INTELLECTUAL PROPERT RIGHTS (IPR) -A CHALLENGE FOR SUSTAINABLE DEVELOPMENT OF INDIAN AGRICULTURE

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INTRODUCTION

The progressive commercialization of agriculture in the developed countries has been linked to the decreasing importance of agriculture as an economic activity and as a provider of employment. It is a great question, how can IPR play major role in the food security concern of the developing countries. The introduction of genetic engineering has had tremendous implications on the agriculture related policies and legal framework. India is also confronted with acute environmental problems and crisis during the last three decades. There is growing realization that the rising biotic pressures, extension of agriculture into fragile ecosystems, over exploitation of ground water, excessive use of chemicals and pesticides, salinity, alkalinity, improper farming practices, deforestation, overgrazing and increasing cropping in undulating lands, bounding without vegetative cover lower yields, shifting cultivation, flooding of low land, regimentation of small tanks and reservoirs etc. Excessive cultivation of hybrid varieties of crops has opened the path for monoculture and genetic erosion .Modified crops pose another threat to human as well as animal health. It is also presumed that entry of MNCs into agricultural economy will make the farmers dependant on them for seeds by losing their traditional rights of seeds protection for next harvesting session. In order, to deal with the crisis India should adopt legal, administrative and institutional reforms, appropriate research investments, and first rate science and technology capability.

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ENVIRONMENTAL PROBLEMS:

India is also confronted with acute environmental problems and crisis during the last three decades. There is growing realization that the rising biotic pressures, extension of agriculture into fragile ecosystems, over exploitation of ground water, excessive use of chemicals and pesticides, salinity, alkalinity, improper farming practices, deforestation, overgrazing and increasing cropping in undulating lands, bounding without vegetative cover lower yields, shifting cultivation, flooding of low land, regimentation of small tanks and reservoirs etc. Nutrient stress, soil erosion, sedimentation acid precipitation, pesticide pollution, land degradation and surface mining are also some of important factors are threatening the future of India agriculture and the livelihood security of its people.[i]

BIOTECHNOLOGY AND GENETIC ENGINEERING:

Biotechnology generally refers to the manipulation of living organisms and is in fact ancient practice. In agricultural biotechnology the scientists use to understand and manipulate the genetic make-up of the organisms for the use in the agriculture. Genetically modified organisms such as transgenetic seeds are modified by the application of transgenes or recombinant DNA technology, in which a transgene is incorporated into the host genome or a gene in the host, is modified to change its level of expression.[ii] Genetic engineering is used in a situation where a desired trait is found in an organism, which is not sexually compatible with the host. The main distinction between conventional breeding and genetic engineering is the latter's ability to move genes across species barrier

Genetic engineering includes insect restraint traits such as where genes that produce the insect-killing toxins in bacteria *Bacillus thuringiensis* (Bt) are transferred into the crop plants.[iii] These crops have been promoted as a way of killing certain pests and reducing the application of conventional synthetic pesticides. It also includes herbicide tolerant traits whereby an herbicide tolerant gene is inserted into the plant that enables the farmers to spray wide-spectrum herbicides on the fields killing all plants apart from transgenetic ones. These types of crops have become popular among the farmers and it has also provided a boost to the food production of India.

A COMPARISON WITH THE GREEN REVOLUTION

The impact of genetic engineering cannot be measured directly. Therefore a comparative analysis with Green Revolution will clear some pictures. The experience with the green revolution is the areas, which saw the introduction of improved varieties of seeds witnessed a

significant yields increase.[iv] This was not successful only due to the introduction of improved seeds but with the improvement of external out puts like, irrigation, use of chemical fertilizers and pesticides. The goal of the introduction of high yielding varieties was not only to obtain higher yields but also to increase yields per acre so as to reduce the need to cultivate even more land to feed an increasing population. The green revolution brought in India a state of self-sufficiency in the matter of food security.

However despite these achievements the green revolution came under the criticism from the late 1980s. The crop output was significantly increased but it created a lot of environmental impacts. These include falling of water level due to rampant use of tube wells, waterlogged and saline soils came out. The soil fertility was decreased with the excessive use of fertilizers and water pollution with pesticides. The green revolution is associated with the spread of monocultures, which led to homogenization of species, greater vulnerability to insects and pests; and to a loss of agro-diversity. Again the sustainability of the high yielding was questioned because the repeated cultivation of the same crop did not give the same yield as it had given in the first harvest. The improved seeds necessitate the high use of the pests and fertilizers as it raises the cost of cultivation. A survey in the Philippines showed, for instance that while the farmers experienced a 70 percent increase in the yield from rice varieties obtained from the International Rice Research Institute, this increase was offset by a 50 percent reduction in the sale price of rice and a 358 percent increase in farm expenses due to chemical inputs. The end result was thus a 52 percent drop in farm income. The green revolution has now been in part discredited in mainstream policymaking and hopes to revive agricultural output growth are often pinned on the development of transgenetic products.[v]

Though the genetic engineering and IPR differ a lot but the introduction of genetically modified crops can invite the similar situation through India had already passed. The green revolution package like the introduction of patented varieties focuses on monoculture and on yield enhancement. Further they both lead to the diminution of the farmer's ability to save seeds. In the green revolution system the farmers are not bound to purchase seeds every year but under IPR regime the farmers cannot replant the saved seeds. Green Revolution also teaches that the huge production of food is not sufficient but the environment sustainability and the protection of farmer's rights are the sole concern of a nation. Therefore, a system must be evolved in which all the purposes can be satisfied.

Intellectual property rights have the potential to foster the development of commercial sector crops by the formal private sector such as horticulture.[vi] Generally, the introduction of

intellectual property rights in the agriculture tends to increase the dichotomy between what is recognize as scientific knowledge and worthy of protection and the scientific and technical knowledge of farmers and other local actors, which cannot be protected through intellectual property rights. This leads to the consequence that the knowledge which is not protected by monopoly rights and is in the public domain is freely available and cannot be protected by holders they have consistently ensured that the knowledge was secret.

IPR AND AGRODIVERSITY:

India's agro diversity is a most significant one in the world. This diversity is the result of thousand years of farmer's selection, experimentation (even cross breeding) and propagation of desirable traits of desirable species in innumerable ways for their subsistence and cultural purposes. Over the years this unparallel diversity of various crops of India has been eroded. Replacement of land races (a crop cultivator that evolved with and has been genetically improved by traditional agriculturists, but has not been influenced by modern breeding practices) or TVs(traditional varieties)by MVs(modern Varieties)or HYVs (High Yielding Varieties) is one of the most important reasons. Genetically uniform MVs that are being cultivated from Kashmir to Kanyakumari have only eroded TVs but also damaged irreparably the diversified cultures, cultural expressions and promoted the regional disparity. Promotion of genetic uniformity in the name of agricultural development (so called Green Revolution) cannot lead to the sustainable agriculture and it has devastating effect on food security of future generations.[vii]

Agrodiversity:

India is classified among the 12-mega diversity centers of the world, in relation to crops. As many as 167 species of crops, 320 species of wild crops and several species of domesticated animals have originated here. Some examples,Rice-50,000 varieties,Mango-1000 varieties,Sorghum-5000 varieties (based on the information of National Bureau of Plant Genetic Resources).India is the region of diversity of many major cultivated crops like, rice, wheat, maize, cotton, mango, pepper, sugarcane and groundnut etc.(source-FAO of the United Nations, Rome,1997)

The Indian rice variety originated from Chhatisgarh, which is home to some rare rice varieties in the country. It has varieties with varying harvesting period from 60 days to 150 days from the time the seeds are sown. The largest rice variety (dokra-dokri); varieties that can grow under 10 feet of water (Natrgoidi); several varieties that are high in protein and

have medicinal properties. These varieties did not come from the laboratories but were produced after years of hard work with ingenuity by generations of farmers of Chhatisgarh. The southern region of Orissa have been considered as a secondary center of origin of cultivated rice. Studies conducted by a project of MSSRF (M.S.Swaminathan Research Foundation in Cuttack, Orissa) have shown that the landraces (traditionally cultivated varieties) from this area could be the primary center of origin of *Aus* group of rice. The landraces of a primary center of origins are assumed to contain many valuable genes particularly for resistance/tolerance to various biotic and abiotic stresses and hence hold promise for their utilization in future plant breeding programme.

GENETIC EROSION OF AGRO DIVERSITY IN INDIA

Genetic erosion is the loss of genetic diversity including the loss of individual genes and the loss of particular combinations of genes (i.e.gene complexes) such as those manifested in locally adapted landraces. The term, 'Genetic Erosion' is sometimes used in a narrow sense, i.e. the loss of genes or alleles as well as more broadly, referring to the loss of varieties. The evidence regarding the genetic erosion can be presented in terms of the replacement of landraces and traditional varieties by MVs (Modern Varieties). MVs that have been developed under the programme of Green revolution (1966-67) in India, heralded the so called genetic erosion. MVs have wide adaptability in various environments and these seeds are genetically uniform.

A single (Green Revolution) wheat variety, *Sonalika,* covering half of the wheat growing area in North India replaced TVs. The adoption of the Green Revolution in rice in Andhra Pradesh led to the loss of 95 percent of TVs without their collection and documentation.[viii] Five decades ago, each region in the state of Chhatisgarh cultivated 19000 rice varieties, which were suitable to the soil and climate. But in the high yielding variety of rice which were insensitive to the local condition.

After Green revolution of 1960s in India, farmers in the hilly region of Tehri Gorhwal district of Uttranchal state of north India also started using high input sensitive techniques of farming to increase productivity. New improved seeds of high yielding varieties were introduced her, along with range of pesticides, fertilizers and other external inputs. In the race of modernization, the farmers began to rapidly lose their traditional system of sustainable agriculture. Several indigenous practices and seeds (rice and kidney beans0 had already been lost in this area.

The Biodiversity strategy and Action Plan (BSAP) foe West Bengal based on a survey conducted in all 18 districts of the state, states in the post independence phase, it is the production of minor crops which are not considered economically important that has gone down. The BSAP mentions that the progenitor of the cultivated maize, which existed in Sikkim and Darjeeling Hills along with Assam, has been lost. Of the five minor millets such as *ragi ,cheena, kaon ,gundli* and *sawon* only two that is *ragi* and *kaon* have survived.

With the introduction of HYVs in 1960,s the fertilizer (N-Nitrogen, P- Phosphorous, K-Potassium) consumption in the country increased from 65,000 tons in 1950-51, to 2,90,000 tones in 1960-61 and 11,000600 tones in 1966-67 and 19,30,6500 tones in 2000-01. Whereas the net area sown (total geographical area 328.73 million hectares) increased marginally from 41.8%(118.75 million hectares) in 1950-51to 46.6%(142.60 million hectares) in 1998-99. Pesticide consumption also increased drastically from negligible amount in 1950's to 43.58 thousand tons in 2000-01.(source-Department of Agriculture and Cooperation, New Delhi).However the homogenization of agriculture (monoculture) that is market oriented cultivation over past few decades present a not-so-pleasant picture in many parts of the country. While the overall fertility of soil has gone down in some cases, in some other the promotion of rice and wheat has led to the decline of crops such as groundnut and millets.[ix] The policy of government and needs of market sometimes compel the farmers to cultivate the MVs.It not only destroys the traditional varieties but also create a monoculture .By which India has destroyed various traditional crops. Excess use of chemicals and fertilizers will degrade the condition of the soil.

GENETICALLY MODIFIED CROPS AND HEALTH HAZARDS:

Although "biotechnology" and "genetic modification" commonly are used interchangeably, GM is a special set of technologies that alter the genetic makeup of organisms such as animals, plants, or bacteria. Combining genes from different organisms is known as recombinant DNA technology, and the resulting organism is said to be "genetically modified," "genetically engineered," or "transgenic." GM products (current or those in development) include medicines and vaccines, foods and food ingredients, feeds, and fibers. Locating genes for important traits—such as those conferring insect resistance or desired nutrients—is one of the most limiting steps in the process. However, genome sequencing and discovery programs for hundreds of organisms are generating detailed maps along with data-analyzing technologies to understand and use them.

In 2006, 252 million acres of transgenic crops were planted in 22 countries by 10.3 million farmers. The majority of these crops were herbicide- and insect-resistant soybeans, corn, cotton, canola, and alfalfa. Other crops grown commercially or field-tested are a sweet potato resistant to a virus that could decimate most of the African harvest, rice with increased iron and vitamins that may alleviate chronic malnutrition in Asian countries, and a variety of plants able to survive weather extremes.

In 2006, countries that grew 97% of the global transgenic crops were the United States (53%), Argentina (17%), Brazil (11%), Canada (6%), India (4%), China (3%), Paraguay (2%) and South Africa (1%). Although growth is expected to plateau in industrialized nations, it is increasing in developing countries. The next decade will see exponential progress in GM product development as researchers gain increasing and unprecedented access to genomic resources that are applicable to organisms beyond the scope of individual projects. [x]Technologies for genetically modifying foods offer dramatic promise for meeting some of the 21st Century's greatest challenges. Like all new technologies, they also pose some risks, both known and unknown. Controversies surrounding GM foods and crops commonly focus on human and environmental safety, labeling and consumer choice, intellectual property rights, ethics, food security, poverty reduction, and environmental conservation.[xi]

Transgenic technology is highly precise and powerful. It is not a panacea, but has the potential to usher in the much-needed 'Gene Revolution' in the face of a burgeoning population. Transgenic crops undergo rigorous bio-safety tests before they are approved for commercial cultivation and their subsequent performance is also closely monitored. Never before in the history of agriculture has food and feed been subjected to such extensive tests before they are declared fit for commercialization. In this respect, GM food is as safe as, if not safer than, conventional food. The fact that this technology has not caused any untoward incident with regard to human safety or pest resistance emphasizes the high regulatory standards. It is important that such positive messages reach the public so as to remove any misconception or apprehension about this remarkable new technology. India, being predominantly an agricultural country with vast land and human resources, has the potential to become a supreme power in agriculture if modern technologies are appropriately reviewed and suitably adopted**.**

CONCLUSION:

There has been a countrywide debate involving policy makers, scientists, NGOs and other stakeholders on the issue of intellectual Property Rights. They are working to find out a solution, which would benefit both the researcher as well as farmers. There is a consensus on the need of legislating an act of farmers for using the material from the harvest, which was traditionally used, by the farmer from the beginning. Again another important determinant of the productivity is the supply of the improved varieties of seeds. Excessive use f pesticide and herbicides had not only created environmental degradation but also genetic changes of food crops had created health hazards.India should formulate policy keeping the interests of farmers. Farmers are the backbone of India's economy and their interests should be given priority for the prosperity of the country. The MNCs should not exploit the vulnerable section of Indian farmers in the context of IPR. The traditional farming as well as Modified cropping should be promoted. India is famous for its agro diversity but with the advancement of new technology -agricultural biotechnology, India had already lost certain varieties of crops. In the coming years, if certain steps are not taken in this direction, India may lose some species of crops. The excessive cultivation of some types of modified crops endangers the existence of low productive crops.

[i] Noomani Zafar, 'WTO, TRIPs Agreement and protection of plant variety: Imperatives and implications for Indian Intellectual Property Rights Regime', in A.K. Kaul and Ahuja (Ed.). *The Law of Intellectual Property Rights: In Prospect and Retrospec*t 116-133 (2001)

[ii] Barnum R Susan, *Biotechnology-An Intrduction* (1998),p.45

[iii] Philippe Cullet, *Intellectual Property Rights and Sustainable Developmen*t,2005,p.195

[iv] Sharma Rita and Thomas T Poleman, *The New Economics of India's green Revolution-Income and employment Diffusion in Uttar Pradesh*, 1994

[v] This is, for instance, visible in the title of a conference promoting agro-biotechnology organized by the Federation of Indian Chambers of Commerce and Industry, 'International Conference on Agricultural Biotechnology; Ushering in the Second Green Revolution'(2004), New Delhi.

[vi] Philippe Cullet, *Intellectual Property Rights and Sustainable Developmen*t,2005,p.216

[vii] Food and Agricultural Policy Organization (FAO), *The state of world's Plant Genetic Resources for food and agriculture*, Rome, 1997.

[viii] Kothari Ashish, 'For those vanishing species,'*The Hindu Survey of Environment*,1993 (annual) N, Ravi (ed),Madras,pp.44-47

[ix] Kohli Kanchi, 'Cultivating diversity',*Frontline*,2003, N. Rama (ed)Chennai,vol.20

[x] Mangala Rai and Prasanna, B. M. 2000. Transgenics in Agriculture. Indian Council of Agricultural Research, New Delhi, 144 pp.

[xi] Jayaraman, K. S. 2002. India approves GM cotton. *Nature Biotechnology*, 20: 415.