Contents

Acknowledgement

I have earned the gratitude of several institutions and individuals while pursuing this study. The enormous patience by colleagues at WIPO has to be appreciated at the outset. It is true that the goals of this study did get transformed during this period and that required some extra effort. However, the incorporation of many more issues and perspectives may have added to the relevance of this study. Readers will have to judge whether justice has been done to various viewpoints and perspectives adequately.

The objectivity in social sciences is suspect. Only thing that a researcher can honestly do is to make one's biases explicit. Readers would find that I am quite biased in favour of defending the intellectual property rights of creative individuals and communities. The only resource in which poor people are rich is their knowledge. Fourteen years ago when Honey Bee Network started, it became obvious to us that the IPRs of the peasants had to be protected. This sentiment has been expressed for last thirteen years on every page of Honey Bee newsletter. And this was much before TRIPS or CBD had created popular consciousness on this subject. I am aware of lot of critics who believe that IPRs are instruments of control and domination by large corporations. That might have been the case. However, I am convinced that with suitable improvements and substantial changes, IPR system can serve the interests of creative people all around the world. I also believe that the Linux philosophy does provide a fruitful way ahead. If people use a particular knowledge for their own livelihood or survival, the inventor should not object. But if somebody tries to commercialize an innovation, then licensing must be obligatory. Just as we have researchers exemption in Plant Variety Acts, we may have to have survival exemption in the patent laws.

Mr.Shakeel Bhatti, Mr. Richard Owens, Dr.G.Jaiya, at WIPO deserve particular thanks for considerable support during this study. Comments and suggestions from Shakeel were most valuable and in many cases have added enormous value to the quality of the study. There is no doubt that without his constant prodding and helpful chidings, this study would not have been completed.

I must thank large number of creative people and professionals, community members and elders I met in Mali, Nigeria and India. The senior researchers at University of California, Davis were also very helpful.

I plan to send a copy of this study to all the individuals who collaborated in this research and request that a summary in local language be sent to the community members. I hope when they read this study, they would find their concerns faithfully articulated and interests earnestly defended.

I have drawn upon considerable literature review done for a study sponsored by Ministry of Environment and Forestry, Government of India, to develop a framework for *sue generis* system for protection of traditional knowledge relating to biodiversity and genetic resources.

Nigeria

Dr. Morris Iwu, the founder of Bio Resources Development and Conservation Programme provided enormous help in all the logistics for pursuing study of his very innovative experiment in benefit sharing. I must also express my thanks to Prof. Wambebe, Mr.Cosmos Obalor, Prof.Komba, Chief Dr.Omo Tosho, Mr.Kent Nnadozi, healers Mr.Alaneme Duru, Mrs.Osebi Lillian, healer Mrs.Azijah, Mr.Letusogu, farmers Mr.David Dike, Mr.Johnson Lereneous and various members of Umowere village. In addition, Katy Moran and Stephen King of Shaman Pharmaceuticals and Dr.Bankole Sodipo deserve appreciation for providing very useful insights and materials.

Mali

The case on accessing gene Xa21 became possible through extensive help of Dr Pamela Ronald, university of California, Davis who had set up the first voluntary benefit sharing fund viz., Genetic Resource Recognition Fund (GRRF). She helped me meet with different senior researchers dealing with gene bank of UC Davis, as well as others who influenced this process. Most notable was Prof Stephen Brush who has written extensively on the subject. He had helped Dr Pamela in setting up the fund. They tried to persuade the university authorities to make contribution to GRRF by researchers using third world germplasm institutionalised. That failed to work is a different mater but it was not because they did not try. Prof. Kevin M. Smith, Vice Chancellor (Research) at UC Davis was very generous with his time and arranged meetings with several other colleagues in his office. It is a different mater that I failed in persuading him to at least initiate inter-campus dialogue on this praiseworthy model of benefit sharing. I must thank Prof. Coulsett, an eminent wheat breeder, Dr. Charles Ricks and several other scientists at UC Davis who helped in getting information and insights for the study.

The wild rice from which the gene in question was taken was obtained from Mali. I must thank Dr. Bino Teme, Scientific Director, Institute of Economic Research (IER), who is in charge of agricultural research in Mali, Dr. Teme and Mr. Dond Kone, Farming Systems Research Team leader at the Niono Research Center of IER.

The stay and interaction with local researchers was facilitated largely through the hospitality of Dr M Diawara heading a Centre for Indigenous Knowledge in Mali. Dr Magassa helped in understanding the larger historical context in which knowledge systems from different parts of Mali evolved and interacted to generate niches of various kinds. I must also thank Mrs. Aisse Toure, and many other participants in the local seminar that I presented about the objectives of the study and its possible implications for international policy. Dr. M. K. Nidia Ye, Soil Scientist, and Mr. Ydounbia, Agronomist, provided additional information about *Oryza longistaminata* and deserve my thanks. Mr. S. Sala, a weed scientist, provided valuable insight about use of this wild rice as a food in the past though it is considered a weed at present. I also met many farmers such as Mr. Okesamaki, Geneva Aia Ho, Ms Aminata and her grand daughter Ms Geneba Dialli, Ms A Coulabally, and farmers of Sasrakalla, Nanco, Niano, Senawal, Musawere villages and express thanks for their kindness and patience with my questions. As I mentioned in the case, I made sure that in every village, the purpose of study was disclosed and the respondents were encouraged to ask questions about myself, my work, background, study and my life in general. It was very interesting to learn many things about cross-cultural perspectives through such exchanges.

Dr Gary Toenniessen, Director, Food Security, Rockefeller Foundation deserves thanks for answering several of my questions about the responsibility of Rockefeller Foundation in the matter.

India

Dr. Pushpangadan, Director, National Botanical Research Institute, Lucknow deserves my most grateful thanks for sharing many moments of anguish and anxiety that he had to go through while pursuing this unique model of benefit sharing with local Kani tribal community. His deep insights about various technical as well as social aspects of developing this model will need separate treatment to do justice. But I have drawn upon only the essential elements of the story here. I am also thankful to Ms Anuradha who had done an earlier case study on the subject for sharing her work. Dr Rajashekaran at TBGRI who collaborated with Dr Pushpangadan was very helpful in sharing his side of the story as well as in organizing logistics for field visit. I thank colleagues at Arya Vaidya Shala, Vivekanand

Research Centre, State Forest Department and TBGRI including its present Director, who all were very helpful in this study.

The warm understanding and interactions with Mallan Kani, and Eachen Kani and other members of their community was one of the high point of the study. Discussions with the members of Kerala Kani Samudaya Kshema Trust and residents of Kallar Mathammodhu settlement were very helpful. I also appreciate the excellent research assistance from Mr.Pradeep Singh in this study.

I am grateful to Dr R A Mashelkar, Director General, CSIR and also Chairperson, National Innovation Foundation, for sharing a very valuable communication from USPTO with me apart from many other insights in the matter. Inspirations from him have helped in sustaining the work in Honey Bee network, and making dream of National Innovation Foundation come true.

I must also thank my colleagues Ms Riya Sinha, Mr. Kirit Patel, Prof Vijaya Sherry Chand, Mr.Shailesh Shukla, Ms.Jyoti Capoor, Mr.Dilip Koradia, Mr.Vijay Pratap Singh, and many others for helpful comments at various stage of the study and evolution of the ideas presented in this study.

I have earned the gratitude of many others while pursuing this study. My secretary Mr.Baskaran had to handle hundreds of mails on the subject, and organize every detail of travel and other aspects of the internal logistics, and do so many other things all, at once and that too without any mistake. I cannot imagine completing this study without his help. In addition my colleagues Mr. R P S Yadav, Mr.Bala Mudaliar, Ms.Nisha Antony, Mr.Unnikrishnan, Ms.Kajal, and Mr.Devshibhai and several others unnamed ones deserve thanks.

I am grateful to Prof J L Saha, then Director and Prof. Bakul Dholakia, present Director, IIMA for excellent institutional support. I also thank my colleagues in SRISTI, GIAN and National Innovation Foundation for making possible every thing that Honey Bee Network has aspired for and which I proudly recall in this study.

Finally, I must thank my wife Sadhana who kept patience with my long hours at work and never once complained in deference to the claims of those who have shared their knowledge with us and but are still to get their due.

Responsibility as usual, for any inadequacy in the study remains entirely mine and I am alone responsible for any suggestions, interpretations of ideas, and imputations made to various colleagues cited or not cited in the study.

I hope that farmers, tribals and other colleagues in Nigeria, Mali and Kerala, India will feel that their faith in me when they shared their insights with me, has been adequately respected while pursuing this study and drawing various inferences.

Anil K Gupta

Abstract

Rewarding conservation of biological and genetic resources and associated traditional knowledge and contemporary grassroots creativity

Anil K Gupta

The traditions of creativity, conservation and innovation exist in various developing countries along side the continuation of obsolete or inefficient technologies and resource use practices. At any point of time, one would notice certain resource use practices continuing in almost the same form with very little change for more than a millennium, few hundred years or few decades. However, such a situation coexists simultaneously with the spurts of contemporary creativity using traditional biological and genetic resources. This creativity manifests in the traditional ways of using an existing resource with a new purpose in mind or in a modern way (that is using modern techniques or tools) for meeting a contemporary need. There has been a widespread concern that erosion of traditional knowledge is as serious a problem as erosion of biological and genetic diversity. While there are many reasons for this erosion such as expanding physical and urban infrastructure, increasing incorporation in market economies, weakening link between grand parent and grand children generation, higher emigration of youth from rural areas, faster diffusion of modern crop varieties (largely developed by public sector for public domain use during green revolution), diffusion of few biological species under monoculture in forests, fisheries, and other sectors, and reduced control of local communities on their own resources. Indifference of public policy makers in various countries towards the positive aspects of certain Traditional Knowledge Systems (TKS) including community institutions for conservation, exchange and augmentation of biological diversity have also contributed to this erosion. It is ironic that many countries complain about unfair treatment of TK and genetic resources in the international markets (and rightly so) but take very few steps to stop similar exploitation in domestic markets. In addition to these factors one factor, which contributes significantly, though not entirely is the lack of adequate mix of incentives for conservation of biological genetic resources and their sustainable utilization and augmentation. These incentives could be material or non-material, targeted at individual, groups or communities. It is my submission that a portfolio of incentives will need to be evolved, suited to specific situations and conditions.

However, in this volume we restrict to the role of one specific set of incentives dealing with different kinds of intellectual property aimed at protecting the interests of and innovations by, individuals and or communities. While evaluating the scope of existing intellectual property instruments I will also speculate on the modifications of these instruments as well as generation of new instruments and mechanisms to meet the goal of conservation, sustainable utilization, augmentation and fair and just share of benefits among different stakeholders.

Rewarding conservation of biological and genetic resources and associated traditional knowledge and contemporary grassroots creativity[1]

Anil K Gupta[2]

The traditions of creativity, conservation and innovation exist in various developing countries along side the continuation of obsolete or inefficient technologies and resource use practices. At any point of time, one would notice certain resource use practices continuing in almost the same form with very little change for more than a millennium, few hundred years or few decades. However, such a situation coexists simultaneously with the spurts of contemporary creativity using traditional biological and genetic resources. This creativity manifests in the traditional ways of using an existing resource with a new purpose in mind or in a modern way (that is using modern techniques or tools) for meeting a contemporary need. There has been a widespread concern that erosion of traditional knowledge is as serious a problem as erosion of biological and genetic diversity. While there are many reasons for this erosion such as expanding physical and urban infrastructure, increasing incorporation in market economies, weakening link between grand parent and grand children generation, higher emigration of youth from rural areas, faster diffusion of modern crop varieties (largely developed by public sector for public domain use during green revolution), diffusion of few biological species under monoculture in forests, fisheries, and other sectors, and reduced control of local communities on their own resources. Indifference of public policy makers in various countries towards the positive aspects of certain Traditional Knowledge Systems (TKS) including community institutions for conservation, exchange and augmentation of biological diversity have also contributed to this erosion. It is ironic that many countries complain about unfair treatment of TK and genetic resources in the international markets (and rightly so) but take very few steps to stop similar exploitation in domestic markets. In addition to these factors one factor, which contributes significantly, though not entirely is the lack of adequate mix of incentives for conservation of biological genetic resources and their sustainable utilization and augmentation. These incentives could be material or non-material, targeted at individual, groups or communities. It is my submission that a portfolio of incentives will need to be evolved, suited to specific situations and conditions. However, in this volume we restrict to the role of one specific set of incentives dealing with different kinds of intellectual property aimed at protecting the interests of and innovations by, individuals and or communities. While evaluating the scope of existing intellectual property instruments I will also speculate on the modifications of these instruments as well as generation of new instruments and mechanisms to meet the goal of conservation, sustainable utilization, augmentation and fair and just share of benefits among different stakeholders.

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[1] This paper draws upon an extensive literature review by the author on the subject pursued for a study for Ministry of Environment and Forestry, Government Of India, to develop a framework for *sue generis* system for protection of Traditional Knowledge related to biodiversity and genetic resources. Responsibility for the views expressed however, rests with the author and no organization with which I am related or which has sponsored this study including WIPO and UNEP, bears any responsibility.

[2] Chair Professor of Entrepreneurship, Indian Institute of Management, Ahmedabad, and Coordinator, SRISTI and Editor, Honey Bee newsletter, and Executive Vice Chair, National Innovation Foundation, Department of Science and Technology, Government of India, Ahmedabad

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Organization of Paper:

In part I of this paper I provide an overview of the context in which the benefit sharing has been tried in three specific cases involving herbal medicine and genetic resources. In section I of Part I, I provide the conceptual overview of the role of Intellectual property with in the context of social capital. I then look at the conceptual basis of traditional knowledge produced through intersection of private, common and public domain of knowledge production, and reproduction in conjunction with local biological diversity and genetic resources. I review in Section two, the recent discussion on the access and benefit sharing at intergovernmental panel under WIPO, international undertaking on plant genetic resources adopted in June end at FAO and Convention on Biological Diversity. These provide the framework for discussions on access on benefit sharing to be pursued under various fora. In Section III, Literature review is presented on the way traditional knowledge and benefit sharing issues have been addressed in different cultural contexts. In section iv, I look at the issues arising in the context of fair access and just sharing of benefits among different stakeholders.

In Part II I present the three case studies. First deals with traditional knowledge of Kani tribe in Kerala leading to the development of a commercial drug. The use of local plant was scouted by Scientists of All India Coordinated Research Project on Ethnobotany and later converted into a product, licensed to an Ayurvedic drug company by Tropical Botanical Garden Research Institute (TBGRI), and benefits were shared with Tribal Informants and community through creation of a Trust fund. Second case involves setting up of a trust fund to access the knowledge of local communities and traditional medical practioners in Nigeria through Biodiversity Development and Conservation Program (BDCP), a Nigerian international voluntary initiative and a US company to share benefits. Third case relates to cloning and licensing of a gene for disease resistance obtained from a wild rice variety found in Mali and conserved by a landless community known as Bela originating from Timbuktu region of Mali. The gene was cloned by a scientist of University of California, Davis and licensed to two companies for creating a voluntary Genetic Resource Recognition Fund to share benefits with the students from gene donating and conserving countries.

In Part III the lessons from each case are drawn along with the suggestions for future research and policy change.

Part One: Section 1
Access To Biological And Genetic Resources and associated Traditional Knowledge and sharing of Benefits

1.1. FAO Undertaking

International Treaty on Plant Genetic Resources for Food and Agriculture, adopted by the FAO Conference on 3 November 2001 provides a framework for guiding the global exchange on the subject. The traditional knowledge about the genetic resources received less attention in the final text. The preamble of the final text affirmed the farmer's rights to save, use and exchange Plant Genetic Resources for Food and Agriculture (PGRFA) consistent with the article 9 and 10 of the undertaking dealing with the farmers' rights'. On the issue of intellectual property rights dealt with in article 12.3(d), there was a considerable tension. The source of debate was the issue of patentability of components of genetic resources, which many developing countries contested. The logic that germplasm was not same as the genes constituting the germplasm was at the heart of debate. The farmers' rights were considered as measures subject to national laws. The states sovereign rights over PGRFA were recognized. The final text underlined the need for contracting parties to provide access to the genetic resources in their territories for research, breeding and training purposes excluding chemical, pharmaceutical and other food/feed industrial uses. It was to be done expeditiously and free of charge (minimum charges to cover the costs may however, be charged if necessary), with passport data available at the discretion of the developer as in the PGRFA under development; in consistence with international agreements and national laws for access to PGRFA. It was agreed that recipient will not obtain any IPRs on the genetic resources in the form in which these were received (Art 12.3(d)). On the issue of sharing benefits arising from the commercialisation of the PGRFA through public and private sector partners, it was agreed in the final text to include an obligatory requirement in the standard MTA (Material Transfer Agreement), that a recipient who commercialises a product incorporating material accessed under the Undertaking, shall pay to the financial mechanism referred in article 19.3f, an equitable share of benefits arising from commercialisation of that product, except, whenever such a product is available without restriction to others for further research and breeding, in which case the recipient who commercialises shall be encouraged to make such payment'. It has also been decided that the governing body shall determine technique available for commercial practices, 'the level, form and manner of payment, with the possibility of establishing different levels of payment for various categories of recipients; exempting the small farmers in developing countries from such payments….'. It was also recognized that modality of the sharing of voluntary benefit from food processing industry would also be explored.

After seven years of the negotiations of IU the issues of patenting of genetic material and whether genetic parts of the components are also defined as resources accessed under the multilateral system still elude consensus. We will not go into the merits of the issue here except to suggest that agreement on mandatory benefit sharing provides a constructive framework for considering the future opportunities emerging through exchange of such materials through bilateral or multilateral systems. Many viewed the technology transfer and knowledge exchange as a more important benefit for the developing countries than just the royalties reflecting the spirit of the new consensus. However, others felt otherwise. Many NGOs had felt dissatisfied with the final consensus that has been reached because they felt that OECD countries have retained their right of IPRs protection over crop seeds and their genes, as has been the practice so far. Many of these issues will be revisited in the world food summit after five years. That would be the time actually to evaluate whether the provision of intellectual property rights have improved or impeded the food security in various parts of the world through presence or absence of incentives for private capital to be mobilized for adding value to knowledge and resources.

1.2. Conceptual framework

Contested Domains of Local Knowledge: private, community and public (Gupta, 2001, Gupta and Sinha, 2001)

The domesticated genetic resources evolve under various kinds of selection pressures. These selection pressures are guided by cultural, socio-economic, gender, and institutional conditions. One of the important ways in which these selection criteria get embedded in biological diversity is the cultural preference for certain kind of taste, appearances, seasonal supplies, and other roles and rituals in which products of these genetic resources are used. The local uses of wild agro-biodiversity may provide clue to unique traits that may be very useful to scientists and breeders. I have shown that in the case of wild rice variety (*O. Langistaminata*) used for cloning gene for disease resistance in the UC, Davis Case given in second part of this paper, it was the Bela community of Mali which could have provided useful clues to the breeders. This community of landless people had known that no disease attacked this wild rice. They were dependent upon this wild rice and thus had evolved unique insights about its characteristics. For landed farmers, this wild rice was a weed, which they wanted to get rid of some how. Traditional Knowledge does not reside always with all the members of local communities but with those subsets of these or even with others (as in case of Bela people who were in migrants from north Mali) dependent upon local genetic and biological resources. The complexity of TK has to be understood properly if incentives have to be matched with contingent conditions in which knowledge systems evolve, get reproduced, validated, modified, innovated and localised or diffused widely.

The knowledge could be produced (see figure 1) by individuals, and or groups alone or in combination. Some of this knowledge may diffuse only locally to be characterised as community knowledge while other may diffuse widely among various communities in a region and some time across regions and countries to become public domain knowledge. Within the community knowledge, there may be elements which are restricted in scope or in terms of accessibility while others may be in public domain. Similarly, individuals may also produce knowledge, which they may share widely with the community and outsiders in a manner that the knowledge might become public domain. However, some of the knowledge produced by the individuals may be kept confidential and accordingly may be accessed only with restrictions. Almost in every society traditional communities have evolved norms under which certain kind of knowledge is kept confidential by individuals with or without explicit consent of the community.

Table – 1 Contested domain of Knowledge

Private individual knowledge inherited from forefathers	K1
Acquired the skill to practice it faithfully without modification	K1-wm
or with modification	K1-m
Individual rights to use the modified and unmodified knowledge	
according to same rules	K1-sr
Or different rules	K1-dr
Knowledge known to the community	K-2
Knowledge practiced by individuals if known to individuals	
Knowledge practiced by individuals if known to community	
Knowledge practiced by community if known to community	K2-c
Knowledge practiced by community even if details known to individual/s	K1-c
Known to community but not practised by individuals or community	K2-n
Knowledge known to community and accessible to outsiders	K2-a
Knowledge known to community and not accessible to outsiders	K2-na
Knowledge known to wider public through documentation or otherwise	K3

Knowledge known to wider public and practiced by only few individual	K3-I
Knowledge known to wider public and practiced by wider public	K3-P
Knowledge known to wider public and not practiced by any one	K3-n

(Own Compilation, Adapted from Gupta, 1999, Gupta and Sinha, 2001)

Contested Domains of Local Knowledge

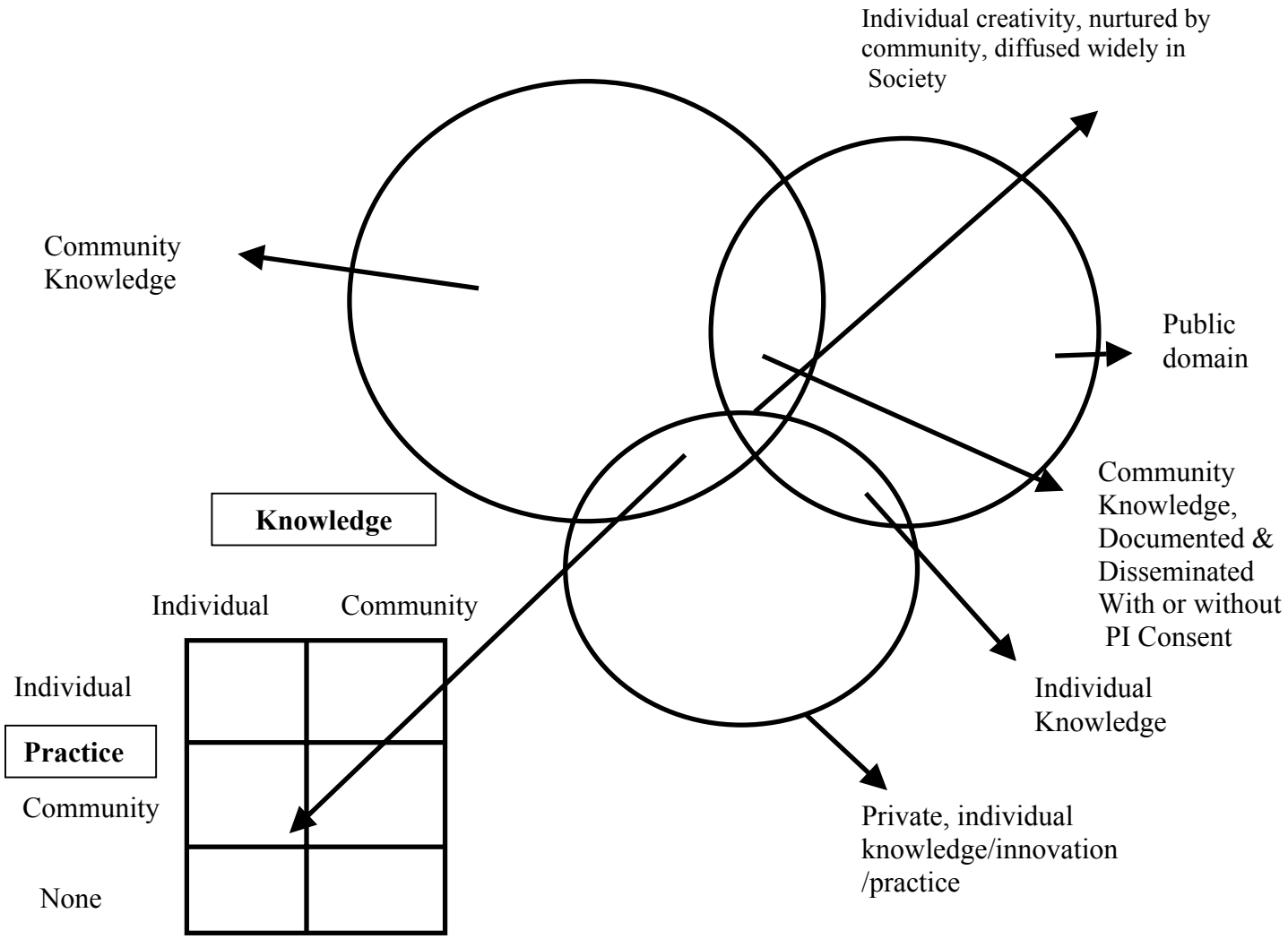

Figure 1. Source: Gupta 2001

The three subsets in figure 1 thus refer to three overlapping domains of knowledge. The contestation emerges when the producers and users of knowledge have unequal access, ability and assurances (Gupta, 1995) about the resources and the benefits emerging out of commercial or non-commercial usage of the resources with or without value addition. The private individuals may have knowledge which they may have inherited from their forefathers (K1), and they may have acquired the skill to practice it faithfully without modification or with modification (K1-wm or m, see table one). The

individual contribution in modifying traditional knowledge may be treated according to the same rules (K1-sr) as the non-modified knowledge is treated, or its use and dissemination may be governed by different rules (K1-dr). Knowledge may be known only to individuals (K1) or to the community (K2) and may be practiced by individuals (K1-I, K2-I) or by the community (K1-C or K2-C), or by none (K1-n or K2-n). In the last case the knowledge because of discontinued use may still be effective or may not be effective. When individual knowledge is shared with the community, its practice may still be restricted to individual experts. There are healers who know how to calibrate the dose and combination of herbal drugs according to the condition of the patient. The general relationship between the plants and their uses in some cases may be known to the community. The specific knowledge may not be known to the community. The experts who produce knowledge and also the contingency conditions under which this knowledge should be used may be free to share their knowledge or may not be free to share their knowledge. Emmanuel and Weijer (2001) provide example of Amish community which may restrict the right of individual members to give consent to participate in a research process. This is not an uncommon case. The communities may circumscribe the conditions under which individuals may or may not be able to share their expert or other knowledge with outsiders or even with other members of the community. There is a famous case in Australia where an art piece designed by a native individual was printed on a currency note by Reserve Bank. The community objected to such use because it argued that the individual did not have rights to assign even individually designed work to outsiders without community's permission since the art work was conceived after rituals and taboos sanctified by the community (Blackney, 2000). There are also taboos implying that a particular remedy might loose its effectiveness if revealed to others. Such a taboo leads to erosion of knowledge when such a knowledge expert dies without ever sharing the secret. The incentives for such knowledge experts to share their knowledge will bring down the transaction costs of external users now or even among the future generation to find such leads for developing various products. But if we argue about the logic of (or lack of it) rewarding current generation for knowledge that might have been partially or completely developed by previous generation, we might win the argument and lose the knowledge.

Further, community knowledge may or may not be accessible to outsiders (K2-A and K2-NA). Different communities may have varying capability to produce, reproduce and practice the knowledge for individual or common good. Wider the sharing, greater is the probability of feedback coming from larger number of people and thus improving the knowledge. At the same time the incentives for individuals to improve such knowledge may go down because such individuals in view of widespread awareness cannot extract the rent. Some communities govern the access to biodiversity resource by different rules than the access to knowledge about such resources. The knowledge with in a community is therefore not distributed symmetrically. The variability not only influences the power differentials but also the extent of efficiency gains that different members of a community make by using the same knowledge differently. The communities benefit from the individual knowledge and thereby rever the local knowledge experts or healers. But this reverence may not be the sufficient motivator to encourage young people, to acquire this knowledge and take it forward with or without improvement. There may be other factors also such as public policy, media exposure, life style changes etc., which may affect the incentives for younger people to acquire particular knowledge. The erosion of knowledge is taking place at a rapid pace also because young people do not wish to emulate their elders who remained poor though they did share their knowledge and skills generously with the rest of the society (or may be because of it). Ideally speaking, I will like generosity to increase in the world, no matter what. But is it not possible that some times we may exploit some body's generosity and remain selfish ourselves. That is what seems to have happened, in many communities. The beneficiaries of the generosity of this healers looked upon the generosity of healers as their, may be, a natural right. They did not reciprocate by providing incentives to these healers such that they could lead a better life, their children could aspire to the same comforts in life, which children of other community members aspired and obtained. Obviously I am referring to the communities, which are stratified and differentiated in term of

economics as well as knowledge. However, the point remains that the existing set of incentives may need to be modified if traditional knowledge has not only to be conserved but also augmented.

The third set of knowledge systems includes public domain knowledge (K3) which may be practiced by individuals, or wider public or not practiced by any one (K3-I, K3-P, K3-n). Ethno biologists, other researchers and firms may document individual and community knowledge and bring this into public domain. Some people have argued that even the community knowledge known only to the members of a village community should be considered public domain knowledge. However, in our view this is not a proper interpretation. From the point of view of protection of intellectual property rights, the knowledge, which is reasonably accessible, can only be considered public domain knowledge and part of prior art. Most of the time the knowledge of people is brought into public domain without the consent of concerned individuals or communities. It is obvious that this way of dealing with people's knowledge is neither fair nor just. What is even more disturbing is the dominant tendency on the part of outside researchers not to share what they have learnt from people back with the same community after value addition in local language.

1.3. Honey Bee Philosophy

Honey Bee Network has tried to counteract this tendency of making people anonymous by insisting that knowledge providers, producers and reproducers must be acknowledged explicitly and attributed as authors and communicators of the specific knowledge. We should also ensure that whatever is learnt from people is also shared with them in local language so that people to people linkages can also be established. In addition, the Honey Bee philosophy (see **http://www.sristi.org** and http://www.sristi.org/knownetgrin.html) also requires sharing by outsiders of any gain that may accrue to them from commercial or non-commercial dissemination of the raw or value added knowledge provided by the communities or individuals. Honey Bee newsletter for last 14 years has tried to propagate this philosophy through SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions) in India and 75 other countries. We strongly believe in the need for protecting intellectual property rights of knowledge rich economically poor individuals and communities. However, to provide such a protection one would have to characterize such knowledge in the manner that the novelty and non-obviousness can be established. This would mean a comparison with available formal scientific knowledge. The present instruments of IPR can provide limited help in this manner. However, with modifications these instruments can indeed go a long way in protecting the intellectual property of individuals as well as communities. The greatest advantage of this system would be that the people will have incentives to disclose their traditional and contemporary knowledge and make it available to others for learning purposes. Once this knowledge becomes a basis for livelihood, conservation, lateral learning and social networking, a knowledge society starts emerging. Once this happens the public domain provides incentives and not disincentives for individual and communities to share their knowledge after due recognition and reward.

1.4 Time Frame for knowledge production and reproduction

There are different triggers, which may lead to evolution of the solution. It could be a concurrent need, a continuing inefficiency or an episodic need, which manifest only in the period of crisis. Various triggers can generate solutions that have emerged recently i.e. in last two years, long ago i.e. several decades ago or over generations. In a complex knowledge system, blending of knowledge produced through different triggers over varying periods continually takes place. It is important that while developing intellectual property systems we recognize the fact that disclosure by people of their knowledge in recent past should not pre-empt their rights to have protection. This will require evolving a special grace period, may be of 5 years, for traditional knowledge. So that communities do not suffer for having communicated with outside researchers and institutions in good faith.

1.5 Right regimes and knowledge domains

We can understand the relationship between different kinds of property right regimes governing biodiversity resources and different kinds of knowledge domains (Figure 2). The knowledge of individuals would be based on plants in his or her backyard or biodiversity in the common land or common pond or biodiversity in public or state owned resources or in open access areas. The interaction between different knowledge domains and resource regimes needs to be studied carefully so that different kinds of incentives for conserving different resource right regimes are compatible with the incentives in various knowledge domains. In some cases new kinds of contextual and actual relationships will have to evolve. Situations become more complicated when users from one country access resources in another country. The discussions in the inter-governmental panel on traditional knowledge and IPR at WIPO provide a detailed understanding of the tensions existing among different countries on the issues of access and benefit sharing. However, the more difficult and challenging issue of providing incentive within the country for different kind of resource regimes and knowledge domains has not been adequately pursued so far.

Resources: Right Regimes and Knowledge Domains

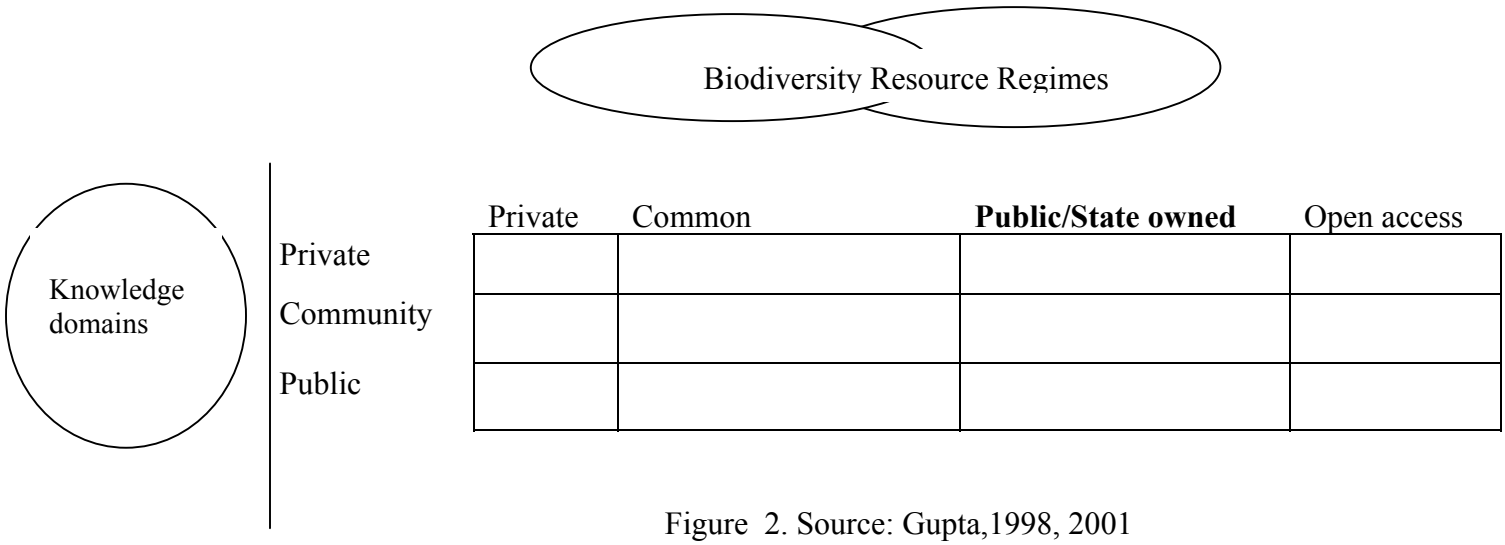

Figure 2. Source: Gupta,1998, 2001

1.6 Transition from natural capital to intellectual

The natural capital has provided the spur for economic progress all through the history, though its role has varied. The natural capital can be governed by social capital, some of which is also ethical capital (Figure 3).

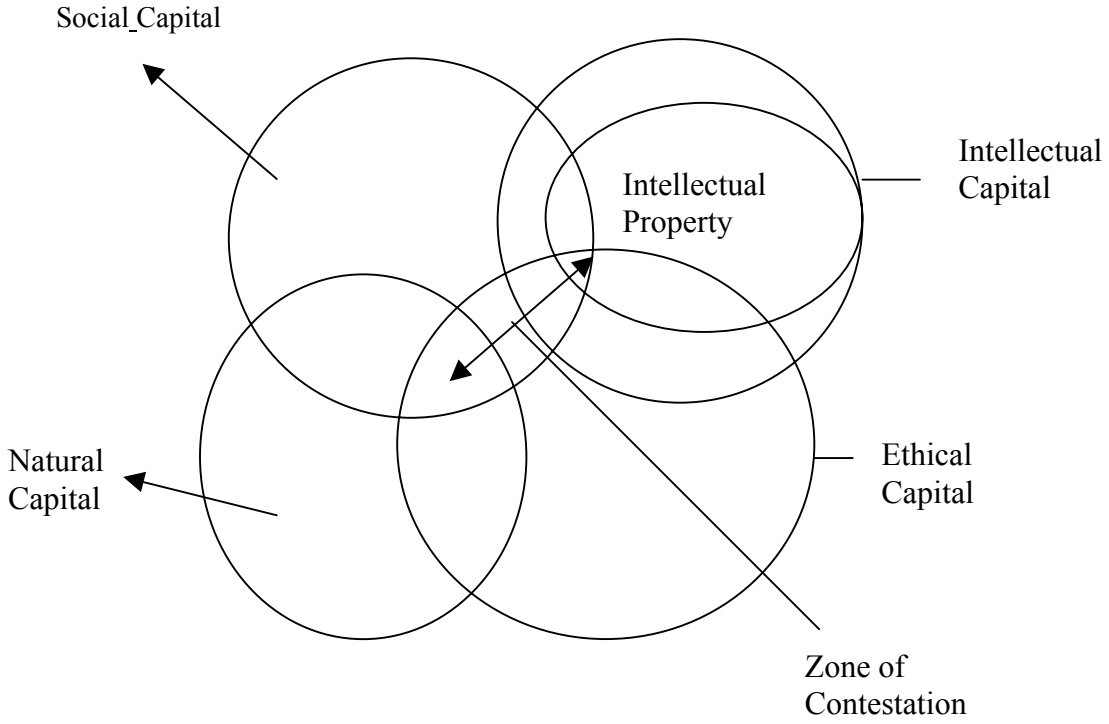

Fig 3. : Source: (Gupta 2001 own compilation)

The social capital could be defined as community based institutional arrangements, which help in conservation and reproduction of natural capital. It is essentially a trust based community capital. The ethical capital is essentially such investments and institutional arrangements that may be governed by ethical norms of accountability, transparency, reciprocity and fairness to both human and non-human sentient beings. Some of the ethical capital is a sub-set of social capital. When common property institutions follow ethical values, then the intersection of social and ethical capital takes place. Knowledge about natural capital as well as other kinds of technological and social interactions constitutes the intellectual capital, which is embodied in literature, databases, folklore and other kinds of formal and informal sources of wisdom. Part of the intellectual capital constitutes intellectual property from which the knowledge producers can exclude others for a given period of time from commercial exploitation.

The purpose of this discussion is to emphasize that intellectual property is only one means of conserving and augmenting natural resources and associated knowledge systems. Since in the absence of this kind of property it is unlikely that private sector would invest resources to add value to traditional knowledge, the discussion becomes relevant. It is not our contention that private investments can alone help in conserving resources and the knowledge systems. In fact, there is considerable evidence that expansion of market institutions has led to erosion of biodiversity as well as associated knowledge. It is more due to the fact that the traditional knowledge was not valued properly within and outside the communities than due to expansion of market alone. Once a commodity

becomes valuable, the bidders would try to appropriate it. Some critics suggests that commoditization of traditional knowledge is contrary to the local culture and ethical values. This may well be true. However, one has to appreciate that every commodity that local communities and individuals have to buy from the market place has to be paid for. It is an ironical situation that the critics see no impropriety in commoditization of rest of the market in which local communities have no comparative advantage. But in resources in which they are rich, the commoditization is supposed to be disruptive. It is also ignored many times that the concept of intellectual property is not inconsistent with community wide sharing of knowledge for self-use. Linux model provides one such template where commercial applications of open source software have to be licensed but self-use is not inhibited, so long as improvement by the users are also shared and put in public domain. It is only when somebody tries to enrich oneself at the cost of the community or individual innovator that the protection could help. Therefore the communitarian spirit, which has helped conserve resources and generate respect for nature, has to be nurtured. Our contention is that this spirit will give way when options for survival require deforestation or other resource degrading livelihood options because the resource conserving options are not available. *The knowledge based approach to livelihood, and conservation of biosphere regions can indeed be evolved without causing any injury to the local institutions that have helped in conservation so long.*

Part one: Section 2 International space: local knowledge

2.1 Debate in Intergovernmental Committee on Intellectual property at WIPO

World Intellectual Property Organization based in Geneva held the first meeting of Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (April 30-May 3, 2001) which went into various issues related to the contested domains, resource right regimes and emerging conflicts among nations. The background document (WIPO 2001) identified three shared characteristics of traditional knowledge, genetic resources and intellectual property: (a) the concept of common heritage was applied to genetic resources, traditional knowledge and folklore. However, ever since appropriation of the common knowledge has started generating private intellectual property, 'the public domain status of the material has been called into question' (b) genetic resources, traditional knowledge and folklore, "constitute subject matter which transforms and evolves beyond the logic of individualized human intellectual activity. Since genetic resources can self-replicate as living resources and traditional knowledge and folklore also evolves across individuals and generations, the intellectual property model suitable for individual creativity and intellectual property may not be suitable. Hence the suggestion for new and specific intellectual property standards and (c) each theme cuts across a range of formal and informal innovations and creative situations. The feeling has emerged that without creating cognate rights for informal innovations or similar subject matter, the informal innovations could not be protected. The concept of farmers right under FAO and plant breeders right under UPOV have tried to tackle these seemingly contradictory urges. Given the fact that much of the biotechnological research draws upon biodiversity, the tensions between different systems of knowledge are inevitable. The Background Note acknowledges the ongoing innovation and creativity within the traditional knowledge systems. In some cases the customary law protects the traditional knowledge with or without sanction of the state. The Background Note identifies contractual arrangements as the most common legal route for regulating access to genetic resource and benefit sharing. The Material Transfer Agreements are used in various sectors for exchange of genetic resources. These MTAs include process dealing with intellectual property such as (a) utilization allowed for research purpose only, (b) obligation not to file patent applications (c) provision to share intellectual property rights, (d) provisions to share royalty from intellectual property rights, (e) progeny and derivative material also covered under the

MTA conditions, (f) grant back licences obliging the recipient of genetic resources to give a non exclusive royalty free licence to the provider of genetic resource if it patents any technology derived from the provided resources and (g) obligations to defer publications till patents have been filed.

The Background Note identified the task (A1) to develop guidelines for contextual practices and model intellectual property clauses for access to benefit resources and benefit sharing, task (A2) to pursue legislative, administrative and policy measures to regulate access to genetic resources and benefit sharing, developing task (A3) multilateral system for facilitating access to genetic resources and benefit sharing. The ongoing revisions of the International Undertaking on Plant Genetic Resources for Food Agriculture are supposed to provide a mechanism for the same, task (A4) protection of biotechnological inventions and task (A5) to pursue the improvement of management systems of genetic resources by exploring methods by which the genetic resources obtained from the protected varieties are integrated into the overall plan for biodiversity conservation.

With regard to traditional knowledge, several tasks were identified dealing with the more precise definition of the traditional knowledge, the use of existing intellectual property instruments for protecting traditional knowledge, to compare and access the extent to which intellectual property rights have been obtained on traditional knowledge, identify the revision of existing criteria of integrating traditional knowledge with searchable prior art and enforcement of the rights in traditional knowledge.

The draft report3 (WIPO/GRTKF/IC/1/13/PROV, May 3, 2001) provides a rich overview of the contestation that took place in the first Committee meeting on the subject. The European Community view represented by the delegation of Sweden stated that it was prepared to engage, in a positive manner, in discussions on the question of disclosing and sharing information about the geographic origin of biological material within the framework of the patent system. With regard to the issue of Traditional Knowledge, the delegation believed that a broader scope of protection, including elements of particular interest to a number of countries, and in particular traditional knowledge, would improve confidence in the international intellectual property system.

The concept of knowledge in general was assumed to (a) evolve incrementally overtime, (b) be known to every body in the community and thus was collective in nature, and (c) passed on orally from one generation to another. Many developing countries like Malaysia and also ASEAN members have taken this view. As I have argued in this study, this view is somewhat inadequate and does not contribute sufficiently to evolving various incentives required for protecting the rights of individuals and communities. Indian delegation recognized the intellectual property as an effective policy instrument, which could be relevant for a wide range of socio economic and political concerns. It was suggested that just as intellectual property system had responded to the new issues in software and layout design, it could also address the issues that are emerging in the area of traditional knowledge, genetic resources and folklore. Government of India has taken initiative for setting up a Traditional Knowledge Digital Library (TKDL) as an electronic database of public domain traditional knowledge in the field of medicinal plants. TKDL would be accessible to all the patent offices around the world. However, the Indian Biodiversity draft Bill, 2000, provides for registration of traditional

[3] This part has been abstracted from the WIPO draft report (WIPO/GRTKF/IC/1/13 Prov.), Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore, First Session, Geneva, April 30 to May 3, 2001, pp 1-74 (excluding the annexures)

knowledge about biological resources through a registration system and development of a sue generis system. The intellectual property protection would require prior approval by the National Biological Authority, which could impose benefit sharing conditions.

The patent (second amendment) bill 1999 contains provisions for mandatory disclosure of source and geographical origin of the biotechnological material used in the claimed inventions. Likewise the same bill also includes the provision by which non-disclosure or wrongful disclosure of the knowledge used for making claims can lead to revocation of the patent granted. Provision has also been incorporated to include the anticipation of the invention made available via local knowledge including oral knowledge as one of the grounds for opposition and revocation of patents. This is a controversial provision since this could make all the oral knowledge with individual healers or herbalists as beyond the IPR protection since this would be considered as prior art. In this case, it would have been all right to restrict such pre-emption only to the widely known and dispersed common oral knowledge. It should exclude the knowledge found in a small group or with individual healer, out side the prior art framework. The Indian Act for Protection of Plant Variety and Farmers Rights 2000 recognizes the role of farmers' knowledge and efforts in the conservation of agro biodiversity and thus provides for benefit sharing and protection of traditional rights of farmers to conserve, exchange, sell and store seeds.

The Sri Lankan delegate speaking on behalf of South Asian Regional Corporation (SARC) recommended collective ownership of traditional knowledge rights, documentation of traditional knowledge and establishing systems that ensure access and benefit sharing through community funds.

The Brazilian delegation noted that existing international agreements for intellectual property rights and other policies might influence the implementation of Article 8J of CBD. They supported Indian proposal for building a database for the protection of genetic resources, traditional knowledge and folklore. Delegation of Singapore while representing ASEAN countries wondered whether one needed to develop a new concept or a model sui generis system for the protection of traditional knowledge and genetic resources and folklore. The Indonesian delegation suggested that framework of protection should deal with not only the individual rights but also the community rights. The Chinese delegation brought out that at the end of 1998 there were 1900 patent applications dealing with traditional Chinese medicine. The delegation of Zambia agreed with all those countries which recommended that protection of traditional knowledge system and innovations be brought under the jurisdiction of WIPO, and added that (existing) protection was not enough. The issue of rewarding the custodian of traditional knowledge system with fair and equitable sharing of benefits must be pursued. It recommended synergy with other similar efforts be achieved.

Japanese delegation felt that benefit sharing could be pursued even through non-intellectual property rights related instruments such as technical cooperation, human resource development, 'access fee' etc. It felt that the standing committee of WIPO should define the traditional knowledge and identify the owners of traditional knowledge. And it should also explore the extent to which existing legal framework could be used to provide protection. Traditional knowledge transmitted by word of mouth was recognized as prior art under the patent laws of many member countries. The American delegation asked whether it was possible or even desirable to establish, 'a comprehensive, uniform set of rules at the international level to govern the use of traditional knowledge and folklore'. It wondered whether an international arrangement be developed when the national arrangements had not been put in place for the purpose. The purpose of intellectual property right laws was to provide incentive for

innovation and it doubted whether a new intellectual property rights regime could be developed to protect the traditional knowledge. It felt that local rules and procedures evolved by the indigenous communities need to be respected. In its view, the WIPO could assist member countries in developing certification marks, collective marks, licensing arrangements as well as copyright, etc. In USA approximately fifteen percent of the applicants are individuals or independent inventors. To help such individuals, US government has aggressively promoted internet based electronic filing systems for patents, copyrights, trademarks; developed extensive public information system and outreach facilities so that these inventors had access to similar information as was available to the corporation worldwide. In addition, there were laws to provide protection to the official insignia of native American tribes

2.2 Operational Principles for Intellectual Property aspects of contractual agreements concerning access to genetic resources and benefit sharing:

WIPO vide its document WIPO/GRTKF/IC/2/3, July 27, 2001 has reviewed various contractual arrangements to facilitate access and benefit sharing between the provider and the recipient of the genetic material. This is an input into second session of the inter-governmental committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore, December 2001. A brief overview of these arrangements may facilitate better appreciation of the specific features of the case studies discussed in Part II of this volume and draw appropriate implications. Under the Convention on Biological Diversity (CBD) several guidelines were evolved to develop model agreements with the aim of reducing transaction costs in facilitating material transfer agreements (MTAs), and umbrella agreements under which repeated access could be obtained. Several other concerns were, (a) need for including user obligations, (b) different kind of resources and users might require different contractual agreements and therefore commercial arrangements could be anticipated at the outset, (c) in view of the synthesis of the derivatives of genetic materials, the contracts could include full range of biotechnological applications to work out fair and equitable benefit sharing, and (d) flexible and simple approach to protect various stakeholders was necessary and the parties to agreement had to be aware of the other multi party agreements already in force before the date of the fresh agreement.

After the final adoption of IU on plant genetic resources in June 2001 under FAO, a multilateral system of benefit sharing has been suggested. Article 41 of the International undertaking provides that recipient of the plant genetic resources would abide by the provision of standard material transfer agreement and benefit sharing agreements. Conditions of the MTA would apply to the transfer of plant genetic resources for food and agriculture to any third party who received these resources. It is also required that contracting parties agree to the inclusion of this requirement on the part of recipients of genetic resources. If the recipient commercialize a product that was plant genetic resources for food and agriculture and that incorporated material accessed from multinational system, he/she would pay to the mechanism referred to in Article 2.19.2g an equitable share of benefits. However, when such a product was available without restrictions to others for further research and breeding, the recipient would be encouraged to make such payments. With regard to the level of payment the governing body was to determine the level, form and manner of the payment in line with commercial practice. The governing body would also decide to exempt small farmers in developing countries and in countries in economies in transition from the need to make such payments. Within five years, the governing body might review whether mandatory payment required in the MTA should also apply in cases where commercialized products would be available to others without restriction for further research and breeding.

The WIPO document provides several sample intellectual property clauses derived from various models in practice or recommended for implementation. Some of the key principles involved are that scope of the contract could include the material, replicates and derivatives where derivatives implied material substantial modifications for new properties: the rights of the providing party could extend to even the uncharacterized material transferred in the sample of characterized material: the materials which were obtained before the CBD became enforceable or were acquired afterwards but with the understanding that these could be made freely available for any such agricultural research purpose would continue to be so exchanged. The legal status of these resources was still under discussions in various international fora. Suggestions have been made that traditional uses of or processes involving material being transferred may be regarded by the concerned local communities as local inventions for which inventorship vests solely with the said communities. The exchange of genetic material between academic or non profit institutions may either require normal acknowledgment as is the practice in research funding by the state institutions. Or specific time frame may be provided for which publications could be withheld so that providing organization may decide to file any patents within the specified time period as suggested by SRISTI in its draft memorandum of agreement. There are also broad agreements under which the recipients give to the provider a non-exclusive royalty free license under any invention that the recipient may patent based on the transferred material or its derivatives. The Traditional knowledge holders have to be assisted in negotiation, drafting, implementation and thereafter protected against the unfair contractual terms and made aware of the best contractual practices (also see Pew Ethical Guidelines, 1993, also Gupta, 1984a, b, Chand, et al 2000). The providing communities could specify various restrictions under which the recipients seeking the application of trade secret or intellectual property provisions would utilize the associated knowledge. The prior informed consent would constitute an obligation for the recipient and the right for the provider of the transferred material (see www.nifindia.org/pic.html)..

In addition to the obligations regarding intellectual property rights, the recipient might also be obliged to provide various other kind of information such as the detailed description of the project, making a lump-sum payment in addition to or in lieu of future gains, provide non-monetary benefits to the resource providers and traditional knowledge holders. In some cases, the recipient may be required to provide the data generated by them on the samples, which they may not be planning to use in further research. And which the providing community or institution could use for further licensing to the third party. There should also be cases where joint ownership between the provider and recipient might be insisted so that all the subsequent benefit-sharing implications are drawn through joint discussions and agreements. The WIPO document recognizes that no matter how carefully a contract was drafted, the possibility of controversy always existed. Disputes relating to intellectual property rights provisions of access and benefit sharing contract could arise in various aspects of contract. One could disagree on several aspects of the contract, (a) the scope of the meaning of derived material whether royalties were payable before or during the commercialization and if so, how were the benefits were to be calculated, (b) what were the mandatory obligations and what were moral and ethical obligations, (c) whether sufficient information was provided in advance to the providing party such that the consent could be considered sufficiently informed, (d) whether all the potential claimants of the intellectual property had been sufficiently involved or provided opportunity to enter into contract, (e) whether the community leaders really represented all the members and (f) to what extent the recipient had disclosed various information that leadership was in possession of. The kind of disputes resolution system to be set up would become extremely relevant if a recipient party (say a company) is acquired by some third party, which did not take over all the obligations of the recipient party. Several complications may arise in such cases. The communities might not have the financial or legal wherewithal to enter into

litigation in the international courts and the government of the respective countries may or may not feel obliged to pursue the disputes depending upon their obligations- legal or otherwise - vis-à-vis the country or party. It is necessary that international principles are evolved to deal with cross broader disputes in such cases. In the context of internet, the Hague negotiations provide for enforceability of judgments from the courts in one country in another country. Whether the similar provisions would apply to the civil disputes in the context of genetic materials governed by the sovereign rights of the nations is doubtful. And yet the issue needs to be clarified. Four principles have been suggested in the WIPO (2001) document after review of various considerations:

The IP-related rights and obligations set out in the Model IP clauses should recognize, promote and protect all forms of formal and informal human creativity and innovation based on, or related to, the transferred genetic resources.

The IP-related rights and obligations set out in the Model IP Clauses should take into account sectoral characteristics of genetic resources and genetic resource policy objectives and frameworks.

The IP-related rights and obligations set and in the Model IP Clauses should ensure the full and effective involvement of all relevant stakeholders and other process issues related to contract negotiation in the development of IP clauses for access and benefit sharing agreements, including in particular traditional knowledge holders where traditional knowledge is covered by the agreement.

The IP-related rights and obligations set out in the Model IP Clauses should distinguish between different kinds of use of genetic resources, including commercial and non-commercial and customary uses.

These principles obviously do not obviate the need for changes in the international regime for intellectual property protection. To what extent the contractual obligations will be enforceable internationally would depend upon the way future negotiation among the parties in CBD, FAO and WIPO precede.

2.3 Second meeting of Inter-governmental committee on genetic resources, traditional knowledge and folklore, Dec 10-14, 2001

The CBD Secretariat informed about the voluntary guidelines developed by the working group to identify approaches on access to genetic resources and benefit sharing. The provisions included the concept of "prior informed consent" and "mutual agreed terms" as well as the institutional framework for stakeholders' participation and monitoring of various guidelines. The group recognized, "that the disclosure of the use of genetic resources and traditional knowledge, innovation and practices of indigenous and local communities in applications for intellectual property rights might assist patent examiners in the identification of prior art". The role of customary laws and practices in relation to genetic resources, traditional knowledge, innovations and practices vis-à-vis the IPRs may also be looked into. The FAO informed that the FAO Conference had adopted the International Treaty on Genetic Resources, Food and Agriculture on November 3, 2001. The treaty included an article on farmers' rights, which were not considered as intellectual property rights. These rights were the responsibility of national governments to realize. A trust fund was to be established, "to collect and use the financial resources, which included the mandatory payments arising out from commercialization".

The African delegation noted on behalf of the African group that WIPO should assist the developing and the least developed countries to implement the appropriate institutional mechanisms for ensuring intellectual property protection for traditional knowledge, genetic resources and folklore. The group also noted that while activities on genetic resources and

folklore are rapidly progressing leading to development of guidelines while the work on traditional knowledge and folklore was still in the definitional and survey phase. The delegation of Venezuela mentioned on behalf of group of Latin American and Caribbean countries that the committee should keep focus on the fundamental principles of CBD. The delegation also stressed the need for participation of indigenous communities in appropriate fora. The delegation of India on behalf of Asian group and China felt that the committee would have to be innovative in regard to intellectual property systems so that the goals of adequate intellectual property protection are matched with the goal of equitable benefit sharing. The delegation felt that Asian group and China were convinced of the need for exploring the feasibility of a comprehensive international instrument for the purpose. The work on traditional knowledge digital library and traditional knowledge resource classification undertaken in India was also mentioned. China supported India's proposal for documenting publicly known traditional knowledge in the form of databases. Delegation highlighted the need for resolving the issue of access to genetic resources and traditional knowledge and its dissemination among the communities so as to participate in the work. Russian delegation also emphasised the need for creating databases of non-patent data on genetic resources and traditional knowledge. The Russian law already included the folk art crafts in their intellectual property law. The US delegation appreciated the incorporation of traditional knowledge in the IPC format so that documentation of prior art and search traditional knowledge terms could become easier. USPTO had started accepting the requests for registration in the Database of Official Insignia of Native American tribe since August 2001. This material was not registered but will be searched to determine the registrability of trademarks.

The delegation of South Africa made a very important point and suggested that, appropriation of "relevant resources without consent should constitute a criminal offence". Delegation felt an international treaty needed to be executed for such a purpose. Delegation of Thailand mentioned about Thai Law on protecting medicinal practices. It shared the perception of South Africa about the inappropriability of existing IPRs for the protection of traditional knowledge and folklore. The representatives of Pacific Island Forum including sixteen member governments identified three reasons why current IPRs could not protect traditional knowledge, (a) IPR sought to emphasise private ownership while traditional knowledge was collectively owned, (b) IPRs were time bound whereas traditional knowledge was held in perpetuity from generation to generation and (c) the traditional knowledge was incremental and informal and did not satisfy the definition of invention as per the IPR laws. They had, therefore, recommended a sui generis system, which was under discussion.

2.4 Operational principals for contractual agreements concerning access to genetic resources and benefit sharing: second Meeting of IGC

The delegation from Ecuador felt that the right of traditional communities to use genetic resources in any way they have used so far, must never be restricted through any agreement. The delegation of Venezuela cautioned that model clauses should not trigger a process that contribute to access to genetic resources without ensuring a fair and equitable benefit sharing processes. The Colombian delegation preferred international guidelines for access to genetic resources to be voluntary and not legally binding and restricted to intellectual property aspects. The Indian delegation speaking for the country felt that the material transfer agreements should include not only the concept of repeat access but also the user obligation and rights of providers including commercial arrangements. The delegation referred to Indian sui generis law on protection of plant varieties and farmers rights. The delegation emphasised that benefit sharing should be broadened to include not only the monetary benefits but also the joint IPRs, R&D and capacity building. Indonesian delegation also felt that model guidelines should be non-

binding. The Turkish delegation suggested the system for informal innovations. The Australian delegation supported by Russian Federation, USA and New Zealand delegations recommended developing a database of intellectual property contractual terms for access to genetic resources and benefit sharing. The US delegation agreed that access and benefit sharing guidelines should include a limitation on the rights of genetic resources collectors to obtain intellectual property rights only with respect to innovations and not with respect to genetic resources in the form in which they exist in nature. The Japanese delegation proposed that the Committee should study the feasibility of establishing a supporting system for stakeholders in genetic resources. Kenyan delegation emphasised that benefit sharing should focus not only on monetary aspects but also technology transfer. The South African delegation felt that non-binding regulations would disadvantage developing countries. The representatives of African Development (INAD) felt that a contractual approach would be a poor substitute for what the countries providing genetic resources needed, i.e. a sui generis international treaty that was binding, flexible, adaptable to local needs and devoid of constraints, generally associated with intellectual property criteria. The delegate stated six reasons, which made the contractual approach inappropriate for African countries as a means of protecting traditional knowledge (a) African countries lacked the technological and scientific capacity to capitalise on commercial collaborations and opportunities that might be created under contractual agreements. The countries also lacked expertise to negotiate a fair deal. Further, the absence of laws to regulate access and ensure benefit sharing was also a problem. Therefore, biotechnology companies might take advantage of the ignorance of traditional communities; (b) few discoveries, which have resulted from bio prospecting, have actually translated into profits and benefit sharing; (c) the local communities could be short changed by changing the rules of the game. For example, by modifying the extracted original compound and claiming that to be different from the one found in the provided material and thus denying any share in the benefit; (d) absence of fair disclosure, the company expected local communities to simply trust them; (e) contractual agreements could be used to weaken the bargaining power of the developing countries particularly when the resource was found in several countries and (f) the contracts apply only to the parties to the contract and did not act as a precedence for other third parties.

He further suggested that contracts should provide for rights of transferred resource to be collectively owned and used by the communities as per the traditional knowledge, to make improvements in it and have rights to all products developed from the transferred resource whether described in the original or over which subsequent intellectual property rights have been obtained. The representatives of the Sami council felt that the distinction should be made in considering the genetic resources as resources of the state vis-à-vis that of the indigenous people or communities residing in those states. They implied that state should have no rights to enter into agreement concerning access to those resources conserved by these communities without their full and prior informed consent.

There were five conclusions in the second IGC meeting, a) the work on establishment of model clauses for contractual agreements in the field of genetic resources should continue taking a prudent and considered approach, b) draft guidelines or model provision should be developed for dealing with intellectual property aspect of contracts governing access to and use of genetic resources without prejudice to the development of international standards on sui generic protection in this field, c) the guidelines should be non-binding without prejudice to the application of national provisions relating to contracts, d) the work undertaken by WIPO should be consistent with work undertaken in CBD, FAO and WIPO, and e) the guidelines for the contracts should be undertaken with full and effective participation of indigenous and local peoples and communities.

Some of the specific points which emerged in the discussion on contracts were, a) the question of disclosure of origin, prior informed consent, and appropriate benefit-sharing scheme, b) transfer of technology associated with genetic resources, c) legal framework for trans-boundary existence of genetic resources, d) principles governing the genetic material made available for research or conservation but later used commercially and also found importance for basic scientific research, e) the issue of capacity building of indigenous local communities, f) patent classification area, g) issue relating to legal status of different genetic resources under international law, h) the definition of different terms and a proposal concerning database on contracts and associated issues. In the comments on conclusion, some of the important issues mentioned by various countries were the need for binding guidelines, consideration of customary laws, requirements for contractual agreements to comply with national and international law on access to genetic resources and traditional knowledge, need for developing an international treaty, etc.

The survey on traditional knowledge: Three basic purposes were identified in the WIPO document, a) to avoid granting of patents for traditional knowledge based inventions, which did not fulfill the necessary requirements of protection, b) to avoid problems of traditional knowledge holders to challenge such patents, and c) to ensure the recognition of traditional knowledge and its technological value. Brazilian delegation noted that examination of traditional knowledge as prior art dealt with only one dimension of protection, namely defensive protection. The other two dimensions were the definition of public domain and involvement and approval of holders of knowledge innovation and practices for equitable sharing of benefits. The delegation, therefore, emphasized the need for elaborating national and international *sui generis* system to protect traditional knowledge. The Indian delegation speaking on behalf of Asian group, suggested the need for consultation at national level with holders and traditional knowledge and other stakeholders. It was also emphasized that all traditional knowledge was not in public domain. The documentation of TK was necessary to avoid its erosion with the passing away of older generation. *In this regard, databases of public domain TK could be developed to prevent granting of any patents over such knowledge and establish register of undisclosed traditional knowledge till new protection standard for undisclosed traditional knowledge were established.* Speaking on its own behalf, Indian delegation suggested the need for examining the issue of searchable prior art data together with documentation of traditional knowledge. These databases could not be protected by copyright alone. There is a need for developing a *sui generis* law for protection of traditional knowledge. India has already begun to prepare Traditional Knowledge Digital Library (TKDL) for traditional uses of medicinal plants. The international search authorities should consult experts in the countries of origin of traditional knowledge so that searchable terms were consistent with the meanings in the local context. There was a need to include more periodical gazettes and newsletters, which documented traditional knowledge into the minimum documentation list.

Delegation of Ecuador supported the idea of *sui generis* system of IPRs for collective knowledge. The delegation of New Zealand shared the proposed changes in the New Zealand's trademark legislation being considered in response to the Maori representation. The Venezuelan delegation did not agree with the terminology suitable for patents while dealing with traditional knowledge. It supported the Indian delegation view on behalf of Asian group. *It reinforced the point that one should not emphasize only the defensive i.e. negative type of protection but also a positive sort of protection should be permitted.* The Canadian delegation emphasized *the need for distinguishing between codified and non-codified traditional knowledge.* The Egyptian delegation argued that protection of traditional knowledge should not be subject to the novelty requirement and, therefore, a *sui generis* system was essential. The

US delegation supported the work programme in this regard and felt that these provided positive and constructive ways of meeting the expectation of traditional knowledge holder. *Japanese delegation considered traditional knowledge to be prior art and, therefore, ineligible to get the patent right*. The representatives of First Nation Development Institute (FNDI) observed that *great deal of traditional knowledge has already been placed in public domain without the consent of knowledge holders by the research community*. They pleaded that (global) community should not compound this breach of rights by digitizing it and making it available to globally for all. It suggested that *currently documented work be verified by the community for proper consent procedures before being offered for wider dissemination*. *It suggested that capacity building was a two-way street* and WIPO secretariat and the committee should identify the training needs of non-indigenous actors with regard to customary laws and traditions governing traditional knowledge. The representatives of the American Association for the Advancement of Science (AAAS) informed the committee of a database created by them known as the traditional ecological knowledge prior art database (TEKPAD). This was aimed at use of public domain in order to promote and protect traditional knowledge.

The Brazilian delegation noted that existing international agreements for intellectual property rights and other policies might influence the implementation of Article 8J of CBD. They supported Indian proposal for building a database for the protection of genetic resources, traditional knowledge and folklore as suggested by Indian delegation. Delegation of Singapore while representing ASEAN countries wondered whether one needed to develop a new concept or a model *sui generis* system for the protection of traditional knowledge and genetic resources and folklore. The Indonesian delegation suggested that framework of protection should deal with not only the individual rights but also the community rights. The Chinese delegation brought out that at the end of 1998 there were 1900 patent applications dealing with traditional Chinese medicine. The delegation of Zambia agreed with all those countries which recommended that protection of traditional knowledge system and innovations be brought under the jurisdiction of WIPO, and added that protection was not enough, the issue of rewarding the custodian of traditional knowledge system with fair and equitable sharing of benefits must be pursued. It recommended synergy with other similar efforts.

Japanese delegation felt that benefit sharing could be pursued even through non-intellectual property rights related instruments such as technical cooperation, human resource development, 'access fee' etc. It felt that the standing committee of WIPO should define the traditional knowledge and identify the owners of traditional knowledge. And also explore the extent to which existing legal framework should be used to provide protection. Ethiopian delegation pointed out that genetic resources could not be accessed or taken out of the country without permit and violation was a criminal offence. The South African delegation supported the statement made by Madagascar on behalf of Africa group and mentioned that legislative action for promotion, preservation and protection of indigenous knowledge systems were in the process. The Bangladesh delegation stressed that while developing mechanism for protection of folklore the studies by traditional knowledge holders themselves needed to be compared with those by outsiders. *It also stressed that protection need not be only local or regional or national but should be available internationally*. New Zealand delegation mentioned that a number of amendments to their trademark law were under consideration to address the concern of Maori about inappropriate registration Maori images and text. The notion of prior informed consent before patent registration was also being considered. The WHO representative shared the issues that have emerged in the workshops organized by WHO such as, absence of formal or informal mechanisms for the participation of traditional healers in policy making; lack of understanding of intellectual property rights systems among various stakeholders; inadequate communication and mutual understanding among traditional medical practitioners and

intellectual property offices; limited applicability of existing intellectual property laws to protection traditional knowledge and high transaction costs for obtaining and enforcing intellectual property rights by the holders of medicinal knowledge. The delegation from pacific island countries preferred that term, "expressions of culture" as opposed to "expressions of folklore". *The term folklore was considered to diminish and demean the rich and dynamic expression of culture in the region*. The International Publishers Association (IPA) expressed concern that possible new instruments to protect traditional knowledge should not negatively impact on the local publishing industries. While discussing the work plan, the US delegation considered that the guide for contractual practices should be only for guidance and not binding. It also opposed the task A2 which was given the highest priority by Indian delegation and also by most of the developing countries. Since it did not want any guidelines for national patent laws. The US delegation also opposed the task A3 as it was currently defined because it preferred a voluntary system of benefit sharing under the FAO's international undertaking. Likewise it opposed A3 and A4. The discussions on protection of traditional knowledge were far more consensual and most countries supported various tasks relating to protection of traditional knowledge.

Part one: Section 3 Nature of traditional knowledge: a literature review

The creative and innovative traditions in various developing countries have been masked by historical misrepresentations by outsiders as well as by pedagogic and policy-induced blinders domestically. From an early age students learn the major inventions made by Europeans, and rightly so, but seldom do they learn about grassroots or higher level inventions and innovations developed by local individuals, institutions or communities with in their respective countries. When local contributions are indeed taught, these are recalled with terminology, which may generate disdain rather than respect for native genius.[4] But this is only one reason why the possibility of building upon grassroots traditions of invention and innovation has not been pursued in most developing countries. There are several other possible reasons for this, such as: a lack of awareness about such traditions among policy planners, the education systems, and civil society at large; the influence of aid agencies whose work often results in increased dependency rather than self-reliance; an education system which does not create curiosity and an experimental ethic and instead reinforces a culture of compliance and conformity; the science and technology establishment which does not encourage local traditions even if they are functional and viable, whether in the past or in the present; the increasing influence of the media which popularize Western images of progress and so-called "Development" rather than indigenous notions of the same;[5] the lifestyles of the elite which do not inspire any respect for local knowledge systems; declining

[4] The 'minor millets,' a group of plants such as 'ragi', 'kodo', finger millet, fox tail millet, and other such small millets crops which provide the major means of subsistence to millions of poor dry farming households, are called 'inferior millets' despite the fact that these are actually superior to many other grains in nutrition and other agronomic characteristics.

[5] The attribute 'indigenous' is used in this paper to refer to 'originating in and characterizing a particular region or country; native' (Webster's Encyclopedic Unabridged Dictionary of the English Language, New Revised Edition, Gramercy Books: New York,Avenel, 1989). It is not used in the technical sense of the Working Group on Indigenous Populations of the United Nations High Commissioner's Office for Human Rights or Convention 169 of the International Labor Organization (i.e., as meaning 'The existing descendants of the people who inhabited the present territory of a country wholly or partially at the time when persons of a different culture or ethnic origin arrived there from other parts of the world, overcame them and by conquest, settlement, or other means reduced them to a nondominant or colonial situation; who today live more in conformity with their particular social, economic, and cultural customs and traditions than with the institutions of the country of which they now form a part, under state structure, which incorporates mainly the national, social, and cultural characteristics of other segments of the population which are predominant" (Working definition adopted by the UN Working Group on Indigenous Populations').

respect for local healers and herbalists among their own communities who are exposed to modern medicine capable of instant effects, irrespective of side effects; declining communication between the "grand parent generation" and the "grand children generation" due to the disappearance of extended families and the increase of nuclear families; a lack of incentives for creative people at the local level; and, most importantly in this context, inadequate intellectual property rights for local communities, informal innovators, etc.

Gloria Emeagwali (1989) observes, "(m)ost of the technological creations of Africa are assigned to artistic designations. Africans find some of their scientific and technological achievements confined to fine art museums. The scientific and technical processes underlying the creation of various inventions are deliberately trivialized".[6] The creativity in Africa and other parts of the developing world did not receive adequate attention and recognition.[7] She perhaps implies that a lack of historical recognition may have influenced the contemporary consciousness about creativity and innovation in Africa. To improve the role of IPRs in the benefit sharing of TK, current IP debates need to study systematically what I call the 'tradition of Invention' instead of 'inventing a tradition[8] (Gupta, 1993)'.

Widespread piracy of cassettes and videos did not generate incentives for many young performing artists to consider the arts and music as a career. Once the market for authentic reproductions increases, the emergence of new artists also becomes easier. India is one good example of this phenomenon. Likewise, the increasing demand for herbal drugs often sold as food additives[9], has proved that global perceptions of traditional knowledge-based products are changing. After all, 80 per cent of modern plant-based medicines are used for the same purpose for which native people discovered their use (Farnsworth, 1981). The correlation between claims of local communities and the evidence from modern pharmacological science was more than 85 per cent in the studies pursued in a part of Nigeria (Iwu, 1999). Chinese right holders held about 45 per cent of all herbal-based patents in 1996, followed by the Japanese and Russia with 22 per cent and 16.5 per cent respectively[10] (Gupta, 1999). The issue is no more whether traditional knowledge and contemporary improvements should be given importance and recognition. Most people accept the need for it. The issue is: how do we recognize this extremely important source of solutions (or "leads" for developing solutions) to the problems of food, health and nutrition and many other needs of the modern world. How do we generate reciprocity among knowledge providers and knowledge- and resource-users, particularly the ones who have commercial goals? Equally important is the goal that traditional knowledge systems with attendant cultural edifices are not stripped of their socio-cultural context.

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[6] Gloria Emeagwali, Science and Public Policy, Journal of the International Science Policy Foundation, Surrey, UK, volume 16. No.3.1989, see modified version of this paper, Eurocentrism And The History Of Science And Technology available at web site address: H ttp://members.aol.com/afriforum/colonial.htm 1999. The quotation is from modified internet version and is not available in the original paper.

[7] Only recently Sir J. C. Bose, a pioneering Indian plant physiologist, and inventors of several electronic instruments was credited with the invention of telegraph, rather than Marconi, as we had learned since childhood (and perhaps most textbooks still teach the old attribution). (The Telegraph, Calcutta; Oct 31, 1997)."As for the claim that Bose's primacy was acknowledged at an international IEEE conference in June in Denver, this refers to the 1997 IEEE MTT-S International Microwave Symposium. The MTT-S did organize an historical exhibition and Special Session on Bose in honor of his centennial. However, they did not take a position on Bose's primacy" (Robert Colburn, ISEE History Research Center, Rutgers, personal communication, Feb 3, 2000)

[8] That is claiming a historical past when every thing was much better and harmonious devoid of any expression of human greed or other frailties. Lamb and the lion drank water, so to say, from the same side of the pond !

[9] The sale of over the counter herbal drugs is estimated to be about 3.5 billion USD in 1996 in Germany alone, about 7 billion USD in Germany, Spain, UK, Italy, France, Netherlands (Blumenthal, et. al., 1998, in King, et. al., 1999). The sales of herbal drugs (about 5 billion USD) were 55.4 per cent higher in 1998 in the USA over 1997 while only 11 per cent higher till September 1999 over the same period last year (Blumenthal, 1999).

[10] These figures are based on the Derwent Pharmaceutical database.

Many times researchers have tried to portray traditional knowledge systems as totally different and opposed to the so-called modern and western knowledge systems. Nothing could be further from the truth. Some aspects of traditional knowledge systems contain most of the elements that make a scientific proposition valid. At the same time, many scientific institutions use traditional cultural symbols and practices to generate an extra ounce of confidence or certainty. For instance, when a farmer decides to sow his crop at a particular time, taking various factors such as meteorological conditions, soil, moisture, temperature, etc., he is using his empirical knowledge which generates replicable, refutable, and verifiable results. No matter who sows crops at that time under the given conditions, other things remaining the same, he or she should get the same result. Likewise, every time the same crop is sown with similar conditions, it should give similar results and if one wanted to prove this wrong, it should be possible to sow early or late and get different results. The scientific nature of much traditional knowledge formed the basis and philosophy of grassroots innovators' own initiatives for benefit sharing in their traditional knowledge. For example, the Honey Bee philosophy about the scientific nature of local innovations was the basis for the creation of the Honey Bee Network a decade ago. At the same time, I and other members of HB network realized that there are cultural codes and institutional mechanisms associated with some of the traditional knowledge systems, which ensure that the knowledge, innovations and practices are understood and explored in a given context. This is not to say that all the elements of this context are scientific in nature. Cultural contexts based on shared beliefs may provide a basis for dealing with a whole range of uncertainties and at the same time provide a common understanding of social, biological, cultural continuities.

Whenever some members of a community recognize the need for a discontinuity, a major transformation takes place. A new crop is introduced, a new implement is invented, a new variety is developed through selection or sometimes through grafting or budding -- an innovation takes place. Some of these innovations over a period of time get embedded in the socio-cultural contexts. While constructing a modern building, setting up a laboratory, installing a new machine, prayers are routinely held in many parts of the world as if the technological insurance is not sufficient, a kind of spiritual assurance is sought even in most of the modern institutions. It is true that causal explanation of modern scientific proposition is sought and provided in the material structures of science i.e. verifiable principles governed by universal laws and which can be tested and measured. In certain aspects of traditional knowledge systems, non-material beliefs and cultural codes are supposed to explain or guide the consequences of material transactions. For instance, a healer may not reveal his or her knowledge lest it loses its significance on being told. It is possible that this belief, seemingly unscientific, might have been a means of ensuring that a complex or risky recipe is not pursued or practiced by someone untrained or untutored in the art. It is also possible that it is just a superstition[11], but in any case it lends coherence to the knowledge system and the surrounding context. It is not my contention to argue that traditional knowledge systems and associated institutional arrangements cannot be dismembered at all. However, in many cases, when we take a plant or some other element of local knowledge systems out of its institutional context, even if a scientific relationship between cause and effect does not get adversely affected, the *institutional* context in which the plant is collected (for example, only when necessary and only in limited quantities) may get affected. Therefore, we may be able to develop a good and effective drug by just dealing with the utilitarian part of the traditional knowledge systems. But we may not necessarily maintain the restraint that may have been kept in place by some of the

[11] How many of us have said, 'touch wood' or expressed similar superstitious slang while dealing with uncertainties. The point is that even in our modern life, there are so many black holes of irrationality which co – exist with rational beliefs that we need not look at all the beliefs of local people as some thing which should make even functional knowledge disrespected. ; AKG

traditional institutions for conservation of that plant. That is the reason why many groups oppose bio-prospecting by outsiders in order to avoid the risk of over exploitation of the resource itself. What they however, miss is that the problem is not so much with bioprospecting as with the institutional arrangements.

The context of local knowledge systems combining traditional skills, culture and artifacts with modern skills, perspectives and tools is not something that has happened only in the recent past. From time immemorial, new crops were introduced from one part of the world to another and cultural and ecological knowledge systems evolved while adapting these crops, animals, trees, tools, etc., into their new contexts. This is an ongoing process. What may set the traditional ways of dealing with local resources and external knowledge and inputs apart, may be a slower trial and error approach which may not necessarily be unscientific. But, it may not be fully compatible with modern methods of experimentation, validation, and drawing inferences. In some cases, the correspondence is close but in many case it may not be. However, it is possible that through flexibility, modification and mutual respect and trust, traditional knowledge experts can and may work with the experts from modern scientific institutions to generate more effective solutions for contemporary problems. After all, the "tool view" of science implying excessive reliance on specific methods of solving problems has never helped in taking scientific research very far. Traditional contexts reflect and embed certain rules about how we relate to nature, to each other and to our inner selves, which can help in generating sustainable and compassionate approaches to solving problems. Incentives for creating a sufficiently strong desire for experimentation will become embedded when modern institutions *recognize, respect and reward* the experiments done in the past. The experiments and innovations have led to very significant and identifiable advances in our knowledge about biodiversity and other natural resources and their application in our day-to-day life. One can make an equally strong case for recognizing traditional art and craft forms, music and other kinds of expressions of local creativity of individuals as well as communities based on traditional as well as modern materials. [12]

Conservation of biodiversity and other natural resources over a long period of time has been possible because of the cultural, spiritual and other social institutions that have guided the relationship of local communities with the resources. Even in a context where deforestation in some countries, such as Nigeria, is about 6 per cent per annum as against the global average of 0.2 per cent, there are forests, streams, old trees, and lakes, which have been conserved by the people extremely well. It is not just the resources but also the *knowledge* about these resources, which has been conserved through practice and innovations.

[12] In many Mali villages, food storage vessels are made of dry gourd skins. These sometimes get cracked or broken. A Bela woman would stitch these pieces together with plastic cords so that these natural biomass-based vessels can last longer. This is an excellent example where the culture of recycling and repair, which is so integral to traditional communities (unlike Western culture which creates a lot of waste), combines a traditional vessel with modern plastic chord. Likewise, in a workshop in the Chittradurga district of Karnataka, India, a creative carpenter once shared an innovative solution (I regret having misplaced his name). He had a wooden plough made of acacia wood. When the shears got worn out, he still wanted to use the same plough since it was light and the acacia wood is scarce in that area. However, he wanted to put a shoe of metal on the worn-out shear. He began to look for different materials and waste iron pieces. Finally he found that the waste spring leaves or suspension springs of automobiles provide the right material having the appropriate combination of weight, torque, durability, etc. Similarly, the automobile repair workshops on the roadside use soap to plug small holes in the radiator. It is this approach of combining a traditional resource with modern materials that sometimes may not happen so obviously in the modern laboratories and academic research institutions. However, this process *per se* is not totally unknown to the modern methods of problem solving.

'Resources ' include not only those, which are visible to the naked eye, but also those, which are not visible, such as microorganisms. Okagbue[13] (1993) provides an example of traditional knowledge systems around microbial diversity and its use for food processing. He observes, "(s)ince microbes and their activities are often difficult to observe and appreciate, we are often unaware of their influences on culture. These facts notwithstanding, several cultural practices designed to preserve food and other materials such as leather, wood, etc., or to protect the health of humans, and crops, are directed towards relevant microbial agents. For example, the efficacy of certain herbs traditionally used in foods and medicines has been shown to be due to the activity of specific chemical components of herbs against some pathogenic and food spoilage micro-organisms". Downes (1999)[14] refers to a U.S. patent 5751,1986 granted on a purported variety of the ayahuasca[15] vine, *Banisteriopsis caapi.* He adds, "many indigenous groups in the Amazon hold this plant to be sacred and therefore feel that it is inappropriate for private persons to have exclusive rights over any aspect of it. Within industrial societies themselves, certain activities or entities are typically excluded from market relations. For instance, a great deal of valuable, novel information -- such as scientific discoveries about the natural world -- is explicitly excluded from intellectual property protection" (Downes 1997:4)[16]. Recently, the US Patent and Trademarks Office (USPTO) had revoked the patent on this plant acknowledging that the inventor had claimed knowledge, which was already in the public domain. However, later the patent was restored only on the specific plant and excluding any claims on uses of this plant.

The USPTO has written to Dr R A Mashelkar, the Director General of the Council of Scientific and Industrial Research (CSIR) assuring him that no such patent will be issued on traditional knowledge on which prior art exists. It has also requested DG, CSIR to provide documentation on Indian herbs, drug formulations in ancient texts as well as recent research so that trivial patents can be avoided. Robert Saifer (Director, International Liaison Staff, US Patent and Trade Mark Office) communicated in a letter dated August 27, 1999 addressed to Dr. R.A. Mashelkar, Director-General, Council of Scientific and Industrial Research, and Secretary, Government of India, Department of Scientific and Industrial Research:

> We should, however, address the need of creating more easily accessible non-patent literature databases that deal with traditional knowledge. Perhaps an office among the developing countries should suggest this as a project for the SCIT Working Group on Standards and Documentation, working in close cooperation with the International Patent Classification (IPC) Committee of Experts. With the help of the developing countries, traditional knowledge can be

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13 Richard Okagbue, "The Scientific Basis of Traditional Food Processing in Nigerian Communities" in G.T. Emeagwali, African Systems of Science, Technology and Art, Karnak House,London, 1993, see at web site http://members.aol.com/afriforum/okagbue.htm#AFPT

14 David R Downes and Sarah A Laird, 1999, Innovative Mechanisms for Sharing Benefits of Biodiversity and Related Knowledge: Case Studies on Geographical Indications and Trademarks, Prepared for UNCTAD Biotrade Initiative, Washington, D.C.: Center for International Environmental Law , draft paper

15 Glenn M. Wiser,1999, PTO Rejection of the "Ayahuasca" Patent Claim: Background and Analysis, Washington: Center for International Environmental Law, http://ciel.org/ptorejection.html
Wiser sumamrises the case,"Loren, S. Miller obtained U.S. Plant Patent 5,751 on June 17, 1986. The patent granted Miller's rights over a purported variety of the Amazonian vine, *Banisteriopsis caapi*, also known as ayahuasca. Miller dubbed his variety 'Da Vine'. The patent was granted on the basis of Miller's claim that Da Vine represented a new and unique variety of *B. caapi*, which was distinct from other forms primarily because of the color of its flower petals. Miller stated that he had obtained a cutting of the plant from a 'domestic garden in the Amazon rain-forest of South America.' He added that he was investigating the plant for its medicinal value".

16 Downes, David R. 1997. Using Intellectual Property as a Tool to Protect Traditional Knowledge: CIEL Discussion Paper. Washington, D.C.: Center for International Environmental Law. November 1997 discussion draft.

documented, captured electronically, and placed in the appropriate classification within the IPC so that it can be more easily searched and retrieved. This would help prevent the patenting of turmeric, as well as karela, jamun, brinjal and other traditionally used remedies[17].

This shows willingness of one of the major players in the field of intellectual property rights to respond to a persistent criticism of the patent system in that it did not pay attention to the rights of local communities. Obviously the above formulation only solves part of the problem, which deals with issuance of unlawful patents on knowledge, which is in public domain.[18] It does not deal with providing protection to the knowledge known only to a local community and/or individual experts/innovators whose knowledge is not ordinarily in public domain. Further, the point that many critics make and quite rightly so, is that thousands of patents on common uses of plants from tropics granted by USPTO do not have to wait for opposition by concerned communities of country. USPTO should take up *suo moto* review of all these patents and thus revoke all wrongly granted patents.

3.1. Functions of Traditional Knowledge:

Traditional knowledge can serve several functions including (i) semiotic, i.e., communication through symbols, art forms, crafts, etc., (ii) institutional, i.e., providing rules coded in rituals and/or other cultural and social sanctions. Some of these rituals and cultural sanctions institutionalize incentive measures for the use of traditional knowledge just as IPRs do. These sanctions could be material such as fines or penalties or ethereal such as the fear of God; (iii) configurational, i.e., the arrangement of various life processes and stages are performed according to the traditional norms generating predictability about their social outcomes; (iv) utilitarian i.e. knowledge of certain plants or animal products being used for various food, nutrition or health needs; (v) situational, i.e., during emergencies or other contingencies, codes of conduct may be specified to maintain social order and responsibility towards other life forms, including wildlife. In addition, traditional knowledge may also have (vi) religious and spiritual functions, which may or may not involve material objects. Since the society has to adapt to emerging situations from time to time, traditional systems of culture, technology and social exchange provide some scope for experimentation, deviance and variation. Same instrument of incentives may not help in nurturing each of these functions.

Some groups demonstrate this innovative adaptiveness more than others, but the innovative spirit is evident in every culture to a large or small extent. Therefore, traditional knowledge systems are not just serving to maintain a *status quo*. There are also provisions for dealing with the demands of modern times. However, there are social, cultural and material forces, which disrupt traditions and create either new traditions or leave a void. There are also cases where

[17] I am grateful to Dr. R.A.Mashelkar for sharing this letter with me and authorizing me to quote it so that the discussion on the subject moves forward rather than remaining locked in an old position. All those groups, which are opposed to the patents on traditional knowledge per se, would find above quoted formulation helpful in so far as it enables prevention of anyone getting a patent on public domain traditional knowledge. However, as we would argue later, such a position would not bring much economic or other benefits to the communities and also may not contribute to the continuance, growth, and vibrance of the traditional knowledge systems. It is certainly alright to prevent public domain knowledge being patented but unless value addition in this knowledge is protected, how would investment in product development take place and furthermore, how will the surplus to be shared fairly and equitably with the knowledge and resource providers be generated.

[18] The US PTO also agreed to correct the status of US Patent 5,401,504 issued on the use of turmeric for wound healing. All the six claims were cancelled after Indian government provided prior non-patent literature on the subject. Likewise, the patent issued on Ayahuasca, a plant used by Amazon community, was revoked and later restored on that particular plant without any use claims being held valid.

certain dysfunctional and socially repugnant traditional practices are outlawed by the State,[19] though these may not completely stop the outlawed measures. Likewise, traditional communities in some parts of the world have used dynamite to catch fish-a very destructive method of fish collection killing young and the old fish alike. One therefore should not romanticize traditional knowledge and take an empathetic but critical look at the traditional knowledge systems.

3.2 Languages and Biological and Knowledge Diversity:

Generally, a community classifies the variability in a natural phenomenon on which it is dependant for its own survival into discrete categories so as to manage that resource efficiently. Since language is the means for expressing such a knowledge, the number of words for such variability in a given language tends to be higher when the dependence of the community on the same resource is high, than when the dependence is low. Therefore, a coastal fishing community may have a much higher number of words for waves, just as farmers in rainfed environments or mountainous regions have a higher variety of terms for explaining soil diversity. Traditional knowledge systems in such cases can contribute to a better understanding of the environment and underlying sources of variation. The inter-relationships between different components of eco-systems are also pursued differently in traditional knowledge systems compared to the modern ecological or other disciplinary studies. For instance, three indigenous communities in Alaska and four in Chukotka Russia were studied by Huttington and Myrin (1995)[20] to analyze their knowledge about beluga whales. They studied the timing, location and movements of beluga whales around each community. How the status of ice, fish, wind, and the presence of killer whales affected the belugas was described in detail. The researchers realized, during relaxed but intensive discussions with the local community members, that these discussions would veer towards some other subjects seemingly unconnected. The researchers tried to bring the discussion back to the topic but before they succeeded in doing that they discovered a new connection. A structured inquiry would have made accessing such data impossible. For example, one digression was about beavers. Beavers, a local respondent informed them, build dams in the streams where salmon and other fish spawn. When the beaver population expands, the spawning habitat of salmon may be reduced. In turn, this affects the belugas, which feed on salmon. Hence, as these authors pointed out, traditional ecological knowledge cannot be preserved merely by documentation. This requires combining knowledge with experience, which in turn means conserving the way of life, which produced the knowledge (Gupta, 1999).

In another example, Merculieff (1990), Commissioner of the Sea Otter Commission, Alaska, raised a fundamental issue about the politics of defining resource boundaries and the legitimacy of the particular ways of local people in dealing with these. Distressed at the poverty of many of the First Nation peoples of Alaska, he decried the tendency of 'Animal First' activists to deny such peoples their autonomy in pursuing a sustainable coexistence in their ecological context.

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[19] The practice of *Sati*, i.e., a widow burning herself on the pyre of her husband or child marriage or taboos on women's participation in certain activities are some such examples.

[20] Henry P Huntington and Nikolai I. Mymrin, 1995, Traditional Ecological Knowledge of Beluga Whales, An Indigenous Knowledge Pilot Project in the Chuckchi and Northern Bering Seas, Anchorage: Inuit Circumpolar Conference-Alaska, http://nmnhwww.si.edu/arctic/html/tek.html

Merculieff (in Gupta, 1991) observed:

"They do not understand that in their desire to protect animals, they are destroying culture, economic and spiritual systems which have allowed humans and wild life to be sustained over thousand of years... Their's (Animal First activists concept) is based upon a belief that animals and humans are separate and they project human values into animals. Ours is based on the knowledge from hundred of generations which allows us to understand that humans are part of all living things - and all living things are part of us. As such it is spiritually possible to touch the animal spirit, in order to understand them. Our relationship with animals is incorporated into our cultural systems, language and daily lifestyles. Theirs is based upon laws and human compassion... Because we are intricately tied to all living things, when our relationship with any part of such life is severed by force, our spiritual, economic, and cultural systems are destroyed, deep knowledge about wild life is destroyed, knowledge which western science will never replace... I leave you with this last thought - we have an obligation to teach the world what we know about a proper relationship between humans and other living things" (see Gupta, 1991a)

3.3. Recognition as incentive:

In cases where the context of local knowledge and its functional or conservational advantages or relevance hinges on the associated cultural and spiritual beliefs, mere monetary compensation or reciprocity towards such knowledge systems may not provide sufficient incentives. This issue became obvious when US government issued an executive order (no.3206, 1997)[21] about the need for federal and state institutions to respect the religious and cultural beliefs of native communities in the reservation areas as well as in the federal or state forest areas. Similarly, the conflict that took place some years ago on the border of USA and Canada on the issue of converting a burial ground of native communities into golf course by local developers highlighted the relevance of this issue. While state tried to make the objections of local communities into a law and order problem, the fact remains that mere use of coercive power of the state cannot subsume or suppress the underlying cultural and spiritual beliefs of communities associated with natural resources with or without human uses. In the context of this study, I must, however, caution that one should not try to resolve all kinds of conflicts by one or two simple solutions. The IPRs have obvious limitations in providing

[21] The American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act 1997, provides that the

> Departments recognize and respect, and shall consider, the value that tribal traditional knowledge provides to tribal and federal land management decision-making and tribal resource management activities. The Departments recognize that Indian tribes are governmental sovereigns; inherent in this sovereign authority is the power to make and enforce laws, administer justice, manage and control Indian lands, exercise tribal rights and protect tribal trust resources. The Departments shall be sensitive to the fact that Indian cultures, religions, and spirituality often involve ceremonial and medicinal uses of plants, animals, and specific geographic places. Indian lands are not federal public lands or part of the public domain, and are not subject to federal public land laws. They were retained by tribes or were set aside for tribal use pursuant to treaties, statutes, judicial decisions, executive orders or agreements. These lands are managed by Indian tribes in accordance with tribal goals and objectives, within the framework of applicable laws.

American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act," and its accompanying Appendix , June 5, 1997, Washington, D.C.: Secretary of the Interior and the Secretary of Commerce. See http://conbio.rice.edu/nae/docs/order.html

appropriate reciprocity for such beliefs and cultural rights.

3.4 Knowledge systems for survival and sustainable biodiversity management

It has been generally believed that the knowledge systems of local communities and indigenous peoples are holistic in nature. Centuries of association with an environment have produced a deep understanding of the inter-relationships among the different elements of a landscape or a habitat. Because fluctuations in the environment require adaptive responses, communities have developed a wide range of diversified survival strategies at intra and inter-household levels as well as at community level. However, local and indigenous knowledge systems, while generally holistic, have some reductionist elements. In order to cope with the complexity of ecological change, some people in the community specialize by knowing more and more about less and less. Such specialized expertise requires focusing, targeting and steering strategies on specific themes or aspects of nature. A good archer may be good because s/he does not look at all at the interconnections between target, the wind and the world around and instead focuses only on the target. This kind of reductionist approach helps in developing a sharp shooting skill.

So-called Western science is biased in favor of reductionist relationships, whereas local knowledge systems are biased in favor of systemic linkages and a holistic perspective on nature. Where efficiency of resource use has to increase so as to cope with increasing population pressures (where applicable), scarcity, fluctuations in the environment, or other contingencies, a blending of formal and informal science may be necessary. Achieving sustainability in resource use requires the fusion of sacred with secular, formal with informal, and reductionist with holistic views (Gupta, 1995, 1996, 1998).

The production of knowledge and its application takes place in a given socio-ecological context, through innovations over a long period of time. It has been suggested that this context influences, and to some extent shapes, the world views of people (Gupta, 1981, 1987,1988), which in turn influence the heuristics used for generating new solutions and knowledge (Pastakia, 1995). The heuristics [22]are like decision making rules, which are also accompanied with criteria of choice. Local and indigenous knowledge systems are not static. They evolve, adapt and transform dynamically with time. New materials are incorporated, new processes are developed, and sometimes new uses or purposes are evolved for existing knowledge besides the acquisition of knowledge. Hence, there is a need for rewarding not only traditional knowledge but also contemporary innovations. The concept of Traditional Resource Rights (Posey et al., 1995), implying recognition of the primarily customary rights does not do full justice to the individuals who are responsible for contemporary creativity and innovation, although it does provide a useful way of looking at community rights in conjunction with basic human rights. Depersonalizing the process of knowledge production and reproduction limits the type of incentives considered and results in concentrating the resources only in the hands of governments or, in rare cases, of local community leaders.

The conceptualization of indigenous knowledge as an autonomous subset of local knowledge evolved through interaction among local communities, individuals, and their environment over a long period of time, is problematic on two accounts: (i) there always are interactions with

[22] The heuristics as a concept is defined by Webster's Encyclopedic Unabridged Dictionary as, "serving to indicate or point out; stimulating interest as a means of further investigation". However, it is used here in the sense of thumb rules for taking decisions. The underlying thumb rules are simple ways in which complex problems are resolved.

other knowledge systems through trade and other exchanges from time to time incorporating elements of these outside systems with or without their contextual incorporation, (ii) knowledge is not produced only collectively and is not only inter- generational in nature. I have argued (Gupta, 1980, 1984,1987,1988, 1989,1992-2001) that knowledge is produced locally and sometimes indigenously by individuals without any interface with the community or outsiders. Just as it is also produced otherwise. The contemporary knowledge could build upon traditional knowledge but may also be developed autonomously. Merely because a particular innovation builds upon traditional reserve of knowledge produced within the community or outside does not invalidate or minimize the contribution of individual in the contemporary context. The possibility of such contributions being recognized by modern IPR systems is obvious, notwithstanding the transaction cost involved therein. The complexity introduced by the conceptual framework presented in Table 1, section 1.20 earlier in this study is indeed real and has not received enough attention in literature as well as policy dialogues so far.

There could be many other variations in production and reproduction of knowledge by individual or communities. For instance, knowledge produced by some individuals in past (a variety selected by some specific farmers) may be reproduced by a community (which grows this variety and provides/does not provide feedback to the original developer). Likewise, a landrace may be developed through collective effort of a community but may be reproduced by only one or two individuals for whatever reasons. The assignment of intellectual property rights in these varied situations will have to follow different kinds of modalities and institutional arrangements. *Just as variations have already taken place in the evolution of Plant Variety Acts through acceptance by UPOV of new concepts such as, "wild discovered plants" having DUS property as the new variety (Gupta, 1999). There is a similar need for modifications and adaptations in the IPR laws to reward different kinds of contributions by individuals and communities in long past or recent times through improvement or innovations in local materials, knowledge systems, or external materials or knowledge systems or a combination of these.* There is no purpose served by engaging in meaningless debate on the comparison or contrast among so-called indigenous or western science or knowledge systems since each has drawn upon the other to varying extent in different places. In any case, the way forward lies, as has been the attempted by Honey bee network to not only engage in debate occasionally about the 'stand alone' view of local knowledge and the supposed incompatibility between `so-called indigenous science` and the western science (Periera and Gupta, 1994, 1995, Honey Bee, 1993, 4(4) and 1995 5(1)), but also to blend the best in both. I have always believed that there is only one science. The variants are, good and bad science. On the other hand, the methods of developing scientific practices are quite different in some cases among various cultures and communities. Likewise, the criteria of evaluation of an experimental result are also quite varied. In addition, there is much greater tolerance among local communities, of empirical practices without knowing their scientific causes[23]. Moreover, those communities that have kept local experts poor, by not valuing their knowledge systems adequately, are unlikely to pass on to them externally-generated incentives. This does not mean that community institutions are to be avoided while developing incentive distribution mechanisms. Much will depend upon the situation specific balance of power among different stakeholders in conservation of genetic and biological resources and associated knowledge systems.

3.5. Conceptualizing communities:

[23] We have used aspirin to control headache for decades without knowing the causal reason. Thus even in the modern science, functional relationships are accepted as valid scientific concepts even if the exact causal mechanism is not known.

Current debates on IPRs and benefit sharing over TK assume a structureless homogeneity of local communities. The believers in such a view of community assume a convergence between the interests of local community leaders and those of local experts and TK holders, but this is difficult to accept. The asymmetry in knowledge systems and related power differentials are apparent in global discourses on incentives and consultations. These have been dominated by often the so-called representatives of indigenous communities, though of Western origin, both in terms of numbers and ideas. For instance, in various consultations by UNEP and the CBD, the more articulate indigenous people from western countries largely represent local communities. Many native communities in the west have suffered in the past and *they* should be heard. But surely, their suffering may not be higher than that of third world communities which continue to suffer far more even today. To anyone familiar with the miserable conditions in which most local communities live and strive to conserve biodiversity and associated knowledge systems, it should be obvious that their problems and concerns are very different from many of the problems articulated at most international fora. Moreover, the concerns of local experts and innovators within impoverished communities may be very different from those of the rest of the people. How can their concerns be heard and addressed? This situation seems to be changing at least symbolically in the meetings of Intergovernmental Panel organized by WIPO (see review in the earlier section).

3.6. Bridges between formal and informal knowledge systems:

Many international consultations and studies on knowledge systems have identified a need to distinguish among different types of knowledge and recognize the need for building bridges between local or indigenous knowledge vis-à-vis formal scientific knowledge (e.g. Atte 1989; Gupta 1989, 1991a, b, 1995, 1997,1998, SRISTI, 1993, Singh and Verma, 1969, Honey Bee, 1990-99, Skolimowski, 1981, Berkes 1988, Brokenshaw, Richards, 1985, Biggs, 1980, Warren, and Werner (eds.), 1980). Both formal and informal sciences are capable of producing abstract as well as practical knowledge, although the latter tends to produce more of the practical kind. Different incentives might nurture different types of knowledge. For instance, material-individual kind of incentives may include IPRs as one kind of incentive. Because of industrial application, these rights have a possibility of either being licensed or being worked to generate commercial returns. But, as I will show later, there is a whole range of other incentives (material, collective, or non-material, individual and non-material collective, portfolio of which may be appropriate in a specific situation)[24] that can play an equally important role in conserving and augmenting biodiversity, greater resources and associated knowledge systems.

However, the same knowledge systems can pursue different functions simultaneously, in various combinations. For instance, a fishing community might use classificatory skills to deal with variations in the movements of fish and locations of spawning sites. It might use indicators for spotting the sites where fish would be found in abundance at different times of the year. It might have to use systemic linkages to relate temperature, wind velocity, turbidity of the water and behavior of the fish, to decide how far to go in the ocean without courting too much risk or uncertainty. One way to understand the complexity of knowledge systems is to link the functions of nature with processes of 'sense making' i.e., drawing meaning from empirical observations. Berkes (1988:18) provides a strong argument for sensitivity in 'sense' making. He observes,

> The traditional ecological knowledge of the Cree is empirical knowledge, as in the

[24] I have described four kinds of incentives (Gupta, 1989, sristi 1993, 1995), viz., material –individual, material – collective, and non-material individual and non-material collective.

> observations of the “disappearance of animal in extremely cold weather, the way black bears try to cover their tracks before denning, the sensing and the avoidance of (predatory) otters by the fish. However, the “sense” the Cree make of empirical knowledge is not scientific, mechanistic, or analytic (re:Skolimowski, 1981). That is not to say that the Cree approach is either superior or inferior to the Western scientific one, but it is different [...] the Cree model of caribou cycles shows a better fit with the actual caribou population dynamic in Quebec - Ungava Peninsula than does the current scientific model.

Diversity, complexity, simultaneity and change in ecological systems are codified in knowledge and practices through language and culture (Gupta 1989). Just as Inuits are recognized for having the highest number of words for classifying snow, fishing communities have many words for distinguishing and discriminating different kinds of sea conditions, fish spawning sites, etc., (Johannes, 1981). Conceptually, any community, which is dependent upon a resource for its survival, as mentioned earlier, has to develop a pattern or a set of categories to deal with variations in the availability of that resource. For example, farmers have a rich taxonomy for clouds and soils and, in some cases, for insects and other animals. Leather workers have taxonomy for leather, carpenters for wood and likewise fishing communities for water and aquatic life.

Languages and diversity: It is very important to understand and to appreciate that different indigenous and local communities develop knowledge systems through a tradition of invention and also develop languages through which to articulate their knowledge systems. If a language dies, a knowledge system partly or completely dies with it. Hence, the conservation of language becomes a crucial factor for conserving taxonomies because each word, conceptually speaking in the context of a natural resource, is a category. Modern science will benefit a great deal and so will the ability of humans to understand their environment and cope with it, if the scientific basis for these categories is better understood. The etymological roots of different words might elucidate the process of codification of knowledge over time in languages, as influenced by exogenous knowledge systems, migrations, wars, and other social interactions. Palomares, Garilao and Pauly (1998) provide an interesting study of local names of the fishes in the Philippines drawing upon the FishBase database maintained at the International Centre for Living Aquatic Resource Management (ICLARM). They present the rather counter-intuitive insight that in subsistence fisheries fifty per cent of the species did not have Philippino language names, whereas in the commercial fisheries as many as almost 90 per cent had such names. Since the number of species named by subsistence categories was only 34 as against 455 in the commercial categories, the difference may be explained by the possibility that subsistence categories of fish were not so crucial to the survival of a community. But the commercial categories were apparently very crucial and thus the variety of names.

Formal science, in its effort to generalize boundaries over large time and space, often masks finer categories. Local Knowledge Systems (LKS) often do the opposite. *LKS help in distinguishing small variations in phenomena and do so within relatively small habitats*. The better the resource management strategies in LKS fit with local environmental conditions, the lower the negative externalities on the environment may be. However, this local focus also means an inability or limited ability of local communities to deal with wider connections. *For the sustainable development of this planet, both telescopic and microscopic visions are needed: the ability to see connections among larger systems and to appreciate interconnections at micro levels; in other words, we need both reductionist science and a holistic vision.*

3.7. Difference among Functional and causal knowledge systems:

Farmers have been known to do right things for wrong reasons[25]. Their practices do not become invalid merely because a supposed causal connection has no known factual basis. Even in modern science, there are effective medicines for which the causal mechanisms came to be known only after a long history of use, e.g., the aspirin. A knowledge system should not therefore be downgraded merely because of such limitations. Rituals and some symbolic totems may be ways of constraining particular healing strategies lest they be used in inappropriate cases, doses or situations. For example, some medicines are suggested to work better when these are consumed with an edge of a finger slowly and slowly. Apparently, the intention is to suggest consumption of only as much quantity as the edge of the finger can contain. In a way, a ritual has incorporated a dosage. A marriage between local and exogenous knowledge and between formal and informal science will succeed only on the basis of reciprocal respect and a well-deserved restraint in exploring their logical bases. Hence, many local knowledge systems emphasize the questions that *should not* be asked rather than those that *should be*. Modern minds reject such boundaries to inquisitiveness, but the sacredness of certain kinds of knowledge rests on faith and its power. It is true that superstitions particularly those that cause definite harm to local communities as well as those that generate other kinds of social or ecological biases, have to be tempered with a scientific attitude. It is not easy to determine when faith becomes a source of superstition. Thus, there is a great need for exercising care in understanding and especially in attempting to influence local conservation practices. In their attempts to unravel the mysteries underlying local faiths, outsiders can erode the power of local experts and institutions without putting anything better in their place.

The local beliefs in the power of spiritual icons have helped conserve sacred groves, lakes, mountains, etc., all over the world. The sacred beliefs are linked sometimes to very basic functional needs. For example, the need to protect the mouth of the rivers, i.e. the points at which rivers originate, are considered sacred almost all over the world. Not much will be gained by dismembering the sacred fiber from the profane one. The two are intertwined like the double helical DNA structure (Gupta, 1993). The conventional intellectual property rights can protect the folklore if national legislation for the purpose exists, they can also protect the uses of various biodiversity elements (even if out of the local context) and can protect the symbols, music, other icons considered sacred by the local community.[26] Reductionist knowledge by itself has rarely generated the social responsibility required to guide collective behavior towards conservation. *The sacredness of certain sites, species and symbols must be respected even if modern minds find this incomprehensible or even irrational (Gupta, 1993).*

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[25] In a field study in Mahendra Garh district, Haryana, India in 1984, I observed that some farmers grew coriander around the field of chick pea. They believed that the coriander helped in repelling pests. M Pimbert at ICRISAT when informed about it, did some studies at ICRISAT and found the coriander did not repel the pests. It attracted in fact the predators of the pests. The ultimate result about control of pest was correct, but the causal reason assumed by farmers was incorrect (Gupta, 1985).

[26] Perhaps just as we have trademarks and service marks, we may have to develop a category *of sacred marks, which* will be restricted for use by specific communities or their representatives or the ones authorized by them. This provision can provide considerable psychological and spiritual solace to the communities, which feel aggrieved by unauthorized and improper use of sacred marks. In the Australian case a native community felt aggrieved when a carpet manufacturer used their sacred signs authorized by an individual artist on the carpet. The community felt that the individual was not authorized by the community to contract the use of signs designed during spiritual ceremonies to anybody outside without communities' permission. The court did not agree with this submission as mentioned later in this paper (Blackney 1999, Also see (1995) 91-116, CCH Australian Intellectual Property Cases, 39,051 and (1991), 2 Intellectual Property Reports 481 at 490

3.8. The Production and Reproduction of Knowledge:

The process of local knowledge production and reproduction may differ. Production of local knowledge can be through (a) discovery of problem-solving on a small scale or in an episodic manner and (b) through interaction with wider knowledge systems, ranging from networking with kith and kin to networking with external partners, for example.

In a dynamic knowledge system, some knowledge is lost when it becomes redundant on account of changes in access to resources, and changes in socio-ecological conditions, or changing perceptions of needs. In a vibrant culture, much of the knowledge that is passed down from one generation to another depends upon social structures and the needs of changing times. Knowledge related to livelihood strategies is embodied in practice. Once the livelihood strategies themselves undergo change due to reduced or modified access to the underlying natural resources, as has happened in most developing countries, the LKS becomes fragmented and also become inadequate to take care of a given resources in a sustainable manner. Cultural knowledge is embedded in rituals, folklore, art and other cultural and social artifacts and processes. Local experts may reproduce some other specialized forms of knowledge, such as making and retting nets or fish traps, individually rather than at the community level in a given community.

Knowledge that is embodied in practices usually takes the form of skills, which are learned. Skills can be repetitive and non-repetitive. "Judgmental" skills are often scarce. Examples of such judgmental skills are weather forecasting, judging the quality of diamonds (diamond polishing using labor intensive methods has grown into an important off-farm employment in many of the villages of Gujarat, India, cattle judging, and diagnosing human and animal ailments and problems of soils, lakes, finding out potential sites with rich fish population, etc. Individuals who possess such skills may become recognized as local experts. Some skills are embodied in the practice and can be converted into specific know-how capable of being applied for industrial applications by anybody well versed in the art, whereas there are other skills which are embodied in the persons as a kind of tacit knowledge. The latter can only be kept either as trade secret or as personalised knowledge. The former can benefit from application of different IPRs whereas the latter may be covered by trade secret protection only.

3.9. The Performance of Indigenous Knowledge:

The performance of indigenous knowledge has been reviewed by Richards (1987). Performance from an indigenous perspective might include a number of functional criteria that are considered by formal science as less relevant: e.g., risk management, contributions to system maintenance, soil health, etc. The same practice could have different impacts on the natural resource base, depending upon the criteria emphasized by a community while deciding the appropriability of a practice in a given cultural and spiritual context. The values underlying the choice of criteria serve as a guide for dealing with each other (social equity), with non-human sentient beings (i.e., other life forms capable of feeling and having consciousness), and with nature (ecological responsibility) and the super-natural (ethereal or spiritual beliefs). For instance, the bowhead whale, which was a protected species for 65 years, was allowed to be killed by the Canadian government in July 1998 for consumption as well as ceremonial purposes by Inuit communities. The Bowhead Traditional Knowledge Study coordinated by Keith Hay of the Nunavat Wildlife Management Board revealed the existence of 350 bowheads rather than a "few tens" believed to exist by scientists. This number made the permission to kill one whale a year for ceremonial purposes quite sustainable. Traditional knowledge embedded in a culture and embodied in practice serves as the mechanism to preserve and pass on

sustainable livelihood strategies to future generations.

Communities give expression to their belief systems, norms, values, and ideologies through folk art, crafts and rituals, taboos, myths, symbols, etc. These values are reflected in their livelihood strategies, which are also closely integrated with local institutions, social networks, kinship networks and knowledge systems. The non-functional aspects of knowledge also influence performance. The cues, as Richards (1988) observes, provide sort of road map on which act is played and replayed. Thus the cultural context in which interactions may take place among different community members may be provided by non-functional aspect of roles, rituals, and responsibilities. The knowledge, as Rengifo (1990) argued then happens. It does not have to be crafted.

3.10. The ecological context of TK:

The ecological context in a given region or for a given community defines the nature of environmental risks or threats. A drought, a flood, erosion of biodiversity, or an increase in salinity levels are examples of threats. The regions that have low exposure to such threats are preferred by markets and are therefore at an advantage in land-based community strategies. Given the low transaction costs of exchanging resources in these regions, the adaptive responses of their households are fast. Their social structures are also different to those of disadvantaged regions that have higher perceived or real exposure to risks or threats. In Table 1, I have enumerated the key contrasts that characterize the advantaged (market-dependent and dominated) and disadvantaged (nature-dependent and dominated regions).

The market dependent communities are the ones in which most exchanges are mediated through markets. The commoditisation of labour, products, and skills is high. In contrast, the communities that draw their major sustenance through use of natural resources, often without much value addition, are defined here as nature-dependent communities. The regions where each type of community predominates are also contrasted here. The market-dependent regions are the high growth green revolution regions and commercial fisheries, while the nature-dependent regions are rainfed drylands, hill areas or forest fringe areas and small-scale fisheries.

Table No 2

		Market dominated	**Nature dominated**
1.	Communication system	Digital	Analogue
2.	Pooling of resources	Very low	Very high
3.	Reliance on common properties	Low	Very high
4.	Settling of books of account	Very short term	Long term

5.	The proportion of women headed or managed households	Very low	Very high
6.	Women's participation rates	Very low	Very high
7.	Reciprocities	Specific	Generalized

Source: Gupta, 1992, 1995

One particular dimension of this contrast between nature-dependent communities and market-dependent communities is like comparing analogue and digital systems. Analogic communication implies metaphorical communication. While digital implies very precise ways of communication suggesting what it is and what it is not. The redundancies are low in the latter while high in the former. Many local experts have a symbolic language through which they communicate their understanding of a problem. Many scientists and policymakers do not appreciate this basis of communications and jump to the conclusion that such expertise involves more 'mumbo jumbo' than actual skills. In some cases, this might be so, but to generalize this over entire bodies of traditional knowledge in contemporary institution contexts is quite inadequate. The persistent neglect of traditional ecological and technological knowledge as well as contemporary creativity of local communities and individuals needs to be avoided. Bridges built between knowledge that has evolved through generations of interaction between humans and nature on the one hand and the western scientific scholarship evolved over few centuries on the other only will enrich both. The fair trial of contemporary creativity by formal scientists will enlarge the repertoire of those institution builders who want farmers and fisher folks to have low-cost, nature-friendly technologies, coupled with institutional structures restraining greed and maintaining respect for the rights of the unknown and unknowable (that is, perfect strangers like the future generations of a community). Many times the motivations for even a contemporary innovation are not entirely utilitarian from human point of view though the invention may be extremely useful for human beings. Amrutbhai Agravat, a farmer-artisan of village Pikhor, District Junagadh, Gujarat innovated a tilting bullock cart in which the burden on the bullocks was reduced considerably because of the four wheels instead of conventional two-wheel cart. The advantage of tilting mechanism was that one could pour the manure directly into furrows instead of putting it in one place. And then distribute the manure manually through baskets. Here the concern for the well being of the bullocks may not be captured in the incentives for the cart per se and yet, this concern has been an important driver of the invention[27].

[27] The patent has been filed by SRISTI on behalf of the innovator for this cart, refer application No… dt. It is interesting to note that this innovation has been licensed to three entrepreneurs for about a 1000 and 700 USD for three and one district each of Gujarat respectively. This is the first time in India when an easily copiable technology has been licensed by the entrepreneurs for small areas like districts just because patents have been applied for and there is a possibility of checking unauthorized imitation. SRISTI has filed several more patents in India and as well as USA through Pro bono help of patent lawyers, such as THT and licensed a grassroots technology even to a company in USA through M-CAM.com..

3.11. Logic of long-term conservation:

Communities and individuals who have long conserved biodiversity have not done so entirely on the basis of utilitarian logic. The efficiency of ethics may sometimes be tempered by the inefficiency of technology which local communities use. That is, while the local communities may not like natural resources to be exploited beyond their sustainable limits, they may use non-sustainable and inefficient technologies. Use of such technologies in the wake of unfair competition with well equipped market forces may lead them, for example, to use unsustainable technologies for catching fish, such as fishing by the use of dynamite.[28] Extractive uses of biodiversity could be sometimes less conducive to the long-term conservation of a species, even though the norms and values guiding the extraction may be very noble. This happens when poachers combined with impoverished local communities may bring a species to near extinction even though local extraction by the communities may be much less than that by outsiders. Once ethical values, cultural norms and belief systems become weak, the inefficiencies of extraction methods may start generating negative feedback effects. That is, the restraint for extracting diverse resources within their sustainable limits becomes weaker. *The important point to note is that improvement in technical methods may not necessarily lead to evolution or restoration of ethical norms*. The challenge thus is to devise incentives that fulfill four conditions of sustainability: (1) access to biodiversity for local communities, so as to ensure their sustainable livelihood systems, should take priority over access for outside institutions or individuals; (2) assurance to individual healers or other local experts, communities, and other stake holders of sustained access to the resources and viable collective responsibility for using biodiversity; (3) blending traditional skills/abilities to convert biodiversity resources into investments with or without value addition; and (4) conservation of cultural lifestyles and value systems in such a manner that basic needs are met without impairing the life support systems of local communities.

3.12. Value chain for TK:

Unless arrangements are made for sharing value added knowledge and benefits from value added gains (made possible by converting local knowledge into economically profitable investments or enterprises) the collectors have no ethical right to collect more of such knowledge. A second requirement should be that research results and lessons learned in the process of value addition should be shared with the knowledge providers in the local languages and in an easily understandable manner. Code of conduct for gene bank managers, researchers, funding agencies, and other development managers should provide for such sharing in an unequivocal manner. Local communities have already paid a heavy price because the designers of dams, hydropower projects, waterways, commercial prospectors of biological resources, and landfill programs that have damaged wetlands have ignored their knowledge and institutions. These communities must not be dispossessed of the only resource left with them; i.e., their knowledge.

The Honey Bee Database (1990-2002) was established fourteen years ago to scout, develop, sustain, disseminate and reward grassroots innovators and experts in traditional ecological, technological, educational and institutional knowledge which was developed by local communities and individuals without any outside help. This database can be accessed by

[28] In this method fisherman used dynamite explosion in the river stream such that all the fish – small or big are either killed or numbed in the process. The method does not discriminate between large and the small fishes and helps in maximizing catch in minimum time. In contrast, traditional practices where such nets are advised in which fish less than 4 x 4 inches cannot be caught are extremely sustainable since small fishes are not caught.

innovators and others who aim to empower them by adding value to their innovations and by sharing benefits with the knowledge providers and innovators in a fair and equitable manner. Members of the Society for Research into Sustainable Technologies and Institutions (SRISTI) and the Honey Bee Network (**www.sristi.org**) have been involved in the documentation, experimentation, and dissemination of indigenous knowledge, innovations and practices in the agricultural and animal husbandry sectors for 16 years, working closely with farmers, and using a variety of methods to document about 12,000 innovations and practices from 6000 villages in Gujarat (SRISTI, 1996) and in other parts of India. In addition, innovations have been documented from local communities in many countries in Africa, Asia and Latin America. Through the Honey Bee Newsletter, grassroots innovations have been disseminated to more than 75 countries. This has produced probably the world's largest database on grassroots green innovations having now more than twenty thousand innovations and outstanding examples of traditional knowledge, with names and addresses of the innovators (individuals or communities) and communicators in most cases (including the innovations/traditional knowledge practices received at National Innovation Foundation).

National Innovation Foundation set up by Department of Science and Technology; Government of India (www.nifindia.org) to replicate Honey Bee experience (www.sristi.org/honeybee.html) all over the country had received about thousand entries with about 1600 innovations and traditional knowledge examples in the first year (NIF, 2001). In second year it received more than 13000 entries with much larger number of innovations and TK. This led the Union Finance Minister to announce in Indian Parliament on Feb 28, 2002, setting up of National Micro Venture Fund in consultation with NIF by SIDBI (Small Scale Industrial Development Bank of India) to help convert innovations and TK into viable enterprises. NIF had already decided to set up four more GIANs (Grassroots Innovation Augmentation Network, kind of incubators, first set up by SRISTI and IIMA in collaboration with Gujarat Government in 1997) in addition to the one set up earlier (www.gian.org) in different parts of the country to convert innovations into enterprises and act as incubator for grassroots green innovations. SRISTI has been experimenting with micro venture capital and has received offer of support from Swiss Development Cooperation to test out a real risky model of micro venture support. In addition, International Development Research Centre (IDRC) has supported an initiative on Women, Wisdom and Well-being to focus on the TK and contemporary creativity of women. (This is the third phase of IDRC, Canada's support to SRISTI's research activities in collaboration with Indian Institute of Management, Ahmedabad since 1992). This aims at filling a major gap in the Honey Bee Data base about women's creativity and innovations (hardly five per cent entries so far were dealing with women's knowledge). While to some extent women tended to be very creative in coping rather than transcending the technological constraints, it was not so much due to any innate difference in their creative capacity as due to their historically constrained access to black smithy and carpentry tools. In the knowledge domains in which they had larger control such food processing, cooking etc., their creativity was quite evident, no two women ever cooked the same recipe alike.

Dr Ben Ngubane, Chairperson of Commonwealth Science Council and South African Minister of Science, Technology, Culture and Arts has written to all heads of Science and technology in commonwealth countries advocating Honey bee approach to document and disseminate, grassroots green innovations and add value to these and share benefits with knowledge rich and economically poor people. Three farmer innovators have gone to South Africa in June 2002 to share their skills and insights with their counterparts in northern province. Commonwealth Science Council (CSC) adopted the Honey Bee Network agenda in its Ministerial gathering held in South Africa in June 2002. CSC decided to evolve into CIN (Commonwealth Innovation Network).

Biodiversity, poverty and knowledge erosion: incentives for conserving diversity, and related knowledge, innovations, skills and institutions

Biodiversity cannot be conserved by keeping people poor even if, historically biodiversity survived largely under such conditions (Gupta, 1990). Our studies (Gupta, 1989, 1991, 1997) have shown that many communities, which conserve diversity, have remained poor because of their superior ethical values. This happens when many healers refuse to demand or accept any compensation or payment for their services provided to individuals within and outside their community. Further, when they decide not to pluck more plants than are necessary for immediate use, they forego an opportunity of accumulating wealth by processing the herbal diversity in larger quantities and selling or dispensing it to others for consideration. There are others at the same time (including local people as well as large corporations - national as well as international) who have no hesitation in extracting biodiversity without taking care of regenerating the same. One of the challenges is to modify ethical positions that threaten biodiversity and, at the same time, to ensure improvements in livelihood prospects for indigenous peoples, through the implementation of the CBD and relevant IP conventions. These communities will then continue to conserve biodiversity along with their associated ethical and cultural values.

The rate of erosion of local knowledge about biodiversity has never been so high as it is in the current generation in areas which did not go through large scale annihilation of local tribal communities as happened in many Latin American and African countries through the influx of missionaries. There are several factors which explain this: the changing family structure from extended to nuclear families, consequently weakening links between the grandparent generation (which holds much of this knowledge) and the grand children generation (the parents' generation is alienated from these knowledge systems already, due to the heavy influence of modernity), lesser esteem for this knowledge in primary school curricula, the transition from oral to written culture, and the inability or unwillingness of many older healers and herbalists to share their knowledge or agree to its transcription, or to transcribe it themselves. This unwillingness arises in many cases because outsiders (such as ethno biologists) have extracted the local knowledge, commercialized it or published it without any attribution, reciprocity, or benefit sharing and thus have offended local communities. *Knowledge erosion is a threat as serious as resource erosion itself. The reasons are obvious. If there is no knowledge about given resources, plants become weeds*. It becomes not only difficult to locate what is useful or known, but also the incentives for conserving what is not known is much reduced. In ecological economic terms, the option values decline if the probability of finding something useful in the current generation is lower because of the loss of knowledge about the resources. Conserving biodiversity without conserving associated knowledge systems is thus like building and maintaining a library without a catalog. It is true that users of such a library might in fact develop a catalog over a long period of time but meanwhile the users would suffer. By analogy, biodiversity users, who are without a

knowledge base, will not benefit from centuries of experimentation and knowledge accumulation by local communities and indigenous peoples. It is true that formal scientific knowledge of plants and animals is diverse and rich. However, the bases upon which different communities have classified and organized their knowledge as well as practices are similarly complex and dynamic.

There are three crucial assumptions underlying this perspective. First, not all knowledge, innovations and practices prevalent in a community are communal in nature. There are individuals who have great expertise in various aspects of local knowledge that is not known at all or known only partly to the local community. Second, not all the knowledge in use by a community is traditional in nature. There are many examples of contemporary innovations by local communities, developed collectively or individually. Third, local knowledge can be conserved perhaps in a more sustainable and dynamic manner if the associated cultural values and ethical institutions contributing to conservation of biodiversity are also conserved and/or strengthened. Sustainable and dynamic conservation would mean conservation in a manner that the knowledge grows through constant experimentation and innovation rather than just being maintained as a fossilized form of historical knowledge, produced at one point in time and carried forward by succeeding generations. The implications are obvious. Incentives for the conservation and sustainable use of biodiversity will have to be sufficiently flexible and diverse so as to provide for the growth and development of the traditional as well as the contemporary knowledge that is held by individuals as well as groups. The same or similar incentive structures or philosophical assumptions cannot provide adequate motivation to conserve what exists and restore what is lacking. Devising appropriate incentives is challenging because many local communities lack access to resources for some basic needs and are impoverished. Factors that have contributed to this linkage between high biodiversity and poverty are discussed by Gupta (1989, 1991a, 1993). SRISTI (1993) has noted the following factors (see also Gupta, 1990, 1992). These factors include:

(a) Biodiversity is high in rain forests, mountains, some arid and semi arid areas, humid areas, primarily due to diversity in soil, climate and other physical and social structures.

(b) Poverty is high because markets are often unable to generate demand for diverse colors, tastes, shapes and qualities of natural products. Products of mass consumption particularly when processed by machines, have low variability because throughput by machines has to be of uniform quality and maturity level (for instance for processing tomatoes to make ketchup, local varieties will not be suitable because these are not synchronous in maturity, have uneven ripening status and thus, taste, color and flavour cannot be standardized). The cost of inventory, transportation, display in shelves of large varieties of, for example, tomatoes is obviously quite high compared to that of only one variety. Consumers who do not demand larger varieties either because they have not been exposed to the same or are unwilling to pay the extra costs also contribute to lower demand of biodiverse products.

(c) The regions of high diversity also have very poor public infrastructure (in tandem with weak private market forces), because the people have limited surplus to attract public servants and they are less articulate and organized to create political pressure (except through insurgent movements as is becoming evident in different parts of the world).

(d) The low demand for the ecological and technological skills of these communities characterizes them as ‘unskilled’ labor, fit for being a part of the urban slums, squatters, or other similar work force. Once the knowledge system is devalued, cultural and social decline follows. The tenuous relationship with nature is ruptured. Ecological degradation

spurred by various external resource extractors is aided and abetted by many poor as well as not so poor people for whom survival in the short term seems possible only through eco-degrading strategies. Thus when the demand for local biodiverse products (main items for the communities to dispose off) is low, exchange value will drop, consequent purchasing power will decrease, and poverty is bound to follow. Supplies for basic needs also get constrained due to administrative and political apathy towards people in these regions where population density is low and thus the number of votes and other kinds of political pressures are lower.

3.14 Incentives for Conservation and value addition

To overcome many of these constraints, four kinds of incentives have been proposed (Gupta, 1991, 1995, 1997):

The matrix resulting from the interaction of two variables a) nature of benefit, whether material or non-material and b) target of benefit, whether individual (including group of individuals) or community provides the framework for designing these four incentives for rewarding innovations.

Forms of Benefit

Target of Benefit	Material	Non-material
Individual		
Collective		

I INDIVIDUAL -MATERIAL

These rewards are in material form such as royalties from patents, copyrights or trademarks, biodiversity user fees, monetary rewards, fellowships, land assignment or equipments, etc., to individuals. These could arise from those who license technologies of herbal- or animal-based recipes by local individuals or educational or research grants etc.

II INDIVIDUAL - NON-MATERIAL

Documentation, press coverage, TV and other media, public felicitation, invitation to lecture in schools, centers of learning and research. Invitation to conferences, workshops attaching the name of the innovator to the innovation (an incentive frequently used by the local communities themselves), photographs being placed in village or district councils, access to new skills. For example, SRISTI has been giving the SRISTI *Sanman* (honour) for the last ten years to outstanding innovators at grassroots level. NIF now provides national awards for similar purposes. Our other collaborators like SEVA at Madurai provide similar awards at regional level.

III COMMUNITY - MATERIAL:

These are relatively quite important. The rewards in material form to communities or groups of people help to generate the right signals for mobilizing the collective action, which is so

important for conservation. The instruments of such rewards could include risk funds, trust funds, priority in the development or allotment of infrastructure such as schools, health care system, access roads etc. free or easy access to data banks, access to external expertise, community awards, community grants/ risk funds, external aid in developing common property assets, marketing intervention for organic produce, etc.

IV COMMUNITY - NON-MATERIAL

These are rather difficult to implement but may have quite an enduring impact particularly when the rewards change the values of the communities positively. Rewards include policy changes to ensure greater control over local natural resources, removal of perverse incentives (that is indications which encourage non-sustainable use of resources) for conservation, favourable policy environments for eco-friendly products, conservation practices, media attention, community awards, capacity building through transfer of technology, building up of negotiation skills, pedagogy changes, inclusion in the curriculum of lessons which raise social esteem for local, eco-friendly practices and innovations, etc.

The magnitude, manner and form of incentives or benefits may influence the degree of involvement of the local communities or individual innovators in future projects of biodiversity conservation.

- Incentives could be in cash or kind, conditional (linked to research) or unconditional.

- Community incentives could be of a direct nature or they could be indirect. They could be provided at one point in time or over an extended period of time.

- Incentives could be provided by external agencies or by the local communities themselves. The improved status of the innovators on account of social recognition may or may not be associated with a greater say in decision making at the societal level.

- Incentives may focus on empowerment of local communities so that they may have better negotiating skills and better knowledge for conservation of local resources. Alternatively, the incentives may be targeted directly at conservation. Incentives targeted at the community may lead to action either at the community level or even at the individual level.

The concern for local knowledge has been there for a long time. As early as 1969, Verma and Singh raised questions about the continued relevance of indigenous knowledge in the context of animal husbandry. The modern health system for human beings was quite weak. For animals it was even weaker. Local communities in many parts of the tropical developing world rely on local knowledge of animal husbandry even today. This is indicative of the fact that mainstream education and public policy still do not give due attention to the peoples' knowledge system. One implication of this is the downgrading of those knowledge systems in the eyes of young people of the same communities. Once the esteem for local knowledge goes down, there are less incentives for young people to acquire that knowledge and to experiment and rejuvenate the same. This leads to serious discontinuities in the intergenerational flow of knowledge. Once the "local experts," the older generation, are gone and there are no successors, the knowledge held in trust by those individuals for future generations is lost forever. Young people are not acquiring the skills of local experts because of a lack of incentives. However, some of these skills might lead to new career options; for instance, the skills of restoring the health of degraded lands, water bodies or forests are becoming increasingly valuable as international conventions and their implementation gain momentum.

3.15. A Framework for Access to Local Biodiversity and Knowledge Systems

Access to biodiversity can be looked upon from the perspective of its uses as well as the methods of access (also see Pew Ethical Guidelines, 1993, Gupta, 1994 a, b).

- **Access Framework**

	Access	
	Extractive	Non extractive
Non commercial Returns	1	2
Commercial	3	4

1) *Non-commercial / Extractive*: The samples are extracted for taxonomic or ecological analysis without any commercial purpose in mind, e.g. for academic research and studies by different individuals, institutions, and public & government organizations. Recent examples of such studies include the Department of Plant Science, Oxford, UK, request to the Ministry of Environment & Forest for conducting field studies and collection of specimen Flora from South India.[29] A similar request was made by the Royal Botanical Garden, Edinburgh, Scotland, conduct field studies and collect flora from Sikkim, India.

2) *Non-commercial / Non-extractive*: Access to biodiversity in order to describe eco-systems or local institutions. For instance, studies carried out by the Zoological Survey and Botanical Survey of India in order to document the biodiversity can be termed as examples of such access. The ethno botanical studies documenting knowledge of ethnic communities about plants are another example of access to biodiversity and associated knowledge systems. It is true that this information may be put to commercial use or the sites described may become sites for economic extraction or eco-tourism later, but if, at the time of documentation, the intention was of a non-commercial nature, then the case will fall within this category.

3) *Commercial / Non-extractive*: The extraction of local knowledge systems of the local community about the biodiversity, rather than the diversity itself, falls in this category. This knowledge is later utilized for commercial gains in collaboration with pharmaceutical firms and other commercial prospectors. The access does not involve actual physical extraction of biodiversity. The use of the knowledge possessed by the Kani tribe to screen a therapeutic drug by Tropical Botanical Garden Research Institute (TBGRI) with benefit sharing agreements is a well-known example in India. Databases, such as the Natural Products Alert Database (NAPRALERT), which contain a range of information including ethno botanical data on selected plants, are accessed by different companies on payment as the data can help at several stages of medicinal development. However, the service is provided free of cost to developing countries.

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[29] The Ministry of Environment & Forest granted access to these Institutions on the following terms and conditions:
~~1)~~ _____The accessor will collect only those species that are specified in the request.
~~2)~~ _____ The specimen or collection will be used only for the purpose listed in the request.
~~3)~~ _____ A scientist from Botanical Survey of India will accompany them to all the field visits made.
~~4)~~ _____ Before publishing the outcome of the research conducted the MoEF permission is to be sought.
~~5)~~ _____ In case the research has potential for commercial exploitation another agreement need to be signed.
~~6)~~ _____Transfer of specimen or the research finding to third party without prior permission of MoEF is prohibited.

4) *Commercial / extractive*: The form of access where the commercial organization, local communities or cooperatives extract components of biodiversity for commercial purposes. This involves physical extraction of biodiversity to produce value added products or for direct use of the resource. The extraction of medicinal plants by firms to produce medicines, the working of bamboo forests by the paper industry for use in pulp production, are examples of this category. The Merck-INBio deal in Costa Rica is a classical example. Merck, a pharmaceutical company, received screened natural samples from INBio, National Institute of Biodiversity of Costa Rica, for further research and development. Similarly, the use of medicinal herbs and plants by an individual herbalist to treat patients may also be termed as an extractive and commercial access. Here the scale, purpose, and location of the user may make a further difference to the obligation of the extractors.

The commercial/extractive and commercial/non-extractive access (No. 3 & 4) can be pursued for different proposes by various extractors. The location of the user and the extractor may influence the respective entitlements and obligations.

The term , `local' refers to geographical limitation such that resources are extracted or used by the communities living around the resource. They may or may not have formal property rights on the resource. The external user or location would mean distant, farther and beyond the access and control of local communities. Thus local context would be a tribal community living in or around a forest and dependent on the locally available resources for its survival. The external agents could include companies or scientists or others located in the cities nearby or even outside the country. The difference is in scale and spatial distance. It is true that local communities may have institutional arrangement whereby the control, the mechanism of using a resource outside. For instance, a local cooperative unit for managing biodiversity resource may have a plant or trading centre in far off place. In such a case, the local user is only implying the relationship of the user with the resource. Obviously, the user may have external connections. The scheme presented here should be seen as a way of looking at contrasting situations to understand the underlying tensions.

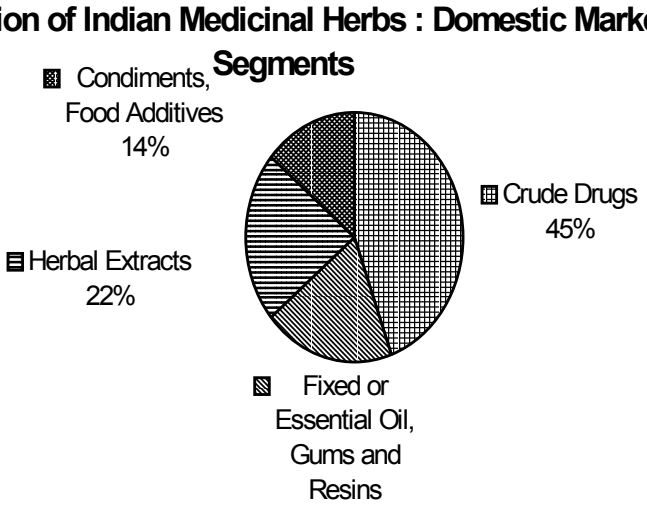
		User Location	
		Local	External
Extractor Location	Local	1	2
	External	3	4

1) Local Extractor-Local Use

The use of diversity by the communities residing near the site, or having property rights over it, for their own consumption, may constitute category 1. Collection of leaf litter from social forestry to be used as fuel by tribal communities in Orissa, India, or the use of bamboo available in the forest for construction of houses by local and indigenous communities are examples of such modes of access. An Exim Bank occasional paper estimates the local extraction and consumption of herbal plants to the tune of Indian Rupees (Rs.) 600 million every year.

2) Local Extractor-External Use

The economic significance of Indian biodiversity can be gauged by the fact that the domestic trade in medicinal herbs and its extracts is to the tune of Rs. 3 billion and is increasing. (Source: Exim Bank Occasional Paper No.54) The medicinal herbs are extracted by the local people and reach the industry, through middlemen, to be utilized for production of value added natural products.



A recent World Bank study pointed out the poor returns on natural resources to India and its local extractors by citing the example of "*Tetu Lakda*" twigs. These twigs are available in India at Rs. 9/Kg ($0.26/Kg) while its extracts are sold in the international markets at Rs 500,000/Kg ($15,000/Kg).

The policy guidelines and protocols should look into these disparities in benefit sharing and enthuse and motivate the private sector to bridge these gaps. In some cases, if motivation does not work, sanctions may have to be called for. The current demand for medicinal plants is being met marginally from cultivated sources however the wild remains the major source of medicinal herbs. The world trade in medicinal plants and related products is estimated at US $ 5 trillion by the year AD 2050. To meet the increased demand, cultivation of these species and use of tissue culture or cell culture techniques need to be promoted. This is a must, as even the current level of extraction from the wild is not sustainable. The private sector has to take the lead in this area and policy measures for biodiversity conservation should include incentives for such investments.

3) External Extractor -Local Use

A paper mill may collect and use "*sabai*" and "*bhabar*" grass for pulp making in India. The grass that is found fit for rope making is sold to the local people. The collection of long bamboo by paper mills operating inside the forest for sale to the local people via the forest corporation is another example of such interactions.

4) External Extractor-External Use

An external extractor, such as a paper mill or a non-timber forest produce contractor uses labor from outside the local communities to prospect biodiversity, which is then transported, to an external location for value addition or processing. The local communities have minimal or no role to play in such extraction though they may suffer the consequences of resource depletion and degradation.

A regulatory regime cannot be designed uniformly for different kinds of extraction options at varying scales for various commercial and non-commercial purposes. The tables below define the interaction of various types of biodiversity with different access regimes and governed under various property right laws.

Table 4: Modes of Extraction and Diversity

Extractors		Biodiversity: Fauna	Floral	Microbial	Genetic	biochemical
Foreign	commercial					
	non commercial					
Domestic	commercial					
	non commercial					

Access to biodiversity *per se* should be distinguished from access to genetic resources, despite the difficulty to draw the line between both categories. This is because genetic access has never been regulated and genetic resources had been considered the common heritage available to everybody before the CBD came into being. Secondly, the monetary gains arising out of genetic resource use are significantly higher than those arising from physical access to biological resources.

Glowka (1998) reviews various proposed legislations, agreements or executive orders (for example, in Philippines) on the subject of access determination processes. In the Indian Pact, Art. 37 provides framework for gene banks to enter into contracts with other partners and Art.36 provides access contracts with universities and recognized investigators. Philippines legislation is also quite flexible for institutional researchers in which case prior informed consent is taken only at local level. However, National Commission on Indigenous People (Administrative order No.1, 1998, Philippines[30]) provides several specific guidelines for Protection and Promotion of Indigenous Systems and Practices (IKSPs). The guidelines are:

The ICCs/IPs have the right to regulate the entry of researchers into their ancestral domains/lands or territories. Researchers, research institutions, institutions of learning, laboratories, their agents or representatives and other like entities shall secure the free and prior informed consent of the ICCs/IPs before access to indigenous peoples and resources could be allowed.

a) A Written agreement shall be entered into with the ICCs/IPs concerned regarding the research, including its purpose, design and expected outputs;

b) All data provided by the indigenous peoples shall be acknowledged in whatever wrings, publications, or journals authored or produced as a result of such research. The indigenous peoples will be definitively named as sources in all such papers;

c) Copies of the outputs of all such researches shall be freely provided the ICC/IP community; and

d) The ICC/IP community concerned shall be entitled to royalty from the income derived from any of the researches conducted and resulting publications.

These guidelines do not seem to distinguish among national researchers and international researchers, as is the case in proposed legislation by Indian government. The issue of course is, as mentioned above earlier, whether similar constraints should operate on researchers with non-commercial and non-extractive motives vis-à-vis researchers having commercial extractive or commercial –non-extractive

[30]Office of the President, National Commission on Indigenous Peoples, Administrative Order No.1, Rules and Regulations Implementing Republic Act No.8371, otherwise Knows As "The Indigenous Peoples' Rights Act of 1997": Quezon City: Philippines

motives. In the absence of proper research and generation of preliminary database how will external or internal prospectors assign values and enter into contracts assuring reasonable returns to local communities and other stakeholders.

Different kind of biodiversity occur on land and water governed by different kinds of property right regimes. The regulating authority has to differentiate the application rules and regulations depending upon the source and the extractors of the resource. (Table II)

Table 5: Governance and Access

	Source regime						
		Terrestrial			Aquatic		
Extractors		Private	Public	Common	Private	Public	Common
Foreign	Non-commercial						
	Commercial						
Domestic	Non-commercial						
	Commercial						

The property right regime governing a resource influences not only the constellation of stakeholders but also the possibility of disadvantaged communities and individuals benefiting from a resource-centered benefit sharing mechanism. Further, benefit sharing need not be seen only among international users of resources and knowledge but among by the domestic users. After all a tribal community or individual healer gets no respite from the fact that the exploiter is from within the community or country and not from abroad. In most developing countries, the greatest damage to the biodiversity and greatest exploitation of local communities has been caused by domestic interest groups in relative terms, exceptions apart.

4.0 The Role of Intellectual Property Rights Regimes

The need for a low transaction cost system of intellectual property protection for TK is obvious and yet most global dialogues on intellectual property rights have not yet embarked upon such a system. Article 23.4 of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) provides for negotiations to be undertaken in the Council for TRIPS of the World Trade Organization (WTO) on the establishment of a multilateral system of notification and registration of geographical indications in the context of wines. There is no reason why such negotiations should be restricted only to wines and not include traditional knowledge as well as contemporary innovations of local communities and individuals.

There are many other policy and institutional modifications that are called for in existing IPR laws. It is not my argument that removing the imperfections of IPR regimes will by itself generate economic rewards and social esteem for local, knowledge-rich, but economically poor people. I realize that the role of non-monetary incentives may be sometimes more important. However, the biotechnology, drug, and other value adding industries have not yet shown any explicit interest as a stakeholder in generating models of voluntary benefit sharing. Does this imply that they believe that future gains in biotechnological products may be made only on the basis of public domain biodiversity?

Machlup, (1958) provides a succinct historical review of the debate on patents in the late 19th century in Europe and America. The anti patent movement collapsed after 1873 following the depression, the rise of protectionism and nationalism and the "willingness of patent advocates to accept a compromise". The rise of free enterprise and trade was accompanied by the

acceptance of principal of compulsory licensing so that inventions could be used by getting them licensed to others at reasonable compensation. The idea of compulsory license evolved way back 1790 but became part of patent wisdom at the Patent Congress held at Vienna World's Fair in 1873. Machlup (1958) provides various arguments that were used to oppose patents among the developed countries including the ethical considerations.

The discussion on registration systems has taken place for about a hundred years now. Machlup reviews this debate and summarizes various considerations that were brought into the discussion. He observes:

> Under the registration system, the validity of a registered patent is examined only if an interested party attacks it in the court and asks that the patent be invalidated. Under the examination system, the patent is issued only after the patent office has carefully examined the patentability of invention. This examination may include so-called "interference proceedings", when the Office finds that two or more pending applications seem to claim, "partly or wholly" the same invention so that the priority of one inventions has to be established. The so-called "Aufgebotssystem", examination-opposition-system provides for an interval of time after publication of the specifications examined and accepted by the official examiner and before the issuance of the patent, in order to enable interested persons to oppose the patent grant…….. *The registration system administratively is the cheapest. But may burden the economy with the cost of exclusive rights being exercised for many inventions which, upon examination, would have been found non-patentable.* In favour of the examination systems, it has been said that it avoid a mass of worthless, conflicting, and probably invalid patents, onerous to the public as well as bona fide owners of valid patents; that it prevents the fraudulent practice of registering and selling patents similar to the claims being patented by others; and that it drastically reduces the extent of court litigation (1958:8).

We will revisit the issue of registration system in the light of recent experience later. Machlup has reviewed several suggestions for reform of the patent system about four decades ago, some of which are still relevant, such as:

> Rewards to the patentees of a sufficiently high level to give general satisfaction to the inventors and those who have invested in their inventions financially in lieu of making inventions freely accessible to all. The rewards will have to be fixed according to the "assessed values created by the invention" (Michael Polanyi, 1944)[31].

a) In this scheme "instead of making annual "participation payment" to the licensers (in addition to the reasonable royalties received by them from licensees) the government would buy the patents outright and open them to all, free of royalty (Hamilton, 1957)[32] Another variant of this suggestion was the option to government to purchase any patent at a reasonable price if it was interested in making it available for general use.
b) The proposals for giving prices, bonuses are said to be as old as the patent system itself (it is important to mention that opposition to the monopolistic features of patents have not come from socialists but mainly from economists believing in free enterprise and free trade).
c) Government should finance the research and development work so that if society wants some innovations it must pay for them in the first place.

[31] Michael Polanyi, "Patent Reform", Review of Economic Studies, Vol.XI (1944) P.67
[32] Walter Hamilton, The Politics of Industry, New York: Knopf , 1957, p.70

In different countries, combinations of incentives system have been followed. Even countries having strong patent systems have recognized the importance of government's investment in research, national awards and in occasional cases option of compulsory licenses. The examination system has been for disclosure rather than for invention or novelty as in the case of Switzerland. Their experience has been that percentage of patent, which worked in the national system, was not very different from the international patent system. Machlup quotes the famous analogy of the automobile brakes. These permit the motorists to drive it with greater speed. Unlike the real brakes in the motor, the patents put brakes on others regardless of "how fast or cautiously they proceed". He concludes that based on the evidence available till then, the implications for strengthening or weakening different features of patent law will not be same for a non-industrialized country or a newly industrialized country or US. In the post GATT phase, the consensus has veered towards harmonization of patent laws across the countries though some exemptions and more lead time has been given to the developing countries. The history only shows that the debate being witnessed now is not new and has never provided unambiguous answers.

Coombe (1998) reviews the interface between intellectual property, human rights and sovereignty in the context of indigenous knowledge and conservation of biodiversity. She reviews the universal declaration of human rights, International Covenant On Civil And Political Rights (CCPR) 1966, and International Covenant on Economic, Social and Cultural Rights (CESCR) 1966. In the context of IP, CESCR provides that an author can benefit from the protection of moral and material interest resulting from any scientific, literary or artistic production. Historically the civil and political rights, she observes, were believed to be absolute and immediate whereas the economic, social and cultural rights were thought to be more "programmatic" in nature such that these could be realized gradually. The former were considered justiciable while the latter were considered more political in nature. She quotes Scott Luckie who argues about the permeable nature of many of the human rights that, "should have long ago laid to rest sentiments divorcing, rather than merging, civil, cultural, economic, political and social human rights" (Luckie 1998)[33]. Despite the fact that most countries who are party to CESCR do not view the intellectual property rights same way as other rights enshrined in CESCR. When reporting to the committee on the realization of rights under Art. 15, the state is asked, she adds, to describe the steps it has taken to realize, "the right of everyone to take part in the cultural life which he or she considers pertinent and to manifest his or her own culture. All the 130 states, she adds, "are party to the CESCR have international human rights obligations to ensure that the intellectual property rights recognized in their jurisdictions are established, granted, exercised, enforced, licensed, and otherwise used in a fashion that does not infringe upon the human rights recognized in the two international Covenants." Despite the fact that about 130 countries have ratified the convention of biological diversity, which mandates under Art.8j the use of local knowledge, innovations and practices through involvement and approval of local communities, the tensions on this account remain.

The application of IPR laws to traditional knowledge and innovations hinges on the conceptualization of the traditional or indigenous knowledge itself. Brush includes all folk of popular knowledge preserved in local and traditional practices as indigenous knowledge (Brush, 1996). Agrawal (1995) decries the tendency to view indigenous knowledge as a counterpoint to western or scientific knowledge. This has been very obvious to the readers of Honey Bee newsletter for over fourteen years. Honey Bee Network has questioned this dichotomy and has always argued for building bridges between formal and informal science. The assumption is that science is a post-industrial revolution western construction. Studies by Needham on the evolution of science and technology in China and the research work on plant science by Mazumdar (1925), and Singh and Verma (1969) clearly demonstrates that the localization of knowledge takes place through practice in different parts of the world.

[33] Scott Luckie, Another Step Towards Indivisibility: Identifying the Key Features of Violation of Economics, Social and Cultural Rights, 20 (1), HUM, RTS, Q 81, 82 (1998)

Likewise, the scientific principle of refutability, generalizability and falsifiability have been at the core of scientific knowledge produced by local communities. Mere abstraction or lack of it does not confer on a practice, a label of a superstition or a conjecture. Lack of causality, likewise, is not a limitation just of local knowledge. The use of aspirin for headache has been a modern scientific knowledge for a long time without our knowing till recently, how did aspirin actually reduce or remove the headache. So far as abstraction is concerned, there is much of agronomy and other plant sciences in which empirical knowledge is generalized without providing the entire rationale of a given practice. Farmers have produced such knowledge for ages. So long as this knowledge produced predictable, functional and context specific results (some of which were also context free), the scientific basis of the knowledge remained only to be articulated. This became essentially an issue of logic and language. Boiling milk at least three times till it comes to brim without spilling over by alternate heating and cooling has been an old practice for extending the life of milk. By doing that at frequent intervals of few hours, one could keep milk fresh for days without using refrigerator. Women farmers and the villagers who developed this method of keeping milk fresh for long did not articulate the underlying principle or the theory, as was done by Louise Pasture (adding a condition of pressure as well). The practice did not become unscientific because the underlying rationale was not articulated in the modern scientific language. Thus the issue is of generating vocabulary, which helps connecting different knowledge systems recognizing in the process, the limitation and strengths of each. There is no question about peculiarities of method, some of which dissolve on careful scrutiny. For instance, many good breeders considered breeding as much an art as science in the sense that they always looked for plant/s that matched their selection criteria – a function that many traditional farmers also performed while selecting their varieties. Some methods of developing scientific information are common among local communities as well as formal scientific institutions. Grafting to improve the horticultural plants, selection to improve self-pollinated crops as well as some of the cross-pollinated crops, selection followed by bulking and again selection iteratively are also common methods of plant breeding, crossing has also been attempted by farmers, plant protection methods, agronomic practices, etc., share a great deal of commonality in approaches in the two knowledge systems. The criteria of evaluation of course differ quite significantly. Local communities may evaluate any technology on multiple parameters, which may include concern for soil, water, long term sustainability, etc. However, in some cases, the shortsightedness of formal scientific systems is also seen in the local knowledge systems.

The issue is not that one is independent of other. After all, chilly, tomato, tobacco, potato and many other crops were introduced in Asia only about half a millennium ago. The local knowledge evolved around these crops in due course and with great cultural, socio-economic and socio-ecological variability. The point is that a local community whether settled from outside or evolved indigenously in a given region does not have any compulsion to test its technologies over a wide region. Therefore, given the closer fit between local technologies and the specific ecological conditions, generalizability across large spatial units may be poor by design. This does not make the specific practices any less scientific.

Coombe (1998) acknowledges, “that opposition between dominant and indigenous culture are often over-simplified, blurring the actual fluidity and permeability of knowledge and cultural boundaries. Just as dominant cultures appropriate knowledge from indigenous ones, indigenous knowledge itself contains knowledge shared between cultures, as well as information brought by colonists, settlers, and traders.” This view, as I said before, has been the basis of our movement in Honey Bee network but also that of a few other attempts (Warren (1989), Varma and Singh, 1969). Dr. Y.P. Singh who guided some of the earliest post-graduate theses on indigenous knowledge in mid-60s had raised the issue, 'whether indigenous animal husbandry knowledge was relevant today (Ibid, 1969)’. He had guided another doctoral thesis (by Dr Hira Nand) on indigenous dryland agriculture knowledge in mid-70s. The tradition of building bridges between different knowledge systems is quite old. Gaya Prasad Singh, (1915) had drawn attention to the practice of storing potato seed on the heap of coal in Frankfurt,

Germany and compared that with the local practice of storing seeds under the cot in a diffused light and relatively cold environment. This concept was later popularized globally by International Potato Research Centre (CIP, Rhoades, 1984). There are many other researchers such as Mauris Iwu (1989), Atte, Paul Richards(1985), Hira Nand(1979), etc., who have tried to pursue the same line of thinking.

DeWalt (1994) reinforces the notion that "those who use and develop indigenous knowledge systems (mutables immobiles) and those who develop and apply scientific knowledge system (immutable mobiles) are constrained by the way in which they have been trained to think and contexts in which they live. The key is to provide both knowledge systems with more opportunities in which they can inform and stimulate one another" (1994:128)[34]. Thurston (1992) has demonstrated the potential of doing so in the case of plant diseases. The TAPP database developed by him traces the local and ancient knowledge on plant diseases documented over last 500 years. Richards (1985) showed similar potential in case of rice, pests and many other agricultural practices. Warren (1991a, b) has also argued for similar need of complimentarity among formal and informal knowledge systems.

The tension on the issue of applying intellectual property right laws to local knowledge, innovations and practices also stems from the conceptualization of the local knowledge as essentially cultural and community construction. Posey and Dutfield (1996) conclude after a review of various IPR instruments and their applicability to different kinds of local knowledge that, "IPR laws are generally inappropriate and inadequate for defending the rights and resources of local communities. IPR protection is purely economic, whereas the interests of the peoples are only partly economic and linked to self-determination. Furthermore, cultural incompatibilities exist in that traditional knowledge is generally shared and, even when it is not, the holders of restricted knowledge probably still do not have the right to commercialize it for personal gain". They suggest instead a concept of Traditional Resource Right (TRR) which recognizes, "the inextricable link between cultural and biological diversity and sees no contradiction between the human rights of indigenous and local communities, including the right to development and environmental conservation" (1996:95). It is obvious that intellectual property right systems never evolved to deal with various other rights that are included in the bundle of TRR. The contributions specifically dealing with intellectual capital are covered by the intellectual property rights. So far as the rights of the communities are concerned which are collective and deal with knowledge produced in past, these may have to be dealt with new instruments. The Community Intellectual Property Rights (CIPR) were articulated by Crucible Group (1994) to enable local communities to assert their "rights to seed" such that no outside company or institution could use their knowledge or resources without their permission – a proposition which is in line with Article 8J and some aspects of FAO's Farmers Right Concept. The Crucible Group also suggested a need for national legislation, an international database for tracing germplasm possibly through CGIAR system and appointing a `public defender' to mediate or act as ombudsman (1994). The Third World Network (Nijar, 1994) suggested a model Community Intellectual Right aimed at preventing the privatization and usurpation of the rights and knowledge of the communities to be called as, "Community Intellectual Property Rights" (CIPR). It was further proposed that local community leaders who would act as trustee of the community and the farmers rights would be held in perpetuity because knowledge and practice evolved over long period of time as the community evolved. A `registry of invention' was also suggested with which the community biodiversity register (Kothari, Ashish, Pathak, N, Anuradha, R.V., and Taneja, B., 1998, Gadgil, Ghate and Rao, 1999) could be linked. This knowledge would lie in public domain. Subsequently, Ghate, Gadgil, Rao (1999) have modified the concept to include only public domain knowledge in the community registers and mentioning the name of local experts (but not their knowledge or innovations) in the register. This was in response to the suggestion by Gupta (1998) that by recording the knowledge of experts in the public domain register, the intellectual property rights of

[34] Billie R. DeWalt, 1994, Using Indigenous Knowledge to Improve Agriculture and Natural Resource Management, Human Organisation, 53, (2), 123 – 131.

the local experts cannot be pursued except copyright. So far as CIPRs are concerned, the purpose of preventing others from patenting will be achieved by publishing the local knowledge and making such publications available to the patent offices.

Stephen Gudeman believes that IPR are another form of market forces, which would further erode an already endangered commons (1996)[35]. He does not believe that technical essence of a local knowledge can be abstracted from the context of its use and tested in laboratory to develop something of common use. He argues, only partly correctly, that if scientists could not validate a particular knowledge, they might consider it faulty. He observes, "The scientists draw a distinction between *res cogitans* (thinking being without spatial extension) and *res extensa* (material things as extended substance) – between the mental and the material, intellect and emotion, knowledge and context (1996:112-13). Undoubtedly, what Stephen has argued has an element of truth. Large number of scientists (in fact majority of them) have treated local knowledge in such a manner. At the same time, the fact that 74 percent of the plant derived human medicines are used for the same purpose for which local communities discovered their use (Farnsworth, 1981) proves that scientists have not hesitated in drawing upon the useful, valid, and abstractable local knowledge when it was appropriate. Obviously the evidence only shows how much great the potential is of using local knowledge even out of its strict socio-cultural context. To what extent the users of traditional and local knowledge have contributed to the growth of the very knowledge system, which generated tremendous commercial returns, is a valid issue and we will revert to it later.

WIPO – UNESCO (1985), Model Provisions for National Laws on the Protection of Expressions of Folklore Against Illicit Exploitation and Other Prejudicial Actions, was supposed to help national governments in enacting laws to provide protection to folk knowledge and also folk varieties. However, the only reason one can speculate, may have been responsible for widespread neglect of these provisions even by the developing countries is the lack of willingness of most developing country governments to check the domestic exploitation of folk culture, art and varieties. In the post-CBD phase, many countries are trying to correct this distortion.

Coombs (1998:107) agrees with the proposal of Gupta (1997) that "every patent office in a Western country should insist that the patent applicant declare that the knowledge and resources used in a patent have been obtained lawfully and rightfully". The lawful acquisition will imply that the prior informed consent and approval and involvement of local communities and creative individuals have been ensured, assuming that the donor country has laws requiring such consent and approval. The rightful acquisition involves ethical enquiries into the corporation's compensation practices. She feels that Western governments who are party to the major human rights Covenants should ensure that "private parties subject to their jurisdiction do not violate the human rights of others, such a premise is congruent with commitments to rights of subsistence, to enjoy the fruits of one's labour, privacy, environmental sustainability, and cultural integrity (although not all of these rights are necessarily implicated in every such taking)". She feels that the lawful and rightful disclosure requirements may be awkward, if not politically impossible, to enforce particularly if it was to be imposed as an absolute barrier to the patent protection. She suggests that in the shorter term this requirement need not include any minimum criteria. For instance, she suggests, "a corporate applicant might simply disclose that the source country impose no legal consent requirements, and that it has made no arrangements for compensation. To the extent that this information is made part of the public record and published by member State governments, it would provide leverage for indigenous peoples, NGOs, concerned consumers, interested citizens, and the media to put political pressure on patent holders to improve their

[35] Stephen Gudeman, Sketches, Qualms, and Other Thoughts on Intellectual Property Rights, in VALUING LOCAL KNOWLEDGE : Indigenous People and Intellectual Property Rights, S.B. Brush & D. Stabinsky, eds., quoted in Coombs, 1998, Op.cit.

research and development practices congruent with developing human rights norms. Over time, some corporations might recognize the publicity values and goodwill to be accrued by greater transparency and might set increasingly higher standards to develop market distinctions" (1998:108).

Dutfield (2000)[36] in an extensive review of various initiatives including peoples biodiversity registers, community intellectual rights, SRISTI's local innovation databases, concludes that the relevance of international IPR regime to the CBD is beyond doubt (2000:125). The questions, which he feels are unresolved, include:

> (1) It is not certain that increased availability of IPR protection will automatically lead to greater levels of innovation in society. Innovation and creativity flourish in many parts of the world without any (western) IPR laws. [37] On the other hand, allegations are increasingly made that too much IPR protection of basic research is stifling innovation (see Heller and Eisenberg 1998); (2) The role of intellectual property rights in the erosion of agro-biodiversity has been the subject of some polemical debates, yet we still do not know how far biodiversity is affected by intellectual property rights for seeds, plant varieties and/or agrochemicals. But it can be argued that we cannot afford to wait for conclusive proof one way or another before making decisions on the design of environmentally sound intellectual property rights. It is vital to consider whether and how the precautionary principle may be applied in the IPR context to minimize the risks; (3) some evidence suggests that most technologies supportive of biodiversity conservation are in the public domain. However, with respect to those, which are not, it is unclear whether intellectual property rights hinder or encourage their transfer to developing countries; (4) it is widely accepted that the application of traditional knowledge and technologies can add value to genetic resources. While patents are clearly unsuitable mechanisms to protect the rights of traditional knowledge holders, the use of other intellectual property rights may in some circumstances be feasible.

Erosion of agro-biodiversity: So far as the issue of erosion of agro-biodiversity as a consequence of use of IPR is concerned, the evidence in the post-green revolution era in most developing countries is quite unequivocal. The erosion has been caused primarily by the public sector induced high yielding varieties, none of which have been protected by either the patents or plant variety acts since the same have not been applicable. In the Western societies, this supposition may have been valid. It is also true that large number of private seed companies and traders have used advanced lines as well as new varieties developed by public sector R&D labs without any reciprocity of compensation or payment of royalty. The result has been that public sector R&D institutions have had to depend primarily on government for resources and thus their creativity and autonomy have been adversely affected. The application of different kinds of intellectual property rights would have made these institutions recover returns on their investment in R&D and in due course have more dynamic and vibrant organizational culture. Obviously, so far as the right of communities and local farmer breeders is concerned, it would require specific institutional innovations to reduce transaction costs and at the same time enhance incentives for contributing their know-how and resources to the public and private R&D institutions where applicable. In many cases, farmer bred varieties can generate incentives for the individual farmer breeders provided they can protect their intellectual property and use it for commercializing their

[36] Graham Dutfield, 2000, Intellectual Property Rights, Trade and Biodiversity: Seeds and Plant Varieties, IUCN and London: Earthscan Publications Ltd.

[37] The knowledge, innovations and practices of indigenous peoples and local communities, for example, are rarely if ever protected by intellectual property rights.

innovation or disseminating it without any cost to others[38]. The response to other questions requires adaptation of the current IPR regime which CBD and WIPO are currently exploring.

Blakeney (1999[39]) reviews various mechanisms for the protection of indigenous knowledge and seems to endorse the suggestion of Gollin (1993) to make it obligatory for any user of biodiversity to pay a fee to the personal group that discovered or traditionally used particular specie through access legislation. Lesser (1998[40]) suggested that a registry of traditional uses of genetic material be maintained in sufficient detail to permit their identification. Koon (1998[41]) regrets that the current patent act of Malaysia does not have any special provision for protecting traditional knowledge, method of treatment in traditional medicine, products and processes. He has suggested a proposal to introduce a special provision in the patents act to protect the end products of traditional medicine and treatment. However, he favours a *sui generis* system, which should ensure that larger public interest must have precedence over commercial interests. He also suggests that traditional medicine and treatments should be available to society as these have been available for generations. In Brazil, Wolff (1998[42]) describes, the bioprospecting legislation no.1235 of July, 1997 of the state of Acre and law no.0388/97 of the state of Amapa. In the law of the state of Acre the bioprospecting was allowed subject to an Agreement of Access including the state, the applicant for access and the furnisher of traditional knowledge or the domesticated agricultural crop. The state was represented by the Department of Environment of the state of Acre. The law also provides that "no individual rights of intellectual property registered inside or outside the state which are universal knowledge held by local communities or which have been acquired without certificate of access and the state exit license will be recognized" (1998:178[43]). The state law of Amapa forbids the utilization of genetic resources for research, conservation, or commercial or industrial applications that do not have the access certificate. Bill No.306/95 dealing with the recognition of the rights of indigenous person to intellectual property rights arising from bioprospecting activities was introduced by senator Silva. It was approved by the Senate on November 4, 1998 and is currently under evaluation by the National Congress. The Bill creates a Commission for Genetic Resources and provides for fair compensation among applicant, access agency, furnisher of traditional knowledge and other parties to access contract. Article 36 provides that a contribution would be made to a special fund from the compensation amount for strengthening conservation, research, and inventory of genetic resources. An interim ministry group offered a substitute bill in August 1998, which provided, "less stringent regulation so as to allow an exchange of information. It acknowledges the right of traditional knowledge holder in deciding upon access of third parties to the information regarding such knowledge, and assures the local indigenous communities' right of

[38] Whether the farmer innovators disseminate their innovation through commercial channels or non-commercial channels should be their decision. We have no right to impose our value judgment on them. There is no reason why when an author can copyright her books, a musician can gain from the sale of copyrighted cassettes, a company can benefit from the commercialization of patented technology, only farmer innovators should be expected to disseminate their knowledge and resources without any claims on the benefits that flow to users of their knowledge or innovations. The knowledge rich economically poor innovators cannot be expected to subsidize the society which on its own does not contribute anything either for conservation of agro-biodiversity or for ensuring that conservators of biodiversity do not suffer economic disadvantage vis-à-vis the cultivators of high yielding varieties.

[39] Michael Blakeney (Ed.), 1999, Intellectual Property Aspects of Ethnobiology, London: Sweet & Maxwell.

[40] W. Lesser, 1998, Sustainable Use of Genetic Resources under the Convention on Biological Diversity. Exploring Access and Benefit Sharing Issues, Wallingford:CAB International, 127-135.

[41] Ong Chui Koon, 1998, Intellectual Property Protection of Traditional Medicine and Treatments in Malaysia, in Blakeney (ed.), Op.cit. 155-172.

[42] Maria Thereza Wolff, 1999, Indigenous Peoples and the Protection of Genetic Resources in Brazil in Blakeney (Ed.), Intellectual Property Aspects of Ethnobiology, pp.173-182.

[43] Maria Thereza Mendonca Wolff, 1998, Indigenous Peoples and The Protection of Genetic Resources in Brazil, in Blakeney, (ed.) Op.cit., 175-181.

participation in the distribution of benefits arising out of the use of such knowledge" (1998:180). Williams (1998)[44] reviews the issues in New Zealand with particular reference to Wai 262 claim presented by multiple tribals about Maori knowledge systems and their protection of sacred wisdom. The Waitangi Tribunal established by an act of Parliament is hearing the claim and no decision reportedly as yet has been taken. Blakeney, while reviewing the position in Australia, cites two recent cases *Yumbulul v. Reserve Bank of Australia*[45] and *Milpurrurru v. Indofurn Pty. Ltd*[46]*.,* in which intellectual property law failed to recognize the communal interests. In the first case concerning *Yumbulul*, the representatives of the Galpu Clan located in northeast Australia tried to prevent Reserve Bank from reproducing the design of Morning Star Pole on a commemorative bank note. The Pole reportedly had been created by one of the member of the Clan, "who had obtained his authority and knowledge to create the Pole through initiation and revelatory ceremonies. In view of the Galpu, the individual artist was obliged to the community and thus the Clan could prevent the use of the design of the pole in a culturally offensive manner. The trial judge felt that the artist who had created the pole was within his rights to dispose off his intellectual property rights through a legally binding agreement. He lamented that, "Australia's copyright law does not provide adequate recognition of aboriginal community claims to regulate the reproduction and use of verbs which are essentially communal in origin"[47].

In *Milpurrurru* the damages were awarded by the court to a number of Aboriginal artists for breach of copyright by those who wrongfully reproduced their designs on carpets. The major problem in this context is that many indigenous communities do not view their heritage in terms of property but consider it as a community and individual responsibility. Further the ethno biologists have put lot of knowledge of indigenous people in the public domain – a position which we have criticized separately. He views that collaboration of indigenous people with ethnopharmacologists may not qualify to be called as joint invention – a position which is not true in many cases.

David Downes, [48]Senior Attorney at Center for International Environmental Law (CIEL) recently communicated to the author for possible endorsement an appeal submitted to USPTO, December, 1999 which made several suggestions for reform at USPTO such as,

> (1) the PTO procedure should be amended to make clear that each patent applicant must disclose any knowledge they obtained from an oral tradition, as part of the general requirement that an applicant disclose any knowledge that is materially relevant to patentability; (2) In addition, the PTO should require patent applicants to carry out their own search of prior art embodied in traditional knowledge systems, and provide the results in their application. They should also disclose the country and exact geographical location from which the knowledge or resources were acquired, and certify that the knowledge or resources were acquired in full compliance with local laws of the source country; (3) Under the current rules, a patent examiner evaluating an application must perform a search of all the available prior art in the form of journal articles, databases or other publications in the relevant field of technology. Examiners should review all public sources likely to contain such information, such as databases and registries of traditional knowledge, to ensure that each aspect of an applicant's claims represents a truly inventive step. The comments will give examples of publicly accessible databases and journals that could help the PTO identify patents that claim to be new inventions but in fact are

[44] David V.Williams, 1999, Traditional Knowledge Systems and Intellectual Property Rights "Talking Past Each Other": Current Issues in New Zealand in Blakeney, (ed.) Op.cit., 123-138
[45] (1991) 21, Intellectual Property Reports 481.
[46] (1995) 91-116, CCH Australian Intellectual Property Cases, 39,051
[47] (1991), 2 Intellectual Property Reports 481 at 490.
[48] David Downes, 1999, personal communication

> part of the prior art found in traditional or informal knowledge systems; (4) The United States is a party to the Patent Cooperation Treaty (PCT). The PCT gives more liberal treatment to traditional knowledge that is eventually recorded in written format than does the current practice of the PTO. Accordingly, we suggest that examiners more fully integrate PCT guidelines governing international and international-type searches into the normal examination process for domestic patents; and (5) CIEL, COICA, and the Amazon Coalition have successfully argued in their challenge of the ayahuasca (Banisteriopsis caapi) patent that the mounted plant specimens in herbaria of United States museums and universities accessible to researchers constitute "printed publications" and thus are prior art that can bar a patent. For plant patents based on specimens that originated in developing countries, examiners should routinely consult expert institutions to determine if herbarium specimens exist that may be materially relevant to the novelty of the claimed plant variety.

Many of these suggestions are in line with the earlier suggestion by us (Gupta, 1995,1998,1999) in terms of (a) requirement of patent offices to ask every applicant to certify that application for patent includes claims based on 'lawful and rightful' access to local /traditional knowledge and resources, and (b) non patent prior art available in data bases like Honey Bee or Biodiversity Registers or other forms of national registers is taken into account.

Sadjo (1992) suggests, drawing upon the work of property rights theorist Demsetz (1967) and Coase (1960) that the externalities generated through the inefficient market outcomes of access to genetic resources may be "corrected" through negotiations among the affected parties particularly if transaction costs are not very high. The contractual arrangements may be able to specify various concerns that each of the party to the transaction may have as distinct from the approach of deriving these concerns through property right laws. Swanson (1998)[49] looks at the property right issues in the same context and observes, "existing IPR system creates incentives to invest in R&D at the end of the industry (the plant breeding sector), but is not generating investments in the earlier parts of the industry (the genetic resource providers)". This happens, Swanson suggests, because (a) farmers in developing countries do not have property rights on their genetic resources and have no direct incentive to invest in diversity and (b) plant breeding industry located primarily in the developed world did not feel it necessary to justify their own independent investments in conservation of *in-situ* diversity in developing countries because of lack of control or rights over this diversity in developing countries. In an earlier study, he found that around 55 per cent of breeders felt that having an in-house collection of germplasm was better and gave more stability than investment in *in-situ* conservation. The remaining breeders considered cost to be important factor. And he considers lack of incentives for seed industry in developed country to invest in developing countries as a case of "property right failure".

This formulation has obvious limitations because lack of property rights need not be the major barrier to investment in conservation of *in-situ* diversity. The contractual arrangements, as suggested by Sadjo above could to some extent achieve the same results, so long as the developing country governments provide legitimacy to these contracts and help in their enforcement. The argument that efficiency needs ownership, is valid but it cannot be the argument that efficiency needs private ownership in each case. After all there is enough literature to show that common property right institutions can generate very efficient and viable outcome given three sets of appropriate rules that is dealing with (a) boundaries, (b) resource allocation and when conflict arise in implementation of both kinds of rules, then (c) rules for conflict resolution (Gupta, 1984, 1998). Ostrom (1993) elaborates this system of rules in much greater detail and considers clear demarcation of boundaries in addition of eight kinds of rules to be necessary

[49] Timothy Swanson, Property Rights Issues Involving Plant Genetic Resources: Implications of Ownership for Economic Efficiency, CSERGE Working Paper GEC 98-13, Norwich: University of East Anglia

concomitants of sustainable CPRs institutions. The point still remains that seed industry need to learn ways of dealing with local institutions having customary rights rather than well defined property rights. It is true that recognition of community rights in the national legislation will be a prior condition for legitimizing the contractual mode of agreements and possible investments by seed and other biotech industries in the *in-situ* conservation. For the sake of argument, one can even suggest that the users of biodiversity need to deal with current diffused status of property rights in developing countries with much greater responsibility and reciprocity rather than using this ambiguity as an excuse for not fulfilling ethical and institutional responsibilities towards conservators of diversity (given the provisions of CBD)

Ben-Dak (1999) prefers compensation at the enterprise level instead of general level of human infrastructure while looking at community compensation process. He suggests that licenser participates with the local partners in the production of value added products and shares or retains certain distribution rights with the licensee. He also suggests that product development assistance be provided as a part of initial compensation with the group providing knowledge and resources. He describes the experience of global technology group of UNDP in collaboration with Centre for Scientific Research into Plant Medicine (CSRPM) based at Mampong – Akwapim in Ghana. Initial phytochemical screening by the CSRPM in collaboration with Health Search Inc.,(HIS) a US based company of *Capparis erithrocarpos* reveal dose dependent analgesic and antipiratic effect. Through various contacts mediated by GTG, CSRPM entered into a licensing agreement and patent process with HIS. Finally the HIS applied for patents on Capparis derivative in US and as a result original CSRPM members became a stakeholder in a newly acquired company called as Ghana Industrial Holding Corporation's GIHOC Pharmaceutical Company Limited. The net compensation for the IPR was, "the capacity building in Ghana, the transfer of technology to Africa, the (soon) new availability of medicine continent wide and the fostering of local entrepreneurship (Ben-Dak, 1999:169)[50]".

Leisinger considers urgent evolution of binding national and international regulation as necessary for fair compensation to the gene-rich developing countries. He also recommends that in the absence of "binding national regulations, seed corporations should not take a free right but look at the issue in the way of tacit licensing agreement and set aside the usual percentages of sales for the support of agricultural research in developing countries (1999:143)[51].

Richard Gerster (1998) looks at the issue of intellectual property rights from the point of view of European NGO rejecting the further extension of worldwide patent protection. Likewise, he also argues for elimination of obligation under Art.27.3 of TRIPS agreement to provide protection for plant varieties[52].

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[50] Joseph D. Ben-Dak, 1999, Rights, Compensation, Indigenous Knowledge Systems and the Strategy of Global Intellectual Property Management: The Challenge in Thomas Cottier, Peter Widmer and Katharina Schindler (Eds.) Strategic Issues of Industrial Property Management in a Globalizing Economy, AIPPI Forum Series, Abstracts and Selected Papers, Oxford: Hart Publishing.

[51] Klaus M.Leisinger, 1999, Ethical and Ecological Aspects of Industrial Property Rights in the Context of Genetic Engineering and Biotechnology in Thomas Cottier, Peter Widmer and Katharina Schindler (Eds.) Strategic Issues of Industrial Property Management in a Globalizing Economy, AIPPI Forum Series, Abstracts and Selected Papers, Oxford: Hart Publishing.

[52] Richard Gerster, 1998, Patents and Development: A non-governmental Organisation View Prior to Revision of the TRIPS Agreement in The Journal of World Intellectual Property, Vol.1.No.4, pp.605-619.

Sherwood, Scartezini and Siemsen (1999) make several recommendations for increasing inventiveness in developmental countries. Those who pursue and inventions in developing countries should be able to access the international literature on the subject while planning their research, should have access to risk capital, and be able to get support of well trained patent attorneys. They recommend that (a) patent should be granted rapidly even before technical examination, (b) rely generally on examinations performed competently elsewhere, (c) add local technical information to existing global databases and (d) facilitate easy and early access to global databases for local inventors. The patent offices should also postpone their fees under certain conditions to promote inventiveness. They feel that if these recommendations were accepted in developing countries, inventors would be able to reduce and postpone patent acquisition cost, will file high quality patents and will also be able to mobilize funds[53].

Merges and Nelson (1990)[54] in an extensive review on the economics of patent scope issues recognize the depressing effect of a very broad patent on other inventors to stay in the invention game. Their view is that the information disclosed in the patent application should be matched with the claims being made by the examiners. This is an extremely important point given the tendency in recent past to have highly broad based patents issued in European countries and US. It becomes relevant in view of the January, 19, 2000 ruling of US appeals court, which, "determined that seeds, as well as the plants grown from them, are patentable under 35 U.S.C. 101. Pioneer Hi-Bred International Inc. v. J.E.M. Ag Supply Inc., No. 99-1035. Although the patent office had been granting plant and seed patents, it was not until this ruling that patentability was firmly established.[55]" The breeders will not be able to use such patented plants for further breeding. This will also affect the rights of the communities, which may have conserved the germplasm and thus may have provided 99 per cent of the unchanged germplasm of the patented seed. *It will be useful to take this issue up during the negotiations under TRIPS in the next trade round.*

The empowerment of local knowledge experts will require building bridges between the excellence in formal and informal science (SRISTI, 1993; Gupta, 1889). Reform of TRIPS is thus a process involving reform of knowledge producing and networking institutions in any society. The process of producing or defining new knowledge having industrial applications is closely linked to the mechanism for its protection. The kind of growth that has taken place or is likely to take place in a given sector or field of technology, invariably influences the evolution of legal system to protect the property rights in that field. For instance, the emergence of biotechnology influenced the kind of protection researchers in the field have been able to obtain in US and other European countries. Likewise, developing countries will have to view their comparative advantage in various fields of knowledge, appreciate the mechanisms of recognition, reproduction and networking of this knowledge and provide appropriate incentives through intellectual property rights as well as other instruments. The collective intellectual property rights have a specific meaning in the context of developing societies where a large majority of people still survives primarily through access to natural resources. It is in this context that reform of TRIPS becomes a process of reforming the knowledge producing, reproducing and networking mechanisms.

The asymmetry in rights and responsibilities of those who produce knowledge, particularly in the

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[53] Robert M.Sherwood, Vanda Scartezini and Peter Dirk Siemsen, Patents for Third World Inventors: Proposals for 21st Century Improvement in Patent World, May 1999 (http://216.3.116.71/PW/artres.htm)

[54] Robert P Merges and Richard R Nelson (1990), On the Complex Economics of Patent Scope, The Columbia Law Review, 90:839.

[55] Victoria Slind-Flor, 2000, Plants Protected by Patents:Federal Circuit's ruling clarifies confusion in the law, The National Law Journal, January 31, 2000.

informal sector, and those who valorize it (in the formal sector) has become one of the most serious and contentious issues. There are possibilities of securing some of the interests of grassroots innovators and traditional communities within global trade regimes, provided the ethics of extraction can be factored into the calculation of respective incentives or disincentives for cooperation among different stakeholders. To do so, some of the fast emerging and expanding technologies like information and communication technologies (ICTs) will have to be adapted to the needs of local communities and individual grassroots innovators.

4.1 Making IPR systems accessible to small innovators and local communities[56]

The debate on the relevance and appropriateness of the conventional IPR regime for plant varieties, products based on knowledge of local communities and individual informal experts, and the use of local biodiversity (even without use of associated knowledge systems) has become very emotive in recent years. Many NGOs and activists see no merit in the IPR regimes for providing incentives to local communities and creative individuals. They term the attempts of the large corporations (generally multinational corporations (MNCs)) to access biodiversity without sharing any benefits with local communities as 'Biopiracy'. Many others oppose IPRs because these are supposed to commodify knowledge, which reportedly was `always' in the public domain for universal/local benefit. The high costs of hiring patent attorneys are also supposed to make the present patent system out of reach for grassroots innovators. The absence of any institutional framework in most developing countries to (a) provide information about IPRs, (b) extend help to obtain patents for individuals or communities and (c) oppose the patents by others on the knowledge traditionally known to local communities, have further alienated the moderates and hardened the attitudes of the conventional opponents.

The arguments of those who do not see any hope in the existing IP systems, and the provisions of the TRIPS Agreement in particular, can be summarized as follows:

All the knowledge held by the people about the use of biodiversity for treating various ailments of humans and animals, producing vegetative dyes, developing local land races, etc., is held in common by the local communities. This knowledge is supposed to have been transferred by one generation to another over very long periods of time with (or without) some value addition by successive generations.

a) The knowledge should be held in the public domain and should not be allowed to be monopolized by MNCs (though the behaviour of the public sector and of private, national drug companies is no different from the MNCs).
c) The relevant existing intellectual property rights regimes, in particular the patent system, evolved for the protection of industrial inventions and are therefore not suitable for biological processes and products.
d) Since the knowledge of various plants has been developed over several generations, why should the present generation be entitled to reap all the rewards if any?
d) Why should governments be entitled to any benefits from the commercialization of patented products when the resource and the knowledge were actually provided by individuals or communities?

f) While process patents can be provided, product patents impede research, generate excessive

[56] Based on Gupta, Anil K , 1996, Rewarding Creativity For Conserving Diversity In Third World: Can IPR Regime Serve The Needs Of Contemporary And Traditional Knowledge Experts and Communities in Third World? a paper presented in AIPPI Forum (September 10-14, 1996) on Ethical and Ecological Aspects of IPRs, Interlaken, Switzerland, on 13 September, 1996 since published in Cottier et al,, 1999.

monopolies to one or a few inventors, make the technology or products out of reach of common people due to price increases, and discourage the expertise of successful reverse engineering in Third World countries.

There are many other arguments on ethical and efficiency grounds against the patenting of life forms and also against the products derived from common knowledge without any reciprocity towards knowledge generators or providers in one or more countries.

Dimensions of the role of intellectual property rights in benefit sharing among communities as well as individual healers.

1. Not all the knowledge held by people in biodiversity rich economically poor regions and communities is (a) traditional, (b) carried forward in fossilized form from one generation to another (rather it has been improvised by successive generations), (c) collective in nature, and (d) even if known to communities, is reproduced by everybody.
2. Knowledge of considerable economic importance is produced, reproduced, and improvised by individuals and also in recent times, i.e. through contemporary innovations.
3. The traditional knowledge should indeed receive certain kinds of protection if incentives have to be generated to conserve not only the knowledge but also the institutions of its reproduction and inter-generational transfer.
4. Given the high rate of success in formal research based on locally identified uses of plants and other components of biodiversity, the transaction costs of formal Research and Development (R&D) systems in private and public systems are reduced considerably. The R&D institutions should in turn share the benefits that may accrue from commercialization of derived and protected products. In some cases local communities or individuals, as the case may be, should be considered co-inventors of the new, value added products.
5. The newness and non-obviousness of a traditional knowledge should be seen in the light of available repertoire for that particular purpose. If the prior art in a given field of knowledge does not provide documentary evidence of a technology evolved by a local community as a part of its traditional knowledge system, should that knowledge having industrial application be not considered new and inventive for the purposes of patent protection? My view is, it should be.
6. The local knowledge should qualify to be considered new for the purposes of prior art since outside communities/companies may not have had access otherwise. The norms regarding the destruction of novelty due to publication of local knowledge should be reconsidered and modified so that incentives to share the knowledge by local communities with outsiders are not affected adversely. A special grace period should be provided. European Union has been discussing the issue of one year grace period given to inventions published in the preceding year. US already has such a grace period. What is being proposed here is that traditional knowledge published, say in last five years may be allowed to be protected so that the local communities do not feel betrayed by the researchers who documented their knowledge and exhausted their rights through publication without their informed consent. The period after CBD may be covered by the grace period.

7. Large number of local experts are extremely knowledgeable though very poor. They know far more than anybody else in their respective villages and have expertise to prepare various solutions. Others may know about it but they may not have contributed to it, except by giving an opportunity for testing. To that extent they should have a small share in the benefits and entitlements. But the entitlements of an expert could not be at par with the rest of the community. What kind of blending must be done among individual incentives as well as community rewards cannot be specified in a generalized manner. It may vary and should be

done on a case-to-case basis. More research is needed to specify the conditions under which one may need more emphasis than the other.

8. Every patent office should insist that the patent applicants declare that the knowledge and resources used in the relevant invention have been obtained lawfully and rightfully.

This implies a need for regulations in developed and developing countries requiring full disclosure by any corporation or an individual seeking patent protection on a plant-based drug or any other natural product. The disclosure should provide that the source material has been *rightfully* and *lawfully* acquired. 'Rightful' acquisition would involve moral as well as ethical issues in access to biodiversity. For instance even if a local community has not asked for any price for sharing the material or the knowledge about it, is the corporation bound by an ethical conduct to set up trust funds and other forms of reciprocity for local communities? Is it incumbent upon it to ensure that the superior ethics of local communities remaining poor despite conserving biological diversity and the knowledge around it does not become a reason for perpetuating their poverty, and thus endangering the survival of diversity itself? The responsibility of the developed countries is higher and thus reforms should take place there immediately. In the developing countries given the poor infrastructure, the process of reform is bound to be slow.

'Lawful' acquisition implies that prior informed consent and approval and involvement of local communities and creative individuals has been ensured, provided that the biodiversity donor country has laws requiring such consent and approval. If a country does not have any such laws, as for instance India, then acquiring any material will be lawful or legal but may not be rightful.[57] Cottier (1999) has suggested the need for negotiating a concept of TIPS (Traditional Intellectual Property Rights Systems) in the next round of TRIPs review. In some parts it is similar to Community Intellectual Property Rights systems and in other parts it is akin to the conventional patent systems except that it resolves the public domain and prior art issues by considering traditional knowledge new and inventive so long as it is known only to a small group of people.

Downes and Laird, 1999, acknowledge what many commentators feel are the inherent contradictions among the existing system of intellectual property rights with traditional cultural property rights and customary law[58]. They suggest, "geographical indications and trademarks have the potential to respond to some of these concerns more effectively than do other intellectual property rights. Rights to control trademarks and geographical indications can be maintained in perpetuity. They do not confer a monopoly right over the use of certain information, but simply limit the class of people who can use a certain symbol". Geographical indications and trademarks, they add, can be used by producers to differentiate their products, according to various criteria such as the sustainability or traditional nature of production, and thus create specific market niches and appeal to the consumers.

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[57] This argument has arisen in the context of Art 15.5 as well as Articles 8(j) and 10(c) of Convention on Biological Diversity CBD). Prior informed consent is required only of parties to the Convention i.e. the contracting nation states and not of the knowledge and resource providing communities. Under Article 8(j) however, the approval and involvement of local communities and individuals is required for ensuring the equitable sharing of benefits. Whether that will happen at all will depend upon the legislative environment and local institutional capacity in each country. Whether the institutions, which deprived knowledge-rich, economically poor people of their basic rights and needs, would let any benefits trickle down to them will depend upon the access of such people to alternative frameworks of negotiation and mutually agreed terms.

[58] See, e.g. Kari-Oca Declaration 1992; Indigenous Peoples' Earth Charter 1992; Mataatua Declaration 1993; Greaves 1994; Brush 1996; Posey & Dutfield 1996; COICA/UNDP Regional Meeting 1994).

Downes and Laird (1999) look at the registries of knowledge as ordered collections or repositories of information. In view of the increasing use of registries by indigenous peoples and local communities "as tools to promote, protect, and either claim rights over or prevent appropriation of traditional knowledge in the form of of databases — "compilation of data," in the terms of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) of the World Trade Organization (WTO). They recognise the problem that arises when oral knowledge of local communities and innovators is converted into electronic format through various mediations by formal scientists and others, such that the final text gets influenced by the culture and knowledge systems of mediators. They review the SRISTI's registery and also the one by the Inuit of Nunavik and the Dene in Canada while looking at IPR options for protecting the same. They summarise their concerns while suggesting future options as:

> Thus, any future steps to define legal rights relating to traditional knowledge in databases will need to respond not only to concerns about protection of database makers interests — and not only to concerns about protection of indigenous and local communities interests in their knowledge — but also to concerns about the broader interest of all social groups in access to and exchange of information.
>
> An additional problem is that the *sui generis* rights desired by database owners extend beyond the conventional scope of copyright, such that owners would have rights to prevent others from using information even when that information is not creative or new, simply because it is contained in the database. Similarly, indigenous and local communities' interest in traditional knowledge extends beyond protection of new information to encompass protection of knowledge that has been held for as long as centuries, simply because it is held by the given community. A corresponding expansion of intellectual property rights could take a great expanse of information out of the public domain. While specific database owners and communities might benefit from such protection, society as a whole — including indigenous and local communities — might suffer from vastly expanded restrictions on access to the growing amount of information taken out of the public domain. If nothing else, special measures to protect indigenous and local communities' knowledge should be designed carefully so that they respond specifically to the interests and values relating to such knowledge and communities, and do not go farther (Downes and Laird, 1999).

Long (2000) suggests that discussions on the incentives for innovation should not assume that scientific research was a linear process. Therefore, a patented product could not be considered as a final consumer end product. Greater the content of information in an innovation as against the physical features, higher will be the positive externalities. The property so produced could be used in various ways and innovator could not recover the cost of revealing all the information. If such is the case then society could expect lesser or sub optimal level of disclosure of information in an innovation (Dam 1994 in Long 2000). Therefore, the tension is between expecting researchers to produce public goods without being sufficiently rewarded for it and encouraging researchers to withhold information or obfuscate the information in the legal and technical ambiguities so that the purpose of building upon patented knowledge for research purposes is defeated. The emerging pattern of genomics and consequent bio medical research implies that future intellectual property in the genetic resources would be very complicated. It will become difficult to isolate precisely the contribution of each actor in the value chain and value of each attribution. The patents on basics research would affect adversely the downstream innovations and consequently the ability of firms with limited financial resources to enter the knowledge domain. If it is assumed that smaller firms are more creative and innovative, the implications could be that larger firms and bigger corporations (less innovative in nature) might block future scope of innovation by protecting some basic building blocks of basic innovations. Therefore, the provider of genetic resources may insist on joint intellectual property from the derived products so that

such tendencies can be kept in check. The appropriability of intellectual property in a complex technological chain would pose new challenges to the designers of incentive system that are fair to the provider and recipients of genetic resources and associated knowledge system.

Farley (1997) looks at the applicability of intellectual property to the vast area of folklore produced by indigenous communities. The issues arises whether the existing copy right laws are too limited in their scope to deal with the protection of folklore and whether new instruments were required. The indigenous motifs, author has argued, are used to sell everything from Japanese Automobiles like the Mazda Navojo to Barbi dolls and yet no compensation to the communities has been in sight. The author suggests that folkloric art has several common characteristics such as is being passed on generation to generation orally or through imitation, is not been attributable to any one individual or set of authors and it is being continuously utilized and developed within the indigenous community.

This definition is not very comprehensive or may not even represent truly the situation. There is a scope for individual assertion or articulation of art forms within a tradition or setting, which is quite different and distinct and attributable to an individual. Likewise, the communities may provide a repertoire within which an individual may operate or beyond which, an individual decides to imagine and perform or draw or create. It is these individual excursions, which are making new demands on traditional boundary, which Farley seems to ignore or underplay. There is a general desire on the part of indigenous communities to have an authority to deny certain use of their art, which violate their spiritual beliefs. For many indigenous people, 'heritage is the bundle of relationship, rather than a bundle of economic rights (Farley 199:12). This may as well be true. Yet the fact remains that the same people have to operate in commodity market where they have to pay for various goods and services that they acquire from outside. Since the aspirations of different members of the community are invariably asymmetrical and therefore the need for acquiring external goods and services is also unequally felt. Consequently the motivations to move from ethereal to material plain in conceptualizing the folkloric traditions may also vary.

Paradox of No property Rights: For some people the traditional knowledge and improvements therein are for everybody to use. They would share liberally and not obtain any remuneration for the shared knowledge. In some cases healers accept any payment that recipient of medicine might make, but they would not ask for it. They thus remain poor while using a knowledge system, which is quite rich and provides for health needs of millions of people around the world. The implication is that young people exposed to media and markets begin to loose interests in the folkloric traditions. They do not want to remain poor. While some values survive, the knowledge dies. Young people appreciate the values of the elders but refuse to pursue the professional art of healing traditions under the conditions (of poverty) provided for in tradition. One of the painful choices before us is to devise mechanisms that may help values, knowledge and the spirit of innovation and enterprise to grow and survive in such a manner that tradeoff between ethics and economics does not become imperative.

Farley (1997) observes that there are some countries (Kenya, 1975, Tunisia, 1967, Chili, 1970 and Bolivia, 1978), which try to provide protection for folklore in their copyright laws. For tradition that last thousands of years, protection for a hundred years is□l a still not a sufficient protection. Therefore, first problem that emerges in using modern intellectual property right laws for classical tradition knowledge i*s the limit of durati*on for which the protection is available. The second problem the author identifies is th*e requirement of originali*ty. The traditional art forms involve imitation and some time innovation. But the tradition rewards faithful

My contention however is that many communities such as Zuni in North West Amica and Madhubani

painting tradition in Eastern India and Patan textile tradition in Northern Gujarat do permit originality and innovation. In the Patan silk saree tradition dating back to seven hundred years when two hundred fifty families were invited by the King of Patan from Maharashtra to set up their silk looms in Patan. Among the three surviving families of these tradition art and cultural form, there is indeed a very rich knowledge base. This knowledge includes the technology of weaving a textile, which has same pattern on both the sides through double ikkat system using vegetative dyes. About 135 years ago they had started using synthetic dyes in their silk sarees. Then about 35 years ago they realized that original tradition required vegetative dyes and they reverted to older tradition ignoring a discontinuity of more than 100 years.

The fact that traditional forms of art and culture using some kind of biological diversity as in this case for dyes, can accommodate transformative discontinuities in specific elements of tradition and yet maintain overall boundary of the traditional form of art and culture. Therefore, the assertion of Farley that originality is foreign to indigenous art and culture, is not true generally, and is certainly not universally true. What is true for certain communities can in no way be called an essential feature of traditional art and culture. In Madhubani paintings originating from Mithula the lady artists used new motifs including modern vehicles and other artifacts in the traditional style of painting. This is of course an original expression and does not detract from the traditional forms and expressions characteristics of that culture and region. Farley acknowledges that in some indigenous art work there could be sufficient variations worthy of copyright. However, the question he raises that is quite valid is that *variations could be protected but continuity would be considered in public domain*. This kind of 'thin copy right', Farley rightly submits, may not provide a reasonable protection.

On the issue of community rights, Farley clarifies that joint authors must in fact collaborate in the preparation of work and they should also intend to merge their contributions into inter-dependent part of the unitary whole. In a community, therefore only those members involved in the creation of joint work can be joint authors. The rest of the clan or community, Farley submits, 'could not be considered co-authors unless they actually contributed to the creation of the work' (Farley 2000:27). He suggests serious damages in case of unfair use of the knowledge, art or culture of the Indian communities. If the damages are not substantial, then the unauthorized use may not be checked. The Tunis model law on copyright (1976) did not require fixation as a condition to provide protection. The model provisions for National Laws on the expression of folklore against elicit exploitation and other prejudicial actions (1982) developed by UNESCO and WIPO have never been adopted by any country or multilateral organizations and thus have no legal force. The working group on intellectual property expects of folklore protection, Farley quotes as required, 'three criteria should be used to determine whether a use is unauthorized: (1) whether the intent is gainful; (2) whether the use was made by members or non-members of the community where the expression is derived from; and (3) whether the use is outside of the traditional context of the usual use (Farley 1997:37). These three criteria are relevant even in the case of other crimes of traditional knowledge although there are some obvious difficulties in the implementation of the criteria. For instance, if traditional healing knowledge is used by a modern pharmaceutical company for developing a drug, which is used outside the traditional context of the usual use, then it could be considered unauthorized as per the working groups observation. However, the material gains can occur for a community or individuals only when the technology or knowledge is used by much large number of people obviously outside the traditional context but were willing to pay a price, which includes a share of royalty for the community. In other words commoditisation of knowledge, the only resource in which poor people are rich is inevitable if the local/traditional knowledge has to receive compensation. The other option is to make it public domain in which case anybody can use it without any reciprocal obligation and of course following certain moral and social constrains. In the United States the Indian Crafts Act of 1935 was an attempt to ensure authenticity of native American works by issuing certificating marks. Farley adds that these marks were to be registered in the US PTO through the Indian Arts and Crafts Board. However, the act did not serve any

purpose since there never has been any single persecution. What is worse as the author points out, after being more than 60 years in the book even the regulation process has not been put in place in the concerned department of the US government.

The author concludes that the given various interest and variety of motives it is not easy to decide what would be the best option for the future of indigenous culture and art. At the same time those cultures, which wanted to derive commercial advantage by wider circulation of their creation, were author submits, 'adequately protected by the legal regime'. He does suggest the use of unfair of competition law. On the other hand he is right in suggesting that there was not sufficient protection available for those indigenous community which do not want their art form being used commercially at all.

The international code of conduct for plant germ plan transfer and collecting (1993) aims at promoting the share of benefits derived from plant genetic resources between the donors and the users of germplasm and related information technologies. It also aims at bringing recognition to the rights for the farmers with regard to the fair compensation and also with regard to continued access to use the genetic resources by local communities in relation to other roles. However, not many practical examples have become available of such benefits having been shared as a part of the collection process.

Weera Worawit (2000) appreciates the requirement under the European union directive of 1998 requiring patent applicants to disclose where appropriate, the information on the geographical origin of the material but does not deny the granting of right if source is not disclosed. Obviously such provisions are very weak and do not take the debate forward. He regrets that while the concept of access was considered desirable, much progress has not been made in modifying the established patent regime. In a study done as a part of the working group on biotechnology for the WIPO a large number of member countries stated, 'that they did not plan to introduce legislation to ensure the recording of such contributions', (Source of genetic resources, grant of prior informed consent to have access to the resources etc.). The author also refuses the argument that international legal protection to folklore should be denied on account of public domain already. He draws attention to the fact that European Union gave special protection to non original and non operative data in the database if the same had been collected through an investment of significant financial resources and if this data constituted a significant part of the database. If such variations from the copyright were acceptable, he implies that there should not be objections to the similar protection for already expressed and shared folkloric knowledge of art and culture. He suggests that an international arrangement be evolved to provide such protection in due course.

Kate and Laird (2000) have reviewed the various issues in the commercial use of biodiversity and the scope of corresponding benefit sharing. In their view the biggest difficulty in generating transparent negotiations between international business and national governments is the absence of 'a focal point on access to genetic resources'. In their view even the well-intentioned international companies, which would like to seek prior informed consent, feel exasperated in dealing with government staff, who may be inadequately informed of various considerations involving commercial research market and regulatory trends. They also found that most companies interviewed on the subject felt that they would no longer seek access to the genetic resources in developing countries if the procedures were too bureaucratic to follow. Instead they like to pursue alternative approaches such as synthetic chemistry or using their own existing collections. The users also wanted the access process to be flexible in terms of variety of users of genetic resources. Different users might impose varying transaction costs and generate different kinds of benefits. Uniform guidelines would not do justice to the variety of use and user conditions. The access agreements should provide clarity on the rights that recipients might have on the transfer of received materials to third party. The companies interviewed by the authors also wanted the academic and government institutions be regulated as the same way. At the same time some others said that there should be clear distinctions in the guidelines applicable for collection of genetic

resources for commercial research and for scientific research. The authors have suggested need for confidentiality, a share of benefits to go for conservation, legal certainty and need for governments to enforce access regulations fairly and uniformly. The authors have also made recommendation for the intermediary organization and for the industry expecting them to ensure compliance with the international law, insistence on prior informed consent, a proper record of partnership negotiations and development of indicators of fair and benefit sharing. The authors feel that it is not easy to analyze whether an agreement between two parties was fair and equitable since the perception of the parties concerned were quite relevant and important consideration. They suggest several process and content indicators, which could be taken into account while accessing whether the access and benefit sharing mechanisms have been fair and equitable.

Dasgupta, Utkarsh and Gadgil (2001) endorse the plea for seeking mandatory disclosure of prior public knowledge, submission of legitimate contract or transfer agreement with the providers of knowledge if held in private, public scrutiny of intellectual property rights claim prior to grant of rights (as is the practice through publication of application after 18 months), disqualification of intellectual property rights applications that fail to duly acknowledge any public or private foundation of grassroots knowledge and innovations, and disqualification of Intellectual property rights applications that seemed to threaten the grassroots knowledge, innovations or practices of using bio-resources. In addition to these measures, they also plead for evolving mechanisms to protect grassroots innovations through petty patents and other similar intellectual property rights instruments. Their arguments about bio-piracy and decline of agro-biodiversity need some reflection. They observe that the existing IPRs regime may propel monoculture in agriculture. However, the evidence of green revolution shows that maximum decline in agro-biodiversity in the last 30 years took place because of the varieties developed and disseminated by public sector R&D and extension institutions without any protection whatsoever. The issue of conservation of agro biodiversity is more complex and requires a whole range of institutional incentives and arrangements to promote conservation.

UNCTAD (2000) organized a meeting on Systems and National Experiences for Protecting Traditional Knowledge Innovations and Practices. The Expert Group concluded that traditional knowledge (TK) has intrinsic value, which went beyond its economic value to encompass cultural, linguistic, spiritual, ecological and other spheres. The decline in linguistic diversity and cultural diversity coupled with decline in biodiversity contributed to the loss of TK. The application of IPRs could be one possible way but not necessarily the only way or a major way for supporting TK. The IPRs should not interfere with the customary practices in providing traditional medicines and health care. The TK, innovations and practices should be protected using existing IPRS or *sui generis* system. The traditional folk artists and creative people should be enabled to build their own database and protect such collections and databases against misappropriation. Several proposals were made to ensure that interest of the TK holders was protected through IPRs such as requirement of certificate of origin, or disclosure clauses in patent applications or by linking the granting of TK based patents after ensuring that a contract for licensing has been made as per the Andean Decision 406. The need for further evolution of IPRs system to match the complexity of TK was emphasized. The TK holders felt that one kind of IPRs system was trying to replace variety of customary arrangements for protection. Several areas were identified for capacity building so that TK based value chain could be developed for product development as well as for commercialization and sharing of benefits without disturbing the biodiversity resource base adversely. Some of the TK holders criticized too much emphasis being put on commercialization of TK rather than on its conservation and further development. The proposed *sui generis* system at national level could have several common elements, “collectively held TK rights; registers of knowledge; clear systems of access to such rights and benefit-sharing; clarification of land resource rights as part of the holding of TK rights; wide participation and consultation” and “creation of effective incentives for research”. In addition, TK protection needs to be reflected in other national policy areas, such as agriculture, forestry, investment and finance. It was felt that national *sui generis*

system by themselves might not be sufficient to protect TK. An international mechanism might be needed with minimum standards of international *sui generis* system for TK protection.

Nino, Bernal and Contreras (2000) shared Venezuelan experience in the matter. In May 2000, Venezuela adopted a law on biological diversity, which provided for the conservation of cultural diversity through the recognition and protection of the TK (Article 39). The TK Holders could oppose the granting of access to genetic material or traditional knowledge or projects on biotechnology in their territories. If their consent had not been obtained. Likewise, they could ask for a halt to the activities that they feared might affect their cultural heritage and biological diversity (Article 44). The national legislation complemented the Andean community decision 486 and 391 dealing with protection of traditional knowledge, granting of patents and access to genetic resources. The decisions mandated that the contracts for access must protect the rights and interests of genetic resource providers in the resources, their derivatives and their intangible components.

Greengrass (2000), while dealing with the issue of plant variety protection and TK, felt that UPOV Convention did not forbid a requirement of prior informed consent (PIC) for the marketing of plant material. The non-commercial activity by indigenous and local communities for subsistence purposes clearly fell outside the scope of breeders' right. Likewise, states could exclude informal non-commercial seed exchange among farmers from the effects of breeders' right.

Pacon (2000), while reviewing Peruvian proposal on the protection of traditional knowledge, explained the initiative of Peruvian government to form five groups to analyses the organizational structure of indigenous communities, and identify mechanisms of benefit sharing, inventorise genetic resources, regulation of access, protection of TK and development of capacity building among indigenous communities in 1996. A proposal was published after lot of consultations in October 1999 to invite comments of wider society till May 2000. The second draft of the proposal was circulated in August 2000. The main components of the Peruvian proposal are: a) scope of protection only TK associated with biodiversity and it does not include other forms of TK . B) The objectives of the regime are to promote, respect, and protect TK, preserve TK, promote equitable benefit sharing and the use of TK for benefit of humanity. C) Possession vs. Creator: the indigenous communities in possession of TK are given protection and without giving too much emphasis on who the creators of this knowledge were. D) The rules and regulations were applied to only collective knowledge and in case where more than one community possessed the knowledge, they became co-holders. E) Prior Inform Consent (PIC): The buyers or accessors of knowledge of a community must seek authorization for access and give fair share of benefits. PIC is required for research as well as for exploiting the resources. In the latter case apart from PIC, a license agreement must also be obtained. F) The public domain TK knowledge did not belong to any indigenous community, and, therefore, did not require PIC or license agreement for its exploitation. However, a contribution must indeed be made to a fund for development of TK. In some cases, communities and the user party may come to an agreement to share profits for such exploitation also. G) Duration of Rights: these rights are unlimited and continued from one generation to another. H) Register: a confidential register is maintained and only those authorized by the communities have access to it. The register is not compulsory but is declaratory of rights. Patenting of the registered knowledge is possible only with the permission of national patent institution. I) License Agreement: The license agreements must stipulate among other things the royalty shares that would accrue to the communities in lieu of their knowledge. Even if knowledge belongs to more than one community, the license agreement may be sufficient if executed with only one of the many communities. The registration of the agreement is desirable but not obligatory. J) Justifiable Compensation: the payment can be made at the time of signing of agreement and this is obligatory. It can be monetary or in the form of infrastructure or other support. The second one is for sharing the benefits when the same have been obtained by the licensee following the exploitation of TK at the minimum rate of 0.5 percent of the gross sales. K) Development Fund: when knowledge is shared by

more than one community and all of them cannot agree to the licensing of use agreement, a development fund could be created for the benefit of all the concerned communities. A committee comprising community representatives and government nominees would take the decision regarding the distribution and destination of benefits. Pacon further discusses the relationship between TK and IP. The proposed protection regime makes it impossible for granting of patent based on any knowledge of a community for which authorized access has not been demonstrated. Similar requirement exists with regard to the Andean genetic resources. The proposed arrangements are aimed at reducing the transaction costs and making communities capable of negotiating a fair benefit sharing agreement. However, the true protection would be achieved only when it is obtained at multilateral level.

Latiff and Zakri (2000) referred to the national policy on biodiversity enacted recently as a legislation, which works in conjunction with other federal and state level enactments. They provide an example of a state level initiative, which has implications for other developing countries. Sarawak region posses the richest and most diverse natural resources. When calanolides, a chemical compound was discovered in a local plant by National Cancer Institute, USA, the state formulated and passed Sarawak Biodiversity Centre Ordinance 1977 and later Sarawak Biodiversity (Access, Collection and Research) Regulations 1998. A collection permit now is required from Prime Minister's department for any scientist to go to Sarawak and collect the plant material. NCI and Sarawak state government have signed a Letter of Collection (LOC) permitting subsequent collections. Sarawak Biodiversity Council set up in February 1998 is responsible for regulating "access to, collection of, study and research on, experiment, protection, utilization, and export of the State's biological resources" (Chua, 2000).

Kumar (2000) looking at the situation in Sri Lanka endorses the proposal of Drahos (2000) further developed in a report to European Union Directorate on Trade. The proposal recommends the establishment of a global bio-collecting society similar to a copyright collecting society to act as a depository of traditional knowledge. It is similar to the proposal for INSTAR (SRISTI, 1993). The Society would not only license the use of TK to potential users but also monitor the use, ensure the collection, and distribution of royalties among the holders of TK and establish a dispute settlement mechanism.

Mbeva (2000) reviews the interface between IPRs and TK in Kenya and observes that the current form of IPRs do not protect TK. The OAU initiated in this regard may provide future directions. Kamil (2000) notes similar lack of progress in protection of TK through various kinds of IPRs in Indonesia. Fenta (2000) focuses on partnership between farmers and scientists to develop new varieties and conserve agro-biodiversity.

Solomon (2000) draws upon Maori tradition in New Zealand pleads for strengthening existing customary laws instead of imposing uniform IPRs. Historically, the custom was easily supplanted by statute and is given recognition only when specific statute requires it to do so. Being marginalized, Maori communities failed to influence the law making process and get their customary practices included in this statute. A Tikanga Maori Framework of Protection, Solomon suggests could help following features: a) evolution by Maoris in consultation with government, based in Tikanga Maori reflecting their cultural values and ethos to acknowledge, protect and promote resources in accordance with their values, b) design of flexible structures to take into account collective rights as well as rights of individual creative people, c) given the existence of several national bodies representing Maori it would be a challenge to get them all involved in the consensus framework. This makes it very difficult and sometimes impossible to determine who had the authority or mandate to represent and make decisions on behalf of people. The traditional tribal structures sometime conflicts with urban Maori authorities over the issues of resource allocation. This complicates the process of obtaining prior informed consent, d) the federal government would be expected to provide funds on an ongoing basis. The legal sanctity would be necessary to ensure the enforceability and compliance of the decisions of

proposed framework. He recommends that compatibility will have to be achieved between New Zealand's national legal structures and the existing Maori bodies as well as the proposed framework for protecting TK. The issues raised by WAI 262 claim are very fundamental to the resolution of many issues and complexities mentioned here. Air New Zealand had carpeted large areas of its airport with the Koru sacred designs and these were walked on by thousands of passengers every week. After complaints from Maori, the carpets were removed. The sacred signs and marks of Maori are often used without their permission in various official documents. Maoris were not against the fusion of tradition with modern to promote national interest. But they wanted a due process of law to permit such exchanges.

Brascoupe and Endemann (1999) look at the issue of IPRs and aboriginal people in Canada in a study prepared for Intellectual Property Policy Directorate Industry Canada. There are several ways in which indigenous communities have tried to protect their rights. The Inuit Circumpolar Conference developed community guidelines for scientists and businesses wanting to access their traditional knowledge. Their informed consent is required while documenting or sharing their knowledge or photographing or using aboriginal symbols. The Scientists Act of Northwest Territories (NWT) requires all scientists conducting research in NWT to obtain license from the territorial government before beginning any research. The scientists are required to disclose the purpose of their research, maintain confidentialities, IPRs and explain the use of data and how findings would be shared back with the communities. This Act has helped in establishing the principles of prior informed consent in Canada. The aboriginal communities are seeking protection broader than permitted by Copyright Act. The Copyright Act does not allow legends and stories belonging to a community to be protected in perpetuity. The aboriginal communities would like to have rights to their cultural heritage indefinitely. They also want to protect the moral rights that means even the copyright owner is not allowed to distort, mutilate or otherwise modify the work that may tarnish the creators' honor or reputation or right of integrity. Similarly, it cannot be used in association with any product, service, cause or institutions, which is prejudicial to the creators' reputation without permission. Likewise, aboriginals prefer longer-term protection for their designs and marks. Many aboriginal business and organizations use the provision of trademark to promote their products. Similarly, they have also protected the certification marks. For example, the Cowichan Band Council has received a certification mark for the words and design, '*Genuine Cowichan Approved*' so as to protect articles like sweaters (1999:20). The logo has also been registered by various native Canadian tribes. They obviously don't like their names, words, symbols and designs used by non-aboriginals. Several of their other objections are similar to the concerns of other aboriginal people.

Guedes and Sampaio (2000) refer to the senate proposal no.306 put forward by senator Marina Silva in 1995 followed by proposal no.4579 by congressman Jaquels Wagner (1998) and later proposal no.4751 submitted by government. In the meanwhile some states have proposed and approved their own texts to regulate the access to genetic resources within their jurisdiction (for example, State of Acre No.1235/1997, State of Amapa No.0388/1997, and State of S. Paulo giving different levels of protection to TK).

Congressman Wagner proposed creation of a national catalogue where any member of indigenous or local community or anybody else could deposit documents relating to TK. This would help better inform decision about access and use of TK while dealing with contracts and benefit sharing. It also proposes that indigenous and local communities hold exclusive rights on any TK associated with genetic resources. In its article 47, the text proposes that inventions related to TK and genetic resources could not be considered for IPRs unless they conformed to the proposed law. In June 2000, Brazilian government published a Provisional Law (PL No.2052) on, 'access to genetic resources, protection, and access to TK, benefit sharing and access and transfer of technology for its conservation and use'. In the chapter III the PL states, 'that TK associated to genetic resources will be lawfully protected against

illegal use and exploitation or other actions not authorized by the national authorities designated to implement the provisional law'. It also states that 'TK can be subject to some cataloguing …….and that the protection given by this PL should not limit any other IPRs that may incur on TK'. It further guarantees the right of TK Holders to TK and associated genetic resources to have the access to all the publications, uses and exploitation of their resources and they could prevent third parties from researching, using and exploiting genetic resources relating TK and further they could prevent third parties from releasing information on TK under their control. They could also share directly or indirectly the royalty accruing from commercial exploitation of TK (2000:3). This PL is yet to become a law. Several national bodies such as Brazilian Agricultural Research Corporation (Embrapa) and National Research Council have suspended granting permission to collect genetic resources till further clarification to the rules. Authors provide an outstanding example of resurrecting an almost lost tradition associated with multi-coloured corn, which disappeared after Kraho Indians shifted to modern varieties in 1970s. When their agriculture became mono-culture and traditional varieties were lost, they realized that they not only lost large number of their rituals (out of 300) which synchronized with rhythms and routines of growing seasons but also lost the community routes, soil productivity, and their self respect. The rice monoculture, they realized were disaster. When the elders wanted to re-established their traditional crops they could no more find any corn seed. With the help of IPGRI Embrapa had organized expeditions in 1978 to collect local germplasm. Almost twenty years later in1995, small quantity of corn seed was reverted back to Kraho community. This was a profoundly emotional moment. Slowly and slowly with the re-introduction of corn, the native pride also resurged. The skills and knowledge developed over hundreds of generations could be narrated again to the children because there was a biological context. Likewise during 1995 to 1999 seeds of several other crops were returned to Kraho community. This led to a cooperative agreement between government and local communities to document their knowledge about their medicinal plants so that value could be added and benefits could be shared. More native communities are coming forward to participate in such partnership. This is an excellent example of how traditional knowledge system can be revived, restored and revitalized by fusion with modern institutions and incentives.

Ahmed (2000) describes the process of developing draft of Biodiversity and Community Knowledge Protection Act after having wide consultation and discussions in1977. The draft Act aims to ensure the goals of CBD through various mechanisms. The plant variety protection Act also supports the farmers' rights and provides for setting up of plant variety development fund. The National Biodiversity Authority would be the implementing agency for various acts related to biodiversity ad innovations. The collectors of biodiversity will have to take permission from the authority and be responsible for any damage that they may cause knowingly or unknowingly to the affected community. They will also pay a fee for commercial collection and agree to share benefits.

Australia in its communication to WTO (IP/C/W/310, October 2, 2001) on review of Article 27.3(b) has provided a very thoughtful perspective. Australia acknowledges the importance of broader issues relating to access to and control of genetic resources and protection of traditional knowledge and their relationship with advances in technology. It shares the international concern on the subject and supports the encouraging progress being made by the Inter Governmental Committee (IGC) on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore. Australia suggests that if an amendment has to be made to TRIPS, it should be in Article 29, which stipulates conditions to be fulfilled by patent applicants. It is here that the concern for disclosure, prior inform consent, traditional knowledge used, equitable benefit sharing, etc., could be responded. It, however, suggests that amendment under TRIPS should be considered only after a complete survey of the situation has been made and options examined. At the same time, Australia is extremely concerned about the matter and accordingly a draft legislation released to the public provides for management of access to genetic and biochemical materials found in native plants and animals in federal government areas such as commonwealth national parks. As per this draft, bio prospectors would be required to obtain a permit

to ensure the collection of biological material in a sustainable manner, ensuring benefit sharing with access provider and ensuring that benefits arising from the use of indigenous knowledge about plants and animals are shared with the relevant indigenous communities.

The Australian government is conscious of the need to protect indigenous intellectual and cultural property (ICIP) within Australia. The government feels that scope of using existing legal framework for increased protection for ICIP should be explored before enacting new systems. So that one does not create extra regulatory burden, procedures and system that might stifle innovation and creativity. Australian copyright laws provide effective protection for indigenous design being illegally reproduced on T-shirts, carpets and other commercial products. Eight case studies in Australia involved a range of issues namely, a) unauthorized use of photographs in any form violating copyright, performer's rights and law of passing off; b) unauthorized reproduction of spiritual rock art images for use on clothing and other merchandise involving licensing of traditional knowledge and copyrights; c) use of a certification trademark by the National Indigenous Art Association of Australia for certifying indigenous art and art products and discourage fake products; d) increased use of trademarks by indigenous art centers and galleries; e) study to examine the extent to which indigenous groups have used design laws to protect their indigenous cultural expressions; f) examination of a recent decision of Australian Federal Court in which use of copyright work of indigenous artist on imported carpet was found to infringe the rights of indigenous artist; g) unauthorized re-production of indigenous artist's work embodying clan design on imported fabric; and h) dispute over alleged infringement of a trademark involving art gallery and indigenous instrument maker. The government also recognizes the need for non-legislative approaches for ICIP creators. In an important submission, the Australian government recommends the examination of the provision of collective management of IPRs in the field of ICIP protection. The protocol and guidelines could be developed to guide the collection of indigenous cultural material by the government. Australia also remains committed to build the capacity of indigenous people in utilizing existing legal framework and exploring the alternatives. The draft amendments to the Environment Protection and Biodiversity Regulations 2000 – Access Permits and Benefit Sharing Arrangements, requires a party seeking access to biological resources in commonwealth areas must apply for an access permit to be issued by the Minister. While the assessment process is under way, the applicant would be required to negotiate a benefit-sharing contract covering commercial and other aspects of the agreement with the providers of the biological resources. The model agreement distinguishes between commercial and non-commercial research and provides flexibility in arriving at an agreement. The Minister would issue the permit after ensuring that environment assessment has been done, proposed access is ecologically sustainable and consistent with the conservation of Australian biodiversity, submission from interested persons and organizations have been taken into account and benefit-sharing contract has been drawn up involving prior informed consent of any indigenous owner of the biological resource, mutually agreed terms and adequate benefit sharing arrangements including protection for and valuing of indigenous knowledge and, if possible, some allocation of benefit for biodiversity conservation in the area concerned. The purpose of Access and Benefit Sharing Scheme is to minimize transaction cost, maximize certainty, ensure transparency and accountability, follow flexibility, avoid duplication, and have simplicity, accessibility, and efficiency. Purpose is to further ensure that the interests of the indigenous people right in land and resources are respected, and industrial researchers feel encouraged to negotiate fair contracts.

Mgbeoji (2001) reviews the legal literature on patent and traditional knowledge of plant users to explore the feasibility of communal patent regime to stop bio piracy. The author finds problems with most proposals to use international registry of traditional uses or adapt existing IPRs to the needs of traditional knowledge holders. He criticizes the proposal for registry on four grounds: a) there was no reason to accept any profit conscious bio prospector to pay for knowledge or genetic material that could be obtained surruptiously by payment of a token sum or for free. Further once the basic information was obtained, the current state of biotechnology and patent system, in his view, leave ample scope for