

GETTING CREATIVE INDIVIDUALS AND COMMUNITIES THEIR DUE:

FRAMEWORK FOR OPERATIONALIZING ARTICLE 8 J AND 10 C¹

Convention on Biological Diversity provides for the first time an opportunity to break the nexus widely observed between the biodiversity and the poverty. It is recognized that one could not conserve biodiversity by keeping people poor even if historically biodiversity survived only under such conditions². Studies have shown that many of the communities which conserve diversity have remained poor because of their superior ethical values. The challenge before us is to modify our own ethical positions. And at the same time ensure that with improvement in the livelihood prospects through the implementation of CBD, the communities will conserve diversity along with associated ethical and cultural values.

The rate of erosion of the knowledge of biodiversity was never so high as it is in the current generation. Knowledge erosion is even more serious threat than the resource erosion. Conserving the biological diversity without conserving associated knowledge systems is like building and maintaining a library without a catalog. It is true that users of such a library over a long period of time may in fact develop a catalog. But such a catalog would not benefit from the centuries of experimentation and knowledge accumulation by the local communities and indigenous people. It is true that formal scientific knowledge of plants and animals is quite diverse and rich. However, the dimensions on which different communities have classified and organized their knowledge as well as practices, are far more complex and dynamic.

There are three crucial assumptions in this paper (a) not all knowledge, innovations and practices prevalent in a community are communal in nature. That is there are individuals who have great expertise in various aspects of local knowledge not known at all or known only partly to the local community. (b) Not all the knowledge in use by a community is traditional in nature. There are large number of examples of contemporary innovations by the local communities developed collectively or individually (c) one could not conserve biological diversity without conserving cultural diversity. The implications are obvious. Any scheme of incentives to be viable and sustainable will have to provide a mechanism for growth and development of traditional as well as contemporary knowledge system held by individuals as well as groups and in a diverse manner. One could not think that same or similar incentive structure or philosophical assumptions will provide adequate motivation to conserve what exists and restore what does not.

SRISTI and Honey Bee Network have been involved in the documentation, experimentation, and dissemination of indigenous knowledge, innovations and practices in the agricultural and animal husbandry sectors for the past six years more formally but for last 16 years informally (through individual efforts of various SRISTI members). This work brought us close to the farmers especially in Gujarat where we used a variety of methods to document more than 5300 innovations/practices from 2300 villages (SRISTI, 1996) but also in other parts of the country (Haryana, Maharashtra, Karnataka, Tamil Nadu, Rajasthan, Madhya Pradesh etc.,). In addition we

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².Anil K Gupta, 1990, Why do regions of high Biodiversity have high Poverty?, paper presented at International Conference on Incentives for Conservation of Biological Diversity, Nairobi: ACTS

have documented innovations from different parts of the world particularly Vietnam, Mongolia, Columbia, Ecuador, Tanzania, Cambodia, Bhutan, Sri Lanka, North and South American Indian communities etc., and have disseminated the grassroots innovations through Honey Bee newsletter in more than 75 countries. We have probably the world's largest database on grassroots innovations with name and addresses of the innovators (individuals or communities) and communicators in most cases.

The challenge of devising appropriate incentives becomes even more difficult when we realize that many of the local communities do not have access to some of the basic needs and are quite impoverished. Several factors have contributed to this linkage between greater biodiversity and poverty (Gupta 1991a, 1991b, 1993). A global initiative, SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions) takes note of the following factors (Gupta, 1991, 1992, SRISTI, 1993):

(a) The biodiversity is high in these areas, primarily due to diversity in soil, climate and other physical and social structures.

(b) The 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.

(c) The regions of high diversity also have very poor public infrastructure (just 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 from different parts of the world).

(d) The low demand for 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, the cultural and social decline follows. The tenuous relationship with the nature is ruptured. The 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 short term seems possible only through eco-degrading strategies.

Not only is the mean income of these areas low, but the variability in income is very high. This makes these areas most vulnerable to external exploitation (Gupta, 1981). These households would have such varieties of crops which are vulnerable to environmental and market fluctuations leading to generation of very low surplus. The livestock breeds though are well adapted to the environment, suffer huge loss due to drought or disease epidemics. The fluctuations in the non-farm sector also similarly impair the capability of household adjustment. In fact most of the households with such portfolios would have deficits in their budget (Bharadwaj, 1974, Gupta, 1981, 1983, 1989). Their dependence on other social groups and informal institutions like moneylenders or traders is enormous. Their vulnerability often acquires highly exploitative forms dividing them into different sub-groups of mutually conflicting identities. Collective action, for economic purposes, among such people is at times extremely difficult. For cultural and social purposes, they have perhaps one of the strongest indigenous institutional infrastructure. Their tacit knowledge base is very rich though it contains many images of self which are not very positive. There are, however, exceptions, particularly among artisans and pastoralists. Such groups may have a stronger self image and are also less vulnerable in regions where some demand for their products exists. The risks spread over space, sector and season or time also need to be appraised carefully to understand the evolution of institutional or individual solutions. Many of these solutions are very creative and innovative. Their relation with nature is often the strongest because they are most dependent on it.

Would these communities continue to bear this burden in the future? The combined effect of the formal educational system as well as high external input farming technology especially in the green revolution areas

has led to the devaluation of local knowledge systems in cropping systems (Richards,1985,Gupta 1989, Atte 1989). Though in livestock and tree based systems in arid and forest regions, large number of people continue to hold the local knowledge systems in high esteem. Our studies have also shown that erosion of traditional knowledge has also been much slower in such regions mainly because the formal scientific knowledge systems could not produce many successful technologies and practices to replace the local adapted ones. Even in green revolution regions, the indigenous veterinary knowledge was found to be quite buoyant though the crop related local knowledge had eroded a great deal. The weakness of formal animal health system became the reason for survival of local knowledge. Can these two knowledge systems be blended?

Singh and Varma (1969) had asked such a question about the continued relevance of the indigenous knowledge in a specific context of animal husbandry. That question could still be asked because the mainstream educational and public policy system still does not give due attention to the peoples knowledge system. One implication of this is the downgrading of the knowledge system in the eyes of young people of the same community. Once esteem goes down the incentives for young people to acquire that knowledge and experiment and rejuvenate the same also go down. This leads to serious discontinuities in the inter-generational flow of knowledge. Once the "local experts" (see part two of the paper) of the older generation are gone there are no substitutes and the knowledge held by those individuals in trust for future generations is lost forever.

The failure of the state delivery system in consulting local communities, including local experts, before implementing large scale projects intended for the development of the rural poor, has often led to adverse impacts on the livelihood /survival strategies of the local communities. The existence of perverse incentives has also blocked space for local innovators and conservators interested in developing and promoting sustainable natural resource practices. The near absence of legal and institutional framework to implement incentives for biodiversity conservation has led to over-exploitation of diverse biological resources by the corporate sector (without compensating the indigenous people in any way) as well as by other users like forest corporation, traders, small scale pharmacists and also in some cases by local communities.

Local communities struggling under the pressures of population, and the failures of both market mechanisms as well as state delivery systems have often resorted to the use of sub-optimal livelihood strategies (annexure one). Given the magnitude and complexity of the situation there is an urgent need to develop global and national strategies for conservation of biodiversity as well as indigenous knowledge, innovations, practices and lifestyles that favour biodiversity conservation. This is precisely what Article 8(j) of the CBD, read with Article 10 (c) proposes. In this paper we outline such an operational strategy.

The paper is organized in four parts. In part one, we describe the dimensions of knowledge system and explore the incentives that will help in sustaining different kinds of knowledge systems and/or their functions. We also discuss different kinds of innovations triggered by varying motivations as well as stimuli. The typology of different types of practices, particularity skills is discussed to suggest mechanisms that can maintain, and or augment or transform these skills. The second part of the paper deals with the mechanisms to conserve the culture and lifestyles which are closely related to any local/indigenous knowledge system. In part three, we discuss a whole range of incentives for contemporary as well as traditional innovations and highlight the bearing different types of institutions and technologies have on the suitability of these incentives. We also discuss the criteria by which different incentives can be operationalised in different locations and institutional settings. We must stress that to conserve this diversity and associated knowledge embedded in local cultural systems, we cannot follow a uniform approach. The thrust of this paper therefore is to provide a variety of instruments for a whole range of socio-cultural and institutional settings, so that member nations can take initiatives at local, national, regional and global levels through their own resources as well as through globally mobilized resources.

Part 1: Knowledge systems for survival and sustainable biodiversity management

It has been generally believed that knowledge system of local communities and indigenous peoples is quite holistic in nature. Centuries of association with an environment has produced a deeper understanding of interrelationships between different elements of a landscape or a habitat. Since fluctuations in the environment required adaptive response, communities developed a whole range of diversified survival strategies at intra and inter-household level and at communal level. However, contrary to the conventional belief, the local/indigenous knowledge system has had both holistic and reductionist elements though much more of the former. In order to cope with the scarcity, complexity and simultaneity of ecological changes, some people in the community specialize by knowing more and more about less and less. Expertise requires development of focussing, targeting and steering strategies over a specific theme or aspect of nature. A good archer may be good because he/she does not look at all the inter-connections between target and the world around it. The degree varies. So called western science is biased in favour reductionist relationships just as local knowledge systems are biased in favour of systemic linkages and holistic perspective of nature. But if efficiency has to increase for coping with increasing population pressures (where applicable), scarcity of the resource supply, fluctuation in the environment or the other contingencies, blending of formal and informal science may be necessary. The sustainability in resource use requires fusing sacred with secular, formal with informal and reductionist perspective with the holistic view.

The production of knowledge and its conversion into practice through innovations over a long period of time takes place in a given socio-cultural and ecological context. It has been suggested that this context influences and to some extent shapes the world views of people which in term influences the heuristics used for generating new solutions and knowledge (Pastakia, 1995). The heuristics are like decision rules which also are accompanied with criteria of choice. Many times it is not realized that local/indigenous knowledge system are not static in nature. The knowledge systems evolve, adapt and transform dynamically over period of time. New materials are incorporated, new processes are developed and sometimes new uses or purposes are evolved for using existing knowledge as well as new knowledge. It is for this reason that we submit, there is a need for rewarding not just the traditional knowledge but also the contemporary innovations. We also submit that the concept of Traditional Resource Rights (Posey, et al, 1995) does not do full justice to individual and contemporary sources of creativity and innovation. Our fear is that by impersonalising the entire process of knowledge production and reproduction, only such incentives will be considered which will provide resources either only in the hands of the governments or in rare cases the local community leaders. It is unlikely that the communities which kept most of the local healers poor by not valuing their knowledge systems adequately will pass on the externally generated incentives to such individual experts who have reproduced this knowledge (if not produced in all the cases). The assumed homogeneity of local communities and supposed convergence between the interests of local community leaders and that of local experts in every case is difficult to accept. How asymmetry in knowledge systems as well as power differential manifests in discourse on incentives becomes apparent from the nature of consultation process that has been followed with so called representatives of indigenous communities so far. Almost in all meetings held so far on the subject, the representatives of indigenous communities from west have dominated the discourse both in terms of numbers and ideas. It is not our contention that these communities have not suffered in past or that they should not be heard. But any one familiar with the miserable conditions in which most third world tribal and non tribal communities conserving biological diversity and associated knowledge systems live, it will become obvious that their problems and concerns are very different from the ones articulated at these international fora. The concerns of the local experts and innovators with in these impoverished communities may even be further different form the rest. How do we get their concerns heard and addressed is major purpose of this paper.

It is not surprising that most of the international consultations and studies on knowledge systems (Singh and Vera, 1969, Atte 1989, Netting 1972, 1981, Marglin, 1990, Sankhya Yoga, 7 A.D., Gupta, 1980, 1987,1989, 1991-96 etc.) suggest the need to distinguish between different types of knowledge. What these differences are

may not however, be agreed upon. For instance knowledge belonging to the present life and the one belonging to future state or ethereal matters has been distinguished in Indian Knowledge systems (para or apara gyan). Similarly, knowledge could be practical or abstract, etic or emic, techne or episteme, formalized or informal, utilitarian or non-utilitarian, segmented or recombinable or non-malleable, etc. (Atteh, 1989, Netting, 1980, Gupta, 1987, Marglin, 1989). Some of these dimensions reflect in the nature of technologies that people developed. The theoretical knowledge could include concepts, principals or abstract conjectures or propositions.

Categories of practical knowledge could on the other hand, include discriminating/ classifying, attributional or characterisational, associative, causal, functional, knowledge about limits or boundaries and about systemic linkages, etc. It is true that these types are not mutually exclusive and each knowledge bit may have all these attributes. It is just that the different incentives may be able to nurture different dimensions. Similarly both formal and informal sciences are capable of producing abstract as well as practical knowledge, although the latter (informal science) tends to produce more of the practical kind.

These dimensions are not mutually exclusive. Same knowledge systems could simultaneously pursue each of the functions though describable in various combinations. For instance a fishing community may have to use classificatory skills to deal with the variance in the movements of fishes, their egg laying sites, nesting sites etc. They may use the indicators for spotting the sites where fishes would be found at different times of the year in higher proportion. They 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 of risk or uncertainty. Since most knowledge systems dealing with nature whether formal or informal are probabilistic in nature, there are times where despite all the care and caution, fishermen and women loose their way and sometimes their life. One way to understand the complexity of knowledge system is to link the functions of nature with processes of sense making. The diversity, complexity, simultaneity and change in ecological systems (Gupta, 1989) are codified in knowledge and practices through language and culture. Just as Eskimos are supposed to have highest number of words for classifying the snow, the fishing communities may have very large number of words for distinguishing and discriminating different kinds of waves/ spawning sites etc. Conceptually one can submit that any community which is dependent upon a resource for its survival, has to develop a pattern or a set of categories to deal with the variance in the behavior of that resource. Therefore farmers should have a rich taxonomy of clouds and soils and in some cases insects and animals, the leather workers would have a taxonomy of leather, carpenters would have for wood and likewise other communities.

In the context of CBD it very important to understand and appreciate that different indigenous and local communities develop knowledge systems through a tradition of invention and also develop a language to articulate the knowledge system. If a language dies, a knowledge system partly or completely also dies with it.

Conservation of language becomes a crucial factor for conserving taxonomies because each of the words, conceptually speaking in the context of a natural resource, is a category. Modern science will benefit a great deal and so will our ability to understand the environment and cope with it, if we understand the science underlying these categories. Etymological roots of different words may provide the process of codification of knowledge over time in nay language as influenced by exogenous knowledge systems through migration, wars and other social intercourse.

It has been suggested that formal science in its effort to generalize over large time and space boundaries, often subsumes finer categories. The indigenous knowledge systems often do the opposite. These systems help in distinguishing small variations in a phenomena but within a, relatively speaking, small habitat. Higher local fit implies very low negative externalities on the environment but it also means an inability or limited ability to deal with wider connections. For sustainable development of our planet, we need both telescopic and microscopic visions. That is the ability to see connections among larger systems and also an ability to

appreciate interconnections at a micro level system. We need both, the reductionist science and the holistic vision. It must be remembered that if everything is connected to everything else, no causal statement can be made.

That is the reason we distinguish between functional and causal knowledge systems. Farmers have been known to do right things some times for wrong reasons. The practice does not therefore become invalid merely because the supposed causal connection is invalid. Even in modern science, there are several medicines which are known to be effective but whose causal mechanism came to be known much later. For instance, aspirin. A knowledge system should not therefore be downgraded merely because of above limitations. The rituals and some of the symbolic totems may be a way of constraining a particular healing strategy lest it is used in inappropriate cases, doses or situations. The marriage between local and indigenous knowledge and the formal and informal science will succeed only on the basis of reciprocity respect and a well deserved restraint in opening up the logic³. For instance the sacredness of certain sites, species and symbols will have to be respected even if a modern mind finds these institutional structures incomprehensible or even irrational. Collegiality can only spring from mutual respect.

Knowledge production and reproduction systems:

In the light of above complexities, Knowledge production and reproduction may not follow similar processes. The production may be through creative problem solving at small scale or in episodic manner, or through interaction with external world/ knowledge systems. Hence knowledge gets added to the local pool mainly through two routes a) local innovation resulting from serendipitous discoveries, trial and error methods, systematic experimentation, validation (trials over time and space), etc., and b) interactions with external world/actors, networking with kith and kin, networking with external partners, etc.

Knowledge reproduction on the other hand may take place through scaling up process, or testing of an idea in a different place, time or context from the one where it originated. Hence the same solution may be tried by the same person or different person in different context or for different problem or at a different scale. These dimensions are important because the institutional support needed would vary depending on these dimensions.

In a dynamic knowledge system some knowledge gets depleted as it becomes redundant over time on account of the changing perceptions of needs, access to resources, and changes in the socio- ecological conditions. However, in a vibrant culture, much of the knowledge is passed down from one generation to another depending upon social structures and 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)

³. That is the reason, many local knowledge systems always emphasize the questions to be asked but also the ones not to be. Modern mind militates at the very thought of a boundary of inquisitiveness. But sacredness of certain kinds rests on faith and the power of faith still eludes any other motivation. It is true that superstitions, particularly the ones which cause definite harm to the local communities besides generating gender or other kinds of social biases have to be tempered with a scientific attitude. When does faith become a source of superstition is not easy to answer and thus the need for exercising care in understanding local conservation practices. In our anxiety to unravel the mysteries underlying local faiths, we may erode the power of the local institutions without putting anything better in their place. For instance, if the mouth of most rivers around the world are venerated as sacred sites, no purpose would be served by explaining ecological significance of conserving these sites only in scientific terms. The reductionist knowledge by itself has not generated the social responsibility required to guide collective behavior in most cases towards conservation.

Cultural knowledge is embedded in rituals, folk lore, art and other cultural and social artefacts and processes etc. Some other specialized forms of knowledge may be reproduced by local experts. Knowledge embodied in Practices: Usually this takes the form of skills which are mastered through practice. The skills could be of different types: repetitive and non-repetitive including judgmental. Judgmental skills may be relatively scarce and individuals possessing such skills may over time be recognized as local experts. Examples of such skills would include weather forecasting, judging the quality of diamonds (diamond polishing using labour intensive methods has grown into an important off farm employment in many of the villages of Gujarat) cattle judging, diagnostics for human, animal and soil or lakes systems, etc.

Paul Richard's work on indigenous knowledge systems has often highlighted the performance aspect of indigenous knowledge as compared to that of formal systems (see Richards, 1987). Performance from the indigenous perspective could include a number of criteria not considered by formal science as relevant such as risk bearing ability, contributions to system maintenance and soil health etc. The practices could have different impacts on the natural resource base of the community. Practices could be resource conserving, restoring, augmenting or even depleting/ degrading. Incentives for resource conserving and augmenting practices could be different from the ones suitable for resource reclamation.

Knowledge Embedded in Culture:

Indigenous life style is a reflection of the indigenous world view. World views in turn are influenced by the changes in knowledge and value systems on the one hand and by the changes in socio-ecological context on the other. The values serve as guides for dealing with each other, with sentient beings and with nature and super-nature. Traditional knowledge embedded in culture and embodied in practice serves as the mechanism to preserve and pass on 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 also reflected in their livelihood strategies which are also closely woven with local institutions, social networks, kinships networks and knowledge systems.

Typology of Local Experts

Given the asymmetry of knowledge, experience and wisdom within and among communities, some individuals or communities in possession of specialized knowledge /skills become local experts. The following is an illustrative list of such expertise:

Local expert	Type of Expertise
Taxonomists	Classificatory knowledge
Herbalists	Functional, attributional knowledge
Ecologists	Knowledge about system inter-linkages, boundaries, niches, holistic knowledge
Reclamation Experts	Causal, functional, integrative knowledge
Plant and animal breeders	Integrative knowledge, special skills
Human and animal healers	Causal, functional knowledge
Semiotist	Symbolic, associative knowledge
Navigators	Knowledge of boundaries, geographical knowledge

Okoth-Owiro and Juma (1996)⁴ Refer to an IDRC report (1980)⁵ which classifies healers into four categories, viz.: (i) pure herbalists,(ii) herbalists-ritualists, (iii) ritualists-herbalists, (iv) spiritualists. The emphasis varies in each case on the process, product and the spirit. The authors suggest that the technical knowledge of the healing properties of plants was socialized. The art of healing, they observe, was not in fact a privatized knowledge nor was the knowledge of the material. They conclude that the present legal arrangements were not conducive to the survival of the indigenous knowledge and were not suitable for protecting the legitimate of communities (and perhaps also of the individual healers) in the knowledge of traditional medicine and the task of the genetic conservation. They stress that the laws relating to intellectual property needed to be modified. But even more important, they rightly aver, is the issue of strengthening the traditional natural resource management which provides the context for knowledge system to grow and evolve.

The typology of experts draws our attention to subtle dimensions of knowledge system for strengthening which appropriate institutional mechanism will have to be created. A whole range of new options become open when we look at the loci of strengths of local knowledge systems. This section was begun with the discussion on the need to recognize the role of individuals in communities. Lest we are misunderstood, it must stress that one possible reason why young people are not imbibing the skills that various local experts embody, could be that they do not feel honored or rewarded in pursuing these careers. If we do not develop incentives which make the expert skills worth pursuing, we will continue to witness the decline of skills and the demise of one expert after another without producing the next generation of leaders and experts. Without questioning the merit of the argument about social context of indigenous knowledge, we cannot ignore the fact that the same context has proved inadequate in generating sufficient self-worth among young people so as to pursue these skills. What is interesting about some of these skills is that new careers options become available when we look at their significance. For instance, the skill of restoring the health of the degraded lands opens new opportunities for combining relevant articles of desert convention and Forest action plan with CBD.

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 increase in salinity levels in coastal areas due to ingress of sea water may be different kinds of threats. The regions which have very low level of threats are preferred by markets and even state and, therefore, are advantaged in most respects. Given low transaction costs of exchanging resources in these regions, the adaptive response of the households is fast. At the same time, in view of the prevalent value system, the social structures are also different compared to the disadvantaged regions having higher perceived risks or threats. In table 1 we have enumerated the key contrasts that characterize the advantaged (market dependent) and disadvantaged (nature dependent regions). The market dominated communities are the ones in which most exchanges are mediated through markets, institutions and instruments. The commoditisation of labour, product and skills is quite high. In contrast, the communities which 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 communities predominate are also contrasted here. The market dependent regions are the high growth green revolution regions. On the other hand, the nature dependent regions are rainfed drylands, hill areas or forest fringe areas.

⁴. Arthur Okoth-Owiro with Calestous Juma. Property rights, medicinal plants and indigenous knowledge, in Ed. Calestous Juma and J.B. Ojwang, In Land we Trust: Environment, Private Property and Constitutional Change, Nairobi: Initiatives Publishers and London: Zed Books, 1996: 279-308

⁵.IDRC . 1980. Traditional Medicine in Zaire: Present and Potential Contribution to Health Services. Ottawa: International Development Research Centre.

Table 1

	Market dominated	Nature dominated
1. Communication system	Digital	Analogical
2. Pooling of resources	Very low	Very high
3. Reliance on common properties	Low	Very high
4. Settling of books of A/c	Very short term	Long term
5. The proportion of women headed or managed households	Very low	Very high
6. Women participation rates	Very low	Very high
7. Reciprocities	Specific	Generalized
8. Empowerment	Material resource-based	Knowledge resource and culture-based

Source: Gupta, 1992, 1995

One particular dimension of above contrast between market dominated and nature dependent communities and knowledge system is worth highlighting. The communication system in the nature- dependant communities is often analogic in nature compared to preponderance of digital communication in the market-dominated communities. The analogic communication refers to metaphorical and symbolic means of communications. Many of the local experts have a symbolic language through which they communicate their understanding of a problem. Many scientists and policy planners who have not appreciated the analogic basis of communications used by the local experts have jumped to the conclusions that expertise involve more of mumbo jumbo than actual skill. In some cases it might as well be but to generalise the entire package of traditional knowledge and contemporary institutional context as the one may be unfair.

Conservation of knowledge, skill, practice and spirit of innovation cannot take place without looking at the socio cultural and ecological context of the knowledge system. Incentives only in the material form and only in the short run will not help in changing the context of biodiversity conservation. In management science we always argue that without changing the context, we cannot change the content. A small story will illustrate it.

Akbar was a Mogul King during fifteen centuries and was very popular among his subjects due to his secular orientation. He had a minister called as Birbal. The minister was very quickwitted person. Akbar and Birbal used to play games of one-upmanship. Each one would try to prove that the other was not very intelligent. Once Birbal asked the king that did not he believe in the dictum that as the king, so were his subjects. Akbar replied of course, that it was true. Since he was a wise king, so should be his subjects. Birbal suggested that they should test this assumption. He wanted to prove that Akbar was not very wise king, though of course in the lighter vein. Birbal drew a line on a paper. He asked the king to announce to everybody whether anyone could shorten the line without erasing it.

After several days and weeks, a child came forward to do the trick. He drew a bigger line adjacent to the earlier line. The original became shorter.

What was changed was the context. What got changed was the content. The incentive for biodiversity conservation have to be seen in the change context discussed in the earlier part of the paper. It should be noted that no one incentive will be appropriate for all situations within a community or across the communities. Hence the need for tailoring or contextualising the content of the incentives.

III Incentives for conserving knowledge, innovations, practices and lifestyles:

Communities and individuals who have conserved biodiversity for so long have done it not entirely on the basis of an utilitarian logic. The efficiency of ethics sometimes may be tempered by the inefficiency of technology. That is, the method of extracting 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 efficient. Once the 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 such an incentive system which fulfills four conditions of sustainability - (1) The access to biodiversity for local communities to ensure their sustainable livelihood systems should take priority over access of outside institutions or individuals, (2) Assurances to individual healers or other local experts, communities and other stake holders to have sustained access to the resources and viable collective responsibility for using biodiversity, (3) blending of traditional skills/abilities to convert biodiversity resources into investments with or without value addition (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.

A Plea for Global Registration of innovations, traditional knowledge and practices:

INSTAR (International Network for Sustainable Technological Applications and Registrations)

SRISTI has been pleading for a global registration system akin to Honey bee network of grassroots innovators for last several years but particularly since 1989 when the Honey bee network was started and reinforced later several times (Honey Bee, 1990-1996; Gupta, 1991, 1995; SRISTI, 1993). Subsequently, the Third World Network also endorsed this idea as a part of their proposal on community Intellectual property rights but they had restricted the scope of such a registry only to the collective knowledge. We have argued from the beginning that innovations are produced not only by collective groups but also by individuals and not just in long past but also in the contemporary times.

It will be possible to achieve the following results from such a registry:

- i) Acknowledgement of individual and collective creativity
- ii) Grant entitlements to grassroots innovators for receiving a share of any returns that may arise from commercial applications of their knowledge, innovations or practices with or without value addition
- iii) Linking the golden triangle of entrepreneurship by linking Investments, enterprise and innovations. Small scale investors in North and South can not afford to go to various countries, scan diversity of knowledge and resources, negotiate contracts and invest up front huge investments for value addition. If they do not participate, then the field will remain dominated by only large corporations. This register will help small scale investors seek opportunities of communication with communities and individual innovators and explore opportunities of investment. large number of potential negotiations will take place increasing the opportunities for innovative communities and individuals. The competition among the investors tempered by competition among potential suppliers of a various kinds of knowledge as well as diversity will moderate expectations on both the sides.
- (iv) An autonomous authority of which local community representatives will be the majority members could be entrusted with the responsibilities of having access to all the contracts. A copy of the contracts may have to be deposited with this Authority so as to avoid short changing of the communities. These contracts will also be scrutinized to see whether management plans for sustainable extraction of diversity have been drawn up n scientifically appropriate manner or not. Penalties may have to be imposed for non-sustainable extraction of herbs by domestic as well as external extractors.
- (v) Each entry in the Register will be coded according to an universal system like ISBN. The postal pin code of the habitat of the community or individuals registering innovations will be incorporated in the indexation system so that geo-referencing of innovations can be done. In due course the contextual information of innovations can also be incorporated in the system so that GIS (Geographical Information Systems) of innovations can help cross connect the communities having similar ecological situations or facing similar constraints or challenges.
- (vi) The entry in the register will in the first stage be mere acknowledgement of creativity and innovation at grassroots level. But later some of the innovations will be considered appropriate for award of inventors certificate or a kind of petty patent which is a limited purpose and limited duration protection. Essential purpose of this innovation also is to enable the potential investors (a cooperative of consumers, producers, an entrepreneur, or a large firm in private or public sector) to seek local innovators and reward them through market mechanisms tailored appropriately by state regulatory mechanisms.
- (vii) The award of certificate will also increase entitlement of innovator/s for access to concessional credit and risk cover so that transition from collector, or producer of herbs to developer and marketer of value added products can take place in cases where innovators deem that fit.
- (vii) The registration system will also be part of Knowledge Network linking problem solving people across the world at grassroots level (see discussion on Knowledge network in the later section, Gupta, 1995, IFAD, 1995). This will promote people to people learning and serve as a

multi-language, multi level, multi media (oral, textual, electronic) clearing house for local and indigenous communities. Wherever necessary and possible, formal scientific institutions will be linked up in the network with local individual and community experts.

Apart from the registration system a large number of specific incentives would need to be developed for different categories of knowledge, innovations and practices. Similarly the incentives for preservation of sustainable lifestyles of indigenous communities would also be different. In the following four sections we provide a shopping list of incentives under different categories.

Linkages with Desert Convention (ICCD) (Gupta, 1995)

In this context, operationalisation of various articles of International Convention to Combat Desertification, particularly Article 16(b), Article 18, Article 19 and 20(c & d), Article 25- 3(a), Article 26, etc., in order to network existing information channels so as to make innovative solutions accessible to people in a manner that they can use these and share feedback/feed forward.

The Article 16 of Convention deals with information collection, analysis and exchange so as to accomplish (a) early warning, and advance planning for adverse climatic periods and (b) practical applications to deal with these variations by the people. It suggests that information needs of the local communities and decision makers are addressed through various ways of information networks integrating physical, biological, social and economic indicators. Article 16(d) suggests use of expertise of governmental and non-governmental organizations for dissemination of information. Article 16(g) provides for exchange of information on local and traditional knowledge, "ensuring adequate protection for it and providing appropriate return from the benefit derived from it, on an equitable basis and on mutually agreed terms, to the local population concerned".

The important caution which needs to be exercised in this regard is about "mutually agreed terms". People providing their knowledge whether traditional or contemporary may not always be able to fully assess the terms at which they should agree to share it. Many times, because of their superior ethical values, they may share it without asking for any reciprocity. Under such circumstances, the values of the receiver would determine whether or not he/she would provide any share in the benefits to the source/s of the knowledge. To avoid such an asymmetry in the exchange of information, I have argued that developed countries should enact a protocol or country specific legislations which should require every company/individual in private or public sector to declare that the product or process being protected is based on knowledge collected 'lawfully' and 'rightfully'.

Thus, even if a developing country does not have a law or institutions to implement a law regarding adequate protection for local and/or traditional knowledge, it will be the responsibility of the user in developed country to declare how the knowledge was collected fulfilling not just the legal requirement but also the moral requirement. Otherwise, it may be legal to take the knowledge of the community or an individual innovator in a country where law to the contrary does not exist but could it be called 'rightful'?

The provisions of Article 16(g) of ICDD can be combined with Article 8(j) and 15.5 of the Convention on Biological Diversity (CBD). In addition to the sharing of benefits, the concept of prior informed consent will also need to be operationalised.

Article 18 talks about transfer, acquisition, adaptation, and development of technologies for mitigating the effects of drought or combating desertification. It implies that parties undertake on mutually agreed terms and according to their respective national legislation and/or policies, promotion, financing and other functions of transfer, acquisition, adaptation and development of environmentally sound, economically viable and socially acceptable technologies.

The problem in this regard would be similar to what has been faced in operationalizing the respective provisions of CBD on the subject. The developed countries may not like to transfer biotechnologies without adequate payment and in some case not at all to safeguard their strategic export interests. But, they may like to continue to have unhindered access to the germplasm in developing countries. In the context of ICCD, situation may be as follows:

Large number of plants from which vegetative dyes can be made for clothes or leather may be found in dry regions. These dyes may be in great demand because of pollution hazards and human allergy caused by synthetic dyes. How will the knowledge and resource be exchanged in a manner that provider as well as receiver see it in their mutual interest that resources are conserved?

Article 19 and 20 deal with capacity building, education, public awareness and financial resources. The knowledge centre has to play a direct role in fostering the use and dissemination of local knowledge, innovations, etc., primarily, "through innovative ways of promoting alternative livelihoods including training new skills", etc (particularly Article 19-d, h, k).

Article 20 provides for financial mechanisms for achieving various goals through Global Environmental Facility or other means for Africa as well as other affected developing countries. Article 20(d) draws attention to the role of foundations, NGOs and other private entities to bring about debt swaps as well as other innovative means of reducing external debt burden of affected developing countries, particularly in Africa. To operationalise this provision, Knowledge Centre/Network would have to mobilize and network financial nodes for this purpose. Knowledge Centre can create pressure on the global institutions by periodically sharing information on how the trade, environment, technology and resources have been made available for the purpose.

A Incentives for Different Types of Knowledge:

Different incentives may be appropriate to conserve different dimensions of knowledge, as indicated in Table 2. For instance classificatory knowledge owes its very existence to diversity in nature. Hence various ways of preserving this diversity in situ or ex situ would be the first step in conserving this knowledge. Documentation of local taxonomies and identification of local taxonomists would be some of the later steps.

Eco-indicators are an important form of associative knowledge and could act as early warning signals of desirable or undesirable natural events. They could also be of help in coordinating the strategies of competing claimants of the same resource niche. For instance the flowering of Tseb plants indicate to the Yak herders in Bhutan that it is time for them to go back to higher altitudes so that cattle herders coming up from the plains do not meet the yak herds. also the pastures grazed by yak could regenerate by the time the cattle arrive. It is undertook that some diseases could be transferred from cattle to yaks and thus these should be kept separate. During summer the yak move to lower altitude up to 4000 feet while cattle move up to avoid the heat of the plains. Herders hundreds of miles apart are able to coordinate their movements over time and space without the help of sophisticated equipments(Gupta and Ura 1992). Knowledge of species or their behaviour which serve as eco-indicators would be an important incentive for the communities which rely on them for various functions to conserve the same. Acquisition of this knowledge would be an incentive for other communities which may not have such a means to regulate collective behaviour.

Sometimes local innovators use heuristics which are very different form those used by researchers in formal science. For instance in a recent study of grassroots innovations for sustainable pest management, (Pastakia 1996) the author found two heuristics not found in the formal research on pest management. One was the exploitation bio-chemical interaction between a plant and an insect pest for generating a repellent of the same insect. Another unusual heuristic was the treatment of seeds of the crop with buttermilk in order to generate metabolites within the plant system which would prove toxic to invading pests. Scientists in formal research

institutes may well be able to extend the frontiers of science and of pest management technology by applying these two heuristics to come up with new eco-friendly pesticides. If they do so there is a case for compensating the original innovators. Since there would be practical difficulties in providing legal protection for heuristics, it may be left to the moral discretion of the scientists to provide suitable compensation to the farmers from whom they learnt about the new heuristic. The least they can do is to acknowledge them in publications arising from the new discovery/ innovation. Though once the protocol for International Registry for Innovations and Traditional Knowledge is recognized and legitimized, the incentives for heuristics as process innovations may also accrue.

Table 2

A. Incentives for different types of Knowledge

Knowledge Type	Incentive
I) Reductionist	
1. Discriminating/ Classificatory	maps of soils, trees etc. in local taxonomies, data banks that are accessible to the local innovators or conservators in local language, gene banks which serve as safe deposit vaults for the farmers conserving germplasm in situ, local herbarium and museums that are linked to local ecological and taxonomic systems; botanical and medicinal gardens in schools or common property lands, employment for local taxonomists etc.
2. Attributional	biodiversity competitions among school children; providing career scholarships to little genius for studying as long as they wish to become naturalists: inviting local experts to school to impart observational skills (with or without honorarium); compensation for ethno-botanical knowledge provided to outsiders etc.
2. Associative	documentation of eco-indicators, some of which could be used as early warning signals
3. Causal	Using causal knowledge of local experts as vital inputs in projects for restoration of ecological balance, reclamation of degraded

lands; grassroots environmental health monitoring units managed by local communities etc.

- 4. Functional adding value to functional knowledge by converting it into technology and /or discovering the science behind it; strengthening local capacity to carry out on-farm experiments, creating community laboratories or research farms managed by creative communities; venture capital grants etc.
- 5. Heuristics Congregational: getting them to gether; compensating local innovators when scientists use their heuristics to make new discoveries traveling seminars of local experts; narrative-metaphorical learning stimulated through small and large group interactions

II) Holistic

- 6. Knowledge about limits/boundaries Consult local experts while targeting new technology, conserving specific species or habitat since they have knowledge about ecological niches
- 7. Systematic linkages consulting local experts during ecological crisis; conserving linkage between sacred and secular;

B. Incentives for Conserving Knowledge in Practice

Karimbhai of Banaskantha district in Gujarat is a very good herbalist. But he earns his livelihood through pottery and does not charge any amount for dispensing herbal medicine. Pottery involves repetitive skills while as healing requires mostly judgmental skills. In such a case incentives for pottery whether through technology, new materials, design or access to markets may help reinforce the ecological ethics underlying free dispensation of herbal medicine. Similarly a trust fund may be set up under the sole authority of such a healer (to act as a gatekeeper for external resources) for the benefit of the community.

The incentives for judgmental skills would be very different from those of repetitive skills. Although learning aids, manuals, and audio-visual aids may help certain skills involving judgment such as valuing diamonds, judging cattle, predicting rains based on meteorological observations etc., are very difficult to acquire by reading or viewing films or through other self-learning means. In such cases apprenticeship and mentoring may be the most effective means. In addition to the skills, the learner acquires values underlying various judgments. Various countries can provide incentives to Local experts to accept some apprentices as mentors.

Restorative skills may involve integration of knowledge of causal relations, associative knowledge, functional knowledge as well as knowledge of system linkages. The Kutchi Patel community is one which is known for its expertise in reclaiming marginal soils for agriculture. Wherever they migrate from Kutch to villages in north Gujarat, they buy marginal land at a low price. After working on the land for about five to ten years they are able to restore the soil health and make it productive again. At this stage they prefer to sell the land at premium and move on to reclaim more marginal lands. As of now the only incentive they have is the price incentive. However, their expertise could be taken advantage of in the design and implementation of schemes for land improvement by the land development corporations and other such agencies.

Conservation or augmentative skills may be repetitive or judgmental. These may often be associated with culture and institutions. Hence conserving eco-ethics in this case becomes as important as conserving the skill itself.

Table 3

B. Incentives for Conserving Knowledge in Practice

1. Repetitive skills	vocational training centers; master trainers; community workshops which could serve as arenas for exchange of skills; new materials, designs or access to new markets; conserving cultural institutions that help generate regularity in pattern
2. Judgmental skills	apprenticeship; monitoring; manuals to aid learning; audio-visual aids; periodic clearing house for unique case discussions, providing regional, national and international opportunities to local experts for participating in such case clinics and conferences
3. Conservation/ augmentative	community incentives for CPR structures; strengthening eco-ethics of individuals; demonstration of economic gains; travelling seminars
4. Restorative	removing market imperfections/ or distortions so that prices reflect the real value after restoration of resource to original levels of productivity; engaging as local consultants and trainers for government schemes

B Incentives for Local Contemporary Innovations:

Innovations could be the result of either individual or group efforts. Sometimes the personal ethics or cultural norms prevent the individual from accepting material rewards or compensations for their contributions to society. Their superior ethics should not be a valid reason for their continued state of poverty. In such cases non-material incentives would be appropriate also incentives could be targeted at the community level, which would enhance the material well being of the entire community. Targeting compensation to the community would also be appropriate in cases where the innovation could not be traced to a particular individual but to a community.

The matrix resulting from the interaction of two variables a) nature of reward, whether material or non-material and b) target of reward, whether individual (including group of individuals) or community provides the framework for designing the incentives for promoting innovations (Gupta 1995).

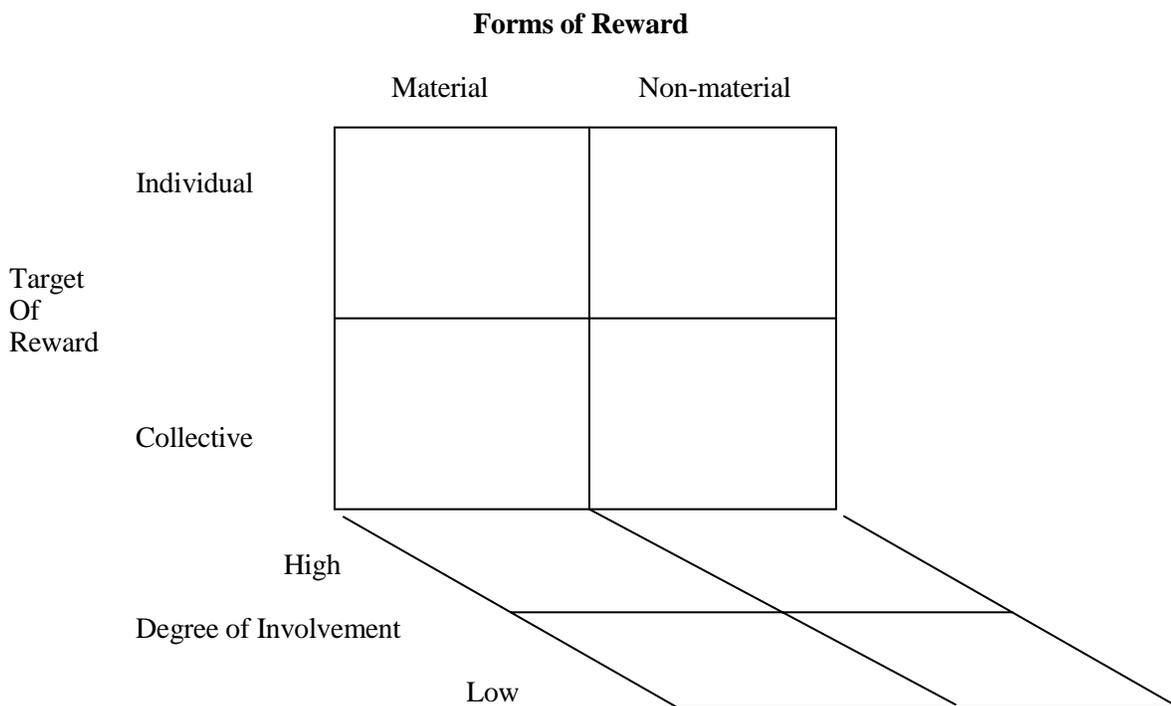


Table 4

C Incentives for Local Contemporary and Traditional Innovations

I INDIVIDUAL -MATERIAL

1. Protection of property rights - patents

- registration scheme

2. User fees
3. Awards, fellowships, research grants
4. Voluntary contributions from users and civil society
5. Pension schemes
6. Allotment of land equipment and other resources needed for further experimentation and innovation

II INDIVIDUAL - NON-MATERIAL

Documentation, coverage in press, TV and other media Public felicitation, e.g. doctorate from formal research institution - as was recently given to Prafull Chandra in Karnataka (Honey Bee 6.4) Invitation to lecture in schools, centres of learning and research. Invitation to conferences, workshops attaching name of innovator to the innovation (an incentive frequently used by the local communities themselves). Local titles e.g., "krishi sant" for Bhaskar Save, one of the pioneers of natural farming in Gujarat National titles e.g. Krishi Pandit, Padma Sri etc. Membership of Parliament, Expert Committees on Resource Use Photographs being placed in Gram and Taluka Panchayats Access to new skills.

III COMMUNITY - MATERIAL

1. Risk funds
2. Trust funds
3. Priority in the development of infrastructure e.g. schools, health care system, access roads etc.
4. Free or easy access to data banks
5. Access to external expertise
6. Community award
7. Community grants/ risk funds
8. External aid in developing CPRs
9. Marketing intervention for organic produce

IV COMMUNITY - NON-MATERIAL

1. Greater control over local natural resources
2. Rights to self-determination
3. Removal of perverse incentives for conservation
4. Favourable policy environment for eco-friendly products
5. Favourable policy environment for conservation practices
6. Recognition to community: media attention, community awards
7. Greater negotiation skills
8. Capacity building through transfer of technology

The magnitude, manner and form of incentive or benefit 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 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 recognitions may or may not be associated with 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 community may lead to action either at the community level or even at the individual levels.

1) Material - individual

The biodiversity and associated knowledge systems may thrive through various kinds of innovative initiatives of individuals. A private farmer may own a large ranch or a small forest which may have some unique biodiversity. Some of the feudal lords who may have been legitimized in the form of aristocrats or other allied roles may possess huge tracts of grazing lands. In some cases, the royal families may own unique habitats having unusually rich biodiversity. For instance, in Bhutan, the royal family owns large tracts of grazing lands as well as forests which are only resource of its kind in the given geo-physical niche. The natural forest have been devastated on both the sides of Bhutan along that latitude around the globe. Were it not for the enlightened conservation royal policies of Bhutan government and prudence of local communities, humanity would have lost rare and unique biodiversity residing in this parallel. But will Bhutan be able to conserve this diversity indefinitely if the global community does not pay the price of foregone income to Bhutan or other such countries.

The incentives for conserving such biodiversity could be in material form and for individual use (though if the incentives are ploughed through external assistance such as aid from OECD countries, there is no justification to reinforce land inequities. In Bhutan the enlightened Kingdom has modified the concept of sanctuaries to include people's rights living in them to be protected. Thus though lands may have been owned privately, the incentives so far have not been utilized privately). If the incentives are only short-term, it is possible that strategy of conservation may or may not be sustainable. If short-term investments develop capacity for generating long term revenues through non-extractive uses of biodiversity, then such incentives will fall under this category. A good example is investment in eco-tourism in some countries. The equity implications of these investments have to be carefully weighed.

The individual - material rewards conventionally include the patent rights, license fees and other forms of remunerations for individual creativity. In many non-OECD countries, there is a considerable misconception about what patents do or do not do. The historical role of reverse engineering in various developed countries in the early phase of development is cited as a justification for continued weak regime for intellectual properties. To some extent there may be some truth in this logic. However, given the economic squeeze and deficit budgets, most developing countries compete for foreign exchange through investments rather than borrowing. Many times flow of technology and resources to various developing countries may be impeded because of weak protection for intellectual properties. The incentives for biodiversity conservation unfortunately have not been linked with the efforts to strengthen IPR regime for individual or firms. Obviously the incentives for firms cannot be justified without similar incentives for farmers, non farming tribal or other communities.

- i) Patent information system at decentralized level to promote participation of small scale sector in new ventures.

The information about patents will serve three conventional purposes, i) it will help investors identify ideas which are out of patent and can be commercialized easily, ii) prevent duplication of R&D and re-discovery of the wheel, and iii) encourage investors to negotiate with the patent holders for local manufacturing base.

However, the information system will also serve at least two non- conventional purposes, iv) make communities and individuals aware of their rights if infringed by any patent and v) encourage innovative communities and individuals to file patents for the improvements they have brought about in their knowledge to generate new products and processes.

- ii) To develop low cost decentralized system of registration of innovations/inventions (as argued herein earlier). It is well known that many innovations known to a small community or individuals may not be easily accessible to outside users and thus could not be considered as a part of state-of-art. The registration system could be relevant for individuals as well as groups and may generate a clearing house for potential investors to contact the concerned inventor/s for possible commercialization. Thus, conditions for material reward will be generated for corporate communities or individuals.

This idea has to be implemented hand in hand with the concept of Knowledge Network so that people to people communication of innovations does not get less importance than the goal of commercialization.

- iii) Public watchdog committees to monitor and ensure sustainable extraction of biodiversity.

The monetary incentives to individuals could also lead to excessive extraction of a resource. A good example is excessive mining of ground water because the power charges are often collected on the basis of horse power of engine and not actual power consumption. Such a system also does not provide any incentive for using energy efficient technologies. The watch dog committees may have to be financially supported for regulating and disseminating information about the scale of extraction of a resource. Special incentive may be provided to individuals who either generate substitutes for products derived from endangered species or provide mechanisms for application through biotechnology, clonal propagation or tissue culture. A wild plant may thus get domesticated and thereby generate opportunities for increasing income of people without extraction of resources from the wild.

Voluntary Incentives: In addition to above externally induced incentives, there can also be incentives of voluntary nature. For instance, some one who develops a public domain software may ask the users to contribute a given amount to the developer if they are satisfied. Voluntary contribution, we all accept, may take place very infrequently. And yet there are large number of people who continue to develop and share public domain softwares. Likewise, this is a model where individual who develops a value added product may make the information a public domain for those who want to replicate. But those who do not want to undergo the hassle of developing their product, may buy it from the producer. An innovator Mr. Uplshwar developed a herbal pesticide based on the recipe evolved by his teacher Dr. Rahudkar who in turn had drawn inspiration from traditional knowledge (Pastakia, 1996). Mr. Uplshwar wrote down the formula on the school walls in the village for anyone to copy and also sent pamphlets to large number of other villages and districts. Those who wanted, could have made it themselves. However, his experience was that large number of people preferred to buy from him rather than make it themselves. This is an example where material individual incentives are generated in the market place through combination of voluntary and entrepreneurial spirit. A fund for helping such ecopreneurs undertake market research, product development and some additional R &D exercise could be set up.

The individual - material incentives can also be generated by providing rewards to those who develop innovations which help in conservation of biodiversity. For instance, there are many medicine men and women who do not charge for their services, as a result their superior ethics makes them remain poor. If the incentive for sharing technologies and keeping them in public domain are matched by the public support for public sector and community R&D, awards for outstanding scientists (formal as well as informal) may be one way for recognizing this contribution.

2) Material - collective

The incentives in this category could be most meaningful in the co-operation between OECD and non-OECD countries. The purpose of such incentives is to recognize that creative activities may require support not just at individual but also at group level. Further, even this support to individuals may in some cases be routed through group processes. Four kinds of incentives be designed to promote creativity and innovation in conservation of biodiversity such as: a) venture capital support, b) risk cover through insurance, guarantee and risk funds, c) trust funds with or without individual leadership, and d) infrastructural development in the economically disadvantaged biodiversity rich regions etc.

i) Venture Capital Funds

Our research has shown that considerable opportunities exist for scientists or firms in formal sector for combining new technology and investments. However, similar facilities do not exist for small innovators anywhere in the world to the best of our knowledge. Perhaps this gap is a natural corollary of the gap that exists around the world in having databases on local innovations. Honey Bee database is an exception. In the absence of venture capital fund, large number of innovations either do not become products or services or remain at the level of idea itself. The linkage between invention and enterprise requires support from formal science as well as investment agencies. If this support is of the conventional banking kind, several innovators may not have risk bearing ability to borrow at market rate of interest. A venture capital fund, on the other hand, assures the inventor that no loss would be caused to her. The fund would share the profits, if any, either through equity participation, partnership or one time payment by the innovator. Large number of natural products for which demand exists remain out of the market perhaps because incentives and infrastructure for scaling them up in a fair manner do not exist.

SRISTI Venture Capital Fund was set up on experimental basis to try to learn by doing. OECD countries could help in setting up a network of such venture capital funds entirely dedicated to development of natural products by small innovators (individuals or communities). In some cases, assistance in market research, product development, testing, etc., may also be required to link local creativity with global markets.

ii) Risk Cover

Many communities are unable to make transition to sustainable land use in case they have been following resource degrading practices because of inability to take risk involved in the transition. Further, acquisition of new technology whether for production, conservation or value addition will also involve risks. In case naturally occurring herbs have to be cultivated, the on-farm research may have to be done which of course involves risks. Even if non-extractive enterprises such as livestock or agriculture have to be developed in marginal environments for people relying on biodiversity extraction, the whole process of developing these alternatives may involve considerable risks.

To encourage financial institutions to lend to scattered population at lower rate of interest may mean higher transaction cost as well as risks.

To cover various kinds of risks described above, OECD countries can help develop international guarantee fund, risk funds and insurance cover.

iii) Trust Funds

The ethical values of many local communities as well as individuals are such that individual as well as collective monetary rewards in lieu of knowledge are shunned. Obviously one cannot justify such communities or individuals being kept poor because their ethical values are superior. Trust funds are a way of providing

revolving funds or expandable resources to local communities for local conservation and employment generation. These funds could be managed by local communities or one of the biodiversity experts/herbalists who could act as a gatekeeper for these resources. In that sense, such funds also help to empower local experts. It remains to be seen whether such empowerment would encourage younger people to emulate such experts and help in keeping the knowledge tree alive. The trust funds can also be used for local market development, processing or adding value to local herbs or aquatic diversity or for providing small loans at low rate of interest to members of the community. The idea is to break the vicious circle of poverty which prevents such communities from coming out of poverty ratchets.

iv) **Support for infrastructural development/Common Property Resource Development**

Whether it is watershed development or re-generation of common property resources or conservation of collective sacred groves, local savings or resources may not always be sufficient for the purpose. In addition, some new infrastructure may be required for education, marketing, processing, storage etc. In some negotiations between corporations and local communities infrastructural development emerged as one of the important demands from the local communities. However, one has to be sure that the kind of infrastructure which is developed as a form of collective reward/compensation does not generate two kinds of problems. One that it absolves the government or local bodies of their responsibility in the matter and second this process distorts the local community relation by emphasizing far too much on the preferences of only dominant sections. For instance, it is possible that the elite may demand motorable road while the disadvantaged women might prefer drinking water facility (Gupta, 1994).

The basic needs of every community should be met as a matter of human right regardless of whether it conserves biodiversity or not. What we are suggesting is that in addition to meeting local needs such funds should also be used for supplementing the infrastructure.

One area which could widen the choices of local communities is access to databases of alternative uses, technologies and resources which can help improve the local livelihood strategies without impairing the ecological balance. Many times developmental professionals have tried to romanticize the relationship between local communities with local resources. Just as no one community can solve all technological or institutional problems successfully, likewise no community would be totally insulated from outside resources and influences. The challenge is to make it possible for local communities and individuals to access and negotiate external resources at reasonable and fair terms. This may require building capacity for negotiations with outside biodiversity prospectors. Since ability to negotiate would depend upon access to alternative information, development of such knowledge networks/databases may be extremely helpful in empowering local communities (Ethical Guidelines for accessing and exploring Biodiversity developed by Pew Conservation Scholars appended to this note could be a starting point).

There could be many other kinds of incentives for conserving biodiversity in material form and for individual purpose but mediated through collective institutions. For conservation of land races of different crops, several schemes can be devised depending upon whether the diversity is concentrated in few pockets or scattered, or has high or low degree of variability within populations. Not every grower of land race can be given incentive every year for every plot of land race. Because if incentive is too small, it will not bring about any perceptible change in the behaviour. One way to increase the size of incentive per household is to develop a system of lottery. Assuming that 500 hectares exist under a particular land race of which 50 hectares (10%) need to be conserved, 50 lottery vouchers of one hectare each could be selected by the lot for allocation among different farmers. These 50 farmers should get difference of value in the productivity of their land race vis-a-vis high yielding variety multiplied by the price difference. Thus, if a farmer got ten dollars per quintal price and only 10 quintal yield with local land race as against 20 quintal yield of the high yielding variety sold at 15 dollar per quintal. Then the farmer who gets the lottery voucher would get $(15 \times 20) - (10 \times 10)$ that is 200 dollars. If it was to be distributed among all the 500 farmers either one would need lot more resources and if resources are same

a farmer would get hardly 50 cents which will make no difference to one's decision making profile.

Many more variants of this scheme can be developed to provide individual material incentive but through collective institutions.

3) Non-material - individual

It is recognized that there are large number of individuals who either do not care for material rewards or do not consider such rewards as a major motivation for their decision to conserve diversity. In such cases owner, respect and recognition in local as well as national functions may provide significant motivation to conserve natural diversity.

Biodiversity conservation and promotion funds can be set up in different parts of the world for not only celebrating unique efforts of individuals or collective institutions but also to publicize in local language such contributions. The essential point here is that various ways of recognition by peers as well as society at large may help in generating the right kind of role models. Reference to such individual innovators and conservators in various media may also provide encouragement to such individuals.

4) Non-material collective

A whole range of measures can be taken up in short-term as well as medium term. The changes in curriculum and pedagogy are one of the most important candidates for consideration. It is well known that the food consumed, by the disadvantaged communities even when nutritionally superior, is considered inferior in the formal knowledge systems. In fact many of these millets grown in dry regions are actually called inferior millets. Obviously, if young minds don't learn about the contribution local individuals or communities make towards conservation it is unlikely that they will develop respect for such behaviour. Policy changes in the regulatory as well as managerial systems is another way in which incentives can be generated for various local communities. One of the specific ways in which non-material collective interventions can help is by modifying consumer preference as well as producer incentives for organic cultivation. In some cases, it may come under material collective if the facilities for organic certification are developed collectively. However, such facilities will also be accessible to individuals.

It is well known that much of the production in drought prone regions, hill areas or forest regions is organic in nature and primarily not by choice but due to compulsion. If organic certification facility can be developed along with market channels then incomes of such communities can be increased without impairing local eco-compatible land use. The consumer will also be benefited through availability of safer foods.

C: Incentives for conservation of Culture/lifestyles

One of the most contentious issues is the goal of conserving traditional lifestyles without denying the opportunity to local communities and individuals to improve their living standards. While the question of resettlement of Lambadas, a nomadic tribe of Rajasthan was being considered immediately after independence, the then Prime minister, Pandit Jawaharlal Nehru questioned the wisdom of preserving them as "windows into antiquity". He believed that they should become rightful partners in the process of development. However he also realized that the pace of development could not be such that the socio-cultural fabric of the community was pulled apart.

It is also assumed that traditional communities are always egalitarian and fair to different section of the community. Not disputing the rationale of, "keeping hands off" strategies in certain situations, markets have an extraordinary capacity to penetrate the most interior pockets. And market forces are often ruthless and thus leave no quarter for local cultural sensitivities, spiritual beliefs or conservation strategies. State can

obviously neither regulate external interventions sufficiently nor insulate local communities from external influences. However, mechanisms can be created such that local communities are not penalized and short changed because of their superior ethical values, generous attitude and willingness to welcome any outside exploration (Table 5). This in short is the fundamental issue in operationalising Article 8(j) and 10(c) of CBD. The nexus between poverty and biodiversity has to be broken.

Table 5

D Incentives for conservation of Culture/ lifestyles

Lifestyle	preserve identity of minority communities -legal framework enhance livelihood opportunities at site in order to reduce out migration reservations/ quotas to be phased in a time bound manner,
Rural eco-tourism	
Belief systems/ Ideologies	ensure freedom of religion protection of religious and cultural symbols, places
Rituals	protection for symbolism and appellation of area of origin for products
Crafts	new markets (e.g. vegetable dyes could be used on all toys as they are safe for children), new designs
Institutions and Bio-ethics	documentation, media coverage, strengthening local institutions such as sacred groves
Culture/ folklore	sponsoring folk performers to perform at schools, and other public fora, developing centers of excellence or cultural heritage centers schools for teaching folk art introducing folk art in school curricula "gyan van" as living museum and exhibition or 'Knowledge Forests' of local plant species and their various local uses - functional, cultural, aesthetic etc.

The argument that if people accumulate wealth they might become less concerned towards conservation may historically have been true. But it need not be inevitable. If one believed it to be inevitable, the morality of the consequent policy prescription of keeping people poor so as to conserve their lifestyle will become suspect.

On the other hand providing material incentives (both at individual and community levels) without corresponding incentives for the conservation of cultural and sacred aspects of the lifestyle of the indigenous people would destroy their identity, their knowledge systems and their confidence in solving their own problems. A case in point are the reservations for American Indian tribes in the USA. Excessive dependence on doles from the government leading to sedentary lifestyle and change in dietary habits has led to high incidence of diabetes and obesity among the residents of the reservations.

There is a close but not linear relationship between the traditional lifestyles in the production of knowledge, innovation and practices for conserving biodiversity. For instance, a lifestyle that promotes close interaction between grandparents and grandchildren through extended family systems may require different kind of strategies for knowledge production, reproduction and diffusion over time and space. The oral traditions and culture of communications may be extremely strong and valid. Within oral traditions the folkloric traditions may be much more robust than simple narration. Once such family structures no more remain viable or functional, similar strategies for knowledge production and diffusion may not be equally efficient.

And yet the knowledge produced in past may still be valid and relevant with or without modification for evolving future strategies of survival and sustainable development.

III Conditions for Effective Implementation

A Cross-sectoral effects of Incentives

Incentives/disincentives for sustainable resource use and biodiversity conservation could create side-effects in non-targeted sectors in the following conditions:

1. When there are trade-offs between interests of local human and sentient beings which have not been balanced.

e.g. eco-tourism: Bhutan has put a restriction on the number of tourists in order to limit the damage done to the environment. Another way to limit the damage is to conduct eco-tourism in a manner that both educates the tourist and at the same time ensures that the local flora and fauna are undisturbed. e.g., turtle sanctuary of Costa Rica where tourists are obliged to undergo training for a whole day and are allowed inside the sanctuary only under the company of local guides.

Conservation of environment /ecology in turn generates a demand for ecotourism. In Zermat, Switzerland, eco-tourism got promoted because the community had developed a clean environment- only three cars are allowed into the township which are powered by fossil fuels. The rest are battery operated. People here still use one of the most environment friendly transport i.e. horse carriages.

2. When there are trade-offs between more than one local goals and between short and long term goals.

e.g., a local innovation for extracting ground water in a more energy efficient way may lead to greater mining of water and abandonment of local land races and varieties in preference for modern fertilizer responsive varieties. In such a situation incentives for the new technology, if not accompanied with disincentives for mining the ground water, may lead to adverse agro-e-ecological impacts, leading to a reduction in resilience of the farming system.

3. When there are trade-offs between local and national/global goals which have not been resolved/balanced.

e.g. disincentives for killing the wild ass in the buffer zone of its sanctuary in Kutch, combined with disturbances in the local habitat, led to this protected animal becoming a major pest of the agricultural crops cultivated by farmers there. In this case the externalities of conservation are being borne by the poor communities inhabiting the buffer zones. In the past their efforts to solve the problem by requesting the Forest Department to come to their help has not resulted in any permanent solution to the problem.

4. When incentives are targeted to components of the system with disregard to the linkages between components.

For instance ban on grazing by local communities in Bharatpur bird sanctuary led to growth of tall grasses such as *Paspalum* and subsequent reduction in opportunities for nesting of song birds in the hollows formed by buffalo hoof marks (Vijayan, 1987 in Gadgil and Rao, 1996). The drop in the inflow of migratory birds like Siberian cranes could also be caused in part because suitable prey was now difficult to pick on. It was not realized by the conservators that the pastoralists in this case had co-evolved with the sentient beings of the sanctuary. Removing them had disturbed the ecological balance developed over centuries. Large scale violence around the issue of grazing which took place in 1982 (Gupta, 1982) has in retrospect shown the futility of Park without People approach of conservation (MCNeely, 1995).

5. When incentives are given with disregard to the carrying capacity of a given eco-system or when there is a lack of understanding/ knowledge of ecological boundaries e.g. a case in point is the tiger sanctuary in which decline of prey within the core area of the sanctuary led to the tigers coming out of the sanctuary in search of prey.
6. Incentives at cross-purposes: When two or more national policies with associated incentives are at cross purposes or competing for the same resources e.g. In 1993, the Gujarat government made a bid to delimit some parts of the Narayan Sarovar Sanctuary in Kutch district in response to pressures from industrial lobby which wanted to access the land for mining of limestone. This sanctuary is the last preserve of the original Kutch thorn forest and home to the highly endangered Chinkara, a rare and beautiful gazelle. Among the other fauna threatened are the caracal, the desert cat, the Indian wolf, the pangolin, the great Indian bustard and the peafowl (Nambiar, 1993).

Designing of incentives/disincentives therefore calls for careful assessment of possible cross-sectoral effects. Environmental impact assessment of rural development interventions would become mandatory in future. potential impact of various incentives on the cultural aspects and eco-ethics of the local communities should also be assessed before implementation of projects/incentives.

B Elimination of Perverse Incentives

Perverse incentives may result from failures of the market or of government policies/ interventions. Perverse incentives give the wrong signals to potential users of eco-friendly technology and place the innovators of such technology at a disadvantage. Some measures for eliminating such incentives are suggested:

1. **Elimination of market imperfections and failures:**

Free access to complete information: One way to improve the access of local communities to information is the development of local knowledge networks which are linked to other local and global networks. The

cost of developing and servicing these knowledge networks could initially be borne by global funding agencies, until such time that the local communities are able to make contributions to bear the cost through improved returns arising from collaborative investments in bio-diversity with external partners.

Avoiding situations of monopoly: One suggestion to overcome this all too familiar market imperfection is the promotion of decentralized, poly-centric entrepreneurship in the small/tiny scale sector where ever possible. We are aware of at least one instance where an ecopreneur in western Maharashtra, Mr. P.D.Uplenchwar is attempting to promote group entrepreneurship of this kind, by encouraging unemployed youth to set up small units to manufacture a general purpose low cost herbal pesticide developed by him. His only conditions are that they should a) not exploit the farmers and b) contribute part of their earnings to a common fund for research on new product development (Pastakia 1996)

Adoption of code of conduct that respects the rights of indigenous peoples as well as the rights of sentient and future life: In this context it is worth recalling that some of the concerned Pew Scholars took an initiative in 1994 to develop ethical guidelines for the prospecting of biodiversity (see Annex one). International agencies could use their good offices in influencing potential prospectors of biodiversity in following some form of ethical code of conduct.

2. Withdrawal of policies that distort the pricing mechanism:

Elimination of subsidies for technologies and land use practices which lead to unsustainable outcomes, such as subsidies for highly toxic chemical inputs. In Indonesia the decision to cut subsidies on chemical pesticides and ban fifty percent of the pesticides used in paddy in 1984 was largely instrumental in the success of the National IPM (Integrated Pest Management) Program there. Within five years, as the subsidies were phased out, pesticide consumption in paddy dropped drastically. Contrary to the expectations of skeptics, the productivity of paddy increased instead of decreasing (Gallagher 1992).

3. Ecological assessment of governmental poverty alleviation programmes and withdrawal of ill conceived programmes interventions

In south Gujarati the state government gave large number of buffaloes to adivasi population under IRDP programme. Buffaloes are unsuited to the ecological conditions in most of these areas which have hilly terrain. Also there is a shortage of fodder/ pasture resources in some of the talukas, making the buffaloes husbandry as an economic activity unviable. But for the interventions of the Behavioral Science center a local NGO, the project would have affected the ecological balance, and put large number of "project beneficiaries" into a debt trap, making their economic position worse than before (Pastakia and Gupta 1996).

Avoidance of standardized solutions while scaling up projects of rural development. One way is to consult indigenous experts, another is to generate such a pluralistic environment for entrepreneurship that different biodiversity resources are used at various places for enterprise development. Periodic market festivals can be organized as done by Dastakar (a national guild of NGOs and others working with rural artisans) for rural artisans to generate consumer demand for diverse products. In the absence of such a support from consumers, there is very little chance for diversified production or value addition systems to evolve and become viable. Weekly markets have been another forum for exchange and trade of such goods. Different streets in cities for instance could be closed for vehicular traffic on different days so that this prime space becomes available for petty vendors of biodiverse and other craft products. Taking markets closer to clients is the only way to compete with the mega sales and discount strategies of large producers of standardized goods.

Counteracting of perverse advertisements on the TV and other media which promote consumerism of primarily non-sustainable life styles and use of high entropy and eco-unfriendly products. e.g.,

Bhaskar bhai an organic farmer in Gujarat said "why can't we have advertisements on natural farming on ZEE -TV (or CNN) to compete with the ones inserted by private companies promoting chemical pesticides and fertilizers?"

C Need for Appropriate Institutional Arrangements

1. Restoring Community Rights

The loss of community rights of tribals and other indigenous communities over local resources such as forests, lakes, rivers, etc either to colonial powers or to the state has been one of the most serious among perverse incentives for biodiversity conservation. Hence restoration of community rights of indigenous tribes and communities for greater control over land and other natural resources would seem to constitute a precondition for greater involvement of the local communities.

Rao and Gadgil (1995) have argued for a scheme of community biodiversity registers for documenting and disseminating individual and collective ecological and technological knowledge systems at village level. For certain purposes of creating community awareness, it is a very good initiative and can go a long way in at least some places achieving the ends of conservation. But as an incentive mechanism, we are not sure how far it may succeed. Though in the spirit of diversity of incentive instruments for conserving diversity, we feel that it must be given a fair trial. It may however, be useful to keep some of the limitations of this model in mind: (a) should entire community become custodian of rewards or benefits that may accrue through exchange, or value addition in the knowledge of few disadvantaged economically poor but knowledge rich individuals? (b) if the poor individual innovators or local experts are unlikely to win any other race for rewards, should they lose the race for intellectual rewards too because they are unlikely to ever occupy the decision making position in the community councils, (c) studies have shown that many times even the neighbors of an innovator do not know about the innovation. In such circumstances, the innovator does not get much feedback or appreciation from the peers. Registering such innovations may not necessarily serve as incentives or generate peer appreciation within the village. There may be other similar but neglected innovators who might constitute a more appropriate peer group. Thus community of innovators need not be co-terminus with village boundaries, and finally (d) why should knowledge of grassroots innovators (particularly the ones who produce contemporary innovations) become a community property and be denied individual contractual incentives when knowledge of corporate sector or individuals is not denied this privilege?

Ramakrishna's study on shifting cultivation system in north eastern India, (1989) shows how reduced community rights over land made the traditional system of jhooming non-sustainable. When jhoom cycles were shortened due to restriction of the area in which this practice could be pursued it became non-sustainable. But then people identified the potential of alder tree which grew very fast and made short cycles relatively speaking sustainable. This is an example where incentive for such innovations can help deal with reduced access. But in cases where such a thing is not possible, the people have to be given access to territories which help in maintaining ecological integrity.

2. Developing New Institutional Arrangements

A resource or technology may be in public or private domain. Or, it may be in use as a club good or as a common property of the community. When an external agency makes an intervention either to access knowledge or biodiversity for extractive or non-extractive purposes, it may change the status of resource and this would have serious implications for future access and usage of the resource. Creative and appropriate institutional arrangements would be needed to ensure that the change in status of the resource with or without value addition, does not deprive the local people of its future usage and results in benefits which are shared on an equitable basis.

The local communities may have to set up new institutions at the community level in order to improve their bargaining power with external partners, and access external resources, skills and information for conservation and sustainable exploitation of local biodiversity and knowledge. These institutions will also have to deal with the question of equitable sharing of benefits within the community. Some communities may need special help as they may lack initially such organisational skills.

Networking among indigenous innovators and conservators is a promising kind of institution for augmenting the capacity of local communities to come out with contemporary solutions to local problems which incidentally also have national and global benefits on account of being eco-friendly, resource conserving, resource augmenting etc.

3. Strengthening Existing Local Institutions

Local informal/sacred institutions have often been a way of practicing the collective wisdom of local communities in dealing with natural resources and sentient beings. The institutions are under tremendous strain. They must be strengthened where possible, e.g. In Denmark, there is a folk song which advises the farmer to rake the soil after harvest lightly, so that the birds and the poor could get their pick.

Another example is the system of sacred groves found in Andhra Pradesh, Maharashtra, Gujarat, Meghalaya and several other parts of India (WWF, 1996).

4. Tapping Socio-religious Movements

New religious institutions for sustainable natural resource management have also been initiated by socio-religious leaders with a vision for sustainable society. e.g., the Swadhyay movement started by Pandurang Shastri. One of the new institutions under this movement is the "Vruksha mandir" which is a sacred grove with a difference. Farmers from a cluster of villages select a plot of marginal land and develop it into a grove with horticultural and medicinal plants entirely through voluntary labour and with a spirit of devotion. Harnessing the energies of such religious movements could be another way of promoting biodiversity conservation.

D Legal and Political Framework

While there is little disagreement on the issue of introducing a law(s) to prevent the on-going uncontrolled exploitation of biodiversity within the country, the debate centers around the issue of the extent of regulation which would be possible or even desirable. Too much of regulation would inhibit foreign and Indian investors and prospectors who have the biotechnology for bioprospecting. On the other hand the absence of regulation has led to over-exploitation of species to the extent of driving some of the valuable species with medicinal properties to extinction. In the past private sector has shied away from the prospect of compensating local communities for the resources of biodiverse nature conserved by them over the generations. The same is true for indigenous knowledge shared by the local people in good faith without attaching any price.

Hence the regulations should be such that they do not involve lengthy bureaucratic procedures. As far as possible the communities directly involved should be allowed to negotiate with the external counterparts. However there should be a national repository where the contracts could be deposited and scrutinized by the representatives of the state, so that they may intervene in case the communities' interests are short circuited.

The degree of regulation should be different for different purposes of exploitation and for different methods

of exploitation (Gupta, 1995).

Method of Exploitation

extractive non-extractive

material commercial ethno-biological

Purpose
of Exploitation

non- taxonomic/
material cytological ecological

Should an academic wanting to carry out a study of ecological nature in a bird sanctuary aimed at generating new knowledge which may prove useful for the conservation of the sanctuary, for instance, (cell 4) be forced to meet the same legal requirements as a private company wishing to develop a new drug through extractive means (cell 1)? If not, how should the regulations vary from one cell to another?

It is obvious that responsibility of outsiders will not be of similar kinds in different roles and for different purposes. It is acknowledged though that line of difference between different uses may be quite thin. For instance the description of a biological resource may generate opportunity for its eventual use. Thus what may begin as a pure academic activity may turn out to be a remunerative exercise. This would call for eternal vigilance on the part of local communities as well as state regulating institutions.

Total reliance on external control to modify individual behaviour is neither desirable nor feasible. It is in this context that strengthening grassroots institutions and value systems and grassroots movements for eco-ethical behaviour are of utmost importance.

Flexibility of contracts:

Model contracts for biodiversity prospecting have been drawn up by Putterman (1996). Similar contracts could be drawn up for prospecting of indigenous knowledge. The models should not leave loop holes for willful defaulters. At the same time they should have built in flexibility of the following types:

1. Contracts should be amenable to review at various stages of the collaboration. Four important stages have been identified by Gupta (1994) as follows: i) initial access ii) when the first discovery is made showing promise of future gains iii) when a prototype is developed iv) when the new product is commercialized
2. Contracts should leave options for either party to opt out at any of the stages if they feel that the progress is detrimental to their interest or if there has been a breach of contract. In case of a breach of contract signed with a community, if the legal system is not responsive in settling the dispute, what alternative mechanisms could be tried?
3. Contracts should allow the possibility of a third party participation at a later date, should the

developments call for such a participation.

Conclusion

Involvement Levels

The degree of involvement of the local communities would vary depending on the role they are able to play in the future activities related to either conservation or exploitation of local resources. Three distinct models can be visualized, with increasing intensity of local participation and involvement:

- I Only Approval of local community: The external agency/partner is expected to play the major role. However it needs the approval of the local community before commencing to exploit either the local resources - be they material or non-material in kind.
- II Approval and Consultation with local experts: The external partners consult the local communities and obtain their prior informed consent. They may also take advantage of the expertise of local experts from time to time.
- III Approval and Partnership: The local communities are expected to play a more dynamic role as compared to the previous two models. It is based on the assumption that local people either possess the expertise for the new activity of conservation or product development or have the capacity to absorb new skills and techniques. Capacity building may form part of the terms of the contract.

Implications for Global Institutions

How can global institutions become more relevant for local actors and their ability to participate in the development process without being forced to abandon traditional culture, eco-ethics and values which enabled them to conserve the natural wealth for other communities as well as future generations in the past?

Three roles for global institutions have been discussed in the past:

- i) Creating a moral pressure on nations as is being done currently through the Convention on Biodiversity.
- ii) Supporting and enabling the demonstration of alternative models of institutional arrangements
- iii) Serving as clearing house for contracts on biodiversity exploitation (UNCTD 1996).

However these roles do not enable global institutions to be linked directly with local initiatives:

Establishing /promoting global knowledge networks of local innovators and conservators, which enable members in one part of the globe to learn from and adapt ideas to their local conditions from other parts, would be a tangible way for global institutions to get directly involved in development and conservation initiatives at grassroots level. This strategy would enable global actors to "act globally and think locally". It would also help local actors to realise the global worth of their innovative solutions. Not only would this result in enhancement of their self worth and pride in their own creative capacity and knowledge systems, it would also

enable them to negotiate well with potential external users and partners for use of local resources. With more and more nations opting for market based economies and reforms for liberalization the improved negotiation skills in the hands of local communities would go a long way in augmenting their livelihood / survival strategies.

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Annexure One

Sub-optimal Coping Strategies leading to degradation of resources and decline of biological diversity

	Land based	Livestock	Off- farm
Private	Reduce fallow period, tractorization and decline of spontaneously sprouted tree and shrubs cultivation of marginal lands, excessive lopping of trees, extraction of biomass mass, such as roots of trees, shrubs for fuel, coal etc., low quality water use, imbalanced use of nutrients, chem. inputs, substitution of land races, etc.,	substitution of indg. breeds shift in species to small ruminants declining pasture quality; invasion woody species unregulated grazing in sanctuaries	excessive extraction of medicinal plants from forests, removal of soil & brick kilns, use of synth. tannins for leather, textile dyes,
CPR sacred Grove	decline of instt., excessive harvest of biomass,		
Public	weak monitoring of adverse industrial impact open access; lack of institutions		
	Protected disruption of natural habitats		