

Does Indigenous Knowledge have anything to deal with Sustainable Development?

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Abstract: In this paper, the author investigates that whether indigenous knowledge has anything to do with sustainable development. First of all this has been targeted to work out that how could knowledge be treated as a integral part of culture that has very broadly a material and a non-material part. This has been tried to see that what happens to knowledge of a folk life when culture develops in civilization. Next step is to see how knowledge of the local/folk/indigenous communities of human society systematically work and construct Traditional Knowledge System (TKS). Traditional knowledge is very much functional and still it is heavily value-loaded and dependent on non-adaptive socio-cultural features. Traditional knowledge traits are not always open but sometimes very much hidden in type- so these have to decode from cultural symbols exclusively in the religious laboratory of survival. In a global context this has been tried to understand the necessity of Indigenous Knowledge System (IKS) constructed by summation of TKS worldwide scattered. The aim is to gain Global Public Services from IKS to meet the negative impacts of Globalization especially falling on nature. This looks like a passive support towards Globalization with virtue of Indigenous Rights for the Indigenous Peoples (not to be much discussed here). However, failure of unidirectional development in Global Market Economy has been tried to be mitigated by IKS that has nothing to deal with romanticism but sustainability even at an extra-scientific humanitarian ground. Out of so many services by IKS so to attain a sustainable development; biodiversity management at a community-specific level within a particular ecosystem is exclusive and probably the timeliest approach.

Key Words: Culture, Knowledge, TKS, IKS, sustainable development, biodiversity

KNOWLEDGE AS A PART OF CULTURE

Human like many other organisms stay in society. But these human beings have its cultural domain despite being only biological entity. Human in cultural life have crossed the bar of savagery and barbarism and then become civilized. Civilization has its own definition as it is very much fixed up with mega-constructions and technological breakthroughs, formation of the state, development of trade and commerce based on cash and/or gold as well as emergence of Great Tradition documented in written texture. However, civilized life is more detached from nature and folk life. Generally, it has been found that the traditional values and social norms remain the same and they can be only alerted when there is either a socio-cultural transformation on strict politico-economic / religious line or migration and adaptation to a new eco-geographic region. Deviation in value system and social norms can happen due

to geographic migration of certain population/community to a different climate and ecosystem. Such migration generates a compelling pressure on that population to acclimatize into that new geo-climatic setup and at the same time urges the community so as to invent or accept a new mode of livelihood in due course. The values, norms, customs and beliefs within a society constitute intangible part of its culture which has a tendency to remain the same. However, attachment to these non-functional/traditional values in a society builds up the core of social system and simultaneously assures sustainability among human society and ecology. In other words, if values and norms are started breaking down, there appears a scope of dismantling the sustainable situation. On the other side, this is actually the tangible part of human culture, i.e. the material culture that can be subjected to a more rapid change. This change in material culture can be caused either due to certain inputs from the external side, diffusion and acculturation or for the reason of some innovations and technological outcomes from the inside. This tangible or material part of culture can be altered to a wider periphery because it could be very much subjected to the introduction of new machinery, instruments, tools and techniques that ensure more luxuriant and better standard of living. When material culture has undergone with a lot of alterations in respect to the non-material/intangible part of culture (non-reflective/non-functional); a peculiar situation can thus arise. Such situation is commonly spoken off as cultural lag. Complexity of material culture after a certain limit cannot check itself from influencing the value system and social norms. At this stage, civilization initiates and progresses forward on the basis of rapid growth, technological boom and revolutions (*viz.* agricultural revolution/ 10mya or industrial revolution/ colonial era of 18th century A.D.). But even we can say that a civilized person may not shed all the values and norms of the past folk life. That person in urban scenario can still nourish these norms-and-values in the name of past legacy. Or this may happen due to the reason that still now one cannot deny the applicability of these features in city/urban life which in some way maintain connections with rural/folk life. So, saying that an urban person in city life is totally lack of rural emblem or folk attributes may not always be true. Human in the society actually stay in an overlapping situation of both folk and urban, traditional and modern, culture and civilization, irrational and rational as well as local and global; but the degree of overlapping cannot be determined on a fixed mode.

An individual in family/ lineage/ community/ well-organized society gradually develops a knowledge bank. Knowledge, a related aspect with the factors like value system, normative behavior, customs and belief, justification, truth and wisdom, actually involving many aspects like empiricism, rationalism and constructivism, is a subset of both true and that which is believed. Knowledge might be situated or partial, unscientific or scientific, theoretical or practical, unqualified or qualified and basically categorized into knowing- that and knowing- how. These knowledge traits can be taught and learnt and even shared. New knowledge traits can be emerged out through unintentional inventions (trial and error method) or intentionally (experimentation on the basis of hypothesis derived from summation of certain older and newer facts). These knowledge traits are thoroughly documented when they are more associated to a modern civilized life. They can also be kept reserved and preserved within the traditional value system and social norms while being attached more to traditional livelihood. In the second case, knowledge traits have become so much cultural that they can be treated as integral part of the culture, especially of the intangible culture.

Traditional knowledge traits work on systematically so as to form Traditional Knowledge System (TKS) - this could maintain a “proper balance between mode of exploitation of ecosystem but with certain amount of feed-back and the minimum energy requirement of a given-size population attached to its folk life” (Dasgupta, 2010). The entire folk life is constructed on assemblage of the following factors: non-reflective intangible part of culture (cultural values, social norms, folkways, taboo and traditional belief); reflective and tangible part of culture (set of material apparatus); reflective but non-tangible part (information, knowledge and traditional technologies constituting Traditional Knowledge System/TKS); mode of communication (formal and informal); the network so formed among

agrofacts, artifacts, sociofacts and psychofacts/mentifacts); and the traditional social system (non-adaptive and composed of various institutions). Within a fixed ecosystem, nature reflects on human mind and gives rise to culture of all types: non-reflective intangible part, reflective intangible part and reflective tangible part (such as TKS, highly functional to all the non-adaptive socio-cultural aspects). This whole process happens according to the psycho-biological functioning of mankind as well as functioning of the social structure organized by various institutions, different social fragments and strata (occupation-wise, gender-wise, status-wise, etc.) (Dasgupta, *ibid.*). Culture therefore symbolizes “inner meaning of the folk life and...the relationship among ecology, energy requirement, traditional technological aid, mode of exploitation of nature, population size and the dependence on super-nature” and on this relationship TKS of a folk life is constructed (Dasgupta, *ibid.*). Scientists generally prefer to use the term Indigenous Knowledge System (IKS) instead of TKS. To them, both are equivocal.

INDIGENOUS KNOWLEDGE SYSTEM

Value-loaded traditional knowledge traits of that aboriginal people are themed as indigenous knowledge. Holders of this indigenous knowledge may not need to be always aboriginal, i.e. indigenous; but they have to be long inhalants of a particular place having intimate understanding of the nature/ecosystem/biodiversity. Culture associated with the indigenous knowledge system is therefore regarded as indigenous culture. Indigenous Knowledge could be said that Indigenous Knowledge traits are oral, undocumented, simple; dependent over the values, norms and customs of the folk life, production of informal experiments through trial and error, accumulation of generation wise intellectual reasoning of day to day life experiences, loosed and rediscovered, practical rather than theoretical as well as asymmetrically distributed. Indigenous knowledge may not be as abstract as scientific knowledge. It is often concrete and always dynamic. It relies strongly on intuition, directly perceivable evidence, and an accumulation of historical experiences (Farrington and Martin, 1987). IK encompasses the aspects like theory, concepts, interrelations, factual data and attributive information with a high degree of accuracy (Agrawal, 1989). IK is also regarded by several names, such as, folk knowledge, traditional knowledge, local knowledge, indigenous technical knowledge (ITK), traditional environmental/ ecological knowledge (TEK), People’s Science or ethnology that often look very much confusing and overlapping.

“Now, the supporters of global Market Economy are of opinion to create a universally applicable “Indigenous Knowledge System” (IKS). To them, this system would behave as a part of the Global Knowledge System and simultaneously work parallel to the Global Market Economy on capitalism. It would deliver some sorts of Global Public Service (GPS) through summation of all the TKS and therefore help in reducing the negative impacts of Global Market Economy....In favor of construction of IKS, all the folk communities (each designated as indigenous community) have now to be gathered under the global category of Indigenous Peoples and their respective cultures as Indigenous Culture. This is another kind of Globalization to save this present Globalization of the West who believes in regulation of nature on technology-and-science and no Super-Nature. Backward communities- the precious suppliers of the Global Public Service- are traditionally highly against the Western way of Globalization and therefore they have to be brought under confidence via the elite and advanced sections among them. They have to be provided with universally applicable protective measures... Indigenous Rights for all the Indigenous Peoples...There are again two distinct problems: 1. New way of colonialism and 2. Scope of ethnic conflict among various folk communities regarding their degree of indigenesness (Dasgupta, *ibid.*)” In broader spectrum the Global Knowledge System is constituted by both Modern/Scientific Knowledge System (regulating the civilized and other advanced livelihoods) and Indigenous Knowledge System. At this global periphery, summation of all these indigenous communities is described as Indigenous Peoples and of all these indigenous culture as Indigenous

Culture. Indigenous Knowledge System (IKS) is now-a-days considered very crucial, because it can provide so much information about traditional environment management techniques necessary for sustainable development. Impartial and one-way application of Modern Knowledge System can precede civilization to a new achievement, but it can cause serious damage to environment, geo-climatic situation and ecology and show a complete lacking of sustainability in development programs. This can be lethal to the socio-cultural set-up of the commoners of a particular place. These people can be tribal or non-tribal but basically rural or folk and now suffering from pollution, displacement as well as loss of biodiversity and natural resources that they use in a controlled way and with a feed-back system.

Indigenous communities may be less-civilized or residents of a place that is geographically and/or ideologically far away from civilization. But they may contain rich cultural heritage and with time that culture can grow up to a level of agrarian civilization with somewhat state formation, religious mega-structures, agriculture on a massive scale, complex mode of division of labor, internal trading of agricultural products and subsidiaries, formation of Great Tradition and culture-complexity. So, these communities have their own significance in the context of both culture and civilization. The personality structure as well as social structure of these indigenous communities tells a lot about these people and their socio-cultural life. This information bulk contains indigenous knowledge traits, their systematic applications and many aspects beyond. This information set is thought to be quite helpful for postulation of a both-way interaction between modern and traditional systems that ultimately leads to sustainable development. This sustainable development instead of ongoing single-door developmental process is far opportunistic for creation of an atmosphere in favor of a good all-accepted civilization. With so many advantages and disadvantages, unidirectional development may lead to prosperity of some parts of the entire humanity but at the cost of the rest. That rest part is referred as the deprived and oppressed section of the society that time to time can organize protest against this discrimination or their protest can be subjected by others for some other politico-economic gain. This malpractice of using peoples' sentiment for some other purpose is definitely a serious crime but sensitivity in this entire issue provides a hard shield to this kind of practitioners. So, social researchers conducting their mission on indigenous knowledge study or some other related aspects have to be serious about political and economic manifestations of their work. They have to keep two things very clear while conducting their research:

- 1) Indigenous Communities as the stake-holders of Indigenous Knowledge and Indigenous Knowledge System have become significant because of their solidarity/community sentiment. These people are well-known for vigorous as well as repeating use of magical practices and traditional religious performances in every aspect of life; they do this in order to fill the lack of modern technological assistance to them. These practices and performances are nothing but Little Tradition of these communities. The entire matter is very part of their value system and norms. As these people in their traditional life do not have scripts, written documents and Great Tradition; these are their own folklore, art, craft and performances that symbolically speak out of them. Often these symbols are too expressive to their folk mindset. This mindset or pattern of thinking constitutes their personality structure/World View/Cognition.
- 2) According to the availability of their natural resources, indigenous communities have constructed mode of exploitation of these resources with some sense of resource preserving/ resource cycling/resource feedback in their own way. They may invent new techniques and technologies mostly unintentionally by the process of trial and error. Psycho-biological and/or Structural Functionalism can be held responsible for this. This nature-society interaction is actually very much appropriate to their economic and political life, social system, and village/ community life and social structure.
- 3) Now the trend is in favor of Post-Modernism approach for the sake of reducing the errors that we have met during the ethnographic study due to researcher-informant bias, objectiveness-subjectivity bias and clash between scientific explanations and unscientific/superstitious/supernatural phenomena.

ROLE OF INDIGENOUS KNOWLEDGE SYSTEM IN SUSTAINABLE DEVELOPMENT

As said earlier, indigenous knowledge traits form a working system called in as the Indigenous knowledge System (IKS). Etymology, stability, transmission, distribution and practical implication of IK are various features of IKS. It should not be forgotten that indigenous knowledge is a very sensitive issue, related with cultural identity and ethnicity of this stakeholders. It reflects dignity and identity of the local community. To some extent, IKS of an indigenous community can share itself with the Western and other major Knowledge Systems with a background of more complex culture or even a civilized life. This is because of the fact that communities in this planet perhaps can exist completely isolated from one another. A civilized body has so many things to be learnt from IKS of a nature-bound community, especially at this high time when this planet has severely suffered from so many problems like pollution, global warming, loss of biodiversity, war and economic crises, increasing economic diversity and subsequent fuel and food crises and at the end, use of genetically modified food, bio-piracy, etc.

Rapid developmental activities performed by the market economy of Modern World in this era of Globalization but accordingly face six serious problems as pointed out by UNDP report: Challenges of global warming, Rapid loss of bio-diversity, Crisis-prone financial market, Growing international inequality, Emergence of new-drug resistant disease strains & Genetic engineering [Grunberg, Kaul and Stern, 1999]. So, there automatically arises an urge for sustainable development. “The concept of Sustainable Development has become a common theme in the debates on development strategies; ever since the famous Brundtland Commission introduced this concept in its celebrated Report in the mid-1980s...Brundtland Commission Report defined *sustainable development* as that development which “meets the needs of the present without compromising the ability of further generations to meet their own needs”. The concept was more in the context of the impact of the development process on environment and *vice versa*...the concept of sustainable development should be considered in its wider framework for evaluating the development process and also for evolving suitable development for the future” (Panchamukhi, 2010). Concept of sustainability in that wider context rather than being an economic term only could be classified into four categories: Environmental, Economic, Socio-Political and Cultural Sustainability. In this period of Globalization and Global Economic Meltdown, crises are prevailing on all dimensions: environmental, economic, socio-political and cultural identity; war and terror attacks as well as money and food crises are so common in this post-Cold War scenario. According to Panchamukhi (ibid), environmental sustainability has conceived different gradations: Weak Sustainability, Strong Sustainability and Deep Ecology. Deep ecology develops an ecological wisdom by focusing on deep experience, deep questioning and deep commitment. This concept of Deep Ecology even goes to metaphysical discussion with a constant process of integration of *Ecological* and *Spiritual Consciousness*. It goes beyond the science that only discusses about the Abiotic and Biotic Community within the ecosystem consisting of human, non-human and nature. It tries to incorporate discussion about the spirituality or supernatural where values and norms are expressed by the common people through their folk life, World View, magico-religious performances, material culture, intangible non-functional part of life, pattern of thinking. This is related to Man-Nature-Supernatural relations. Here, human is not the biotic element in ecosystem, but something more- its mind has also to be considered which might work beyond the scientific explanations. So, human gradually moves from strict demarcation of scientific discussion to the domain of humanities. Fro that domain of humanities of those folk people, information or knowledge regarding nature and how to conduct a nature-friendly livelihood with the notion of controlled exploitation of resources could be achieved. This type of knowledge is often looked less-profitable from the angle of pure market economy, but obviously helpful for environmental and other sustain abilities. These traditional knowledge traits are actually kept covert within Mind of these folk people that time to time express through the symbolism of arts-and-craft as well as value-oriented performances (religious/seasonal/ceremonial/regular/occasional). So, any kind of sustainability discussion (whether environmental or others) cannot set itself free from the

virtue of traditional knowledge information and local-level informal innovations of folk people having the closest interrelationship with the ecosystem through value-loaded, community-centric, partial and unscientific/ethno-scientific cultural life. Traditional knowledge has no longer been viewed as part of a romantic past, as the major obstacle to development, as a necessary starting point, and as a critical component of a cultural alternative to modernization (Norgaard, 1984). Traditional knowledge is treated as knowledge of the agricultural and environmental management as well as sustainable development.

DISCUSSION

Indigenous knowledge is very much functional or dynamic in nature. It the information base for a society with both open and hidden-ends. These functional knowledge traits have become integral part of non-functional folk life which has become highly loaded with the value system and norms of the community. So, proper decoding of folk life could give us proper information regarding indigenous knowledge traits and how they systematically work in the fashion of indigenous knowledge system. In order to gather IK traits, domains that have to be decoded within the folk life are folk song, folk proverb, folk etymology and chants, folk music, folk tales, folk literature, folk dance, folk painting, folk sculpture, folk recreation, folk play, folk art and craft, folk cookery, folk settlement and patterns, folk architecture, the notion of time in folk society, weather forecasting, dialectology of folk speech, superstitions, myths, legends, riddles, folk religion folk lore, like sense of right and wrong (folk ways), norms regarding kinship relations and rites of passage (rites-de-passage), folk customs regarding household affairs and agricultural operations and behavior of the folk people, folk dialect to folk technology, various type of organization (political, economic, religious, and social) and ethno-medicinal practices. So, folk people have preserved these functional knowledge traits within non-functional symbols of their respective value loaded folk life. They are well aware of how to apply IK traits in quite a systematic way and so to gain certain nature-friendly Public Services form the so formed Indigenous Knowledge Systems (IKS). So, Public services from IKS are very much helpful in filling up gaps within Scientific Knowledge System and achieving sustainability in development programs. IKS is a multidisciplinary subject and incorporates the following dimensions: physical sciences and related technologies, social sciences and humanities. It could be divided into various domains like agriculture, animal husbandry (including poultry and fishery), handicrafts, tools and techniques, nutrition, health care practices and bio-medicines, psycho-social care, natural and biological resource, management of environmental and bio-diversity resources, disaster mitigation, human resource management, saving and lending, poverty alleviation and community development as well as education and communication; each of these domains is provided with own respective area and manifestation (Mondal, 2009). There should be definite Interrelationship among production and technical practices in a specific farming system, conservation of crop varieties, alternative agricultural production, production of various cash crop/vegetables/spice/fruit and flower, maintenance of the nutrition level and traditional concepts of health, food preservation, labor-oriented hand-loom industry, traditional type of division of labor, ethno-fishery, animal husbandry and poultry, agro-forestry and use of forest products (timber and non-timber), sacred groove, agro-ecology and food web, bio-diversity with feed-back, water and soil management, house construction and kitchen garden, folk taxonomy, magico-religious performances, belief in super-nature, cultural lag, emerging socio-economic challenges, social transformation, sustainable rural and human resource development (Dasgupta, *ibid.*). IKS has therefore very much usefulness in biodiversity conservation, Natural Recourse Management (NRM) and Sustainable Livelihood Development (SLD) [Das Gupta and Saha, 2009]. IKS are tuned to the needs of local people and the quality and quantity of available resources. Holistically, IKS is quite unevenly distributed throughout the globe that is socially clustered. But within a specific society, it looks like the actual knowledge of a given population. There it forms a systematic body of knowledge acquired by the local

people. The knowledge bulk seems to be indigenous in respect to a particular geographic area. All of these farmers, landless laborers, women, rural artisans and cattle rearer are well informed about their own situations and their resources; what works and does not work and how one change impacts other parts of their system. There it is really hard to separate the technical part from the non-technical one and the rational domain with the non-rational sector. On the community basis, IKS could be divided into various domains like Agriculture and Post-Agricultural Practices; Animal Husbandry and Poultry; Ethno-Fishery; Hunting and Gathering; Artisan; Disease Treatment, Ethno-Medicine and Folk Remedy; Traditional Economic and Political System (Banarjee *et al* 2006). Out of so many problems that humanity is now facing, IKS in both agrarian sectors and pre-agrarian situations can highly contribute to the protection of bio-diversity that is now rapidly deteriorating due to pollution, unplanned exploitation of resources and use of genetically modified breeds in the name of meeting the profit level, demands and pressure of common people. Biodiversity in a sense cannot specify to either of flora or fauna, medicinal plants or crop plants, domestic breeds or wild varieties. It would encompass whole of the food chain/food web in the ecosystem. Biodiversity is a public policy as well as a scientific issue. It is stratified into a four-level hierarchy (i.e., genetic, species, ecosystem and landscape). It maintains ecosystem stability. IKS on the other hand provides empirical insight into crop domestication, breeding, and management. It further acts in favor of agro-ecology, agro-forestry, crop rotation, pest and soil management and other agricultural activities. Agro-based IKS also develops guidelines of natural forest management and biodiversity management. It also delivers information about preservation of fruits and vegetables (Lal *et al* 1986). It behaves like a good source of various fermentation processes (Azam-Ali and Battcock, 1998). It is related to application of indigenous fermented foods. IKS deals with manufacture and use of pickles, dry foods, liquor, spices, sun-dried elements, soil preserved food, concept of fresh food and various types of food taste (Fellows, 1997). IKS involves local-level innovation and their transmission to a wider periphery. Actually, farmers remain no longer passive consumers, but active problem solvers (Warren, 1991). It is exclusively related to the traditional non-subsistence symbols and technologies developed without direct inputs from the formal sector (Chambers *et al* 1989). This agriculture related IKS is exclusively related to the communication process between informal and institutional sectors (Slikkerveer *et al* 1993). There is a constant need so to respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional life-styles and that would be very much relevant for the maintenance of sustainability in environment/ecosystem/nature. “So, whether in favor of Globalization or not, in India there is a need to study applicability and impact of IKS. And to do this, the community-specific TKS has to be thoroughly investigated on humanitarian ground, especially about the agriculture, from the paradox of the complex agrarian rural structure- heterogeneous and extra-caste extra-class extra-power in attitude” (Dasgupta, *ibid.*). What is needed for a proper output of sustainable development/GPS/IKS is an appropriate negotiation between development inputs and inner perception of the folk people through their cultural performances/symbols. Cooperatives can play a good role if they are provided with bank and government assistance. That would be helpful for both Micro-Economies as well as traditional economy of Indian rural society the precious source of GPS/IKS. This is actually telling the scope for saving the current globalization by the virtue of a new one with IKS.

CONCLUSION

“There is growing interest at national and international levels in the role that indigenous knowledge plays in participatory approaches to development. Research is generating more and more data showing the relevance of indigenous knowledge for sustainable development” (Slikkerveer *et al* *ibid.*). Basically, in India, the emphasis has been given upon the ethno-medicines, but there is actually a lot to do with other things, especially when it is the issue of IKS including the various domains like social/cultural

anthropology, rural sociology, agricultural economics, ecology, soil science, agricultural education and extension, agronomy, veterinary medicine, fisheries, entomology, forestry, human health, wildlife management, water/aquatic resource management, botany, zoology, international development studies, mathematics, management science, range management, information science, economics, geography, journalism and mass communication, and agricultural engineering. Cultural diversity is closely linked to biodiversity. Information base of biodiversity regarding its proper utility and management depend on cultural diversity and in reverse biodiversity often helps strengthening cultural integrity.

REFERENCES

- Agrawal A. 2004, Indigenous and Scientific Knowledge Some Critical Comments, *IK Monitor* 3.
- Azam-Ali, S. and M. Battcock 1998, Fermented Fruits and Vegetables: A Global Perspective, Rome: *FAO Agricultural Services Bulletin* No. 134.
- Banarjee, S. with D. Basu, D. Biswas, and R. Goswami 2006, Indigenous Knowledge Dissemination through Farmers' Network: Exploring Farmer-to-Farmer Communication, *In* B. Choudhuri and S. Choudhuri, (eds) 2007, Indigenous People: Traditional Wisdom and Sustainable Development, IUAES Inter Congress (Vol-4), New Delhi: IIP.
- Chambers, R. with A. Pacey and L.A. Thrupp (eds) 1989, *Farmers First: Farmer Innovation and Agricultural Research*, London: Intermediate Technology Publications.
- Davis, S. H. and K. Ebbe (eds) 1993, Traditional Knowledge and Sustainable Development, *Environmentally Sustainable Development Proceedings Series* No. 4 World Bank, Washington.
- Dasgupta, A. 2009, The Relevance of 'Indigenous Peoples': A Case Study of the Rajbansi Community of North Bengal, *In* A. Mukherjee with P. K. Pal and R.K. Sen (eds) 2010, Environment and Sustainable Development in India, New Delhi: Deep and Deep Publications.
- Fellows, P. 1997, *Traditional Foods*, UK: Intermediate Technology Publications.
- Grunberg, I. with I. Kaul and M. Stern (eds.) 1999, *Global Public Goods*, New York: Oxford University Press.
- Lal, G. with G.S. Siddappa and G.L. Tandon 1986, *Preservation of Fruits and Vegetables*, India: Indian Council of Agricultural Research.
- Muchena, O.N. and D.L. Williams, Utilizing Indigenous Knowledge Systems in Agricultural Education to Promote Sustainable Agriculture, *Journal of Agricultural Education*, 1991/Winter
- Norgaard, R.B. 1948, Traditional Agricultural Knowledge: Past performance future prospects and institutional implications, *American Journal of Agricultural Economics*, 66: 874-878 pp.
- Panchamukhi, V.R. 2009, Globalization and Sustainabilities: Issues and Challenges *In* A. Mukherjee with P. K. Pal and R.K. Sen (eds) 2010, Environment and Sustainable Development in India, New Delhi: Deep and Deep Publications.
- Slikkerveer, L.J. with G.W. von Liebenstein and D.M. Warren 1993, Networking for Indigenous Knowledge, *Indigenous Knowledge and Development Monitor*, 1(1): 2-4 pp.
- Steinkraus, K. H. 1996, *Handbook of Indigenous Fermented Foods*, New York: Marcel Decker.
- Warren, D.M. 1991, *Using Indigenous Knowledge in Agricultural Development*, Paper No. 127. Washington D.C.: World Bank