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Protecting Traditional Knowledge of small, scattered and disadvantaged grassroots innovators and traditional knowledge holders: Honey Bee perspective

: Agenda for Policy and Institutional Change

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Most cultures around the world from time immemorial have exhibited dialectical tendencies of encouraging sharing of knowledge as widely as possible and at the same time encouraging, or at least tolerating, the efforts of some knowledge producers to keep their intellectual property secret. Some times the owners of the property tried to keep it secret through various coercive strategies. After all Shahjahan who built Taj Mahal did get the right hand of the workers who had built Taj Mahal, amputated so that they could not build another Taj Mahal. Many traditional medicine men and women decided to keep their life time experiences secret and thereby exercise control over the boundary of their knowledge domain. Traditional weavers of patan silk once were reported to impart the skills of producing patan silk only to their daughters in law instead of daughters so that skill did not go out of the family. Only four families are now left practicing this 750 year old silk weaving and dyeing tradition.

However, these exceptions apart, by and large the communities and innovators have been very generous in sharing their knowledge with whosoever approached them. The result has been that they have remained poor whereas those who access their knowledge and develop products after seeking IP protection or otherwise, have become prosperous. Ironically the very success of the commercial products developed through value addition in local knowledge many times becomes reason for the erosion of knowledge itself. This happens through: i) excessive extraction of the

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biological resource on which such valuable knowledge is based, ii) denial of fair share of benefits to the knowledge providers who then emigrate to urban areas discontinuing the practice of place based or local resource based knowledge(though some parts of the knowledge may still continue to be practiced for a while in new places of employment and settlement), iii) lack of incentives for younger people to learn this knowledge which they see, had kept their elders impoverished, and iv) weakening of social networks due to increased vulnerability and thus impaired incentives for sharing knowledge (Sinha, 2003).

The key challenges before the policy planners are: (a) How to provide incentives to local communities and individuals to share their knowledge innovation and practices without the fear of being exploited, (b) how to ensure that the intellectual property rights of the communities as well as individuals are protected through a low transaction cost system available globally in the form of registry like INSTAR¹¹, (c) how to ensure that patent offices in the developed countries do not issue patents on traditional knowledge and/or knowledge obtained either illegally or unethically or both from developing country sources and d) how to ensure that TK continues to evolve through dynamic inter-generational as well as inter-community knowledge transfers.

Paper is divided into four parts. In part one, we discuss the definitions of indigenous knowledge systems, traditional knowledge, intellectual property, Prior informed consent etc. In part Two, we describe the contested domain of private or proprietary knowledge, community knowledge and public knowledge. The experience of Honey Bee network, SRISTI, GIAN, NIF, etc., is briefly described (details are available at www.sristi.org , www.nifindia.org, www.gian.org indiainnovates.com) in Part three. Lastly, in part four policy implications are given which can hopefully widen the options for Traditional Knowledge holders and grassroots innovators (i.e. knowledge rich economically poor people) by building upon the resource in which poor people are rich that is their knowledge.

Part One: Framework for Understanding TK

Definitions: Indigenous Knowledge:

Indigenous knowledge has been defined here as the pool of beliefs, values, and, institutional and technological practices developed by individuals and/or communities for solving their problems, and making sense of the world through rituals, rules and a kind of ready reckoner of do's and don't's in the wake of uncertainties. It is natural that IK systems (IKS) will have rational as well as not so rational practices, including superstitions (and some time socially repressive institutions whether with regard to gender or other cultural roles. But such may be the case with so-called exogenous or global knowledge systems too. Both need careful and critical appraisal). What is important here is to recognise that there is a lot of dynamism in the IKS which can indeed be built

¹¹ INSTAR: International Network for Sustainable Technology Applications and Registration, is a suggestion made by SRISTI in 1991-93 for a global registry of traditional knowledge and grassroots innovations with geo-referenced database providing medium term protection, say ten years. Such a database would reduce transaction costs of the potential investors and entrepreneurs and help generate economic opportunities in global market place for local knowledge holders.

upon selectively while evolving national and international development policies and programs (Gupta, 2004). This can not be any one's argument that IKS can solve all problems or even most problems. But by building upon IKS, we provide opportunities to local communities to participate intellectually in the discourse on dignified development, reinforce the self-respect of the people and embed the values of frugality, simplicity, sharing and sustainability underlying many of the innovations and TK (though not all) in the development process.

The IKS involve use of not only local but also external materials. It includes traditional knowledge evolved over centuries but also includes innovations, knowledge and practices of contemporary origin by groups as well as individuals (see Fig 1)¹¹. Most of the traditional knowledge may be indigenous though there are examples of lot of exogenous materials, information and insights being incorporated in IKS from time to time. IKS in that sense is local, as distinguished from globally available pool of knowledge and it includes contemporary knowledge as well. Though with passage of time, much of the IKS is coming into public domain without any attribution, acknowledgement and reciprocity or compensation, an issue that led to the birth of Honey Bee network fifteen years ago (sristi.org, honeybee.org).

The IK policy thus will have to draw upon not just the traditional knowledge (TK), valuable and precious as it is, but also draw upon the creativity and innovations developed unaided by people at grassroots level individually or collectively. Purpose is to unleash the creative potential of people's knowledge and innovations and practices, which may have relevance for improving productivity, overcoming poverty and generating employment (also see Gupta and Pereira, Honey bee, 1993 and 1994).

It is necessary that one does not romanticise the potential of IK and at the same time does not minimise the potential solutions developed in one region or sector may have for another. Blending of modern science and technology with informal science and technology is necessary to add value to local knowledge, innovations and practices. Likewise, many examples of IK developed by the local communities may advance frontiers of science or provide leads for developing modern technological solutions to the local as well as global problems. It is desirable that IKS are seen as insights about opportunities communities and individuals have discovered through their own experiments and trials and error methods.

Traditional Knowledge:

The knowledge produced over generations by communities and/or households through experimentation, innovation, trial, and errors to solve local problems, manage resources and deal

¹¹ The figure one shows that survival strategies hitherto had been explored through either access to factor and product markets, kinship networks or through direct transfers i.e. food for employment work, running gruel kitchens and other support measures to keep people alive during stress periods. In this framework, Honey Bee approach relied upon knowledge systems as the major point of departure. Through scouting and documentation, converting innovation into products and rewarding and compensation, the knowledge network is created modifying the micro and macro policy in the process. The value chain so built is able to reinforce the experimental and innovative ethic in society, generate sustainable livelihoods and help in conservation of natural resources and associated knowledge system.

with uncertainties in environment and social interactions through local institutions. It is possible that traditional knowledge (TK) may have experienced periods of discontinuity or restoration of a given practice through local as well as regional or long distance movement of people and /or assimilation of resources and/or knowledge from various regions and communities over long period of time or in recent past. It is well known that some times certain kind of traditional knowledge is maintained only by a few or just one or two families in the entire region. It is our contention here is that TK should not be seen as entirely communitarian though much of it is. Likewise, it should not be seen as a form of fossilized knowledge transferred by one generation to another without making any changes or innovations in it. In fact TK includes a tradition of invention, innovation and cross cultural learning across time and space. The degree of change however, varies from place to place. Some regions have experienced much more rapid up-gradation of traditional knowledge compared to others. TK includes, as mentioned above, not just indigenous knowledge but also exogenous knowledge, resources and cultural influences. Traditional knowledge comprises, what Gupta (2003) has called 'traditional ways of knowing' and validating knowledge. Thus when new weeds are introduced in a given region, such as *Lantana camara* from another continent, local communities and individuals explore and observe its ecological and technological properties, develop ways of dealing with it, using it and developing new products such as herbal pesticides (refer sristi.org/knownetgrin.html) or food preservation technology as in Uganda¹².

Traditional knowledge and traditional ways of knowing

Many scholars have argued that traditional knowledge is primarily transferred from one generation to another, managed by communities and is contained in a cultural context which is quite different from the so called modern consciousness. There is an element of truth in it. But the complexity of traditional knowledge systems is quite high. One has to distinguish between traditional knowledge and traditional ways of knowing. Traditional knowledge is further segmented into knowledge i.e., known and practiced by everybody or known/or practiced only by few. The production and reproduction of knowledge, innovation and practices at local level requires various kinds of social networks which may vary from one place to another and one knowledge and resource context to another. It is not as if the knowledge produced over long period of time gets transferred to subsequent generation in a fossilized form. Every generation makes its own contribution to improvise and adapt the knowledge system. Some of these innovations may be quite common in one community whereas it may appear as innovation to another. On the other hand, the traditional ways of knowing may produce contemporary innovations which may be of considerable

¹² A farmer Auta Deogratias of Soroti was found to have developed a very innovative technology of extending shelf life of sweet potatoes dried slices using *Lantana camara* leaves layered between the slices¹². In an international competition among seventy countries organised by IFAD, Rome, with the support of SRISTI, Ahmedabad, he was given first prize by us and yet, how much research has been done about his innovations, how many farmers know about his solution which can improve food availability for many people. Do students read about this innovation in primary education text books? Has agricultural research council been able to take it up for further research? Why should local media have not made this a household story (see Honey Bee database CD, 2002, also see sristi.org/knownetgrin.html). Obviously, even functional Tk has not become a point of contemporary concern at national and international level despite hundreds of meetings having been held on the subject around the world. Real life incentives have often eluded the TK holders.

importance and in some cases may even advance the frontiers of knowledge. It is this source of creativity which has remained grossly neglected. The framework for rewarding traditional knowledge systems thus has to provide incentives for both, the knowledge produced in the long past and carried forward by subsequent generations through their own improvisations and the knowledge produced in recent past using traditional ways of knowing building upon local or even external resources or a combination of both.

The scientific basis of many of the traditional technologies can indeed provide new ways of solving contemporary problems. At the same time, there are many traditional practices which may not only be totally unsustainable but even positively harmful to the environment and biodiversity. One has to therefore be sufficiently pragmatic while deciding which elements of traditional knowledge systems should be sustained and which not. However, one can indeed assume that proportion of non-sustainable practices in traditional knowledge systems is much lesser than in the contemporary modern life and belief systems.

Intellectual Property Rights

Intellectual property is often defined as “A range of property rights accorded to “creations of the mind” - resulting from intellectual activity in the industrial, scientific, literary or artistic fields “(WIPO, in Conolly, 2003¹³). Essentially these are rights to exclude others from commercial applications of one’s intellectual property for a given period of time (this could also extend for perpetuity, if the rights have been regularly renewed and maintained, as in trade marks) without authorization from the rights holders.

The rights to make, market, use or make available the industrial applications of intellectual property are governed by various laws in operation in a country. These are national rights though may have cross border applicability as in the case of copyrights through international convention governing the rights. Thus, a person having a patent on a drug based on a plant or otherwise, may not be able to make it or market it unless approval from drug controller or other agencies responsible for consumer safety has been obtained along with manufacturing license if needed as per the national laws.

Protection of TK and biological resources on which it is based

Use of various measures ranging from application of IPRs or material transfer agreements, Prior Informed Consent, confidential clauses as part of the contract law could be used to provide protection nationally as well as internationally.

¹³ Kim Connolly-Stone, 2003, Intellectual Property, Bioprospecting and Traditional Knowledge: who benefits?, Intellectual Property Group, Ministry of Economic Development, Bioprospecting in New Zealand Seminar, Feb 2003, mimeo

Prior Informed Consent (NIF): Once an entry about innovation of TK fulfils the initial criteria of inclusion in the National Register of Grassroots Technological Innovations and Traditional Knowledge, National Innovation Foundation (NIF) sends a consent form to all the innovators to seek their written consent and choice of conditions for the dissemination and licensing of their products/processes/ideas. NIF strictly follows the conditions advised by the innovator/traditional knowledge holder. The form provides a model of benefit sharing among six stakeholders – the innovator, his/her community, the innovators' fund, research and development professionals/institutions who add value to the innovations/traditional knowledge and the institutions that facilitate the whole value chain and nature (that is contribution towards conservation of nature). (refer annexure..)

Part Two: Contested Domains, Fragmented Spaces (Gupta and Sinha, 2002)

A bird flies across the sky over a private home garden, community forest, public forest and the sea beyond. So do fish or other wild life move across different resource regimes. Can we conserve wildlife only by conserving protected areas and biospheres. McDonald, Arragutainaq and Novalinga (2001) provide an interesting example of how the interconnections among different parts of ecosystems influence the way we perceive the environment and its components. The ecological indicators have been used by the communities from time immemorial to interconnect various biological, meteorological, edaphic and aquatic resources and information. In the western Hudson Bay, local Cree and Inuit communities forecast weather and seasonal characteristics by looking at the behaviour of birds, clouds, winds etc., This is a complicated knowledge system in which biodiversity based knowledge system are produced in conjunction with other kinds of knowledge. In a recent conference to discuss criteria and indicators of sustainability, the issue of local knowledge and indigenous indicators emerged quite strongly (Gupta 2001). Within biodiversity, the complexity is no less. The taxonomists have named hardly 1.4 million species out of estimated 10-100 million species in the world (WCMC 1992). Even among the known species, certain regions and certain categories are far more researched than others. Different stakeholders value different species variously and thus have asymmetric interest in their conservation (Koziell, 2001, Gupta 1995, Suthersanen 1999: 72-77). Pimental et al (1992) estimate that about only 35-40 per cent of total 30,000 species in Germany were found in protected areas. Even the boundaries of most protected areas have not been drawn rationally on conservation ground. A mismatch has also been noted among some of the protected areas and hot spots. They therefore argue and rightly so, that while protecting the 'islands of biodiversity', we should also protect the 'sea' in between. The socio-cultural and institutional knowledge systems are extremely important and have been discussed elsewhere (Gupta, 2000, 2001). There is no doubt that technological knowledge exists in an institutional context. What kind of rules govern the evolution of knowledge and its dissemination are therefore important to determine the typology of incentives that will nurture or impair the processes of knowledge production and reproduction. The generation of creative and innovative solutions for local problems will also be influenced by these incentives. Therefore, the interaction among three sets of knowledge domains is important to understand the complexity of knowledge systems.

Contested Domains of Local Knowledge: private, community and public

The knowledge could be produced (see figure 2) 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.

Table – 1 Contested domain of Knowledge

a) Private individual knowledge inherited from forefathers	K1
b) Acquired the skill to practice it faithfully without modification	K1-wm
or with modification	K1-m
c) Individual rights to use the modified and unmodified knowledge according to	
same rules	K1-sr
Or different rules	K1-dr
d) Knowledge known to the community	K-2
e) Knowledge practiced by individuals if known to individuals	K1-l
f) Knowledge practiced by individuals if known to community	K2-l
g) Knowledge practiced by community if known to community	K2-c
h) Knowledge practiced by community even if details known to individual/s	K1-c
i) Known to community	K2-n
j) knowledge known to community and accessible to outsiders	K2-a
k) Knowledge known to community and not accessible to outsiders	K2-na
l) Knowledge known to wider public through documentation or otherwise	K3
m) Knowledge known to wider public and practised by only few individual	K3-l
n) knowledge known to wider public and practised by wider public	K3-P
o) Knowledge known to wider public and not practised by any one	K3-n

(Own Compilation, Adapted from Gupta, 1999)

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Contested Domains of Local Knowledge

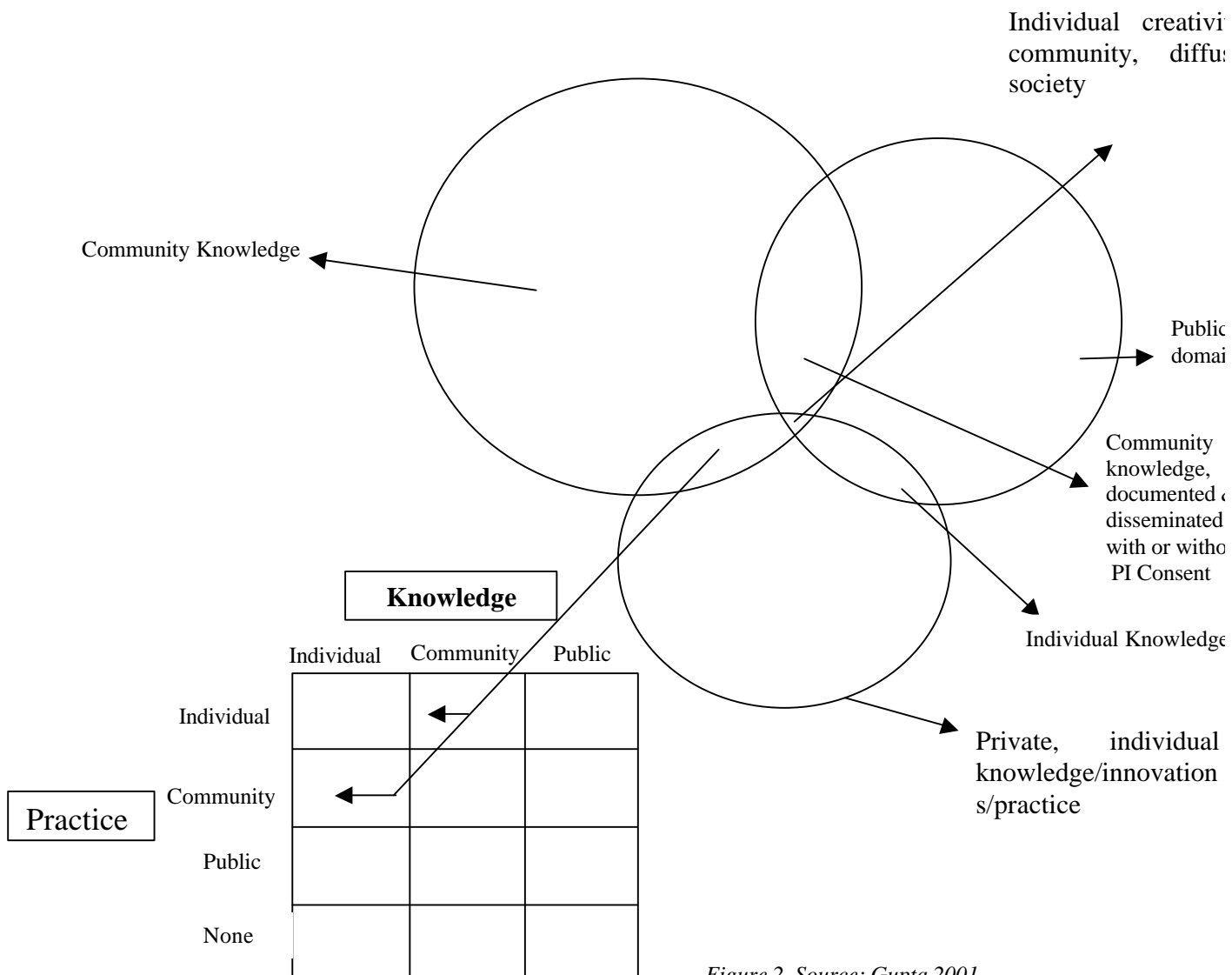


Figure 2. Source: Gupta 2001

The three subsets in figure 2 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 as the non-modified knowledge is used, or its use and dissemination may be governed by different rules (K1-sr, 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 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 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 are also taboos implying that a particular remedy might lose 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.

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 within 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 revere 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. 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 system 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. 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 also requires sharing of any gain that may accrue from commercial or non-commercial dissemination of the raw or value added knowledge provided by the communities or individuals. Honey Bee newsletter for last 12 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 merging. Once this happens the public domain provides incentives and not disincentives for individual and communities to share their knowledge after due information and incentives.

Knowledge and practice:

The relationship between individual, common, public knowledge and practice by individuals, communities, public or none is shown in the matrix in the figure two. The point made here is that incentives for those who only know and who know as well as practice can not be same. Likewise, knowledge may be known to community but practiced by an individual. Should the entitlements of the community members and the practicing individual be same? The issues of this kind need careful attention so that while developing a framework of protection and incentives for knowledge holders we do not dampen the drivers of knowledge production, reproduction, exchange and valorisation.

Part Three: Honey Bee network: context and contribution¹⁴:

The Honey Bee network

Metaphorically speaking, the Honey Bee represents the ethical and professional values that most of us seldom profess or practise. A honey bee does two things that we intellectuals often fail to do i) it collects pollen from the flowers, which do not complain, and ii) it connects flower to flower for pollination. In the Honey Bee network, we always credit the knowledge we collect from people to knowledge providers. They are not made anonymous, as has been the practice so far. We communicate the knowledge we have gained back with the knowledge providers as well as with other in local languages so that people to people connection can be set up. We share any benefit arising from this knowledge with them fairly. Honey Bee is a knowledge centre/network pooling solutions developed by people from different sectors throughout the world and creating links not only between people but also between formal and informal science. Honey Bee has collected over 36,000 examples of contemporary innovations and outstanding examples of the use of traditional local knowledge in the sustainable management of natural resources through various collaborators and now through National Innovation Foundation (NIF). These innovations are shared with local communities and individuals in over 75 countries through the Honey Bee newsletter which is being issued in eight different languages (English, Hindi, Gujarati, Tamil, Kannada, Malayalam and Telugu). SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions), a global NGO based in India, was set up in 1993 to provide back up support to Honey bee network. Several NGOs, such as SEVA, Pritvi, Pedes and many others have joined hands to sustain this voluntary network.

¹⁴ *The authors would like to thank all the Honey Bee collaborators and other colleagues from Honey Bee Network, GIANS and National Innovation Foundation for receiving helpful comments at various stage of the study and evolution of the ideas presented in this paper.*

Of course, people cannot solve all their problems and sometimes their solutions will be inadequate. Often there is scope for adding value and improving efficiency and effectiveness. However, it is clear that a development strategy that does not build upon people's knowledge will never be ethically sound or professionally accountable in terms of building upon a resource, in which poor people are rich in that is their knowledge, institutions and creativity. Only when we deal in a resource in which we are weak, and some one else is strong that we become humble. Humility of this kind will generate dignity in development. It will also be efficient because we are drawing upon the experimental reserve that local community or individual knowledge experts have already accumulated through their own struggles in past..

Honey Bee Network(including various voluntary organizations and individuals), SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions), GIAN (Gujarat Grassroots Innovation Augmentation Network) and NIF (National Innovation Foundation) have tried to provide some more alternatives for recognising, respecting and rewarding local creativity, traditional knowledge and contemporary grassroots innovations. SRISTI has documented through Honey Bee Network more than 11000 outstanding examples of traditional knowledge and contemporary unaided innovations. Some of these have been taken up by GIAN Gujarat set up as a venture promotion fund in 1997 for incubation and product development. Through the grants under TePP programme of Department of Scientific and Industrial Research and Department of Science and Technology, Government of India, not only patents have been filed, but also the technologies have been licensed to the entrepreneurs on district and state basis. The benefits in the process have gone to innovators three to five times of their annual income. In addition, SRISTI has honoured the innovators every year which has led to reinvigoration of the local knowledge systems and community arrangements for recognising the same. SRISTI has also organised biodiversity competition among children so as to identify the little genius who often are forced to become unskilled labourers in the local area or cities. Paradoxically enough the urban kids who may have had no background in conserving or utilizing local biodiversity are often trained as botanist or foresters. The competition among women for demonstrating various recipes which use at least uncultivated plants helps in drawing attention towards the less known (but perhaps more valuable) source of food and nutrition. Further, these contests help in identifying women experts whose knowledge is often discounted. Every six months the members of Honey Bee Network walk for eight to ten days in extreme summer and winter from one village to another to scout for innovations, respect the knowledge experts at their doorstep and share the mulitmedia, multi language Honey Bee database of innovations with the local communities, triggering in the process the experimental and innovative ethic.

In addition to above, SRISTI has campaigned for protection of intellectual property rights of local innovators and communities much before CBD or TRIPS came into existence. It is a firm belief in our mind that we cannot consider the only resource in which poor people are rich, i.e., their knowledge as a public domain open access resource. In March 2000, Government of India, Department of Science and Technology announced the formation of NIF under the dynamic and inspiring

chairpersonship of Dr.R.A.Mashelkar, Secretary DSIR, and DG, CSIR. NIF has already organised three national competition for scouting innovations and attracted about 10, 000 entries with more than 36, 000 innovations and traditional knowledge examples. The awards of the first and second round have been recently announced and interestingly enough the market demand for technologies of some of the awardees has already picked up.

The value chain of innovations beginning from scouting, validating, value addition, product and enterprise development, intellectual property rights protection, licensing and dissemination requires a whole range of institutional innovations which are absent in most of the developing countries. Protection of intellectual property rights is just one step in this value chain. Without accompanying institutional innovations and variety of non-monetary incentives, intellectual property rights alone may prove to be of limited significance.

The challenge thus is to recognise the need for (a) national and international register of innovations and outstanding traditional knowledge, (b) incubators for converting grassroots innovations into products and services and eventually into businesses, (c) setting up micro venture promotion and capital funds to provide risk capital for sustaining the value chain, (d) developing a low transaction cost intellectual property rights protection system which provides incentives to individuals and communities to disclose their knowledge, innovations and practices and (e) bringing about change in the educational system so that the young minds not only anticipate innovations but also create them. In a globalizing economy, innovations at grassroots, if properly supported by formal science and technology and financial institutions, can provide a basis for achieving competitiveness and excellence as a means of dignified survival.

Ultimately, a synthesis of seven Es, i.e., Excellence, Equity, Environment, Efficiency, Ethics, Empathy and Education would provide the right chemistry for societies seeped in mediocrity to get over their inertia and move towards a compassionate, creative and competitive as well as collaborative society.

Part Four: Policy implications: Issues for discussion

1) Protection of Traditional Knowledge

Traditional knowledge systems help a very large section of our society not only survive against all odds but also generate in the process, some of the products, which might have national and global markets if properly developed. Within the Traditional knowledge systems, there are innovations and improvements by individuals and communities which need protection so that potential investors can have incentives to invest and recover one's investments. It has to be appreciated that if TRADITIONAL KNOWLEDGE is assumed to be in public domain, then there is no reason for any exploiter of this knowledge with in or outside the country to have obligation to compensate or reward the knowledge provider. Further, the TRADITIONAL KNOWLEDGE systems in many cases when blended with modern science and technology can generate immensely valuable solutions for

societal problems and opportunities for improving livelihood opportunities for knowledge holders. *Another very important ethical, moral and institutional issue is as to why should traditional knowledge holders be expected to disclose their knowledge to national research or database institutions these institutions can not protect their rights?*

Proposal: Systems of protection may require that any community or individual disclosing their knowledge for National Register on green Grassroots Innovations and Outstanding traditional knowledge may get provisional protection for say, ten years with maximum of five claims per innovation or traditional knowledge subject to the conditions:

- (i) ***if any other community also claims the similar knowledge, then that community will be considered the co-holder of the rights***
(we will not like to encourage inter -community fights about this matter). We will also make assumption that unless there is some thing very unique, it is quite possible for similar solutions to emerge across communities over time and space for similar problems particularly when base resources, say same plants, exist in those regions.
- (ii) ***The duration of protection may be extended if any further improvements have been made and disclosed***
- (iii) ***It may be considered whether a small tax on every herbal and ayurvedic product and forest product import as well as domestic trade above a particular scale, be levied to collect the revenue for conservation, reward and information dissemination to traditional knowledge holders***
- (iv) **Local language databases** (of such disclosed innovations and traditional knowledge as well as of patents issued on herbal knowledge) be developed of such claims which should be made available at district level for scrutiny by the traditional knowledge holders and tribal communities. Such a service must be insisted upon at international level also.
- (v) All university and research institute scientists in developing and developed countries, working on Traditional knowledge must be advised to use PIC form (see nifindia.org) with whatever modifications authorities may consider relevant so that they do not publish the results of their research without (a) sharing it back with the knowledge holders and providers, (b) consent of the traditional knowledge holders, and (c) ascertaining uniqueness of their results so that intellectual property rights protection opportunities are not missed. They must be obliged to share part of their pecuniary gains if any, through the licensing of such technologies produced through value addition in traditional knowledge, back with the specific communities or a national fund. This fund may be managed by non-bureaucratic body responsible for

sharing it fairly and without much transaction costs with traditional knowledge holders. The guidelines of AAAS and other research bodies need to be changed urgently to reflect this ethical correction.

- (vi) All commercial organizations (such as Dabur, Zandu, Procter and Gamble) must be obliged to share part of their profits with the National Biodiversity conservation fund in each country since they draw upon wild biodiversity (on which local communities depend and survive) without any reciprocity and responsibilities for conservation. This is important because traditional knowledge systems cannot survive and grow if the resource base on which they rest itself does not survive.
- (vii) An international fund needs to be set up to promote filing of patents by grassroots innovators and TK holders internationally. NIF has facilitated five patents for innovators in US of which one has already been granted with the help of SRISTI and THT, a Boston based law firm without any fees to be paid.

3) Disclosure requirement in patent applications

Every patent applicant is obliged to disclose whether the resource and/or knowledge obtained from third parties for developing the patent claims have been obtained lawfully and rightfully. The 'lawful' access would imply that whatever laws exist in the source countries, have been complied with. The 'rightful' would imply that the prior informed consent of the knowledge providers has been obtained. It is obvious that any developing country can plead for this change only if it brings it about within its own territory.

4) Product Patent

Product patents are must if traditional herbal knowledge system has to be valorised for generating new products and services for increasing social welfare as well as providing a new knowledge-intensive model of poverty alleviation and employment generation. It may be mentioned here that in a study of herbal patents done a few years ago, Gupta, 2001, had found that China had about 45 per cent share of the total herbal patents followed by Japan, about 20 per cent and Russia about 16 per cent. Most of the inventors were individuals and not corporations. The concentration of patent was very low and most people had protected only in one or two countries. Two other observations make this point even more important. One in five Americans has used Chinese medicine and in China, Chinese herbal medicine finds a place of honour in the chemist's shop unlike India where such medicines would generally be kept in an obscure corner. Without product patent, we cannot protect herbal knowledge in any significant manner. The TKDL provides only a defensive protection through disclosure so that patents on public domain Indian traditional knowledge are not issued by various patent offices in the world. This is a very useful purpose being served in a pioneering manner, but it obviously is an answer to a limited but important problem. The

larger problem of protecting the rights of traditional knowledge holders remains un-addressed by TKDL.

5) International registry of sustainable technological innovations and traditional knowledge

SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions) had made a proposal for INSTAR (International Network for Sustainable Technology Applications and Registration) in 1993. The purpose is to provide a low transaction cost system to innovators and traditional knowledge holders to obtain worldwide protection and have incentives for disclosure. Traditional knowledge holders in many developing countries which do not have capacity to set up such systems in next decade or two would suffer if such a registry was not there¹⁵.

In TRIPS there is a provision for an international registry to be negotiated for wines and spirits. There is no reason why such a negotiation should only concern itself with the interests of a particular European country at whose behest, this clause was incorporated in the TRIPS.

6) Geographical Indications and service Marks

¹⁵ National and international registry systems have been proposed to incorporate the elements of innovation patent system so as to provide incentives to local communities, herbalists and developers of plant varieties to share their knowledge without forgoing the benefits possible through intellectual property protection. The issue still remains as to whether knowledge produced over a long period of time through cumulative contribution of communities in a given region should get only a short duration protection and that too with limited claims. There are several other reasons why a registry may help the innovators and TK holders even if with shorter duration protection:

- a) the possibility for potential investors, entrepreneurs and R and D partners to seek collaboration with innovators and TK holders would be very low if they did not have access to registry which would reduce transaction costs (TC) in the process,
- b) the possibility of willing partners filing joint IPRs for longer duration may also be low if the registry was not there,
- c) the technological obsolescence factor being high, many leads might not have much value if not explored within ten years any way,
- d) the possibility of learning from one another might increase if there was a registry. Many times this goal gets neglected in the debate and to us in Honey Bee network, lateral learning among the local innovators and communities is a central concern. Surviving collectively is some thing that registry can facilitate.

The cost of filing patent can be very high. For example, a US patent application in 90s could be about 20,000 USD while in EU, it could cost twice that amount. However, this cost varies a great deal and in thirty two countries it was found to vary from USD 355 to 4772 in 1990s (Helfgott, 1993). We need to devise ways of reducing these costs for small innovators and traditional communities. INSTAR, an international registry might offer one way.

The collective marks could also be utilized by association of healers, seed producers and others to provide guarantee about quality as well as authenticity of claims. Accordingly these could improve the prospect of market returns and consequent benefit sharing. These provisions can go a long way in safeguarding the traditional habitats and lifestyles without constraining these by non-sustainable livelihood strategies and poverty. It is obvious that if a particular production process and output does not derive any specific advantage from a given region, this might move to the locations where it is cheaper and more profitable to make it. Accordingly the local producers might have to emigrate to these regions where production now takes place or may have to become unskilled labourers in the other urban and rural regions. Patan silk is a good example, only three families are left in north Gujarat and one on Baroda which pursue authentic 750year old patan silk tradition. Rest all is unauthentic. Lot of traditional knowledge and products have disappeared precisely through such erosion of opportunities associated with geographical regions. Most developing countries have not yet taken, steps to provide protection to the locally distinct and characteristic products and process based on value addition in local knowledge and bio diversity.

7) Sacred Marks registry at International Level

There have been many cases where sacred signs and marks of one culture have been used by another culture in an irreverent manner causing hurt and disrespect to other cultures. We should plead strongly for an international registry of such marks and also a general agreement that names and signs associated with God and goddesses venerated by any culture would not be allowed to be used in a disrespectful manner (some years ago, a US company had put such pictures on toilette seats and in another case on chappals). Of course such respect should be shown domestically also.

8) Intellectual Property Information System

The ability of the local communities to avail of the existing intellectual property instruments depends considerably on their ability to access existing IP information in their own language and in a manner that is accessible to them close to their place of residence. Granting that much of the traditional knowledge is available in the ecologically rich regions where market forces and administrative support systems are weak, one has to recognize the complexity of providing IP information system in a widely accessible manner.

The essential elements of IP information system in such a context would include following institutional and technological arrangements:

- a) A very wide information technology based communication network in some of the remote regions enabling community leaders and educational research institutions to scan prior IP existing on the plants, animal products or other associated knowledge or innovations innovated by these communities. In the absence of prior experience and training many of these communities

would find it difficult to make sense of the IP information even if available in local languages.

- b) Capacity building among the educational research community local NGOs and public service legal agencies for providing support to the local communities in searching and interpreting existing IP on the biodiversity, genetic resources and associated knowledge system.
- c) It is to be expected that there would be many cases where traditional knowledge and or genetic resources have been obtained without prior informed consent, or developing mechanisms for sharing of intellectual property or any kind of benefits. Many of such cases could relate to periods before CBD came into being and also before national sovereignty on biodiversity was recognized. It will be difficult for the local communities to recognize and appreciate that they should not object to the violation of their ethical and intellectual property rights simply because the legal system was not in place to defend their claims in the absence of such rights. There could also be cases where the opposition could not be filed even if the patents have been issued in such cases using prior known TK of some specific communities, as was the case in ayahuasca (*Banisteriopsis caapi*) patent. The conventional legal constraints of the period within which opposition can be filed may have to be reviewed so far as it relates to the knowledge of communities.
- d) The legal help to local communities to file objection in cases where intellectual property has been obtained on prior traditional knowledge could pose two problems: (1) if local community knowledge is considered prior art then it might facilitate questioning of some of the existing patents but it also might prevent seeking new intellectual property on the unclaimed intellectual property of the local communities, (2) it will be difficult to make the case that a plant found in many places could not have been identified as a source of a particular compound or use independently for which a particular local community had found the use. Therefore this issue of prior art is very complex. Our own preference in the matter is that communities have more to gain by accepting that much of the local knowledge is considered outside the prior art definitions unless it is well known, and is in public domain through widespread practice. For all other cases where knowledge is restricted only among a small localized community otherwise inaccessible to outside scholars or corporations, it should be considered a patentable subject matter.
- e) The information system will have to have a national and international hub in such a way that national and international IP support organizations can play a role in educating as well as empowering local communities in dealing with a whole range of issues affecting their rights. In other words IP help desks capable of handling queries from local communities in local language would need to be created to provide the support.
- f) It is obvious that current capacity of WIPO and also national IP systems is grossly inadequate compared to the need of large number of communities all around the world. This has led to the widespread feeling of violation of

rights among these communities. Many communities which do not support the concept of IP on their community knowledge would also like to make sure that others not authorized by them do not seek private individual IP rights on their knowledge. The IP information system which could be administered by WIPO should take care of the needs of such communities as well

Pilot projects for providing access to IP information system with the help of NGOs and willing national agencies need to be started to learn first hand various complexities involved in the task.

9) TK Value Chain: What are the ways of disentangling the contributions of individual innovators who may modify in TK based knowledge bits, from that of the community (current members of it as well as historical members)? After all the individual experimenters have driven the engine of knowledge growth at all times in history as well as at present. How should we apportion benefits among various contributors in the TK value chain?

10) The Grace period: EU is still discussing the need for one year time period which USA already has for disclosure of an invention. Should there be five years grace period for TK so that communities, which shared their TK in good faith, are not penalized?

11) Should first to invent --a system used in USA --be applied for TK protection since it is very helpful for those small inventors who are not smart enough to reach a patent office fast enough gathering all the support that is necessary to get the benefit under “first to file” system.

12) Protection of TK may offer little benefit per se unless the protected TK moves up the value chain and generates profits, which can then be shared with various stakeholders. The contribution of communities and individuals (not just the tribals, but also other local communities) needs to be understood not only in its functional attributes but also in analogic dimensions. Clearing Houses at global, regional and national level need to be set up to provide easy, accessible and fair opportunities for the registered TK to be negotiated. (We are trying to develop one such exchange at sristi.org/knownetgrin.html)

13) We must recognise the need for developing new instruments, new ethics, and new frameworks for providing real life alternatives to knowledge rich and economically poor people.

Some of the basic building blocks of the emerging policy consensus are:

- a. The process of development cannot be dignified unless it builds upon a resource in which poor people are rich, i.e., their knowledge.

- b. The conservation of knowledge in a globalising economy cannot take place entirely on cultural grounds. Institutional support systems are necessary to document, characterize, valorize and incentivise these knowledge systems.
 - c. While the role of communities in conserving the resources and the associated knowledge system is very vital, without proper incentives for individual experts and innovators, the incentive for specialisation and adaptation of knowledge to changing needs may not exist.
 - d. The educational system has to make a significant contribution in this regard so that the esteem for this knowledge system begins to take shape right from the early stage.
 - e. The intellectual property rights of the individuals and communities have to be protected if benefits have to be generated for the knowledge experts as well as local communities. If knowledge is in public domain, then there is no need for any one to pay any compensation to access such knowledge and/or resources.
- 14) Whether the disclosure and informed consent can be incorporated as a requirement in patent applications is an important issue. Some legal experts' view that contracts mediated by insufficient disclosure and information cannot be legally questioned only on that account. Theoretically, the information asymmetries have been exploited by the market players for extracting rent from time immemorial. The issues are whether new legal regimes have to be created in the aftermath of CBD through revision of Art.27.3b of TRIPS so that some of these questions can be of knowledge, information and power, requires modification in the property right definitions. For instance, if state accords property right to a patent applicant on the basis of disclosed invention, state may well be within its rights to require that the applicant declares in an affidavit that the knowledge and materials used to create invention have been obtained lawfully and rightfully. This will require enactment of laws in each country and at the same time, modification of laws in developed countries. An amendment proposed on this account in the European Council three years ago is reported to have been rejected. The issue still remains. The inter government panel set up at WIPO to discuss access to genetic resources and benefit sharing has recommended that the amendment to the existing patent provisions need to be made so that it becomes obligatory for applicants to declare that they have obtained material, and or knowledge associated with it lawfully. This will pre suppose the need for national laws requiring such permission in the national acts. This does not adequately take care of the 'rightful' claim to the knowledge and or genetic resources obtained for filing patents. In other words in countries where laws do not require prior informed consent of the communities, it would be lawful as well as technically right to use knowledge and/or resources without any concern for expectations of the local communities. We strongly believe that ethical responsibility of the patentee cannot be denied in such cases. While

ethics cannot be legislated, it is useful to generate discussion on the subject so that consciousness of the dominant players in the IP game slowly transforms.

- 16) Even if sufficient disclosure is made, it may not be made to all the stakeholders at the same time so as to achieve complete satisfaction on this account. An issue has also been raised that if the state or other organizations having provided the informed consent, recognize after the event that the information provided to them was not sufficiently up to date or state of art, the possibility of nullifying the consent would appear very difficult if not impossible. Because the consent provided earlier would have already given out the access to material and knowledge. The contract law requires parties to the contract being sufficiently aware of the implications of the contract but it does not require any one party to make other one aware beyond the reasonable level accepted as the norm in the business?¹⁶
- 17) Given the fact that industry is always apprehensive about competitors coming to know about, their sourcing strategies, they try to deal with such matters confidentially. Some of the draft legislations require a public notice about access agreements to ensure that every body is aware of the impending contract. This is an issue, which will need to be further explored with country governments and the private sector so that a consensus can be reached and one can evolve the best practices in such matters.
- 18) In the Pew Ethical Guidelines (see srsiti.org/pub.html), we had raised an issue about the capacity of the host country or community to negotiate. Many times in the absence of this capacity, even if sufficient information is provided, the community and/or host country institutions may not have the *capacity lo process this information*. Should this capacity building be not considered non-material benefit, which will always hold the community in good stead.
- 19) The disclosure to local communities and the national authorities will be of different kinds. The initial disclosure will have to be distinguished from the subsequent sharing of information about the R and D pursued by the commercial or non-commercial partners. This is an issue on which we did not come across any outstanding example of information feed back in the language and manner that people can understand during and after research is done. Though this is an expectation, which was articulated by many of the individual local healers and communities we have met. The access of the communities to the existing intellectual property on products and services with which they are familiar will help in expanding their repertoire and generating pressure for further inventive efforts. However, so far no group has made the effort of *disseminating patent information in local language to local communities* and individuals in an easy way and comprehensible manner. It will be necessary to evolve institutional mechanism so that *every provider of knowledge is entitled to receiving a state of art information on the subject of his/her expertise*. This is a challenging task but is a goal worth pursuing.

¹⁶ In fact if there were no asymmetries in information and information processing capabilities, there would be many business transactions made any way. The point is that if these asymmetries are far too much, then fairness of contracts may come n question and hence the case for capacity building

- 20) We *did not* come across any case where *intellectual property was shared* between local healers and the scientists. It is an issue, which needs considerable debate and discussion among scientific bodies. This is so despite more than 75 per cent correlation found between local knowledge and modern scientific information in some of the cases (Farnsworth, 1981).
- 21) The emphasis by some of the healers on the need for *recognition* of their contribution while developing modern medicine or other products indicated the potential that exists for evolving best practices in material as well as non-material incentives for sharing local knowledge.
- 22) The tendency of researchers particularly ethnobotanists of documenting and publishing the knowledge generally without any acknowledgement of the local information providers must be censured unequivocally. *Publication with acknowledgement* also poses a dilemma. In the absence of publication, particularly in local language (scientists seldom do that), other communities may not be able to learn from each other. But with publication, their *IP rights get preempted*. In the absence of registration system, which provides a low transaction cost system for quick protection, lesser and lesser knowledge may be shared and still lesser knowledge may be published - a goal contrary to the evolution of intellectual property rights.
- 23) **The right of communities vs. individuals:** The rights of communities in the collective knowledge may be exercised by some group norms putting constraints on individuals about what should be shared and with whom. It is true that the local communities do process certain kind of information collectively through cultural processes and institutions generating a local common good. At the same time, certain individuals within a community demonstrate enormous creativity and eventually become knowledge experts. Should the IP rights of these individuals be at par with the rights of local communities?
- a. The protection of collective rights should not curtail or conceal the rights of individuals. It is all the more important because there are local experts who may specialize in certain specific kinds of knowledge. Protection of their rights might provide incentives for such experts to emerge and be respected. We need to have mechanisms for protection of collective rights just as we have for individual rights.
- 24) **Duration of the Protection:** For how long should the rights of communities or individuals drawing upon traditional knowledge be protected. One view is that such rights should exist in perpetuity. The problem of course is that those who license this knowledge may not have the rights beyond the twenty years as applicable in modern patents. However, if traditional knowledge rights are considered valid for 99 years, then the licensees can also claim longer rights, as is the case in the trademarks and copyrights. The rationale for 99 years may be that at least four generations have no ambiguity about their rights in the knowledge and thus can think in the long term while dealing with it.
- 25) **The Balance of Rights:** The characterization of the local biodiversity uses in a manner that one can protect the rights in the value added knowledge comprehensively may be beyond the capability of local healers or

communities. And yet, should the rights of those who merely characterize a drug or natural product be at par with the rights of those who did the basic R&D of linking cause and effect. Similarly, the pricing of R&D by the corporate sector invariably tends to underestimate the value of contribution by local community and individuals vis-à-vis the valuation of formal scientific knowledge.

26) **Utility model/Petty patents:** It has been suggested that for incremental inventions or innovations where inventive threshold is lower, one could use utility models to provide protection to the innovators. However, the experience of Australian intellectual property office revealed that even in a developed country the system had not served the purpose of making a small sector competitive. A small firm could be competitive by being innovative through licensing in of external innovations or development of innovations within the firm. The petty patent system did not serve either purpose because the inventive threshold was similar to one required in the standard patent system. The case of providing such protection to communities of course remains within the realm of speculation since the same has not been tried. The Australian intellectual property office recommended an 'innovation patent system which would overcome some of the deficiencies of utility model. It was suggested that any inventor could get protection within three months of application after paying a very small fees and get eight years protection with maximum five claims. The prior art requirement would be same as in the standard patent and formality examination would also be undertaken on all applications though substantive examination only on the request by the applicant or third party. The publication of the innovation patent application would occur three months after filing. Dual protection by standard and innovation patent would be possible (Review of the Petty Patent System, Advisory council of industrial property, AIPO Canberra, 1995). Conventionally the fees for the Petty Patent and the Standard Patent were more or less same and the time taken in the Petty Patent was lesser. On an average 300 Petty Patent applications were filed with 50 to 60% being granted patent. The foreign applicants had rarely used it. Individuals rather than companies made the majority of the Petty Patent applications. In comparison, Australia received 20000 applications for standard patents out of which only 10% made by Australians. As against this, only 1.5% was the share of Petty Patents. The share of agriculture or veterinary knowledge based patents was just about 5% in petty patent.

27) The distinction that one needs to make from the conventional utility models relates to the subject of protection. The utility models were intended to cover designs and other incremental improvements but not necessarily a kind of product patent for drugs, or agriculture. Although interpretation vary from country to country. What is recommended here would be further improvement on the Australian innovation system so as to include the term of at least 10 years, claims 5-7, lower inventive threshold but availability of a product and use patent. Thus an indigenous herbal drug developed by a local healer can receive product patent for 10 years. During this period, potential manufacturers may get in touch with the inventor and may negotiate the right so as to file a standard patent if large scale manufacture was considered desirable and profitable. The fees should be negligible but publication of application within a

year should be obligatory and the granting of patent should not take more than a year or 18 months. The provision of product and process patent through an innovation patent system might stimulate efforts on the part of local communities and healers as well as other innovators to seek quick short term protection for their non obvious knowledge. It is hoped that potential stakeholders in such innovations might enter into collaboration with the inventive community or individuals and if successful, file for a standard patent with appropriate benefit sharing clauses. However, it is also possible that such a thing may not happen unless public policy triggers a partnership between private and public sector labs and such innovative communities willing to bring their knowledge in public domain through disclosure in the patent application. National and international registry systems have been proposed to incorporate the elements of innovation patent system so as to provide incentives to local communities, herbalists and developers of plant varieties to share their knowledge without forgoing the benefits possible through intellectual property protection. The issue still remains as to whether knowledge produced over a long period of time through cumulative contribution of communities in a given region should get only a short duration protection and that to with limited claims. There are several other reasons why a registry may help the innovators and TK holders even if with shorter duration protection:

- a) the possibility for potential investors, entrepreneurs and R and D partners to seek collaboration with innovators and TK holders would be very low if they did not have access to registry which would reduce transaction costs (TC) in the process,
- b) the possibility of willing partners filing joint IPRs for longer duration may also be low if the registry was not there.
- c) the technological obsolescence factor being high, many leads might not have much value if not explored within ten years any way.
- d) the possibility of learning from one another might increase if there was a registry. Many times this goal gets neglected in the debate and to us in Honey Bee Network, lateral learning among the local innovators and communities is a central concern. Surviving collectively is some thing that registry can facilitate a great deal particularly if local language interfaces are developed and IT kiosk can make this registry accessible at local level.
- e) Search for sustainable technologies and ways of conserving resources, and using them also necessitate that green grassroots innovations be accessible to those who need it at low TCs.
- f) Isolation of communities from one another has meant increase in their cost of learning optimal solution to some of the common problems. Possibility of pooling of best practices to generate optimal solutions is a kind of benefit which local communities might cherish a great deal as evident from SRISTI's , Seva's and NIF's experience.

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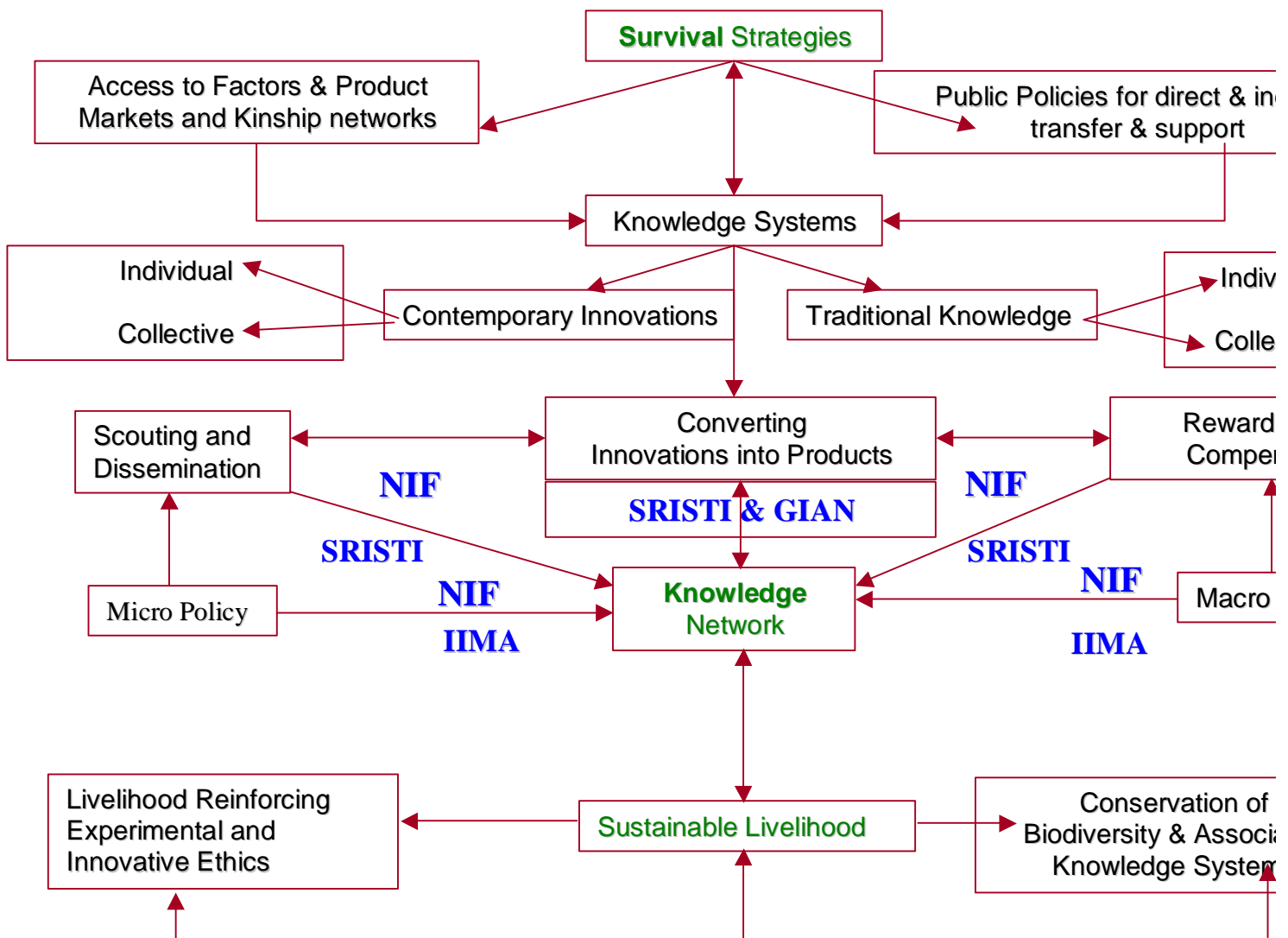


Fig one

**Framework for building upon
Indigenous knowledge, creativity and
innovations**

Source: SRISTI, 1993, NIF, 2004