

Knowledge Networks for Augmenting Grassroots Creativity and Innovation:

Organizational Innovations for sustainable Agriculture and Rural Development

The developmental theory has got stuck in the last one decade after reaching the limits of various models tried in different parts of the world. And yet, never before, the pluralism was so high in search of solutions. A large variety of civil society initiatives are being taken in north and south to try various models of agricultural and rural development regardless of ideological boundaries. Despite this positive trend, some gaps have remained. I discuss ten gaps in developmental processes that Knowledge Centre/Network approach tries to overcome in part one of the paper. In part two, I describe the heuristics of innovations in the context of local knowledge systems. The recent experience of Honey Bee network, SRISTI and GIAN is discussed in Part Three in the context to erosion and other threats to local diversity, creativity and knowledge systems. These initiatives aim to build upon what poor people are rich in, i.e. their knowledge systems and creative spirit. Finally I summarize my arguments and suggest that agricultural economists move beyond finding out what went wrong, where and why and get involved in building new participatory institutions and knowledge networks for generating developmental alternatives.

PART ONE CHALLENGES BEFORE DEVELOPMENTAL PLANNERS

While articulating the concept of knowledge center/network at International Conference on Hunger and Poverty, October, 1995, I had recognized the power of Honey Bee model in strengthening lateral learning among struggling populations in different parts of the world. The Honey Bee network described in part two essentially builds upon a fundamental ethical premise that we, the intellectuals have ignored for a long time. Honey Bee does what we intellectuals don't do. It collects pollen from the flower and flowers don't complain. It connects flower to flower through pollination apart from making honey. When we take knowledge of the people, we are not sure that people don't complain. Since we publish our work in global languages, there is no way people ever know what we learn from them and whether it was of any use to them. We almost never share our findings with providers of knowledge in their language. Much of the discourse on participation and participatory research avoids these issues. For instance, we do not explicitly acknowledge that providers of knowledge about whom we write have a right to get a share in the pecuniary gains that we make in the process. Obviously the ethical basis of our discourse and development has to merge at some stage with our own practice in day to day life. Otherwise, as Gandhi suggested in his Experiments with Truth, the intellectual discourse will be bereft of any authenticity and accountability towards the disadvantaged if we did not face such dilemma. It is in this context that 'Knowledge Centre/Network Approach underlying Honey Bee philosophy assumes that future transformation of developmental alternatives for alleviating

poverty and hunger will emerge by networking large number of decentralized nodes around the world generating practical solutions to the problem of hunger. Since these nodes are distributed across different institutional settings, regional and cultural contexts guided by various philosophical and ethical values, building bridges across these nodes will require respect for pluralism inherent in civil society. This respect will perhaps emanate when we will take into account the existing differences in access, assurances and abilities available to different communities as well as formal institutions across north and south'(Gupta, 1995).

Turning the Tide: Ten challenges before Development Planners

There are several challenges that development planners face in the next century.

One is to find ways by which people struggling with similar problems in different parts of the world get to know the solutions developed by some innovative and creative communities or individuals in another part of the world.

Second is to link formal and informal science so that value can be added to these innovations. These can be made more robust without losing the advantage of their simplicity or low cost. It is understood here that in large number of disadvantaged regions, ecological conditions are highly heterogeneous. The classical lab to land model of developmental technology will not bring about major change in the foreseeable future. There is no escape from building upon local knowledge and innovations - a task still beyond the day to day consciousness of most mainstream scientists, not withstanding the rhetoric on the subject.

Third is to mold public policies for development, credit, and science and technology development etc., in a manner that these little innovations can get scaled up or become enterprises. It is sad commentary on the state of developmental initiatives that no where in the world a venture capital fund exists which can support small innovations and help convert other such ideas into enterprises.

Fourth challenge in the wake of globalization is to make niche markets accessible for decentralized production by communities in different parts of the world particularly for organic or low chemical input products, crafts, other farm and non farm products etc.¹ This will require market research, consumer surveys, data base development, brokerage function between financial institutions, entrepreneurs, and product development and marketing expertise. Niche markets will evolve by influencing consumer preference in favour of biodiverse products which can generate incentives for in situ conservation as well as for organic products. In any case the ultimate cost of development is borne by the consumers.

Fifth challenge is to build upon and augment the empathy and concern that poor people seem to have in larger measure for the non human sentient beings as well as nature. This is evident from their greater reliance on the common properties, livestock, forest products etc., for their survival. These concerns are becoming weak in many cases due to lack of alternative survival options.

Sixth challenge is to generate self design institutional innovations which make it possible for people to take control of the resources for sustainable livelihoods. This will include land and water reforms but more importantly reforms in political institutions. The constitutional amendment in India making elections in institutions of village self governance compulsory is a step in that direction.

Seventh challenge is to transform the learning systems and strategies in public systems and also international development institutions. The change is slowly taking place but true proportions of

crisis in the post structural adjustment phase are not fully fathomed by leaders of civil society.

Eighth challenge is to enable Knowledge networks follow an approach of having Two way-Communication and Two way - Power. Thus the poor should be able to influence the content of what they need and what they will provide but also determine how the knowledge provided by them will be used. They should have countervailing power to match the power of providers in formal knowledge system.

And that brings us to the ninth challenge which is to involve civil society in taking responsibility for shaping values and generating responsibility for a fair and equitable society devoid of hunger.

Tenth challenge is to provide youth in or out of educational system an opportunity to recognize the nature of embedded injustice in various existing institutions and the scope for non-violent Gandhian way of correcting them. This is the most difficult challenge. Because patience required for non violent processes does not evolve if we have decided to replace primacy of means by ends. It is true that lack of employment opportunities hardly provide the conditions suitable for generating non violent and patient approaches. And yet if knowledge centers/Networks can link innovators around the world, it may be possible to generate competitiveness in the knowledge and enterprise networks. In the process employment may be generated by adding value in the local knowledge blended with formal science as well as knowledge of others, to alleviate poverty.

These challenges will require a new paradigm of thinking if solutions have to be lasting. First transformation required in our thinking is that we have to move away from just problem solving to solution augmenting strategy. Second, we need to recognize that our excessive patience with mediocrity and injustice is a moral ingression into the realm of self serving world view. Thus we need to question the moral basis of co-existence of hunger and affluence and restrict not just to the economic and social basis. Both of these transformations are fundamental to the new goal of having a world without hunger. And what is most exciting aspect of these transformations is that once transformed, any individual or institution does not remain the same. The change begins from within and infects others rather quietly. People do not even realize that they have started seeing the world differently for some time. This vision may look similar to the missionary mode of social change. But are not we all pursuing some missions always relentlessly. The point is to modify these missions.

Modification of Missions: getting locked into relevant Knowledge networks

a Reducing Transactions Costs of poor

Knowledge networks perform the task of socialization of members but not just that. These networks help the members in reducing transaction costs for accessing certain kind of information and increase costs for others. For instance if a network insists on (a) drawing upon only such information which has been shared with the providers in their language before being used and (b) also has been authorized by the providers for wider diffusion, then one's transaction costs of getting authentic information will go down. But one would be deprived of considerable social information which does not meet this criteria- the not so authentic information. The latter may be correct, useful, and relevant but may not be ethically derived. This then is the challenge which aids or impedes the modification of mission. Williamson (1993) acknowledges one of the criticisms of transaction costs economics about its inability to either deal with hybrid forms

instead of only markets or hierarchies, or deal with non-western capitalist and non-capitalist economies (1993:76). He suggests that the adaptation is central economic problem and both Hayek and Bernard were right about the role of markets and internal organizations. However, the role of networks as a non-hierarchical contracting relation is offered as one of the responses to above criticism. Since reputation effects are quickly and often accurately disseminated in the networks, people not only consult each other but also care for each other. He accepts that role of reputation effect may have been overstated. However, what is important is his observation, “ethnic communities that display solidarity often enjoy advantages of a hybrid contracting kind. Reputations spread quickly within communities and added sanctions are available to the membership (Light, 1972). Such ethnic communities will predictably displays non-ethnic communities for activities where inter firm reputations are important. Non-ethnic community, to be viable, will resort to market or hierarchy (in a lower or higher k niche, respectively” (1983: 101). It is this insight which is very meaningful for squatting the potential of knowledge networks in marginal environments where traditional cultural and the ethnic ties are still very strong. If organic certification systems have to be evolved, perhaps reputation effects could be harnessed for achieving quality control and scale. I agree that not everyone cares equally for reputation effects even among the ethnic communities and also for different issues same person may respond differently.

Reducing transaction costs in timely provision of information about innovations is of great consequence for poor people. The tacit knowledge (Polanyi, 1962) or ‘epistme’ (Scott, 1996 pc) or local knowledge for survival as distinct from the one for accumulation (Gupta, 1986, 1987, 1990) will not be available for use by the network members unless a trust is created (Ouchi once had suggested that in addition to market and hierarchies, Clans maximize trust and minimize transaction costs in certain situations). Poor people have evolved indigenous institutions which have become weaker overtime. New institutional innovations have not built upon the traditional institutions where necessary and feasible to reduce their transaction costs.

b) Ethical aspects of accessing information: persuasion or legislation

Recently several of the Pew Conservation scholars endorsed the Ethical guidelines many of us (Pew Conservation Scholars) developed for Accessing and Exploring Biological Diversity based on several background papers(Gupta, 1994a, 1994b, Nitechman and Churcher, 1994). We realized that ethical responsibility of those who access the diversity for non-extractive non-commercial goals can not be same as that of those who access diversity for commercial and extractive purpose or commercial but non extractive purpose. The former would include the case of ecologists describing interrelationship among different natural species and systems by living in, or visiting a forest. Latter include drug companies (commercial-extractive), or ethnobotanists (commercial and non extractive) who collect people’s knowledge without ever sharing their findings or rewards generating from the same with the providers of knowledge. These guidelines may require changing the way business is done. If these are adopted by large number of professional bodies with or without modification, the relationship between conservators of knowledge and resources and the users of these resources might change. Surely legislations cannot change the perceptions always but some times these do.

c) Coping with complexity: multi actor, multi-level, multi node networks

Knowledge networks include voluntary actors and institutions but can also incorporate mandated or co-opted information nodes. These networks are nested into cultural and political networks.

As Godel's theorem implies, for understanding any relationship or phenomena we have to make assumptions which cannot be tested within the framework in which relationships are being defined. The nested networks are a response to this limitation. We may have to delve into cultural networks or socio political networks of which the members of a given knowledge network are a part so as to understand their motives, preferences and limitations adequately. It is obvious that any one system can deal with only finite limit of complexity. Therefore, to achieve parsimony the knowledge networks help in simplifying the information and classifying it in the order of complexity. Thus different members in a network having varying capacity to process information and understand complexity can draw and assimilate knowledge of different orders of complexity. If a network provides similar information to everybody, sooner or later it may suffer from alienation, which may lead to indifference and also 'exit'.

d) Validation through feedback and utilization: generating authenticity and accountability in networks

Another feature of knowledge networks is their ability to validate the information through the feedback, and measure and monitor the relevance by gauging the utilization. Therefore, if certain bits of knowledge remain unutilized but are important for building relationships among other bits of knowledge, they are retained for some time. Eventually, pressure increases for keeping more and more relevant information in the network. The risk is that relevance may be defined in a given social context bound by time and space. When new members come into network bringing new perceptions and insights, they may realize that networks did not have information that was of use to them. To some extent, there is no solution to this problem except to keep making effort to make process of knowledge acquisition, dissemination, utilization and feedback iterative and interactive with the users and providers. However, just as in libraries, some books may be browsed in the shelves but never used. These may be the bits of knowledge which are not withdrawn by the users but their presence may make other bits of knowledge more relevant. For instance, lot of people may never refer to an encyclopedia dealing with whole range of chemical information about pesticides, their residues and effect on neuro physical systems. But, if they knew that such an encyclopedia is available, their responsiveness to another bit of information which was simple and communicated to them some dangers of pesticides might improve.

The utilization of knowledge is essential but if we produced knowledge which can be used only according to the needs and preferences of current generation, the rights of future generations may get sacrificed. Thus futuristic perspective is essential and a match has to be found between the requirements of utilization today and fertilization of imagination for future use.

e) Redundancy, reductionism and response

Redundancy is necessary in any knowledge network. But as I have argued elsewhere (Gupta, 1984) too much of it can generate inertia and too little can cripple. An optimal amount of redundancy has to be evolved through experimentation and experience. This also requires combining holism with reductionist approach to understand resource use options. Many populist writers on the subject decry the fact that much of the formal science is reductionist. It is a criticism which is valid in great measure. But the answer is not to throw away the baby with bath water. We have to realize that if every thing is related to every thing else, no causal statement can ever be made. Thus we need reductionist approaches to target a technology and holistic approach

to embed it in cultural and socio-ecological context.

Knowledge networks can also reduce fear and uncertainty if the response time is short and concern for each others' need is high. Asymmetry in power, status, endowments both intellectual and socio economic can create tensions in any knowledge network. One response to deal with such problems of asymmetry is to have loose coupling amongst different channels and nodes of communication and information. For instance, on the contrary, if a given network was to include only one channel, i.e., electronic, and only one level of complexity, i.e. very high and only one language, i.e., English, then larger number of rural people particularly the disadvantaged ones will be excluded.

f) Vernacularisation of discourse: Language, culture and values.

Without vernacularisation of discourse, there is no way that we can reach people in different language cultures and regions of the world. Since each language also reflects a habit of thought, the knowledge networks need to deal with correspondence among different habits of thoughts.

Hjelmslev,(1936:30 in Johansen, 1993:21) observes,

Every nation (or culture) has a habit of thought just as every dialect has its own habits of language. This does not prevent, however, that many nations can build on the same system of thought, and many dialects on the same language system. The habits of thoughts are closely related to language. We think as we speak.

Johansen provides an example, "The proposition the man is poor is an example. In some languages, the same meaning is, however, differently expressed; e.g., the man poor, i.e., without copula as in Russian; or poor the man, i.e., predicate before subject and no copula as in Hebrew and Hungarian". For our purpose, it is sufficient to note that knowledge networks can be very effective if they can not only show sensitivity but also explicitly seek out these differences.

g) Homogenization of knowledge: Generating Pluralism

Knowledge networks have to recognize the danger of homogenization of knowledge and consequent production and reproduction of a universal culture. This problem is becoming extremely accurate in the wake of satellite invasions and mindless popularization of western culture by private and public media. It is not surprising therefore to find that metropolitan elite all over the world reads same novels, speaks same language and has similar habits of thought in terms of their indifference to the goal of poverty elimination and generation of unethical and accountable system of governance.

h) Translating ideas: Shaping habits of thought and adding dignity in development

Knowledge networks being nested in different kinds of consciousness also have to grapple with a process of translation within oneself. Many of us who got early education in vernacular media and learnt English or French later in the life cannot get rid of the habits of thought built early in life. Certain kind of deference towards elders and some concern for non-human sentient beings may get reflected in one's psyche from time to time. This is not to imply that people from English speaking countries would not have the same tension between a local dialect whether of Scottish or Welsh origin and a global dialect. The only implication is that the translation process

has to be taken note of as a reality and therefore, distortions in meaning occurring on this account have to be anticipated. In certain cultures, no matter how hungry a person is, unless repeatedly asked, he or she would not take food. In another culture, if you have said no after being asked once, you better remain without food. The same hunger therefore may not get alleviated by using similar means in different cultures. In Gandhian thought, a person who helps another person should ensure that the recipient does not feel either humiliated or humbled by the aid. And yet we know that both national and international aid in large parts of the world has generated not only dependence but also learned helplessness. In some drought prone parts of India and perhaps Africa, people would not de-silt their tanks or deepen their wells till Government starts the drought relief or food for work programmes. Now that governments are under budget squeeze due to structural adjustment programmes the relief is becoming more difficult to mobilize and at the same time efforts for self help are not being made in the spirit in which these should be. The result is greater misery. One is not sure that out of this misery will emerge greater responsibility amongst all, i.e., the poor and the providers or it would lead to more chaos and increasing lumpenization and criminalization of the society.

i) Rethinking 'our' life styles for removing 'their' poverty

Thus, the knowledge networks have to not only look at old habits of thought but also have to ensure that new habits of thought do not create more problems than they solve. Increasing spread of consumerist culture is certainly one such consequence of new habits of thought spread by elitist media. That is the reason that in most conferences on hunger and poverty elimination, a discussion on changing the life style and consumption pattern of the elite in developing as well as developed countries is always pushed out of the agenda. We ignore the old Gandhian dictum that there is enough in this world for everybody's need but not enough for everyone's greed.

j) Combining sacred with secular and drawing upon alternative consciousness

The concept of aparigraha and zakat are two sides of the same coin. The first originating in the Buddhist and Hindu philosophy implies not acquiring and accumulating more than what one's minimal needs are. The latter is a concept evolved in Muslim philosophy implying that a small share of one's income must necessarily be given for a social good by everyone. And yet, when a document entitled Caring of the Earth was developed and distributed world wide by IUCN, WWF and WRI, it was ignored that most references in the document were post eighties, and ninety per cent were western in origin. There was no reference whatsoever to any religious text or eastern philosophies. If the intended implication was that one can generate a culture specific ecological ethics that will help in conserving resources without invoking religious consciousness or other sacred belief systems, then surely one was missing an important point.

The knowledge system in the end must achieve a reasonable blend between secular and sacred consciousness. Just like a double helical structure, the sacred and the secular tendencies intertwined in our consciousness. There is no truly sacred belief which is not secular in its orientation. And there is hardly any secular value which is not guided by some sacred belief or assumption or concern (Gupta, 1993a). The great divide between the two may have served its historical purpose. The time has come to combine these two judiciously and carefully. If we did not do this, the alternative would be continued growth of intolerance and fundamentalism. In such a context, knowledge networks will fail to achieve the goal of harnessing the saner, secular and the sacred urges of society for preventing hunger and eliminating poverty.

k) Transition towards diversity and sustainability

These networks have to thus help make a transition from non-sustainable opportunity matrix to a sustainable one. We can see scope of such a transition with the help of following matrix.

	Development Models		
		Time Frame	
		Short	Long
Range of Choices	Narrow	Non-sust	Vulnerable
	Wide	Oppur.	Sustainable non-sust

(Gupta et al, 1993)

Fig 2

The widening of decision making choices and extending the time frame is the ultimate test of any development process. Wide choices in short time frame are sign of opportunism, and narrow choices in short time frame are non sustainable. Narrow choices in long time frame make the poor people extremely vulnerable. Knowledge Centre has to define the nature of vulnerability jointly with the partners and then devise strategies for extending time frame and widening the choices.

Access to resources, skills and technologies, institutions and cultural networks makes a considerable difference to achieving sustainable outcomes. The communication between the people and the professionals or the managers of development projects and programmes influences the range of choices that different social groups can exercise. The ability of people to extract information, provide feedback or influence the design of the dialogue depends upon the respective power that the two ends of the communication channel have.

1) Empowerment through knowledge networks: Linking communication and power

The interplay between communication and power at the grassroots level is illustrated in Figure two. On one axis we have one-way, two-way and no-way power, and on the other axis we have the same dimensions, but of the communication process (Gupta 1980). Power is defined as the ability to change the other's behaviour or response in accordance with one's own preference. How would knowledge networks influence the preference of providers and poor?

Fig : 3
Power

Communi-cation	One Way	Two Way	No Way
One Way	Authori-tarian	Impossible	Street Singer or Tom Tom beater
Two Way	Farmer training Centre	Empowerment	Collegial learning
No Way	Power of Silence	Impossible	Indifference

(Gupta, 1980)

One-way communication — one-way power exists in an authoritarian arrangement. It is obvious that any exchange in this framework cannot be sustainable. A large number of top-down projects or programmes suffer from this limitation. Since there is no feed back, poor people often either ignore, or become indifferent or sometimes rebel against the oppressive structures. In the last case, one-way power is accompanied by two-way communication — protest being the way of communication from the side of the disadvantaged people.

One-way communication — two-way power is impossible because those who have power are unlikely to restrain its indefinitely.

One-way communication with no power either way is a case of street singers or tom tom beaters. These people perform their roles with almost no ability to change the context or message. The providers or originators of the message may have power but not the ones who broadcast it. The latter can neither change the times through incorporation of powerful myths or metaphors into their narration. In that case, it becomes an example of one-way communication and one-way weak power. But generally, such a system survives either as entertainment or as a simple information-diffusion system. In the period of silent revolution, these subtle forms of communication can also create considerable mass upsurge of consciousness.

Two-way communication with one-way power is reflected in the usual training centres or officially designed development programmes. While people can give their feedback, they have no ability or power to ensure action on it. Such a system sooner or later becomes unresponsive to the needs and aspirations of the people at the grassroots. The communication flow from the people slows down and eventually stops completely. The system then evolves into one-way communication — one-way power. Learning is impaired. Two-way communication and two-way power is the most viable and sustainable institutional arrangement. This is an arrangement which Gandhi articulated as “Gram Swarajya” or Village Republic and Mao Tse Tung called the Mass Line approach. It is true that both failed to achieve it on durable basis. Yet, the merit of the arrangement remains. The two-way communication system may not prevent mistakes altogether but certainly avoids blunders. The power both ways ensures learning and mid-course

correction. It also generates mutual accountability and authenticity in transactions. Both the ethical and institutional responsibilities are shouldered in a shared manner. People are truly empowered in this case. People can not only communicate their expectations and feedback to the planners, policy makers, and other external agents but also exercise power to shape the content of policies and programmes. The initiative remains at both ends and mutual support and learning are emphasized. People's initiatives and innovations can become the basis of public policy. In some cases people can also support some of the desirable initiatives of the external agencies or actors. Given the quality of communication and play of power at both ends, the system can be sustainable. Two-way communication with no power either way is the system of lateral or collegial learning. Farmer to farmer learning takes place informally. This is a very powerful medium of knowledge buildup though it can also be demoralizing sometimes. This happens when the dominant peer group reinforces despondency and cynicism rather than hope and experimentation.

No-way communication with one-way power: In general, one can assume that power cannot exist without articulation. However, when poor people decide to exercise the power of silence, for some time, a situation of one-way power with no-way communication can indeed arise. The case of no-way communication and no-way power is an alarming situation when indifference and cynicism become pervasive at all levels.

Empowerment is thus a process of conceding the right to question and communicate alternative opinions to disadvantaged communities. The only limitation of this definition is that it presupposes that those who have power will willingly share it with others. This definition also masks our — the external resource provider's — powerlessness in understanding and uncovering the creativity and entrepreneurship of knowledge-rich and economically-poor people. The latent power of the creative people can manifest through institutions that permit two-way communication and two-way power. However, the process of such an empowerment will vary in various regions and institutional contexts with different vulnerabilities.

From Knowledge Networks to Knowledge Centre

The hierarchical model akin to CG centres will not suit the ten challenges and transformations of communication and power described above. Hierarchical models are optimal where degree of complexity varies at different levels and line of commands can be linearly drawn.

The implication is that maximum information and minimum data reaches the highest level. It is assumed that information processing capacity are hierarchically organized. The recent trends even in the corporate sector clearly indicate that such assumptions are no more true in most cases. The firms are not only down sizing but also are encouraging intra-preneurship. The conventional wisdom in economic theory was that if transaction costs are higher in performing a function outside the firm than in side, then vertical integration may be appropriate. That is how the large firms came into existence and were successful for some time. Very soon it was realized that such economies of scale were achieved at a great cost. And that was technological obsolescence. It is in this context that small firms were found to be not only more innovative but also more democratic. Partly owing to job overlap and partly due to shifting product lines a small firm had no option but to diversify skills within to be able to diversify products outside.

Lately, an even more interesting innovation has emerged in some parts of the world such as South Italy called as Small Firm Networks (SFN, Perrow, 1993).

Under this approach, many small firms realized that even though they had knowledge, skills, and technology, they were not able to compete globally and bid for large orders because of their smaller size and limited information. Slowly and slowly individual entrepreneurs started bidding for large orders and once they got it, they got in touch with other small firms with similar production line. They decided to cooperate and network till the pendency of the order. Once the order was complete, they shared the gains at pre-determined rates and started competing with each other. This model of cooperative- competition though recent in origin actually can be traced to certain attempts made in early 18th century in France.

In Lyon, there used to be several silk cloth looms manufacturing different kinds of fabrics with varying shades, colours and designs. At the same time, when competitive model of industrial revolution was emerging in England, a small experiment was opening up new possibilities in Lyon. The master weavers and owners of the looms noted that there was some kind of cyclical trend in the demand of silk cloths among the consumers. The result was that when demand of cloth with one kind of design and shade was increasing, the demand for other patterns of cloth was declining. The loom owners devised a very interesting model of competition and cooperation. If a loom owner was having an up turn in the demand of cloth from his loom, he would keep his son or daughter as an apprentice with some loom owner who might have been having a down turn. Thus, in the market place, they competed but in the process of capacity building they cooperated. It was known that one of the looms having down turn may get an up turn after some time.

The challenge in designing Knowledge Centre/Network is to combine the spirit of competition and cooperation in such a manner that the capacity building goes hand in hand with accrual of reward for pioneering innovative and entrepreneuring role. Also the knowledge centre has to be based on the assumption that a poor farmer in a remote region of Asia or Africa may have to handle far more complex information for ensuring survival than possible with the most sophisticated computer. Obviously therefore the hierarchical models will not work. The same person may have high capacity for processing environmental or climatic information but may have very limited capacity to process information about distant markets or even some of the bureaucratic institutions. The knowledge centre will have to build upon another unique property which is of mutual dependence among each node.

Since different nodes may specialize in different kinds of problem solving, the centre for different activities will be in different places. Unlike the classical model of organization having heads of different functions or division in one place reporting to the chief executive officer, the knowledge centre would recognize the distributed expertise and therefore the leadership.

In a study of food gathering and hunting tribe in Andhra Pradesh (Gupta, 1987; Gupta & Gangadharan, 1983), three insights were gained. In this tribe there were five different bands or subgroups engaged in different tasks such as food gathering, hunting, honey collection, fish collection, agriculture, etc. The Chenchu tribe of which we studied three groups showed very interesting way of matching skill, status, risks, and resources. The three principles observed were: (a) Pooling was independent of redistribution, (b) Leadership was skill based and not status based and (c) Leadership was iterative.

If a particular group brought a game or caught fish it was not distributed only among the members of the sub groups, but was considered the common property of the entire group and shared accordingly. When any group went for food gathering, hunting or honey collection, the leadership was in the hands of the most experienced person in that task - the one who had most crucial skill. For instance, while going for hunting, much depended upon whether one could

interpret the foot prints of the animal appropriately and determine the direction in which to go. Thus, the person who had this skill became the leader. Similarly, when one went for honey collection, the leadership went to someone who could spot the mature honey combs best. When the same person who was leader in one group became member of another group for which he/she did not have special skill, one became a follower. Thus, leadership in one group was perfectly compatible with being follower in another group.

In my view, these three lessons have some implications for designing the Knowledge Centre/Network. A community which specializes, say in Banni area of Kutch in Gujarat specializes in conserving rain water under ground in saline soils and on the top of saline under ground water in an arid region, then such a skill may make this community a leader for designing experiments in other arid saline areas with similar problems. This is particularly true when modern science and technology may not have devised as yet a solution so efficient and economical. The same community also has skill of embroidery for which export markets exist but it is beyond the capacity of the community to do market research, identify consumer needs, mobilize capital, organize production and export. For such a skill, it would be a follower of some other community or institution which may have expertise in this regard. Within this community, there may be some people who are expert in animal breeding or animal health but do not know how to build a *virda*, i.e., the structure for conserving and extracting fresh water in saline soil and saline under ground water. The leadership therefore may iterate within the community as well as the among the community and institutional nodes of a knowledge centre.

Another facet of Knowledge Centre/Network is to prevent information overload and also reduce entropy in the system. The farmer would require user based information retrieval and dissemination systems. The latter would require reliance on metaphorical communication rather than only on analogic communications. An example follows. Generating restraint among communities in using natural resources even when there is no control requires development of institutions. As a concept, this point may be valid, but may be of limited significance in generating appropriate action in the light of wide spread erosion of resources in such situations. A metaphor, or an example can convey not only what is intended, but also what a community or user group may like to interpret in its own historical cultural context.

Pierce defines the essential function of a sign is to “render inefficient relations efficient....Knowledge in some way renders them efficient; and a sign is something by knowing which we know something more (Pierce, vol 8 para 332)

To Pierce, knowledge unmediated by signs is impossible. He considers sign function as a necessary precondition of any knowledge whatsoever (Johanssen, 1993:56). There was a tribe living in a forest knowing exactly when would the animals come for drinking water in a pond. An easy option for the members of the tribe is to go and hunt the animals when they come for drinking water. The fear is that animals may learn and stop coming. They may change their location and make the task of hunting even more difficult and uncertain. What the tribe decided to do was very unique. The leader of the hunting expedition on a given day would take a sling, tie a stone and hurl it around. In whichever direction the stone went, the group would go for hunting in that direction. Even if that meant going in opposite direction of the one where game was likely to be. This meant that some days they get lot of game and other days none at all. Apart from the fact that this principle made their behavior unpredictable for the animals, it also meant development of an ethics in which having too much at some time was compatible with having none at other times. Gerlach and Palmer (1981) while describing this example demonstrate how a problem of risk can be converted into uncertainty when rule of randomization has to

be rationalized for equity, ethical and conservation purposes. It is obvious that maintaining ecological balance would require restraint in use of resources. But this restraint cannot be generated only on utilitarian grounds and as a technological solution. The economics, ethics, institutions and technology have to be combined in the system of governance. All of these messages may get across through a metaphor or a story or a symbolic communication much better and much faster.

In the process the distortion of information and therefore the entropy may be minimized. That is how oral traditions have ensured purity and consistency of communication much more accurately than the written traditions have achieved in terms of values and ethics. The entropy can also be reduced by having optimal redundancy in the nodes as well as network channels. The most important way to reduce entropy is to link theory with practice. More an idea is tested, tried and transformed, greater is the chance that it will be owned and assimilated in the local knowledge system. It has been argued elsewhere that quick acceptance of an idea is sure sign of its abortion (Mathur and Gupta, 1983). Unless the soil is ploughed and pulverized, ideas are unlikely to take roots. Embedding an idea in the existing knowledge system makes it last longer compared to a process of transplanting or grafting the same.

The links between formal and informal knowledge systems have to be crafted carefully if Knowledge Centre has to draw upon both the streams of knowledge. The criteria of evaluation may vary in different knowledge systems. Similarly, the criteria of effectiveness also vary in formal and informal knowledge systems. The knowledge centre cannot validate and authenticate the information collected from different information nodes nor should it try to do so. It can merely vouchsafe for the authenticity of information it generates itself as a node. Therefore, the roles of knowledge centre as a node, hub, coordinator and as a generator of values and norms have to be distinguished.

The goals of Knowledge Centre/Network would be as follows:

- a. To trigger a multi channel, multi node and multi level network of individuals, institutions and social movements engaged in generating solutions to the problem of hunger and poverty,
- b. To operationalize 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.
- c. To generate reciprocity amongst providers and receivers of information so that incentives for problem solvers to network with knowledge centre continue to grow.
- d. To develop and operationalise an international fund for recognizing, respecting and rewarding creativity and innovation at grassroots level ensuring sustainable use of natural resources, protection of basic human rights, gender equality, and ethical discourse and conduct of business.
- e. To network with existing efforts all over the globe with similar goals such as International Foundation for Science, Sweden (IFS), Society for Research and Initiatives for Sustainable Technologies and Institutions (SRISTI), Honey Bee network for indigenous innovations, Tranet, ISEE, IASCP, CIKARD etc.
- f. To mobilize volunteers from private and public sectors, third sector and even religious organizations to generate and support local trust funds to be managed by communities trying to

augment innovative solutions developed by them or others.

g. To set up a venture capital fund for small innovations which may support innovators directly or may underwrite risk or provide bank guarantees for similar funds to be set up in different parts of the world for augmenting peoples capacity to solve their own problems.

h. To fulfill an ethical obligation towards poor people by ensuring, (i) all the information concerning any programme or project is made available in local language to the peoples' representatives at local level before designing and implementing the same, (ii) sharing of information during the course of project implementation and respecting the right of people to information, (iii) protecting the intellectual property and cultural heritage rights of local communities.

It is obvious that the transformation being suggested through above model would require considerable rethinking on the subject of designing future organizations and linking them with the knowledge network of grassroots innovators. How Honey Bee network, SRISTI, GIAN have tried to do this is discussed in next part.

PART TWO

TRANSFORMATION OF AGRICULTURE AND RURAL DEVELOPMENT OPTIONS: Building upon Local Knowledge systems-heuristics of innovations

A : Where have we gone wrong?

The crisis of food production and geo political considerations created conditions in many developing countries particularly in India to strive for food self-reliance. The possibility of using high yielding varieties (more appropriately highly responsive variety) brought about what is popularly known as green revolution. Simultaneous changes in the banking institutions, price support, procurement and distribution infrastructure and extension machinery along with subsidized inputs made the transition to high growth agriculture possible. It is well known that this growth took place primarily in well irrigated, good soil and level land areas. A large part of arid and semi arid regions and mountain areas were left nearly untouched by the green revolution technologies. The non-sustainability of different inputs can be understood by looking at the condition that became limiting with passage of time.

In case of fertilizer, several factors have contributed to declining productivity such as: (a) imbalance use of chemical fertilizers, (b) excessive mining of native soil fertility leading to micro nutrient imbalances, (c) changes in the soil physical and chemical properties because of absence of or low quantities of farm yard manure (FYM) applications, (d) the modification of soil microbial diversity due to excessive nitrogen application and also other chemical inputs, etc.

The case of water is even more serious. In case of ground water, excessive mining of water led to (a) increase in the cost of energy for extracting water (b) ingress of the sea salinity in coastal regions, (c) toxicity of fluoride and some other elements due to creation of cavity and oxidation processes, etc. In case of surface irrigation, excessive irrigation, irregular supply, lack of complementarity between surface and ground water, lack of on-farm development, high seepage from canals leading to water logging and rise of salinity, influx of weeds, etc.

The declining water table also meant increasing cost of energy which further affects the viability of the returns to the investment. Both increase and decrease in the water table in different areas have made the respective farming systems non-sustainable. In some areas water is being mined

from as deep as 1000 mts. or more. In a few cases, the water being extracted could be called as fossil water which is not going to get recharged and while stored when the earth was being formed.

The case of pesticide is the most obvious and at the same time most pathetic. Not only large number of pesticides which are banned in the European countries are exported to developing countries. But within the ones which are not banned, the information provided to the farmers is totally inadequate leading to considerable ecological and human health damage. Excessive use of pesticide has led to (a) elimination of useful predators and other beneficial insects including pollinators, (b) toxic residues in the soil, water as well as products affecting human and eco system health, (c) deleterious effects on the soil microbial diversity, (d) resistance among the pests and diseases leading to tread mill effect, etc.

There are several other areas where we have made costly mistakes. The declining crop biodiversity is an important one. Studies by Hargrove (1981) and others have shown that as many as one third of modern varieties of rice had a common parent for important traits leading to very high risk of diseases or pests spreading on large scale. The uniformity of crops and varieties has also meant tremendous increase in the weed infestation and consequent application of chemical weedicides. What are the lessons from all these mistakes and how can one see their social and political implications:

a. The modern agriculture as conceived and operationalised under green revolution strategy is not sustainable. There has to be a change in the strategy, structures and the processes of understanding inter relationship between different parts of the eco systems.

b. The dominance of large corporations and big scientific establishments generated a false hope that 'Lab to Land ' model will not only sustain green revolution model but also provide spur for continuous innovations.

c. The institutions emerging as a consequence of chemical intensive subsidized agriculture could not generate a world view which will easily help in restoring eco-compatible resource use systems. The barriers in making a transition to an alternative system should be recognized and faced with squarely.

d. The increasing imbalances among regions, commodities, and social classes would endanger the social amity and intensify struggles for greater control over natural and other resources among deprived sections of society. Some times these struggles will dissipate lots of creative energy of a society and generate false identities including rise of fundamentalism of various kinds.

e. The public sector science and technological systems which delivered the most goods so long may be squeezed of resources and thus market forces may further accentuate the technological imbalances unless small scale, alternative technological innovations can find space for their expression.

B: Survival Under Stress: Coping Creatively

But with all these constraints, some system or pattern has to be developed to reduce complexity in nature. These patterns constitute the basis of indigenous ecological knowledge

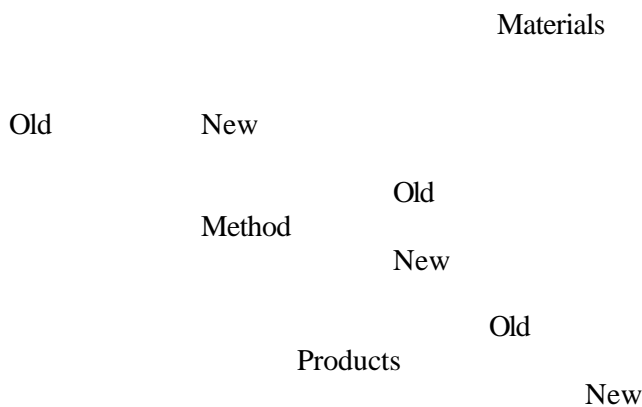
system. Within these patterns, some occur with greater regularity than others. The language and folk culture generates symbolic or other means of memorizing these patterns. It is not surprising that communities which depends upon a particular natural resource often are reported to have many more words to capture the variability in that resource compared to communities which are independent of this resource. For instance, a coastal community dependent upon offshore marine fishery resources may have far more words to classify waves in the sea than a fishing community dependent upon inland sources. Eskimos similarly have been reported to have large number of words for snow.

The taxonomic basis of soil, clouds, waves, winds, plants etc., thus constitutes the bedrock on which edifice of indigenous creativity and innovation is built. An artisan who would like to economize on the use of wood in replacing a worn out shoe of a plough, has to find a suitable material to replace or repair the shoe. In a workshop of innovative artisans in south India, a blacksmith reported the outcome of a material science research that he pursued for some years. He found that the iron of scrap leaf springs or suspension of automobiles was most suitable for making shoe caps for the shear of the wooden plough. The precious wood used for this purpose was thus saved through a creative blending of traditional technology with a modern material.

It is this process of blending that I intend to discuss next to illustrate how coping strategies imply combinations of materials, methods, products to generate or improve options for survival in high risk environments.

a) Combinational heuristics:

The search for innovative solution can be through several routes. In this case various combinations of old and new methods, materials, products generate a whole range of choices of which sustainability can be determined on the basis of renewability of resources involved.



i) Old methods, old material and old products signify the traditional wisdom which may have relevance even for contemporary context. For instance, Virda is an age old technology for

conserving rain water in a saline arid region with saline ground water. In an otherwise flat land region, the rain water temporarily gets stored in some minor depressions or tanks. Within these tanks, the pastoralists dig shallow wells lined with frames of wood of *Prosopis juliflora* having grass layer between different square wooden frames as well as between the earth column and the frames. Hardly ten inches rainfall provides sufficient storage of fresh water in these wells above the saline ground water. These Virdas are covered with silt and sealed. Depending upon the need one Virda is opened at a time and the water remains sweet for two to three months after which it turns saline through upward movement of saline water.

This technology has enabled the pastoralists in Banni pastures to survive for several centuries. Even ten inches rainfall in this area may fall within a few days and hence the need for a robust, efficient and adaptive strategy.

In such a case, the modern science does not merely help explain the functional viability of the technology but also provides basis for abstraction and generalization.

ii) Old methods, old material and new products

The wool on the mane of the camels is known to be very hardy and resistant to corrosion. Traditionally the pastoralists make different kinds of ropes, carpets, bags etc., out of wool on different parts of the camel's body. Once somebody figured out the use of these carpets as oil filters in oil refineries, a new product got developed out of old method and material. Similarly sisal rope has been used in various activities both for commercial and domestic purposes. It was found these ropes could withstand corrosion better than any other material in sea. Thus a new use for old material made by old method generated a new opportunity for value addition and income generation in some of the most economically depressed regions. The sisal grows in poor soils in semi-arid regions.

Processing of sisal is very painful because of various tannins released in the water tank in which sisal plants are immersed for sometime. While taking the fibre out, the tannins cause blisters on the hand. Simple technologies have been developed to take the fibre out without having to go through painful process. An old material can be used using new method for old products or uses. Modern science can blend with the method leaving other choices intact.

iii) New method, old material and old product

In many of the cumin growing regions, farmers had observed that the plots on the roadside had better productivity than the interior ones. They figured out that the dust which settled on the plants saved them from certain pests and fungal diseases. Some other farmers observed similar pattern near the brick kilns. Dusting with ash or fine soil became a new method for controlling pest and fungal diseases in this crop. In many other crops, the use of ash has been well known as a dusting material for a long time.

Similarly, in the case of termite control in the light soil areas, farmers had known that moisture keeps the termites under check. However, they had also known another seemingly unrelated phenomena that sorghum plants when young were not eaten by the cattle because of some toxic compounds (Hydrocyanides). One farmer in a dry region thought of cutting, chopping and putting the sorghum plants in the irrigation channel. The assumption was that toxic compound in the plant would mix with the water and help in overcoming termite problem in this field. This is what actually happened. In this case a whole new field of research has been identified. So far the

sorghum breeders were looking for land races with low hydro-cyanide content. This innovation opens the opportunity for selecting high HCN content sorghum lines. In case this technology works in different parts of the world, dry farmers could grow a small patch of high HCN lines to be used for pest control purposes.

(iv) Old methods, new materials and new product or use

Some innovative farmers have used a drip of castor oil organized through a tin box with a wick hanging over an irrigation channel. The castor oil drops into the water and spreads into the soil. In a crop of banana, this oil adds to the lusture of banana by making its skin shining. Apparently, consumers like such bananas more and pay a better price. This drip is also used in other crops for soil based pest control.

Similarly examples can be found for other cells. What these examples show that farmers can be extremely creative in solving local problems. But issue is whether this knowledge systems will survive the onslaught of iniquitous markets and big science?

Part Three: The Threats to Localized Knowledge: The Case of Honey Bee Network

Erosion of knowledge is as much, if not much more, serious problem than the erosion of natural resources. We can probably reverse the declining productivity of natural resources like soil through watershed projects or other resource conservation strategies. However, erosion of knowledge can not be easily reversed once lost.

In order to stem knowledge and resource erosion, the Honey Bee network, a global voluntary initiative was launched six years ago. Its purpose is to network the people and the activists engaged in eco-restoration and reconstruction of knowledge about precious ecological, technological, and institutional systems used by other people.

This network aims at identifying the innovators (individuals or groups) who have tried to break out of existing technological and institutional constraints through their own imagination and effort. What is remarkable about these innovations is the fact that most of these require very low external inputs, are extremely eco-friendly and improve productivity at very low cost.

It is necessary to note here that organizations of creative people, which take the form of networks or informal cooperatives or just loose associations, would generate a very different kind of pressure on society for sustainable development. The spirit of excellence, critical peer group appraisal, competitiveness and entrepreneurship so vital for self reliant development, may emerge only in the networks of local 'experts', innovators and experimenters. It is true that every farmer or artisan does experiment. But not every one is equally creative and not in the same resource-related fields. The transition of the developmental paradigm from 'people as victim's perspective to that of the people as potential victor's is the answer. Former may generate patronizing and externally driven initiatives where as latter may spur endogenous initiatives by people themselves.

Honey Bee network newsletter is brought out in six languages in India (English, Hindi, Gujarati, Kannada, Tamil, and Telugu) and Zonkha in Bhutan so that dialogue with the people takes place in their own language. The creative people of one place should be able to communicate

with similar people elsewhere to trigger mutual imagination and fertilize respective recipes for sustainable natural resource management. The Honey Bee network is headquartered at SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions c/o Prof Anil K Gupta, Indian Institute of Management, Ahmedabad),an autonomous NGO.

It is realized that the technological innovations cannot survive without institutional innovations and support structures. Hence we have been documenting the ecological institutions which have been evolved by the people to manage knowledge and resources as common property.

Honey Bee insists that two principles are followed without fail: one) whatever we learn from people must be shared with them in their language, and two) every innovation must be sourced to individuals/communities with name and address to protect the intellectual property rights of the people.

It is possible to take the current global debate on biodiversity and peasant knowledge beyond rhetoric. Our network extends into 75 countries at present. Some of the colleagues have started similar documentation in their respective regions. Offers have been received from Nepal, Sri Lanka, Uganda, Paraguay and Mali for local language versions.

Honey Bee has already collected more than five thousand innovative practices predominantly from dry regions to prove that disadvantaged people may lack financial and economic resources, but are very rich in knowledge resource. That is the reason we consider the term 'resource poor farmer' as one of the most inappropriate and demeaning contributions from the West. If knowledge is a resource and if some people are rich in this knowledge, why should they be called resource poor? At the same time, we realize that the market may not be pricing peoples' knowledge properly today. It should be remembered that out of 114 plant derived drugs, more than 70 per cent are used for the same purpose for which the native people discovered their use (Farnsworth, 1988). This proves that basic research linking cause and effect had been done successfully by the people in majority of the cases. Modern science and technology could supplement the efforts of the people, improve the efficiency of the extraction of the active ingredient or synthesize analog of the same, thereby improving effectiveness(Gupta, 1991).

Honeybee in that sense is an effort to mould markets of ideas and innovations but in favor of sustainable development of high risk environments. The key objectives of SRISTI thus are to strengthen the capacity of grassroots level innovators and inventors engaged in conserving biodiversity to (a) protect their intellectual property rights, (b) experiment to add value to their knowledge (c) evolve entrepreneurial ability to generate returns from this knowledge and (d) enrich their cultural and institutional basis of dealing with nature.

Of course no long term change in the field of sustainable natural resource management can be achieved if the local children do not develop values and a worldview which is in line with the sustainable life style. Thus education programs and activities are essential to perpetuating reform. That is also the reason why we have organized biodiversity contests among primary school children to identify little eco-genius.

SRISTI's Strategy for augmenting grassroots innovations

The essential focus of SRISTI is to generate a knowledge intensive approach for development because that is the only resource on which the outsiders also have something to learn and appreciate. Reliance on any other resource in which poor people lack sufficient skill or control tends to make development process highly patronizing. The lessons from SRISTI's approach for design of development organizations as well as sustainable agriculture can be summarized as follows:

1. SUSTAINABLE AGRICULTURE

a. Concern with only urgent and immediate issues will always tend to down play the importance of long term goals. The conservation of plant and animal diversity both domesticated and wild in marginal environments is an example of this kind. Given the fact that very small proportion of local land races are now a days used as parents in the crop breeding programmes implies a weak constituency for in situ conservation of germ plasm. In any case conservation by itself does not generate the same kind of resource rewards as value addition does. The incentives for such a research have to be based on prior work of the concerned scientists and administrators, recognizing the work as extremely important.

b. When generating constituency for conservation of flora and fauna biodiversity it is so difficult, the problems in conserving soil microbial diversity can only be imagined. SRISTI's effort to link monitoring of soil eco system health with developing indicators for discriminating organic soils and screening diversity for other uses brought several seemingly unrelated interest groups together. *Thus, narrow focus in doing short term research may help in building networks but broad focus in long term research may be more efficient in mobilizing research networks for sustainable agriculture.*

c. One should never underplay the importance of voluntarism while exploring the scope of voluntary organizations. Large number of research studies requiring access to natural science laboratories could be pursued primarily through the voluntary help of researchers who shared the mission of SRISTI. In our search for voluntary organizations, we have missed the volunteers without whom much of the social networking become meaningless.

d. The scouting of innovations requires faith in peoples's ingenuity and an eye for detail. We neither use nor advocate the so called participatory methods such as RRA, PRA. Much is talked about participatory research but seldom are people allowed to participate in the intellectual discourse. When five farmer breeders including Takarshibhai, Rajabhai, Mooljibhai and Sundaram presented their breeding approaches and outputs before the participants of International Crop Science Congress in New Delhi, November, 1996, a clear statement had been made. It will not suffice to have the voices of creative people we represented only through their spokesperson or intermediary organizations. Accordingly, in the International Conference on Creativity and Innovation at Grassroots held at IIMA during Jan 11-14, 1997 organized by Centre for Management in Agriculture and co-sponsored by SRISTI, FAO, NABARD, etc., more than seventy five grassroots innovators, men and women participated in the conference. The point is that direct participation of innovators in international and national discourses will improve our understanding of the development process much better and we will realize what makes for so much of research to be irrelevant.

e. The policy dialogue, we feel, should be based on performance rather than promise. It seems that policy makers no more get persuaded by the promises inherent in the various social

policy goals. On the other hand they seem to be far more enthusiastic to support the scaling up of pilot project experiences. It was proved far more clearly when the SRISTI's initiative in setting up an experimental venture capital fund helped in the launching of a larger fund supported by the state government.

f. The new forms of organizations would require partnership between state, corporations and civil society to achieve developmental goals in a professional manner. The experience of GIAN explained next illustrates how such a partnership can be built.

Gujarat Grassroots Innovation Augmentation Network (GIAN)

Knowledge Network for sustainable technological options operationalised through Honey Bee network approach (see figure four) implies that innovations in one part of the world, may seek or attract investments from another part, if necessary, to generate enterprises (whether commercial or non commercial, individual or cooperative) in third place. Several innovative experiments have been started to explore this Golden Triangle of Creativity (Fig four) in institutional context so that policy framework also becomes favourable for such tie ups across the world—a serious handicap in most developing countries despite WTO.

Golden Triangle for rewarding creativity thus requires acknowledging that not all innovators may have the potential for becoming entrepreneurs or have access to investible capital. One could have an innovation say from India, investor from Europe and enterprise in South Africa. Forces of globalization could after all be also mobilized in defense of poor creative people.

Gujarat Government recently joined hands with SRISTI (Society for Research and initiatives for Sustainable Technologies and Institutions) and colleagues from IIMA (Indian Institute of Management, Ahmedabad) and other civil society NGOs like SEWA, Gopal Dham etc., and public sector corporations, to set up **GIAN** (Gujarat Grassroots Innovation Augmentation Network). Incidentally, GIAN in Sanskrit means Knowledge. The idea is to convert innovations into products and services diffused through commercial or non commercial channels with in or among the regions and countries.

Honey Bee Data base with thousands of innovations is also being upgraded to multi-media capabilities so that barriers of *languages, literacy, and localism* are overcome to connect innovators, potential entrepreneurs, and investors across regions. Idea is that using the electronic, textual and oral media, a multi level, language, node network must be put in place so that individual as well as collective grassroots innovations get documented, experimented, disseminated and rewarded in material as well as non material manner (see figure five).

The linkage between survival strategies, Knowledge systems, Knowledge network and sustainable livelihoods has been shown in figure two. Contemporary as well as traditional innovations are scouted, screened for experimentation for value addition or dissemination as such and are then rewarded through various material and non material incentives for individuals as well as for collectives. The policy support at macro as well as micro level becomes important for conversion of innovation into products and eventually into sustainable resource use pattern. The networking of various strategies, actors, and institutions through Knowledge Network leads to sustainable livelihoods apart from mechanisms for conservation of resources and knowledge around it.

One of the major bottleneck has been the insularity of formal research system towards informal innovations. The Research stations or laboratories dedicated and designed to work under

the leadership of knowledge rich economically poor people are yet to come up. R and D for the Poor can not be just an attempt of the 'appropriate technology' kind or some other variants of sub optimal solution. The best of the formal and informal sector have to join hands to compete in the market place. Some initial steps have been taken in this regard in India but much more remains to be done.

Much is said about participatory research and millions are spent in augmenting capacity of formal institutions to 'learn from people' (unfortunately using short cut methods which are neither accountable nor ethically very sound or even scientifically very efficient). However, not even pennies are spent (exceptions apart) in augmenting the capacity of innovators themselves to do research, take risks, and generate new enterprises themselves or through partnership with other entrepreneurs. We perhaps, do not have a single Venture Capital Fund for tiny and small innovations in any developing country. SRISTI and GIAN have taken the first step but a great deal more remains to be done.

The outstanding aspect of most of grassroots innovations is that these are also often green. Thus we are talking about establishing GREEN GIANS all over the world and help transfer technologies from south to north to trigger sustainable future for biodiversity poor western societies as well as for financial capital starved developing countries.

Future organizational choices: Matching Household Portfolios and Transaction costs

We have discussed in part one, the framework for Knowledge Network and part two, the way Honey Bee network has tried to operationalise KN with the support from SRISTI and GIAN. As is evident from the GIAN's creation, the conceptual blocks prevent realization of some very important institutional goals. Since potential of grassroots innovations for diffusion through commercial or non-commercial channels was never explored, institutional innovations for the purpose never took place. There have been large scale conferences and projects on micro credit and for good reason. There has not been a single institutional initiative for invention promotion or venture capital fund for small innovations in third world so far. This is so despite SRISTI's lobbying for this intervention since 1993. Thanks to the generous support through Pew Conservation Scholar Award given to the author in 1993 and equally timely support from IDRC, Canada, several initiatives could be tried simultaneously in the last four years. Once the potential of these ideas was visible, the policy response was not all that difficult in many cases. In some cases, I must admit that policy response at national as well as international level is still very poor. One example is the creation of INSTAR (International Network for Sustainable Technology Applications and Registration). The incentives for local communities and individuals to disclose their inventions, traditional knowledge and unique insights cannot be generated unless their intellectual property rights are protected. The main goals of INSTAR are:

INSTAR (SRISTI, 1993, Gupta, 1996 a,b,c), will seek to achieve the following goals:

- 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 in 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 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 pursue proper patents.

(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 marketeer 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). 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.

Information asymmetries, transaction costs and niches for organizational revolution:

So long as information asymmetries remain high in society, need for information brokering will remain. In annexure one, I have given a matrix having four kinds of household portfolios on one side and eight kinds of ex-ante and ex-post transaction costs on the other side. The purpose of the matrix is to demonstrate various client needs and configurations for which different kinds of institutional innovations are called for. Some of these needs can be met by market or state exclusively. However, for other needs, various kinds of hybrid organizations (Williamson, 1993) may be required. In an earlier study of interface between banks and voluntary organizations, we

had identified three roles of bridges, brokers and 'baniyas' (informal flexible lender). Similarly, one can think of many more roles as illustrated below.

For searching information, the cost to be paid by various kinds of households will be different. A Knowledge Network which is entirely electronic may reduce this cost of clients connected electronically. Therefore, we argued for multimedia, multi level and multi node networks that can connect people without access to modern communication technologies.

The households with low average returns and high variance in the portfolios will be most vulnerable. The cost of searching information, negotiating contract and developing agreement will be enormously high. Without some kind of risk cover or guarantee funds, such farmers may not be able to take much risk. Even if they innovate, they may not be able to scale up these innovations in the absence of venture funds. Because of their dependence on money lenders and other traders, they may not be able to use their ethnic strength adequately.

For monitoring the ex post costs, the traditional leadership or institutions might be able to bring down the transaction costs. However, there is an equally high possibility of free riding in the groups because of decline of traditional institutions. Because of weak economic base, such households may enter in to forward trade at considerable discount in order to obtain advance payment.

The advantage of the matrix is that it provides scope for designing institutional flexibility to incorporate the interest of households with diversified portfolios.

In the context of grassroots innovations and transition to sustainable agriculture, organizational initiatives in the realm of competitive markets, state guarantees, informal institutions, individual information entrepreneur and brokers, multiple contract with the same partners to avoid complexity etc. may arise.

Summing up:

In this paper I have tried to cover a rather large ground ranging from the concept of knowledge net work to flexible institutions for supporting households with varying portfolios. The basic purpose was to demonstrate the choices that exist for creative search for alternatives.

There is no way liberating environment for agriculture and rural development can be generated without creating fifth generation organizations and initiatives. While excessive emphasis has been given to the role of NGOs in rural development, the role of NGIs (Non Governmental Individuals) has not been adequately appreciated. In fragmented markets and disorganized or weak state infrastructure, the individual initiatives as well as group processes in the informal sector become extremely important.

I have suggested that by building upon the existing strengths and knowledge systems of grassroots innovators, new kinds of organizations and knowledge network can be created. It must be remembered that every organization has some resources which can not be optimally utilized within the boundary of that organizations. Inter organizational networking becomes necessary. The various kinds of network may evolve depending upon the interface between households portfolios and supply opportunities.

Honey Bee network, SRISTI, GIAN, and IIMA have collectively explored many of these individual and organization based initiatives. Some of these initiatives have become innovations.

But only a few have moved towards institutionalization.

The global search for accountable organizations, can not be completed or pursue without recognizing that in marginal environments, the conventional organization have proved ineffective. Can developmental theory move beyond organizations into networks so that viable choices become available. The barriers to entry and exit in social network may often be lesser than in the conventional organization. That is the reason Honey Bee network remains informal structure whereas SRISTI and GIAN are formal people oriented science and venture structures.

I may conclude by suggesting the need for exploring the possibility that by paying the ex ante costs more generously, we may reduce ex post costs. In other words if we invest in negotiation (and capacity building), our investment in monitoring may go down. The choice is to make investment of ideas, initiatives and innovations at ex ante stage so that ex post compliance costs may come down. The people would have internalized the needs for rules, sanctions and reciprocity. They will behave in an institutional manner despite being member of various organizations.

It is these internal commands from which spirit and missions for lateral learning, accountable and authentic organizations, initiatives and networks emerge.