CHAPTER 10

Biodiversity, Open Source and Intellectual Property Rights: Towards Alternative Models and Paradigms

Introduction

Using open source models and perspective some alternative strategies have been evolved so that IPRs do not result in monopolizing access. Some such initiatives are discussed in this chapter. In the later part of this chapter some concrete suggestions are put forth in using open source models in plant genetic resources and the combination of open source models and other perspectives is suggested as an alternative. To illustrate that a case study is given and the alternative solution is also put forth. The objective here to challenge the idea that TINA (There is no alternative) to current IP regime and to suggest alternatives.

Public Domain, Genetic Resources and IPRs: Trends and Issues

The extension of IPRs in plant genetic resources has been compared with the Enclosure Acts of the seventeenth century which privatized collectively owned property and the result was the impoverishment of the peasants and reduction of community property rights.[1] In the view of Boyle this second enclosure extends property rights to what was either common or, thought to be uncommodifiable.[2]

The expansion of IPRS and the extension of IPRS through TRIPS, the relationship between globalization, TRIPS and expansion of IPRs, the privatization of intellectual commons and other issues have been discussed at length by scholars who point out that this expansion has serious consequences for public domain. Whether patents or copyrights the scholars write about the trends that favor private interests over public interests and the necessity to achieve a better balance between public property, private property and collective property. Similarly it has been argued that extension of IPRs to embryonic stem cells, DNA

fragments and gene sequences creates an imbalance and to restore balance the current IP regime needs some changes.[3]

In case of genetic resources they were considered as free for all and part of Common Heritage of Humankind and were appropriated without any regulation or conditions. Now the extension of IP rights has resulted in privatization of what was once beyond the scope of IP. Technological developments have also been a factor in this and the result is that many rights which were taken granted have been threatened or are under pressure. But this has not resulted in fair and equitable sharing of benefits. One approach would be to restore the balance or at least ensure that the IP regime does not create further imbalances or result in new enclosures. Another approach would be to suggest alternatives and workable solutions to the current IP regime and develop strategies that help in sustainable use of genetic resources while fostering innovations and further technological development. It is suggested that the Open Source Model is a paradigm that could be used for this. But Open Source Model is not the solution for all the problems or is a Model that will fit in any context without modifications. The problem of enclosure can be addressed in many ways. One way is to arrive at a balance, between private and public property so that the public interest and using technologies for further innovation is protected. In genomics and biotechnology innovative solutions have been found to arrive at this balance. These solutions are crucial for it is in biotechnology and genomics there has been a phenomenal expansion of IPRs coupled with integration of science and market.[4]

The SNPs consortium is an example of using an arrangement with members from various sectors (commercial, non-commercial, universities, foundations) coming together to create a database open to all and to pre-empt the anticommons situation.[5] The data is in public domain. One reason why even commercial firms opted for this model is if SNP markers were in private databases the cost of using that by pharmaceutical laboratories will

be high. Putting them in public domain helps in creating knowledge. Although the interests of different companies are not complementary having it in public domain benefits all and results in diffusion of research. The consortium uses publication of markers so that access is available. In addition the consortium uses patenting for defensive purposes and to ensure that SNPs' accessibility is maintained. For the purpose of defensive patenting the consortium uses provisional patents and this ensures that date of the particular SNP is recorded and can be used a proof of priority if there is controversy over ownership.[6] The point is it was not altruism but a win-win situation that resulted in the formation of the consortium. There is a trade off between facilitating access and claiming IP rights. It is in the interest of the pharmaceutical companies to have access to data and to negotiate licenses with several small companies would have increased the transaction costs.[7] Rajan's analysis also reveals the tension between the interests of various actors in bioinformatics.[8] There are other initiatives in bioinformatics using Open Source model. Rimmer who has examined the application of open source software and peer to peer technologies in life sciences points out that open source software movement has been co-opted but the open source and peer to peer technologies can be used as strategies for resisting privatization of information. [9]

The Open Source model has also been tried in biotechnology. Although the major supporters of such initiatives at present are research institutes and government funded institutes it has found favor with commercial ventures also. One important objective of using Open Source model is to ensure that further innovation/research is not blocked and Open Source has provided the basis for a contract and license scheme that can meet many objectives.[10] A recent study examines the potential of Open Source model in drug development, particularly for tropical diseases[11]. Another study – a dissertation in progress analyzes Open Source Biotechnology and the relevant business models. The fact that Open

Source thinking is no longer confined to software is acknowledged by The Economist also.[12] There has been a discussion on Open Source Genomics also.[13]

The above examples show that Open Source models can be used in industries other than software and a combination of Open Source Model and peer to peer technology can be used innovatively. In this section some examples have been highlighted as an extensive analysis of using Open Source Model in biotechnology and genomics is beyond the purview of this chapter.[14]

Open Source and Biodiversity

The Open Source model can be adopted in biodiversity conservation and sustainable use and is appropriate where the commons are being privatized or enclosed. Open Source model can be used a defensive strategy as well as a model for production and distribution. As a defensive strategy Open Source model will be relevant where the need is to preserve the commons from enclosure and to prevent misappropriation of genetic resources, traditional knowledge, safeguarding rights of communities and farmers. As an alternative paradigm for production and distribution Open Source model is very appropriate in developing new plant varieties and seeds, farmer led innovation, using bioprospecting to empower communities, utilization of genetic resources, participatory plant breeding for innovation and conservation, access and benefit sharing etc.

As a defensive strategy the examples discussed earlier in biotechnology and bioinformatics can be cited. In case of plant genetic resources such a strategy can be used to ensure that research tools, genes, cell lines, in bred lines and germplasm are available for exchange and fair use without being misappropriated by one institution. A consortium similar to the SNP consortium and can develop public or open licensing plan for sharing technologies and for providing access. In the previous chapter the various licenses available under Open

Source model have been discussed. A suitably modified GPL with a binding MTA can be used and the licenses can be used by the participants to permit others to use their products or technologies. The outline of such a strategy is given below.

A consortium of institutions, universities, research centers and others (including foundations, commercial entities, start ups) can build a database of technologies available for plant breeders in a crop say rice and facilitate access. By a combination of patent pools, licenses the consortium can help plant breeders to exchange information, share developments, and promote innovations. For this at first there should be a policy regarding access and sharing of data/technologies. The broad policy framework will aim at preventing the tragedy of anticommons and appropriation and blocking by using IPRs. Within this framework the different types of licenses can be used to suit the needs of users. A license patterned after GPL can be used with a Material Transfer Agreement where there is a transfer of materials. To provide access to technologies GPL model can be used and conditions can be stipulated so that the technology is not 'enclosed' or blocked.

For example access can be granted to a genetic resource with a condition that the institution which seeks the access will not seek patents on the material per se or on its components per se. The consortium can engage in defensive patenting also to prevent others misappropriating the resource. The initiative by CAMBIA to build a collaborative database of 300,000 patents in agricultural biotechnologies will be useful for researchers and will be available for access to all. This will help researchers to know which patents are available under what conditions. Similarly CAMBIA is developing a gene –transfer technology based on the Open Source model. It is to be managed by a network with 'liberal licensing arrangement' and allows others to use it, build on it and share the improvements.[15]

In Situ Conservation and Sustainable Use of Genetic Resources and Open Source

In Situ conservation has many merits and it is in situ conservation by farmers and farming communities that have nurtured and safeguarded the plant genetic resources for centuries, much before the establishment of botanical gardens and gene banks. In situ conservation still continues to be a significant mode of conservation. In situ conservation can be promoted using Open Source Model and peer to peer technology/model. Under this there will be a network of farmers, research centers, universities and gene banks. The details about the genetic resources available in, in situ conservation will be given in a database with all the relevant information. For the sake of organizing the database can be organized crop wise or region wise. One institution will function as network facilitator and will manage the database. The transfer of genetic resources will be governed by a license similar to GPL and a MTA. The access can be free for small farmers and farming communities or indigenous people. Commercial users will be allowed access to genetic resources available in situ provided they agree to the license, MTA and agree no to seek patents or trade secrets on materials in the form it was received and will not apply for broad patents or patent on genes etc. Thus they are free to use it for plant variety development which will be governed or regulated by a separate licensing and contract agreement with provisions for benefit sharing.

The users can be organized in a peer to peer manner and exchange with them is encouraged as long as some conditions are met. Thus in situ conservation can be complemented by farmer led innovation programs, participatory plant breeding. The in situ conservation as proposed above will result in farmers seeking germplasm/varieties they need and will also result in, in situ conservation of germplasm in different areas.

This model can be used in conservation programs, in addition to the existing arrangements. Valuable germplasm can be conserved by this if additional incentives are

provided to farmers. This model will encourage farmers to try new varieties of plants or germplasm elsewhere and use them and evaluate them.

Re conceptualizing Farmers Rights

Farmers' Rights as an idea has been in vogue for more than two decades. But as argued elsewhere in this dissertation the discourse of Farmers' Rights has undergone changes over the decades and now the international community has left it to the national governments. Looked from a Open Source perspective Farmers' Rights can be conceptualized in a different way and what the Open Source/Free Software offers to customers is right to modify the source without blocking further innovation can be applied here also.

Farmers' Rights can be conceptualized as a bundle of rights which includes the right to modify or innovate without enclosing the innovation or blocking fair use by others. The Open Source community offers quality software which is not free, but which is not covered by patents as well. Just as in Open Source, a license similar to GPL is relevant in case of Farmers Rights.

Just as the users' rights were severely restricted by using shrink-wrap licenses and conditions on copying and use, Farmers rights have been curtailed using technology and law. If hybridization made the farmer dependent on seed suppliers/seed producers, later developments have ensured that Farmer has limited rights over seeds and in many developed nations there is no exemption for farmer saved seeds or for what is known as brown bag sales. The seed is no longer a seed, it is a matter covered by IPRs and licensing arrangements. In other words if seed is the code, then the code is no longer free or cannot be accessed without permission. These developments have eroded Farmers' Rights. The tendency to seek patents on plant varieties and availability of more than one mode of protection has ensured that farmers have been reduced to users with very few rights.

Open Source model can redress this imbalance. Just as Open Source opposes patents on software a Open Source perspective will oppose patents on seeds and plant varieties, particularly broad patents and GURTs. At the same time an Open Source perspective is not opposed to Plant Breeders' Rights. The Farmers' Rights includes right to save seed, exchange seed and to take part in innovations beneficial to farmers. In Open Source there is a developer community which also works as a peer group and is a community that shares information. In one sense farmers can be considered as the pioneering Open Source Community who not only conserved germplasm, but also experimented, selected, tested and propagated thousands of varieties without any centralization or commercial motive. In case of farmers till the advent of modern scientific farming and large scale production and distribution of seeds they have been by and large a community that was self sufficient in seed production. The modernization of agriculture resulted in integration of farming sector with industrial sector and the biotechnology revolution in agriculture is taking this a step further with farmers losing even the little control they had over an essential input- the seed. Empowering farmers to ensure that they have some choice over seed selection and saving is an essential step. But this empowerment is not an issue of technology alone. Real empowerment is possible when farmers can have a say in shaping the research that benefits them. But today the trend is such that public sector research is getting confined to some areas while the private sector is gaining dominance in seed production and development of plant varieties. To turn this logic on its head the Open Source model can be used. A collaborative relationship between plant breeders and farmers can be organized using the Open Source Principles.

Open Source gives users the right to modify and reuse code, besides sharing it with others. But Open Source also ensures that transactions are covered by licenses depending upon the context. At present laws recognize farmers' rights and try to define the same. But with the expanding scope of IPRs on genetic resources and technological developments

Farmers' Rights granted by laws may be negated to a great extent. For example in case of genetically modified seeds although the law may recognize Farmers' Rights, agreements like end user license will result in restrictions on, if not negation of Farmers' Rights. To overcome this, Farmers' Rights can be defined using the Open Source idea and a license based on GPL should become part of seed sales. Such a license will recognize the rights of the farmers and will explicitly provide for them.

It is argued that patents are needed to stimulate innovation and hence patents over seeds, plant varieties are needed. It is also argued that for diffusion of biotechnology in agriculture more investments are needed and these investments will not be forthcoming unless strong IPRs are available. This argument has some merits but in the absence of fair use exemption and research exemption the balance is tilted in the favor of patent holder. On the other hand a recent report argues that the diffusion of agricultural biotechnology is impeded by IPRs and if agricultural biotechnology were to take roots and find wide spread application in Africa weak and not stronger IPRs is needed.[16] Thus irrespective of the case for or against biotechnology in agriculture it is essential that the imbalance created by technological developments and IPRs are set right or at least minimized.[17] Open Source principle ensures that the IP holders' rights are respected and protected and so are the rights of the users.

In fact using a license that permits the use of germplasm/seed for further development without restricting further development by others will restore to a great extent the exemption that was available under UPOV 1978. A tailor made license that can be used by plant breeders and seed companies can incorporate this and they will be at liberty to use germ plasm or seeds for further development or incorporate genes from them in the varieties they develop and claim plant breeders rights or even patents, subject certain restrictions, and, as long as they provide for farmers' rights and research exemption. If laws recognize such a license and incorporate that as a part of the regulatory framework it would strengthen

farmers' rights. This will enable farmers to use seeds for further development. This is essential because farmers' rights also include the right to choose the relevant technology and the right to innovate.

The open source perspective and peer to peer idea can be used to promote farmers' rights as an alternative or as a countervailing concept to plant breeders' rights or patents. The idea of farmers' rights was raised first because plant breeders' rights were recognized by law whereas the farmers' rights or their contributions went unacknowledged. A symbolic gesture of recognition is not sufficient. Peer to peer principle can be used organize farmers as groups of peers and these groups can be formed on the basis of region or particular crop. Later on groups may emerge based on common interests also. In such a peer to peer arrangement to begin with small and marginal farmers can be encouraged exchanging ideas, germplasm, and seeds. This does not require a large organization but a small team to co-ordinate. The peer group in turn can act as a catalyst to facilitate farmer led innovation, participatory plant breeding, farmers experimenting in fields and sharing their experiences besides farmers' interaction with NGOs, civil society groups etc. In a peer to peer network there is both give and take and the users find the sources from which they can get what they need. They also come to know what is available. For example through such a peer to peer group a farmer can offer to share a traditional variety or a new found technique to control a pest or a traditional medicinal process to treat ailments of farm animals.

There are some initiatives that document farmers' knowledge, record their innovations and facilitate exchange of information. For example Honey Bee Network has pioneered documenting farmers knowledge and recording their innovations, recognizing the fact that farmers do experiment. In the process it has built up an extensive database on farmers' knowledge and knowledge of the rural/artisan communities and individuals. In uttranchal seed bacaho andolan has focused on traditional varieties and exchange of seeds

among farmers.[18] Decan Development Society has played am important role in bringing back the traditional varieties and promoting sustainable agriculture.[19] There are many NGOs working on traditional knowledge, farmers' knowledge, traditional varieties etc.

What is being suggested in this chapter is not to duplicate such initiatives. Rather what is being suggested is that an Open Source perspective and a model, (not necessarily a business model,) coupled with peer to peer principle can revolutionize the way Farmers' Rights are put to practice. The networks and the network of networks will create an alternative source of information, technical know how and facilitate sharing of knowledge, techniques and even seeds and germplasm. If Farmers' Rights is given recognition by law, but if the policies and technologies are in favor of seed industry and stronger IPR regimes then Farmers' Rights will be curtailed. In a situation where private sector dominates the seed supply and stronger IPRs are available to the private sector then hybrids and patents will be preferred over open pollinated crops and weak plant breeders' rights. The public sector research if confined to basic research but not production of new varieties will leave the farmers at the mercy of seed companies. Since Open Source provides an alternative framework of IP protection and also a different mode of production, a combination of Open Source and peer to peer network principle can supplement the efforts of public sector research also.

The idea of Farmers Rights can be expanded if we recognize Open Source model as an alternative or complementary system to the IPRs on seeds and plant varieties. Another idea which is relevant in this context is users' rights and its application to mitigate the negative impacts of IPRs.[20] If Farmers' Rights are considered as users' rights and if the same can be incorporated in anti-trust laws or legislations regulating competition then Farmers' Rights would get strengthened. It is suggested that an Open Source perspective which recognizes users' rights and a re-conceptualization of Farmers' Rights can be combined to

develop an alternative form of protection to farmers' interests in the context of seed monopolies and agreements that restrict the rights of farmers'. [21]

Bioprospecting and Open Source

In case of bioprospecting a major issue is that the communities do not get adequate returns for the knowledge or the resources they share. Often the communities are not even the suppliers of medicinal plants or the genetic resources. Another issue is communities own the knowledge collectively but the patents based on this knowledge or patents using this knowledge as a key component are not with the communities and it is companies that own patents. Of course as argued by WIPO collective entities can apply for patents and hence there is no bar a collective entity representing the indigenous peoples. Since the pros and cons of this idea have been discussed, the same will not be repeated it here.

The idea of bioprospecting was put forth as a win-win solution for biodiversity conservation and utilization of genetic resources and indigenous knowledge, particularly ethno-medicinal knowledge. However it has failed to deliver the results as expected because of various factors as discussed elsewhere. Often it is alleged that bioprospecting is another name for biopiracy. It is also pointed out that the return is pittance for indigenous communities nor adequate funds have been generated for conservation.

The bioprospecting contracts can incorporate Open Source principles and this will be reflected in the contract itself instead of a license similar to GPL. If the ethno-medicinal knowledge is treated as a resource that can be accessed and made use under a license without denying the rights of the communities over the knowledge or resources and their right to use that for innovations and new processes, it is possible to develop a contract giving effect to this. Normally under ABS regimes benefit sharing includes access fees, some money as upfront, royalties in the event of commercialization and the IPRS arising out of the product developed are vested with the bioprospector. In case of Kanis trust fund was created for

community's benefit. But most ABS agreements do not empower the community or enable them to use the knowledge to innovate. This is because the knowledge and resources are considered to be valuable in the initial stages but value addition comes from application of science and technology. The royalty rates are often less 5% or so. On the other hand the bioprospector gets patents and if the outcome is a blockbuster drug it is a bonanza. Since broad patents block further innovation the bioprospecting agreement can contain a clause that while the bioprospector is free to apply for patents he will either provide for research exemption or will grant licenses for others to have access to the patented resource on some conditions. This will result in a better utilization of ethno-medicinal knowledge and genetic resources. The ABS regime can stipulate that while patents will be granted the IPRs will not be used to block further innovation. The community which provides access to knowledge and, or, or , genetic resources can enter in a contract stipulating that it is granting a license to use the knowledge or resources without the right to claim broad patents on that or to use it n a such way that no body else is able to use it. It can be argued that no bioprospector will agree to such conditions and will not evince interest in entering in to such deals.

While this is true the bioprospector will have no option if such features are incorporated as a part of ABS regime or bioprospecting agreements by developing nations. The idea of making disclosure of origin as a mandatory condition and to incorporate PIC as a condition in ABS regime has found favor with developing nations. So this can also be a part of the ABS regime. If software companies can insist on users agreements and licenses why not indigenous communities or developing nations incorporate some rules in ABS regimes so that IPRs are not used in a way that monopolizes the benefits from the genetic resources and knowledge.

Another important issue is often the ethno-medicinal knowledge is used to identify, screen and test plants for compounds and substances with potential therapeutic value. But the

indigenous systems of medicine or the ethno-medicinal knowledge is not used further to develop useful products or new processes. The knowledge needs further development, testing and validation also. But if the knowledge is given in exchange for royalties and other benefits, the IP holder can exercise his right and can prevent the community from developing a similar product or a substitute. While it is true that indigenous communities often lack the technical skills, nor have access to capital and other resources, this need not result in impoverishment or stagnation of ethno-medicinal knowledge or under utilization of genetic resources. They always need not remain as suppliers of raw materials. Moving one step ahead and making value addition will empower them and the royalties and similar sources need not be the only avenue available to them. For example in case of Kanis they shared knowledge and supplied the major raw material. But there was no value addition at their end. Instead if there had been an attempt to develop a process that could convert the raw material into a semi processed state, which they could supply it would have benefited the community more. But such a possibility is not available if the community remains as a provider of raw materials or the ethno-medicinal knowledge is used only in the preliminary stages only. Instead if the ethno-medicinal knowledge is treated as a sort of code over which the communities have more rights than others, and have the right to develop it even after sharing it under a bioprospecting deal then it will result in community empowerment and better utilization of knowledge.

To actualize this, a community can decide that while it is willing to share knowledge and access, it will not relinquish its rights and will not allow misappropriation of the knowledge or uses. For this it can permit defensive patenting. The community will permit others to do value addition or innovate but the value addition or innovation should not result in the knowledge becoming unavailable to the community. With this in mind the community can devise various arrangements including contracts, bioprospecting deals.

Developing nations can benefit from bioprospecting but they should not end up as mere suppliers of basic materials. To actualize the potential of the resources and knowledge they have to invest in capacity building, promote research and development, give incentives for projects that build upon the knowledge of the communities and implement IPR regimes to promote innovations. They should examine how Open Source principles and models can be used in this. They should also give attention to biodiversity conservation and protection of bio-cultural diversity.

Participatory Plant Breeding, Seeds, and Plant Varieties

Participatory plant breeding involves collaboration between plant breeders and farmers in selecting, testing and developing varieties that meet the needs of farmers in diverse agro-climatic zones cultivating different crops.[22] This combines the experience of the farmers and the expertise of the breeders to develop varieties that cater to specific needs of farmers. Normally post green revolution agriculture is characterized by monocultures, application of fertilizers, insecticides etc and the seeds are released for cultivation across nations, often one variety is planted extensively in a continent. For example the earlier varieties of rice (IR-8, IR-36) were released for whole of Asia and were planted in many countries in millions of hectares. Over the years the need for varieties specific to regions or areas was felt and hence agricultural universities and research centers developed varieties specific to regions or agro-climatic zones. But it was a top to down approach in which what farmers needed was decided largely by the experts. The farmers were given training and were covered by extension programs. However the Farmer First approach and participatory research models questioned the relevance and the wisdom of this approach.[23] It was argued that farmers were not mere users and their knowledge and experience should also be taken into account. Moreover it was argued that most projects fail or do not deliver the desired results because the users needs and perspectives were not taken into account in the projects.

Participatory plant breeding is a combination of bottoms up approach and scientific and technical aspects of plant breeding. In this farmers are involved is almost all stages and ultimately as users they are the ones who decide which variety to choose and use. Participatory plant breeding can be combined with in situ conservation of germplasm also. Recent attempts include using biotechnology in participatory plant breeding.

Participatory plant breeding is similar to open source model in many ways. In both users play an important role and 'code'is free. The idea is to develop quality seeds that meet the needs of users than thrusting seeds on them. In open source high quality software is developed and customization and modification to suit the users' needs are permitted. In both there are communities of practice and the extended peer review process is at work. Both are again based on the principle of gift economy. Both recognize that one solution fits all paradigm is wrong and innovation is possible only if the users needs are taken in to account. In fact both seek the active participation of users in the development process. This is also in tune with recent works on innovation which suggest that users can play a key role in fostering innovation.[24] Both resist the idea of commodification , be it of source or seeds. Both also assert that the right of the others to innovate and build upon available source/s germ plasm is a must and there should be no attempt to restrict this right. Both are based on the premise that it is possible to develop and deliver quality, fully functional product through collaborative work. What is al the more interesting about both is that both have emerged as alternatives based on a different mode of organizing for production.

It is suggested that the participatory plant breeding programs should release the seeds under a license similar to GPL and also use defensive patenting if necessary. Right now participatory plant breeding is not a major source of seeds, nor is a major program in plant breeding. Its importance is acknowledged but it is yet to become a major component of plant breeding programs. With interest in traditional plant breeding programs is in the decline and

with more importance given to private sector in seed development and delivery it is necessary that participatory plant breeding is given more importance. Participatory plant breeding can be used effectively to use traditional varieties and improve them.

Universities/research centers with germplasm collection under their control participatory plant breeding can use participatory plant breeding to collaborate with or permit others to use the germplasm or give access to them under a license. Participatory Plant Breeding can be used to develop varieties by them and the varieties can be given to others for seed production and distribution and university can collect a royalty from seed sales and it can also get them registered in the name of the university.

However the full potential of participatory plant breeding can be exploited if farmers are organized on a regional basis. The participatory plant breeding aims at building varieties that meet farmers' needs. The high yielding varieties will do well and give a good yield but they may fail totally also if the farmer is unable to provide the requisite inputs. In case of varieties developed under participatory plant breeding the priority is to ensure that farmers get some yields instead of maximizing yield under ideal conditions. For example a drought resistant variety may not be very high yielding but will not fail altogether in case of a drought.

Just as open source is based on the view that customization and developing the software that meets the real needs of the software can be performed by peer production participatory plant breeding also lays emphasis on seeds that meet the varied needs of farmers.

Open Source and Indigenous Knowledge/Traditional Knowledge

A major issue is how to prevent misappropriation of IK/TK without resorting to IPRs like patents and trade secrets. A license based on GPL can be a solution and this can be incorporated in any transactions relating to IK/TK entered between the community and an

outside entity. The idea of conceptualizing IK/TK as a Limited Common Property has been discussed elsewhere. An Open Source perspective on IK/TK can help in formulating some strategies in preventing misappropriation.

IK/TK can be considered as a (re)source that should not be allowed to be enclosed or misappropriated. One way to ensure is to strengthen the existing criteria on prior art, novelty so that the technical loopholes are not used to misappropriate. Other solution is to encourage communities using IPRs as a defensive strategy. Under this communities will cover IK/TK as subject to licenses similar to GPL so that third party is prevented from making claims that are stronger than that of the communities unless there is a real invention or innovation. Communities can be encouraged to seek patents as a defense strategy only. At the same time the major problem in misappropriation of IK/TK is that since most IK/TK is in public domain poaching and enclosing is easy using IPRs. But if IK/TK is conceptualized as a common property resource then the rules that apply to management of common property resources can be used to protect IK/TK. For example in managing common property resources communities decide on access rights, usage rights and all these rights are subject to conditions. Similarly in case of access to IK/TK some conditions can be imposed and regulations can be enforced. For example a community can decide to share knowledge or give access to genetic resources provided the outsider accepts conditions. These conditions may relate to patents based on TK/IK, commercialization etc.

To put it in other words when IK/TK is conceptualized as available under open access, then it means that no one can exclude anyone else from access and use of that resource. But common property resources are not considered as resources available under open access. Now IK/TK is considered as a resource available under open access, and hence there is little scope to prevent misappropriation. But if IK/TK is conceptualized as a common property resource then the rules of the game are different. As it has been observed for long

genetic resources were available under open access regimes although not all benefited from that.

For example a farming community can insist that germplasm is shared subject to the condition that the rights of the farmers are not endangered by IPRs on varieties developed using that germplasm. Similarly another community can insist that ethno-botanical knowledge when shared will still be available for use by the community and the community will have rights to develop that further or to access the relevant genetic resource. But only IK/TK is conceptualized as a common property resource and the customary rights of the communities over this knowledge is recognized it will be possible to create mechanisms to implement this. This raises an important question – whether information/knowledge can be conceptualized as a common pool resource? This dissertation is not the right place to answer that question but the point is scholars are already talking of knowledge commons and information commons.[25]

It is suggested that a further analysis of common property resources and community management of natural resources can give some ideas that will be helpful in conceptualizing IK as a common property resource and as a resource subject to community management. It is not suggested that IK need not always be treated as a common property resource per se, rather what is suggested is that conceptualizing IK as a common property resource and using insights from research on common property resources regimes will be relevant in formulating strategies to prevent misappropriation and in formulating alternative IP strategies.

Plant Breeding, Agricultural Research and Bio-cultural Diversity

The public sector is under pressure not only to perform better but also to seek innovative solutions for funding. And public sector–private sector collaboration is also encouraged. In contrast the private sector investment in agricultural research and development, particularly in agricultural biotechnology is increasing. Moreover the mergers

and consolidations in agrochemical and seed industry had resulted in the emergence of the a dozen players who are emerging as the key players. While such collaboration need not necessarily be a taboo, only detailed analysis of each such research deal or collaboration will reveal whether it is a win-win deal or not. Again it is worth noting that many commentators suggest that public sector can supplement or complement the role played by private sector and both can engage in a division of labor which will benefit both. Over the years the investment of the private sector in agricultural research and development particularly in agribiotech has increased considerably while there is no corresponding increase in public sector investment in agricultural research and development. Thus while the overall budget of IARCs under CGIAR is less than that of those of the National Agricultural Research Systems (NARS) , the private sector's investment surpasses the combined investment of both. The issue is more than that of investment. It also involves capacity building, conducting research in critical areas and in basic research and research that is oriented to the needs of the poor peasants.[26]. It seems that the support for classical plant breeding itself is in the decline and this has serious repercussions for development of new varieties in public sector. The changes in the intellectual property regimes have affected public sector plant breeding.[27]

The public sector agricultural universities are thus left with few choices. With cuts in budgets and increased expectations in terms of financial viability and resource generation through industry partnership they are forced to rediscover their roles and reorient their functions. So it is no wonder that they view deals with MNCs as a win win deal or such deals are no longer considered as abnormal but as an acceptable practice. And if a University or Agricultural Research Center has a good collection of germplasm it can leverage that for commercial deals. The University can get income in the form of license fees, royalties etc. And the universities, non-profit research institutes are also earning sizeable income by effective utilization of intellectual property rights, although all patents are not cash cows.[28]

In the Indian context also university-industry collaboration is being encouraged and universities can apply for patents and other IP rights based on the research done by them. While the idea of university-industry research per se is not controversial, some deals have been controversial. For instance the proposed collaboration between Indira Gandhi Krishi Vishwavidyalaya (IGKV) and Syngenta had attracted much attention. The proposed collaboration did not materialize and this deal had raised many questions about the way such deals were negotiated and some had even questioned the motive behind such deals.[29] For those who opposed this it is a victory as the deal has not come through. Since the collections in question were the result of the pioneering work by Dr.H.Richaria it is no wonder that civil society organizations took more than a mere interest in this issue. It is an irony that even after ten years the provisions of the Convention on Biodiversity are yet to be implemented although two laws have been enacted for that purpose.

There is no point in blaming the University for showing interest in such a deal. But the picture is not as simple as that. For although the University has collections of rice varieties and rice germplasm the university cannot claim that it owns them. Under the Convention on Biological Diversity the collection is under the sovereign control of Government of India which is empowered to regulate access and to develop an appropriate regime for utilization and conservation of the germplasm in question. And the freedom to operate should not be compromised by agreeing to IPR clauses in collaborations which may bring in financial support and access to technologies but restrict the right to develop products or engage in specific research areas or barring commercialization of products or making the results public.

In this context it worth pointing out that questions relating to rights of farmers and indigenous communities on such germplasm stored in CGIAR centers is yet to be fully addressed. The notion of Prior Informed Consent or benefit sharing and access on a

conditional basis was not there earlier. According to one scholar who has written extensively on these issues

"An issue that has not yet been addressed by the CGIAR or the FAO is the question of the rights, if any, of the indigenous and traditional communities from which seeds may have been collected by the CGIAR institutes, - that collection may have been informed by the knowledge of those communities, or may have occurred without the communication by the collector to those communities of the implications of the act of collection".[30]

Similar concerns have been expressed by civil society groups and questions have been raised as to in whose trust these collections are held and what are the rights / stakes of the farmers and indigenous communities in this. A relevant question is that what are the rights of the farmers and indigenous communities on the collections at IGKV and considering the fact that these collections were made primarily at the initiative of Dr. Richaria, what was the mandate under which they were collected and whether the original objectives are being fulfilled now.

It is suggested that there is enough scope for developing a Biolinux model in plant breeding and development of new varieties, based on the models being used by open source and free software movements. For example using the farmers' germplasm or a traditional variety an agricultural research university can develop a new variety and allow others to develop new varieties using this as long as two conditions are met - the developer allows others to use that for further development and no proprietary right claims like patents are made. Another solution is to allow farmers to modify an improved variety and make it accessible or available to any interested farmer. For example over a period of nine years farmers in Mexico 'creolized' an improved variety of maize into a variety that is better and suits the needs of poor farmers as well.

The MASIPAG founded by a group of farmers, scientists and social scientists has proved that farmers can learn and innovate. Much to the surprise of conventional plant breeders the farmers produced varieties that were crosses between High Yielding Varieties and traditional varieties and the result is something that farmers prefer – pest resistant, good yields with reduced amount of fertilizers applied. Participatory varietal selection (PVS) is another method in which farmers select the cultivars and choose the ones that meet their criterion. It was found that the varieties chosen by farmers performed better than the varieties preferred by plant breeders.

Thus there is enough evidence to show that farmers can be encouraged to innovate and plant breeders can work with farmers to develop varieties that are more suited to the needs of the farmers. In many areas farmers themselves are involved in bringing back traditional varieties into use, exchange and preservation of seeds and in India itself there are at least two successful examples of this.

The top to down model of technology transfer has been proved to be problematic in agricultural research. In case of plant biodiversity there is good scope for a combination of what is called as 'memory banking' and 'gene banking'. By integrating indigenous knowledge in in situ conservation and in plant breeding it is possible to enhance the biocultural diversity

The above discussion is only illustrative and not exhaustive. What is needed is a commitment to such a research partnership with farmers and communities and a plan to put this into practice.

Broadly speaking there are two divergent approaches to plant varieties development and propagation. The dominant view is that Intellectual Property Rights are a must for innovations and further development and hence the stronger the IPR regime the better it is. Hence we are witnessing proliferation of techniques like Genetic Use Restricting

Technologies (GURTs) popularly known as terminator technologies and legal regimes that negate the farmers' right to sell her/his seeds.

It is not argued that universities should shun the private sector and work only with farmers, for to a great extent it is the policy framework developed by the government which determines the options available them. But it is possible that a University may choose to work with both private sector and farmers in different issues. In any such case it is essential that such universities are aware of the intellectual property rights dimension of their research and collaborations. A university can have different sets of policies on IPRs depending upon the client or user. It can provide many exemptions like fair use exemptions to farmers and other research centers while opting for a stronger IPR claims to protect its interests and to augment its revenues in certain cases.

The above suggestions are necessary but not sufficient. For IPRs can affect the FOT adversely unless some changes are brought in the IPR regime agricultural research and applying open source models and paradigm to issues relating to biodiversity and plant genetic resources will not be sufficient to prevent enclosure or misappropriation. One idea is to constitute a patent pool for technologies relating to plant breeding and policies to minimize the harmful effects of patents.[31]

Conclusions

In this chapter the applicability of Open Source models was examined and some other examples were given as solutions. It is not suggested that these would be sufficient. Since this chapter is an inquiry in initial stages these ideas have to be elaborated upon and examined. The idea is that Open Source model and principle can be used to create alternative models to current IP regimes as well as to mitigate the negative impacts of IPRs. Open Source does not negate IPRs, rather it only ensures that IPRs are not used to create monopoly rights to block others from innovating and to enclose what was in the public domain. A theoretical exercise

on public domain in the context of plant genetic resources and applicability of Open Source models is needed but it has not been attempted in this chapter. Thus this chapter should be read as a preliminary inquiry in these issues and the idea was to flesh out some suggestions and models.

Notes and References

---

[1] Rifkin, Jeremy (1998)

[2] "We are in the middle of a second enclosure movement. It sounds grandiloquent to call it "the enclosure of the intangible commons of the mind," but in a very real sense that is just what it is. True, the new state-created property rights may be "intellectual" rather than "real," but once again things that were formerly thought of as either common property or uncommodifiable are being covered with new, or newly extended, property rights." Boyle, James (2003a).

[3] Refer to the discussion in the previous chapter

[4] Cassier, Maurice (2002)

[5] "In recent years, various biotechnology companies have identified and sought patents on large numbers of SNPs, provoking concern on the part of both NIH and the pharmaceutical industry about the potential for balkanization of intellectual property rights in this important resource. Paradoxically, in the Bayh-Dole era, the pharmaceutical industry has enjoyed more latitude than NIH to respond effectively to this threat by placing SNPs in the public domain. Pharmaceutical companies have joined together with the nonprofit Wellcome Trust, a U.K.-based, non-governmental partner in the public Human Genome Project that is not bound by the Bayh-Dole Act, in a consortium to sponsor a SNP-identification effort with explicit instructions to put the information in the public domain. The SNP Consortium has candidly avowed a goal of defeating patent claims to SNPs. The willingness of private firms in a patent-sensitive industry to spend money to enhance the public domain is powerful evidence of a perception that intellectual property rights in the research results could create significant barriers to subsequent research and product development. "

Rai, Arti K, Eisenberg, Rebecca S (2003) at 299.

"Another example of private investment to preempt an anticommons comes in the area of Single Nucleotide Polymorphisms, or SNPs. In the late 1990s, scientists were beginning to appreciate the value of SNPs as "disease markers," which could make them extremely valuable as diagnostic tools. French biotechnology firm Genset was said to have begun filing patent applications in this area. SNPs represent a perfect example of a potential anticommons, since in theory many SNPs might be present in an important gene, such as a common mutated gene that causes a disease.

Merges, Robert. P. (2004) see also **SNP** Consortium website, http://snp.cshl.org for more details.

[6] Cassier, Maurice (2002), Rajan, K.S. (2003),

[7] ".... it ensures that, by immediate release of information into the public domain, the major pharmaceutical companies do not have to go through tedious or expensive licensing procedures with smaller genomics companies." Rajan K.S. (2003).

[8] "What is evident however is that The SNP Consortium is less an attempt to negate market logic as much as it is to redefine the terrain in such a way that 'market logic' is dictated by the strategic interests of the consortium members (whose aims are by no means identical or even co-terminous". Rajan K.S. (2003).

[9] "The open source software movement and peer-to-peer technologies have been co-opted by commercial interests in the field of information technology. It is conceivable that the same pattern will occur in relation to bioinformatics." P. 48.

"Similarly public researchers and even private organizations have much to learn from open source software and peer to peer technology. Such strategies may provide the means to resist the privatization of genetic information'. (P 49) Rimmer, Matthew (2003a).

[10] According to Cukier

"Tim Hubbard at the Sanger Institute, surfing the Net instead of peering into a microscope. His work between 1999 and 2000 on open source licenses for the Human Genome Project, although never used, didn't lie fallow - it supplied the critical groundwork for researchers, lawyers and officials to directly build upon. The fruits of Dr. Hubbard's efforts will be resurrected this fall in an unprecedented approach for the life sciences - an open source contract for access to data on the haplotype map of the human genome, or HapMap. Licensees agree not to use the data in any way that will restrict the access of others, and will only share the data obtained with others who have accepted the same license. It serves to block "parasitic patents" by industry, which could otherwise combine the HapMap's public data with a smidgeon of their own and patent the haplotype, explains Mark Guyer, the director of the division of extramural research at the National Human Genome Research Institute." Cukier, Kenneth Neil (2003).

[11] See Maurer, Stephen M. et.al. (2004) for an analysis of using Open Source Model to develop new drugs. Inevitably this uses the key ideas in Open Source Software development to provide innovative solutions without strong IPRs.

[12] The Economist (2004) http://www.economist.com/displaystory.cfm?story_id=2724420

[13] 8 B.U. J. SCI. & TECH. L. 254.

[14] For an analysis of the Open Source models in biotechnology refer to Janet Hope's dissertation is progress available at http://rsss.anu.edu.au/~janeth/

Hope is primarily interested in applying Open Source in the context of biotechnology industry.

[15] See for details Goetz, Thomas (2003), and about CAMBIA and Open Source see http://www.cambia.org.au/downloads/misuse_of_ip.pdf, http://www.cambia.org.au/main/opensource.htm

[16] Taylor, Michael R, Cayford, Jerry (2003).

[17] A discussion on the relevance or irrelevance of agricultural biotechnology is beyond the scope of chapter/dissertation.

[18] Kothari, Smitu (2003).

[19] Satheesh, P.V, Pimbert. M (1999)

[20] See for example on users' rights and TRIPS, Dreyfuss, Rochelle Cooper (2004)

[21] Since this idea needs to be developed further it is not discussed in detail here.

[22] Cleveland and Soleri (2002) give an extensive analysis on participatory plant breeding.

See McGuire. S. Manicad .G & Sperling. L (1999) for an analysis with case studies and also the write up on PPB at http://www.prgaprogram.org/index.php?module=htmlpages&func=display&pid=9

See also Cleveland and Soleri (2002a), Sperling, L et. Al. (1993)

There is an ever growing literature on participatory plant breeding. Since the idea is not to discuss that in details but to highlight the potential an extensive listing of the literature is avoided.

[23] Buhler, William et. al. (2002)

[24] Douthwaite,B (2002), See also the papers available at http://opensource.mit.edu/online_papers.php

[25] Hess and Ostrom (2003)

[26] On international agricultural research, biotech and privatization see Anderson, J.R. (1998) Byerlee, Echeverria (2002a), Byerlee & Fischer (2002b), on IP issues and Agricultural Research see Adams, Henson-Apollonio (2002), Salazar et. al. (2000), Erbisch & Maredia (1998), Bragdon (2000), Wright (2000). The list is only illustrative. See Duttfield, Graham (2003) for an overview of IP and life sciences, particularly in agriculture and biotechnology. See also Jackson, Lee Ann (2000).

[27] "... until the 1960s, breeding for crop improvement was largely a public endeavor, but a survey of US plant scientists in the mid-1990s found more than twice as many breeders in the commercial sector than at universities and government agencies combined. And although breeders' skills are still alive in the private sector, they are now working to subtly different ends. For seed companies and

agribiotech firms, the top priority has been developing crops that can maximize profits from the intensive agricultural practices that are widely used in the developed world." Knight. J (2003)

[28] In 2000, institutions of higher learning reaped more than $1 billion in patent royalty income, and they highly value such revenues since they can be used for any purpose. However, of the 200 patent licensing offices that American universities support, only 19 earned more than $10 million; only 50, more than $2 million. Like most athletic programs, the large majority failed to earn an appreciable profit. Bok (2003).

[29] See Krishnakumar, Asha (2003), Krishnakumar, Asha (2004) See also the reports in http://www.ukabc.org/syngenta_foiled.htm, http://www.indiatogether.org/opinions/guest/riceigkv.htm Interestingly this deal raised concern about interpreting the term 'in the form received' under ITPGR.

[30] "An issue that has not yet been addressed by the CGIAR or the FAO is the question of the rights, if any, of the indigenous and traditional communities from which seeds may have been collected by the CGIAR institutes, - that collection may have been informed by the knowledge of those communities, or may have occurred without the communication by the collector to those communities of the implications of the act of collection". Blakeney (2002b).

[31] See Resnik (2003) for a discussion on biotechnology patent pools.