Arunachalam, V.
Indigenous Knowledge and Intellectual Property Rights: The Latent Logistics and the Overt Concerns.

Journal of Intellectual Property Rights, 7(2002): 222-232.

Journal of Intellectual Property Rights
Vol 7, May 2002, pp 222-232

Indigenous Knowledge and Intellectual Property Rights: The Latent Logistics and the Overt Concerns

V Arunachalam

M S Swaminathan Research Foundation[†]

Third Cross Road, Taramani Institutional Area, Chennai 600 113

(Received 27 December 2001)

Awareness of indigenous knowledge (IK) and concerns of protecting it are growing over time. Most of the IK descends from ancient tradition and would need a proper validation and documentation. IK is found in a wide variety of areas, but this paper covers only agricultural crops. There are provisions in the Plant Variety Protection and Farmers' Rights Bill, 2000, for registration of farmer-varieties with associated protection and benefit sharing but exclusive provisions for IK protection possibly remains to be focused. Indigenous genetic wealth (IGW), on the other hand, consists of herbs, medicinal plants, landraces of a variety of plant species and such genetic resources. The expression of the characteristic traits of IGW is highly site-specific. To meet the commercial demands of protected IGW, their genetic purity has to be maintained. This would imply maintaining their site-specific trait expression and therefore conservation at their native habitats. Further IK and IGW are tightly linked and cannot be isolated for protection; they must be treated as one integrated unit. These perceptions, the emerging problems and paradigms are discussed in this paper.

Indigenous knowledge (IK) is a term of wide repute, appeal and confusion. Some claim a highly specific boundary and definitive characteristics for IK while a majority concurs that it is a term with a high scope for dynamic flexibility. Therefore, attempting a unique definition, it appears, would, at the most, be an elusive exercise. Nevertheless it seems certain that everyone has a feel of IK and construes it correctly in the context it is used. IK, in fact, permeates wide regimes of human interest, of which agriculture, biodiversity and medicine, to cite a few, are of major concern. The current highlights on patents, patent-related disputes including the origin of the material under patent and the intensifying views on protecting IK, complicates the already-complex territory of IK. In this backdrop, it would be a futile attempt to analyse IK in its entire perspective and therefore this paper confines itself only to agricultural crops. Yet it seems important,

[†]E-mail: biodiversity@mssrf.res.in

in the light of the proceedings of a Chennai Round Table on Traditional knowledge (TK) [1], to analyse the latent logistics of IK against the overt concerns of IK protection. This is attempted in this paper with a few illustrative cases from agriculture.

The word, 'indigenous' connotes something native, often traditional, evolved over a long time. IK therefore could be precepts, practices, diagnostic or prognostic clues, recorded or passed on orally or otherwise from generation to generation. Since such IK has to apply on some test material, IK automatically includes the material subjected to such IK. Particularly, a number of wild species of plants, which possess unique characteristics and more importantly, grown over a long time and hence adapted to sites, come under the purview of IK. In essence therefore, it would be difficult to deal with IK isolated from the associated material. For example, if a preparation made of leaves of an herb cures a disease, not only the IK on the method of preparation but the material, namely the herb, is equally important. Therefore the folk who nurture IK remain the best plant taxonomists simply on their IK of discrimination and individual capacity for identification and should be the best to conserve the material *in situ*. In this context, the concept of providing IPR to IK would immediately imply protecting both the method and the material, as they are not independent but highly interactive (see also p5). Protecting IK would be of direct value when it leads to commercial products and hence, if unprotected, would impose a heavy loss to the country of origin and the people concerned with the products in particular. Several instances of IK are specific to local conditions and the country of origin, such as cures for snake and scorpion bites, jaundice and the like. Such knowledge itself can trigger pursuits by others, including other countries, for their direct use or application in related areas, particularly in the fields of health and medicine. There is thus a strong reason for protection of IK to counter, among others, piracy of potential knowledge. But IK cannot be patented except under the provisions of a *sui generis* system as undisclosed information including trademarks. The WIPO report, 2001[2], argues, in addition, for strengthening 'Geographical indications' to protect any expression, sign or material indicating that a product or service originates in a country, region or specific place (e.g. Champagne, Darjeeling, Sheffield). However, our concern in this paper is IK associated with IGW.

The Intellectual property (IP) needs for traditional knowledge and its holders were first recognized in 1992 Convention on Biological Diversity which binds the signatory nations to the three laudatory goals – to respect, preserve and maintain traditional knowledge (TK), to promote wide application of TK and to encourage equitable sharing of benefits for TK. WIPO report stressed those goals further and observed that there are examples of IK that could be protected by existing IP system. But it was also felt that the present system does not adequately recognize TK holders' rights, and does not effectively insulate IK from

intellectual piracy. Such areas of enquiry, as per WIPO report, come under "legal questions". In addition, it was realized that indigenous technical knowledge holders would have "difficulty in availing themselves of benefits of IP system as well as IP-like rights because of the cost associated with acquisition, maintenance and enforcement of IPR. Further, indigenous peoples, local and rural communities and other TK holders were also hindered by having, generally, little knowledge of or practical experience with formal IP system". Such problems come under "operational questions".

In this scenario, the Protection of Plant Varieties and Farmers' Rights Bill, 2000 recently passed by Indian Parliament, is unique in the sense that, for the first time anywhere in the world, the rights of breeders and farmers have received integrated attention. It deals with farmers' rights of registration of varieties (other than an essentially derived variety) which enables associated protection and benefit sharing. Though IK relating to a farmer variety can be included while applying for registration, there appears to be no specific or exclusive IK protection provisions. But such a need has been recognized and has found a place in the ministerial declaration at the fourth session of WTO held at Doha during 9-14 November 2001. It was recorded as: "we instruct the council for TRIPS to examine, *inter alia*, relationship between the TRIPS Agreement and Convention of Biological Diversity, the protection of TK and folklore."

However, documenting IK is a massive exercise for India, in the context of enormous diversity of areas, dynasties, peoples, habitats, social structure, culture, food resources and consumption patterns. Of interest and appreciation in this context is the project, Honey Bee Network[3]. Essentially it is a mission-mode action plan in which volunteers visit villages, locate the people "who are known for working in a different way from others" and document their ideas, innovations, etc. The network, it is reported, has more than 10,000 innovations, mostly on traditional experience. Likewise, there are numerous illustrative examples of various materials and their associated IK fit for IPR; it would, however, be illuminating to look at a few, but diverse examples.

Bioindicators

In the context of deepening genetic erosion and global interest on developing indicators, bioindicators assume a special importance. The FAO initiative and their software WIEWS (World Information and Early Warning Systems) aim to ensure a dynamic documentation of genetic resources with a view to developing timely alarms for regenerating or protecting the fast eroding regional and indigenous genetic wealth (IGW). This top-down initiative can succeed only if the bottom-most structure, namely, the farmer -conservers, their habitat, the folk culture and the like are strengthened substantially and catalyzed to provide an economic stake for their voluntary efforts and participation in the conservation of IGW. Such an exercise would make the current top-down visualization a bottom-up realization.

A folk song which, when translated from its original *Oriya* language, brought to light clues valuable as bioindicators of IGW (Table 1). For example, insect population dynamics was found to be capable of indicating the extent of degradation of forests[4] and visible symptoms of foliar damage in Poplar species was found to indicate ozone load[5]. Amidst such diverse reported cases of indicators[6], it is not very common to find one plant species indicating the abundance or otherwise of another species. This folk song is an important illustration of IK in that context. However, this IK remains still to be validated or test-verified.

But one illustration on bamboo in the folk song has a defensible basis. Gregarious flowering in bamboo results in abundant seed set through wind pollination. The huge quantity of seed-shed attracts seed predators, mostly rats (species of *Mus* and *Rattus*). With the following rains, the bamboo seeds germinate. All on a sudden, the huge food supply of seeds becomes, unavailable and the rats consequently shift to the farms in the vicinity for alternate food source[7]. In Orissa, rice being the primary crop, this would explain the heavy damage of rat-infested young rice crop resulting in huge chaff at harvest.

The IK of a Gujarat farmer that some weeds are an indicator of soil fertility[3] is another interesting example. But this IK needs more evaluation against variation in soil fertility and other characteristics of the field(s) where it was observed (especially when the field is used to grow various crops and varieties), the climate and seasonal conditions, the time when there was natural proliferation of weeds (its implication in relation to water availability and the like) and the impact of residual or acquired moisture, etc. Such scientific enquiry would only help to understand the limits to generalizing this IK. But, taking it as a consistent observation in that field across years that experienced changes in climate, rainfall and, in general, weather parameters, this IK would be valuable and merit detailed verification and validation.

The examples examined suggest that it is not right to argue that IK should be protected, as it exists, even if there were possibilities. If, for argument sake, such a criterion is accepted, the responsibility for failure of such IK to deliver goods cannot

Table 1—IK on bioindicators

Indicator spp.	Indication
Sal (*Shorea robusta*)	Mango production
Bamboo (*Bambusa arundinacea*)	Chaff in rice
Sabai grass (*Eulaliopsis indica*)	Less soil erosion
Mango (*Mangifera indica*)	Upland paddy yield
Potato (*Solanum tuberosum*)	Bamboo growth
Finger millet (*Eleusine coracana*)	Yield of niger
Redgram (*Canajus cajan*)	Yield of sorghum and foxtail millet

Source: *Khana Bachana* in *Oriya* language (old tribal songs of India)
Courtesy: Sukanta Kumar Sarangi and Bibhu Prasad Mohanty, MSSRF, Jeypore, Orissa

be assigned; neither a commercial formulation could be attempted and even if it could, may not remain sustainable. An example is the popular "fish in a betel leaf" cure of Gowda lineage for asthma that has failed in several cases. It seems justifiable to argue, therefore, that there is a scientific basis behind IK that needs to be validated and documented

Some Mechanisms of Genetic Conservation

There are various types of scented rices indigenous to India other than well-known *Basmati*. Several other rices with unique characteristics including medicinal properties exist in various parts of India [Jeypore tract, Kerala (Wayanad), for example]. A profile of a few such varieties[8] (Table 2) brings to light the latent specifics demonstrating the value of tradition-driven IK. The predominant quality characteristics described in Table 2 indicate that those varieties carry 'functional' genes for those traits, which are maintained at their native habitats under traditional practices evolved by farmers over a long time. Any disturbance in the genotype-habitat-cultural practice coadapted complex would entail the possible loss of one or more of the unique characteristics of the gene repositories. The motivation behind maintenance of varieties carrying those 'genes' is the festivals and functions whose sanctity depends heavily on those rice varieties.

Further, it is interesting to observe that the maturity period of the varieties spreads over November to April (6 months; several such varieties not listed here could be maturing in months not shown). Consequently ,the planting periods of those varieties range over a few months covering usual pre- and post-monsoon periods. Thus there is a built-in natural risk-avoiding recipe available to tribal farmers of Orissa; in case of an unusual monsoon, farmers can choose an appropriate variety, usually their preferred landrace, and its optimal planting period. This crop cafeteria valid to tribal tracts of Orissa is definitely in the regime of IK base encompassing social and livelihood needs.

Farmers living in various tribal areas thus grow, as a routine, those specific landraces consonant to the monsoon

Table 2—Some valuable land races of rice preserved by Orissa tribal farmers for religious functions

Rice variety	Predominant quality	Festivals	Time of maturity (month)
Kalakrishna	Scented	All festivals	January
Tulsi	Scented	*Chaitra Parva*	April
Machhakanta	White slender short grains, good taste	*Manabasa* and *Lakshmi pooja*	November
Mer	Black grains with medicinal properties	Annual ceremony of forefathers	November
Haladichudi	White slender long grains, good taste	*Shakti pooja*	December
Deulabhoga	Bold and short grains, reddish tinge on cooking with mild scent preferred during worship at temples	Temple deities	December

conditions at their habitat. Community gatherings during a festival bring farmers from various tribal areas together, result in exchange of seeds of those landraces and ensure a continuum of conservation.

Utility of Genetic Wealth

The clamour to conserve biodiversity, including crop diversity is justified; at the same time, it must be conceded that crop revolutions have resulted from exploitation of a handful of genetic resources. Well-known examples are of wheat, rice, sorghum, pearl millet and maize. Whether all entries in the gene banks world over have been evaluated and experimented is a moot question. An encouraging example in contrast is the large number of wild plants utilized for various purposes by Indian tribals (Table 3)[9]. Some of those wild species are also of common use across divergent Indian systems of medicine (Table 4)[10]. As we now know, a number of plants of medicinal value have been, or have the prospects of being, used in commercial preparations (Table 5). Several exploratory accounts add more plant species to the list of like importance (Table 6).

Such plant genetic resources are diverse in their characteristics, utility by people and commercial scope. Thus, IGW is a function of the (undisturbed) habitat and community tradition of conserving them; in other words, it is a repository of rare genes governing traits with site-specific expression. In other words, the rearing of those varieties elsewhere may not guarantee their expression. Importantly, such IGW is, at present, being conserved at personal cost for public good.

Need for Sharpening IK with SK

In turn, this would emphasize the need to recognize the IK of farmers used in conserving IGW. At the same time, IK must be validated and where necessary reinforced with IK-consonant scientific knowledge (SK) (in contrast to scientific concepts impractical to be extended to

Table 3—Utilization pattern of wild plants by tribals in India

Particulars	Number
Total	9,500
Medicinal	7,500
Edible use	3,900
Other material & cultural requirements	700
Fibre and cordage	525
Fodder	400
Pesticides, piscicides, etc.	300
Gum, resin & dye	300
Incense and perfumes	100

Table 4—Some examples of species used across various Indian system of medicine (Ayurveda, Siddha, Unani, Tibetan)

Botanical name	Sanskrit name	Tamil name
Indigofera tinctoria L.	Nilini	Avarai
Juglas regia L.	Aksoda	Akrottu
Lawsonia alba Lam.	Madayantika	Maruthani
Myristica fragrans	Jatiphala	Jathikai
Nelumbo nucifera Gaertn.	Kamala	Tamarai
Saraca asoca (Roxb.) De Wilde	Asoka	Asogam

Table 5—Medicinal plants leading to benefit products (e.g. of IK-IPR – commercial link)

Plant	Local name	Country and product	Suggested for
Trichopus zeylanicus[11]	Arogya pacha	India Jeevani	Removing fatigue
Bacopa monnieri[11]	Brahmi	India Memory plus	Improving memory
Phyllanthus amarus	Kizhanellli	India	Treating Hepatitis B infections
Prunus africana[11]		Tropical Africa	Treating benign prostatic hyperplasis
Withania somnifera	Aswagandha	India	Homoeopathy treatment for leprosy, nervous disorders, intestinal infections and rheumatism
Piper longum	Long ppper	India	Absorption of antibiotic rifampicine (RFP); tuberculosis patients can be cured with lower doses of RFP
Oryza sativa	*Njavara*	Kerala, India	Treating an array of stomach ailments

Table 6—Biopesticides from plants: examples of exploratory accounts

Source	Effective against rice
[12]Karanj	BPH; WBPH
Ipomoea	BPH; WBPH
Mahua	BPH
Neem	AGM
Palmarosa	Leaf folder
[13]Swallow root (*Decalepsis hamiltonii* Wight & Arn.)	Weevil Grain borer Flour beetle

BPH: Brown plant hopper; WBPH: White becked plant hopper; AGM: *Angoumois* grain moth (*Sitotroga cerealella*)

farmers' sites holding genetic wealth). In this context, 'the need for combining the ecological prudence of traditional technologies with contemporary bio-, information, space and renewable energy technologies' giving 'due recognition to women's role' has been rightly emphasised[14].

One of the reasons to whet IK with SK is the need to optimize and mobilize the potential of IK in habitats undergoing dynamic changes in the environment, both natural and artificial. For example, the cultivation practices evolved in tribal tracts of Orissa in yester years with a predictable pattern of rainfall and edaphic regimes no longer remain optimal at present. Population-triggered constraints and constantly rising industrial advances, to cite a couple of causes, have contributed to high environmental degradation, which has its fall-outs in the sphere of agriculture too. Recent SK interventions in the tribal farmers' cultivation practices have resulted in significant saving in seeds for planting the rice crop, and eliminated the need to beushering (a form of traditional weeding by wet-ploughing and laddering of a young rice crop); and more important is the substantial yield increases without increasing cost of cultivation[8]. Such a strengthening of IK of cultivation of landraces by SK concepts has found such a favour with tribal farmers of Orissa that

the modified methods of cultivation are voluntarily extended on a farmer-to-farmer mode. A reinforcing recorded example is that of people such as aboriginal Australians. They, until recently, were technologically primitive, but could speedily master industrial technologies when given opportunities to do so[15]. A parallel and known example was that of the farmers of Punjab and Haryana acquiring sophisticated skills in productive agriculture[11].

In this context, there are conceptions involving difficulties in putting them to practice. For example, the conception is that farmer-varieties are mixtures providing a natural risk cover and, therefore, they must be notified and protected. The myriad of questions, given below, that springs as a sequel highlights the hurdles in translating the concepts to action.

- Can we characterize the varietal mixtures? Is their performance consistent and capable of quantification? Or is it only that some performance is assured under wildly harsh growing conditions?
- Many farmer-varieties grown from varied seed lots saved or procured by farmers commonly show varying performance. How then do we attempt to produce seeds assuring stable yields especially when we do not know the components (or their genetic nature) of the mixture? The situation contrasts sharply with synthetics and composites that are also (genetic) mixtures but their components and regeneration methodology are known.
- If we want to protect those farmer-varieties (mixtures) globally, we need to characterize them unequivocally, using conventional (easy) or molecular (relatively tough) genetic tools. Is it feasible? Even if it were, it would imply enormous human resources and funding. In view of the acknowledged site-specific trait expression, such characterization should preferably be done *in situ*. How much proactive thinking has gone into such needs or how prepared are we to tackle the problems?

These issues are crucial, no doubt. But when do we need to protect farmer-varieties and establish the IPR? Obviously when that variety has a demonstrated potential for commercialization, and the indigenous demand across the country other than their native sites is high as also their export value. Further, patent protection is for a short-term and does not immunize the patented material from invasion. To protect a patent even in that short-term, a constant vigil is essential. But there should be a conceived and immediate apprehension that some other country may counterfeit the variety in question, if left unprotected. The argument that one would never know whether such fears are imminent, will lead to an untenable exercise of protecting, on principle, scores of farmer-varieties of the country. Even if we concede that those varieties

command, in an unknown future, high demand for seeds/grain, how are we to meet the demand? How many such varieties could we multiply and keep in potential store?

Indian experience in meeting such demands of even the established high-yielding varieties enjoying a definite government support has unequivocally demonstrated its impossible enormity and this would urge us to agree to 'hasten slowly' in the case of farmer-varieties.

However,there is no denial of the potential market value of genetic resources. It has been observed that the size of their world markets in 1997 was of the order of $500-800 million compared to petrochemicals ($500m) and computer ware ($800m) [16].

Possible Community Initiatives

M S Swaminathan Research Foundation has taken note of emerging gene, ecotechnology and information technology revolutions, for example[11]. Judging the dimensions of the problem, people- and eco-friendly concepts like grain banks, and gene-cum-seed banks with appropriate links to institutional gene banks are under test-verification through desired site-specific experiments.

The principle behind operating various community banks is self-governance by people through their own elected governing council. In such a body, a scientist representative from an organization (including NGOs) that institutionalized the concepts at the villages or sites in participation with people would be included. The prime responsibility of the scientist is helping to keep the community decisions on course and facilitate action plans. In addition, the scientist would also provide technical know-how of new beneficial initiatives and enable e people to learn the do-how. The governing body, being supreme at the community level, would arbitrate conflicts of varied nature that arise during implementation of the programmes and provide acceptable solutions. If, for instance, a wild plant species happens to be the source of varied aspects of IK shared by different communities, the same body, which would have representatives from those communities, would decide how the IK and the plant species could be protected and how the benefits shared. It would also delineate the responsibility and role of communities involved in protecting the plant species on mutual conciliatory consultation. Yet one hopes that such complications may not be frequent; clearer perception and solution have to wait for the occurrence of specific instances. At the moment only a theoretical path can be visualized, a number of intricate problems may arise in due course. Naturally, people would also find solutions at that time on a case-by-case basis. Peoples' contribution to handling several challenging tasks, including revolutionary agricultural production that made India self-sufficient in food availability, provides hope and encouragement. Regardless, it has become abundantly clear that IK-IGW is a tightly linked single unit and must be dealt with accordingly in IPR initiatives.

At this point we must recognize the fundamental differences between

indigenous germplasm and commercial varieties. Most of the expressed concerns relate to farmer germplasm or IGW that need to be characterized, documented and whose seeds need to be genetically purified and conserved securely. Even this is an enormous effort; recognition of this need, necessary funding support and human resources to work on IGW hotspots are crucial.

The foregoing deliberations emphasize a crucial need – that of characterization of the genetic material behind IK if we have to patent and protect the IK associated with them. The genetic composition of farmer- varieties needs to be intensively studied so that not only such farmer-varieties will be characterized, the capacity of farmers will also be built to produce adequate seeds. Until then, the maximum one can think of is to seal, to the extent possible, the free movement of the potential material to materialistic agencies by activating effectively the 'prior informed consent' provision in the Plant Varieties and Farmers' Rights Bill.

More than acts, a constant vigil on its implementation and preventing its circumvention are the needs of the hour. There is no way that an individual; government or a private agency can do this. The only way is to build sufficient capacity with the farmer stakeholders in a participatory mode so that each and every one of them exercises their right to protect their indigenous knowledge and genetic material wealth.

Until capacity building (IK-SK synergy), equitable benefit sharing and sustainably secure livelihood options are enabled at the grass root scale, tangible success in deriving the maximum benefits from IK and IGW would continue to remain a regular cry.

Acknowledgement

The author expresses sincere thanks to the anonymous referee whose constructive suggestions have helped to vastly improve the earlier version of this paper.

References

1 Anonymous, Chennai Round Table on Indigenous Knowledge (Traditional Knowledge) (Madras Institute of Developmental studies, Chennai), 2001.

2 WIPO Report, IP Needs and Expectations of Traditional Knowledge Holders (WIPO, Geneva), 2001.

3 http://www.sristi.org

4 Rodriguez J P, Pearson D L and Barrera R R, A test for the adequacy of bioindicator data: are tiger beetles (Coleoptera: Cicindelidae) appropriate indicators for monitoring the degradation of tropical forests in Venezuela? *Biological Conservation,* **83**, 1998, 69-76.

5 Franz-Bernstein C, Fuming A and Knodl T, Changing conditions of air pollutants in the Nie derlausitz – regional monitoring of ozone levels using bioindicators, *Archives of Nature Conservation and Landscape Research*, **34**, 1995,169-179.

6 Hawksworth D L, Litmus tests for ecosystem health: The potential of bioindicators in the monitoring of biodiversity, in Biodiversity: Implications for Global Food Security, Swaminathan M S and Jana S (eds), (Macmillan India Ltd, Chennai, India), 1992,184-204.

7 John C K and Nadgauda R S, Bamboo flowering and famine, *Current Science*, **82**, 2002, 261-262.

8 Arunachalam, V, Participatory paths to conserving and utilizing plant biodiversity in India. *Biodiversity: Journal of Life on Earth*, **1**, 2000, 9 –20.

9 Anonymous, Ethnobiology in India – A Status Report (AICRPE, MoEF, Government of India, New Delhi), 1994.

10 Darshan Shankar, Ved D K and Geetha U G, 2000, A green pharmacy, The Hindu Portfolio, October 2000, 14-17
11 Swaminathan M S, Science in response to basic human needs, *Current Science*, **77**, 1999,341-353.
12 Sadakathulla S, Raju N and Meerazinudeen M, Ecofriendly pesticides control rice pests, The Hindu, 15 June 2000
13 George J, Ravishankar G A, Pereira J and Divakar S, Bioinsecticides from swallow root (Decalepis hamiltonii) Wight & Arn, protects food grains against insect infestation, *Current Science*, **77**, 1999, 501-502
14 Swaminathan M S, Government-industry-civil society partnerships in integrated gene management, *Current Science*, **78**, 2000, 555-562.
15 Diamond J, *Guns, Germs and Steel: The Fate of Human Societies* (W W Norton & Co, New York), 1997.
16 Kate K T and Sarah A L, *The Commercial Use of Biodiversity* (Earthscan Publications Ltd., London), 1999.