deaths have grown significantly over the last few decades. There is a need for strengthening the capacity of developing countries in coping with extreme weather events, which are increasing in frequency and severity due to climate change.

Many countries, who wanted to pin down developing countries were not pleased. But the arguments won. Along with emphasizing that mitigation of greenhouse gas emissions to combat climate change continues to get high priority under the provisions of the Convention, the Delhi Ministerial Declaration also adopted that at the same time ‘urgent action is required to advance adaptation measures.’

Five years later, Pielke et al. (2007) wrote that in the first two decades of climate change discussions the mere idea of adapting to climate change was treated with the same distaste that the religious right reserves for sex education in schools. Al Gore, vice president of the USA, had declared in 1992 that adaptation represented a kind of laziness. But finally, the taboo was lifted. Adaptation gained parallel importance to mitigation in Paris Agreement (2015). By then, the works done during the interim period had brought enough clarity about the important ways for climate change adaptation. It was realized that traditional knowledge is a major resource for this part of the program. For the first time, the Paris Agreement clearly brought traditional knowledge in climate change action, via adaptation. The Article 7.5 of Paris Agreement runs as follows:

Parties acknowledge that adaptation action should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous

peoples and local knowledge systems, with a view to integrating adaptation into relevant socioeconomic and environmental policies and actions, where appropriate.

India is one of the most vulnerable countries. Govt. of India in its first report to UNFCCC in 2004 identified that the major impacts of climate change (UNDP, u.d.a) would be felt as:

1. decreased snow cover, affecting snow-fed and glacial systems such as the Ganges and Brahmaputra,
2. erratic monsoons with serious effects on rain-fed agriculture, peninsular rivers, water, and power supply,
3. decline in wheat production by 4–5 million tonnes with as little as a 1 °C rise in temperature,
4. rising sea levels causing displacement along one of the most densely populated coastlines in the world and threatening freshwater sources and mangrove ecosystems,
5. increased frequency and intensity of floods; increased vulnerability of people in coastal, arid and semi-arid zones of the country; and
6. shift in forest types for over 50% of India's forests, adversely impacting associated biodiversity and regional climate dynamics, as well as livelihoods based on forest products.

In 2008, the government released a National Action Plan on Climate Change. Adaptation finds a place, though it might be too early to expect any mention of traditional knowledge in the document. However, the relations between traditional knowledge and coping strategy had started appearing, long before the explicit recognition given in the Paris Agreement.

Early in the morning, on 26 December 2004, a massive tsunami struck the Indian Ocean regions. While reporting about the estimated damage on January 8, 2005, the Ministry of Home Affairs of India announced that five out of the six tribes (Onges, Jarawas, Sentinelese, and Shompens) in Andaman and Nicobar Island were safe. Only one, the Nicobaris suffered; as many as 1151 of them lost their lives and 5580 reported missing.

Similar was the case of many other island tribes in other countries struck by tsunami. How did they predict and took timely precaution? This has raised global interest. Recently, *Indian Journal of Traditional Knowledge* brought out a special issue (IJTK 2011) on indigenous and local people's detailed knowledge, practices and beliefs in relation to environmental change, particularly weather anomalies and climate change. The collection of research papers in that issue describe the use of varieties indicators like plants, animals, fish, and other living organisms, their movements, flowering behavior. by tribal and local people in different parts of India to predict disaster. As we have already indicated, in ancient India, folk practitioners' pragmatic knowledge were often codified as *shastras*. While researching on methods of locating groundwater and metallic ore deposits, late E A V Prasad, a geologist, did valuable research on the use of bio- and geo-indicators in ancient scripts like Varahamihir's *Brihat Samhita* (Prasad 1980, 1986; Prasad et al. 1987).

The tsunami also affected the long coastline of Peninsular India. More than ten thousand people died. After immediate relief works, the post-disaster rehabilitation problems came up. Nagapattinam district in deep south was one of the worst-affected areas. The fishers lost both lives and means of livelihood. Farmers too suffered severe loss. Coastal agricultural activities were badly affected by seawater inundation. A study of agronomic rehabilitation needs by M.S. Swaminathan Research Foundation (MSSRF) observed that traditional knowledge played a vital role in mitigating the localized problems (Thamizoli et al. 2006: 12). In some villages, farmers could recall that seawater intrusion and deposition of sediments from the sea have occurred also in the past. They had a fairly good idea about how to cope with it. The villagers differentiated the incidents, based on the types, whether intrusion was of seawater alone or seawater with sand or clay deposits. Farmers knew how to reclaim land of each type. But in those villages where similar deposits occurred for the first time, the farmers were not confident how to proceed (Thamizoli et al. 2006: 12–13).

The MSSRF team recommended several salt-tolerant varieties of paddy. One of these was a traditional variety *kuzhivedichan*. This variety—short duration, drought tolerant, resistant to moderate flood, was still widely cultivated and hence available as paddy seed. The team was able to record around twenty-seven flood and drought-resistant landraces in different micro agro-climatic zones all along the Nagapattinam District coast. Out of this, they noted, several landraces were already out of cultivation. The team noted, ‘Immediately after the Tsunami, there has been widespread recognition for the traditional varieties which are vital to such vulnerable ecosystems. Of late, due to the introduction of high yielding varieties of paddy, the area, as well as the number of genotypes under traditional landraces is gradually declining. In certain pockets, the communities tested the high yielding varieties, but reverted to the cultivation of traditional landraces’ (Thamizoli et al. 2006: 21).

During the same time, another organization, Centre for Indian Knowledge System (CIKS) was working in Nagapattinam area. CIKS was established by a scientist couple—A.V. Balasubramanian, a molecular biologist, who decided to work on country’s traditional knowledge while pursuing his doctoral work at the USA, and K. Vijayalakshmi, who did a pathbreaking doctoral work about use of spiders as biocontrol agents. The Centre, founded in 1993, works on biodiversity conservation, organic agriculture and Vrksh-ayurveda (Vrksh—plant)—traditional knowledge about plant health and plant treatments ranging from biopesticides, seed treatments to methods for yield increase. As an immediate measure after tsunami, CIKS did some short-term relief works at their field office at Nagapattinam and simultaneously started working for amelioration of the long-term impact on coastal agriculture. With the help of the nearby Agricultural University, soil testing and soil mapping of the affected area was done. Experiments were conducted to find the performance of different rice varieties in the tsunami-affected land. Finally, they came to the conclusion that land affected by tsunami could only accommodate certain traditional varieties. Through these works, they realized that conservation of a large genetic pool to draw upon in times of disasters like tsunami is a very important task. In a recent publication, FAO make similar observation:

Plant genetic resources will be vital in adapting crop production to the effects of climate change. Diverse species, varieties and cultivation practices allow crops to be grown across a wide range of environments. Over 10,000 years, diverse genetic resources have enabled farmers to adapt to gradual climatic changes and to other shifting demands and pressures. Traditional crop varieties are well adapted to current conditions in their local production environments. The challenge for the future is to maintain a good match between crops and production environments as the effects of climate change increase. Crop wild relatives will be a key resource in meeting this challenge, as their genes can promote resistance to many of the environmental stressors associated with climate change. (FAO 2015: 12–13)

FAO also argues (FAO 2015: 16) that the past efforts at conservation of plant genetic resources had focused mainly on *ex situ* conservation. But lately, it was being recognized that a complementary approach, involving both *in situ* and *ex situ* methods, has advantages. In a painstaking effort over the last two decades, CIKS has collected more than 100 indigenous varieties of rice suitable for cultivation in Tamil Nadu. The *in situ* method of conservation they practice requires planting of all these varieties year after year. Also, each variety needs to be conserved in more than one region so that they are not destroyed due to the vagaries of climate. In some cases, the organization could access only a few grains of seeds of a rare variety. Those were cultivated with great care and propagated. CIKS is conserving these indigenous varieties in its experimental farms in Kancheepuram district and Nagapattinam district. They explain that in public interest, this large genetic diversity needs to be conserved. As a participatory move, recently CIKS has launched an innovative scheme inviting persons and organizations to adopt a traditional rice variety. CIKS also promotes organic farming, which they argue is the most suitable for traditional varieties. Balasubramanian (2017) explained that sustainable agriculture of this kind meets both the goals of climate change agenda—mitigation and adaptation.

From climate change, India expects increased frequency and intensity of floods. In the case study on housing, we have already discussed the use of TK for earthquake resistant houses. Unfortunately, little has been done in India on flood disaster-proof house designs. In the subcontinent, however, there is an acclaimed work. Following the devastations of repeated flood of 2011, 2012, and 2013 in Pakistan, Yasmin Lari, a leading architect, came out to help the NGOs in post-disaster reconstruction. Her designs based on vernacular techniques were taught to the affected communities to Build Back Safer. Thereafter, the people themselves built above 40,000 shelters in the flood ravaged region using locally available resources (Lari 2014). Additionally, not a single tree was fallen in this effort.

DHAN Foundation has related their works on tank irrigation with climate change. The area they work is semi-arid and tank irrigation is rainfed. Building resilience there among the small farmers, to ensure food and water security by augmenting traditional irrigation tanks, easily qualifies as a Climate Change Adaptation program. A half of India's forests are likely to experience adverse impact on associated biodiversity. Thus, along with overexploitation climate change impact too is a looming danger on the endurance of medicinal plant species. Most of the medicinal plants of India, including red-listed species, are being conserved *in situ* in hundreds of MPCAs

established by FRLHT. These can be closely monitored and action taken quickly for any adverse impact of climate change.

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Chapter 8

Conclusion



Abstract The notion of traditional knowledge that emerges from the case studies shows that the hierarchic division is rooted in existing power structure of the society. Knowledge exclusion may happen again and again, though it may appear with some different names. The task of bridging the gap will remain there in all differentiated societies. The case studies not only establish the importance of current set of programs but also show certain limitations that need attention.

What is traditional knowledge? In the first chapter, we explained this by tracing the historical roots of the division. Now, at the end, we may try a conceptual meaning. The first point that strikes is that all those knowledge with tradition are not labeled 'traditional'. Though they have very long tradition, Greek philosophy, Sanskrit grammar, and yoga are not dubbed 'traditional knowledge'. Similar are the cases of agriculture and medicine with one distinction. The terms 'traditional agriculture' or 'traditional medicine' are in use, to single out certain types from the general. The noun form is always used to induce pride, awe, confidence in a proven practice or entity, for reasons both progressive and oppressive. But the adjective form 'traditional' connotes only negative features like antiquated, unchanging, obsolete. Thus, ancient knowledge of cosmetics is now marketed as a 5000 years of tradition. But 'traditional cosmetics' are unfashionable. Tank irrigation, a proven technique, has a glorious tradition. But it is labeled 'traditional irrigation' to endorse ignorance and indifference about the proven system still in use.

We could include only a few case studies. They show that far from being obsolete, in several spheres, the use of traditional knowledge is sensible. Our introductions to each chapter show how numerous are valuable applications of traditional knowledge in each category. To what extent are such knowledge archaic and unchanging? Knowledge evolves. Tangible heritages such as monuments are static. So are other expressions of knowledge. But the knowledge per se is not static. It does not only express itself again and again but also evolves. Indeed, it is impossible to fossilize individual or community knowledge sealed from being influenced by experience, environment, learning by doing, and internal evolution. Consequently, expressions differ over time showing constant evolution. Even the quintessential symbol

of unchanging tradition, Sanskrit language, has been changing. Latter day scholars considered Panini-Patanjali's Sanskrit as imperfect. 'Ordinary Sanskrit is regarded by Navya-Nyaya as an imperfect vehicle for philosophical discourse' (Ganeri 2008). The last great Nyaya author of pre-colonial India, and also its most refined exponent, Gadadhara lived in the seventeenth century (1604–1709 C.E.).

How much did Indian traditional knowledge and its expressions evolve in the past? Let us consider the case of traditional food that is so culturally unique and is a hallmark of tradition. Restaurants specialize in authentic regional food. But how traditional was grandma's kitchen? Gupta (2012: 41) shows, 'Much of what passes for Indian food today ... is composed of foods native to the New World (South America): chilies, potatoes, tomato, maize, groundnut and cashew. Fruits such as pineapple, papaya, cheeku, guava, etc, have also found their way into the culinary cultures and eating habits of South Asians, who regard most of these products as part of their inherited traditions.' Potato entered Europe and Asia only around 1600 A.D. Three centuries later, it has become an essential ingredient of Indian food of all regions.

Potato, tomato, chilies, and other items introduced later are not only eaten regularly but are also examined by common folk for their effects on health and disease. Sujatha (2007), Unnikrishnan and Hariramurthi (2012: 280–282) explain that in such examination people use Ayurvedic principle, *dravya guna* that provides the basis for comprehending and addressing aspects such as health, disease state, drug materials, diagnosis, or disease management. Folk people are 'always examining new resources and their medical properties.' Even eucalyptus, introduced in India by Tipu Sultan (Handa et al. 2002), is a plant for medicinal use in medical folklore (Unnikrishnan and Hariramurthi 2012: 280–282). Also, recall Laurie Baker's appreciation of the traditional knowledge of ordinary village people (*lok vidya*) making livable everyday buildings using locally available materials and simple tools. It seems that in the past there was an easy transmission between shastras and local practices, between codified (scripture based) knowledge and medical/structural folklore. Both Gandhi and Nehru wrote that there was extensive education in India, in both Hindu and Islamic rule. What was the content? Did the people learn and apply only Ayurvedic and similar non-European analytical categories? Jaipur Raj (1688–1743) sponsored translation of Euclid's geometry and Napier's logarithms for enriching the Shilpa shastra of India. Thereafter, dissemination of Western knowledge occurred more easily. Is there any ground to assert that folk people learnt only about chilies and potatoes, not more fundamental aspects of Western knowledge? Banarasi saree makers started using chemical dyes; toy makers of Channapatna began to use woodturnery. Farmers switched to high yielding varieties from the indigenous ones. Did they become 'modern' or remained 'traditional'?

We were not selective in choosing our examples. Very few activities remained insular. Some readers may feel that the term 'modernizing' may be better suited than traditional. But this is not a matter of individual choice. The division exists not only in popular perceptions but also in the functioning of many modern institutions. Further, it is not innocuous. It exerts peer pressure for rejecting certain knowledge and promoting certain others favored by the dominant elite. Our historical introduction

in the first chapter shows how the division was created in late colonial and immediate post-independence period and escalated thereafter. The examples show how the knowledge capital acquired by depressed communities over time were undervalued, their applications thwarted, spread discouraged, how theft was made easy by denying legal protection. The traditional–modern dichotomy of knowledge is the instrument of legitimization of social and economic exclusion of colonized people, indigenous communities, depressed castes, and on the basis of gender, religion, ethnicity. Lately, several agencies have realized this and its consequent loss. They are trying to rectify. The present-day segregation may wither away in time if we succeed in rehabilitating the neglected knowledge at par. But the awareness must always be there. In future, human society may again breed knowledge segregation by creating another sphere of marginalized knowledge. Instead of ‘traditional knowledge,’ it may get another name. But the task will be similar, bridging the gap and abolition of all hierarchic divisions within hard-earned human knowledge.

Current global agenda—to respect, preserve, and promote these once neglected people and their knowledge, is a struggle against social and economic exclusion. It is to be followed up by give and take at ethical terms. The global community stands to benefit by getting access to local traditional knowledge. The agenda reminds that the knowledge owners too must receive adequate share from the consequent benefit. Unfortunately, fairness in benefit sharing is often understood as sharing a substantive part of the financial benefits of development of traditional knowledge. This is essential but not enough. Implicit in such a narrow approach is that outsiders alone are to develop local traditional knowledge; a tacit imposition of ‘unfreedom’ of Sen. Development consists of the removal of various types of unfreedoms that leave people with little choice and little opportunity (Sen 1999). In the Knowledge Age, wealth lies not simply in accessing own and other people’s knowledge but also in the ability to produce new knowledge and to benefit from this creation, culturally and economically. Failing to accept the capacity of the marginalized people for creative work and restricting their participation in global culture and commercial markets frustrates development as freedom (Sunder 2007). The marginalized owners still apply the so-called traditional knowledge not just routinely but also creatively. It is improper to demand from them to be eternal custodians, preserving biodiversity, traditional knowledge, and traditional cultural expressions as these exist now. The people who continuously learn, constantly change, and use their imagination and creativity cannot be commanded by agencies to be only curators. Any modern development plan using traditional knowledge should solicit their participation at all levels. Their creations should be part and parcel of the modern knowledge. This is the challenge of ethical benefit sharing.

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