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Role of Trips in Indian Agriculture Sector: Balancing Traditional Knowledge and Biotechnology

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Role of Trips in Indian Agriculture Sector: Balancing Traditional Knowledge and Biotechnology

Vani Aggarwal¹ and Aditya Satpute²

Abstract:

Historically, the onset of green revolution that led to the introduction of high-yielding varieties (HYV) seeds rewrote the growth story of Indian agriculture. In the long term side effects of intensive farming were realized. In the meanwhile this success led to introduction of Bacillus Thuringiensis (Bt) cotton in India. Since then various divergent voices are being raised to protect traditional seed holding rights of the farmers. The policy paralysis due to elusive fear of patent rights has contributed to stalemate in embracing Genetically Modified (GM) crops. The study finds that the heightened scrutiny due to those fears brought new evidence about non-viability of such crops for Indian conditions. The agriculture sector has overcome the stalemate and is silently evolving to embrace its vast cultural knowledge and biodiversity along with non GM technology. The study is centered on the role of trade related aspects of intellectual property rights (TRIPS) and its impact on agricultural innovation lead by traditional knowledge and biotechnology. The data extracted from RBI, FAO and UNCOMTRADE WITS suggests that the share of primary products in the total exports is on decline. Similarly, the yield of Bt Cotton has become stagnant after an initial increase till 2004. After critically analyzing the reasons for current decline, the study suggests a relook at innovation by increasing the research and development (R&D) expenditure in traditional knowledge (TK) and biotechnology by both public and private stakeholders.

Keyword: Agriculture, TRIPS, Traditional Knowledge, Biotechnology

Jel Classification: Q1, O34

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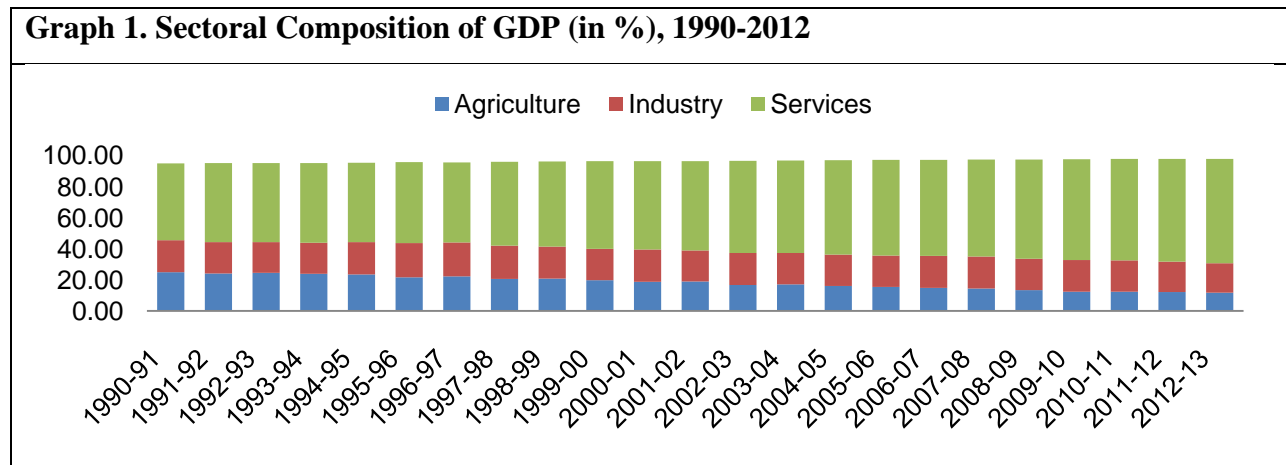
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State of Agriculture in India

Since independence India has made strides in agriculture from being a net importer today it has not only achieved food security through domestic production but also registered a high level of exports in agricultural goods. Globally, India has secured the largest position in terms of agricultural land, 179.9 million hectares (IBEF 2013). India accounts for only about 2.4 % of the world's geographical area and 4 % of its water resources, but has to support about 17 % of the world's human population and 15 % of the livestock (Ministry of Agriculture, 2012-13).

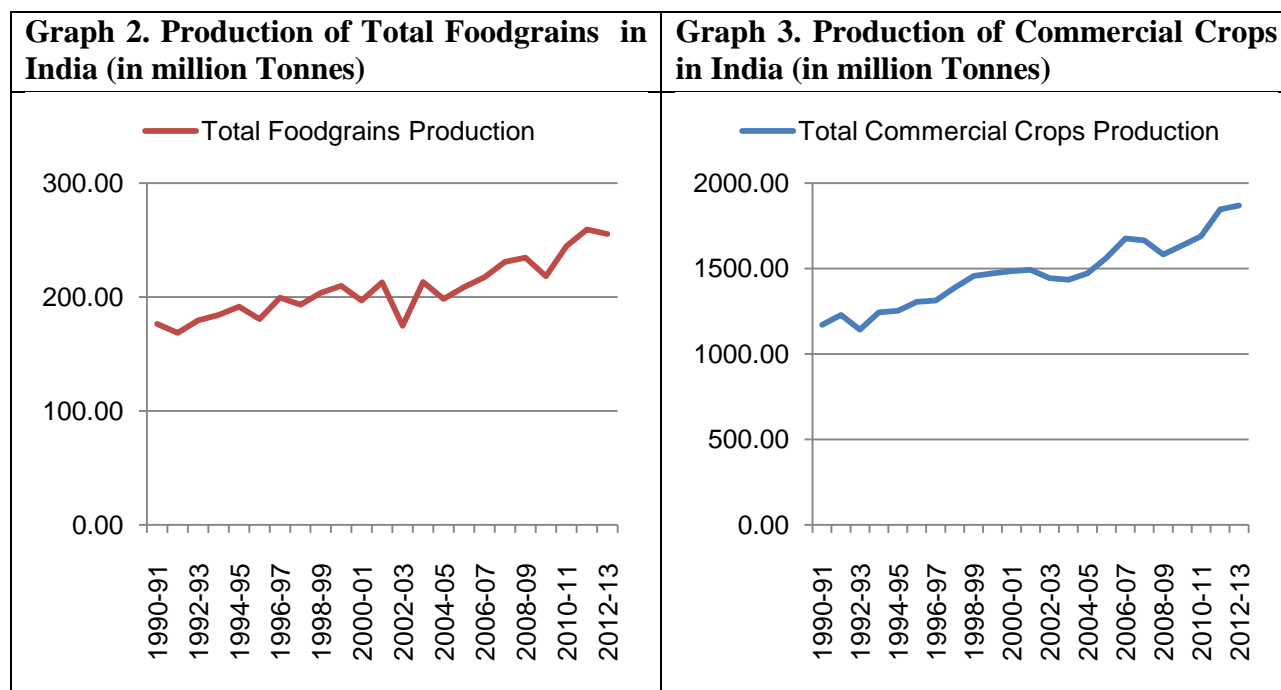
Historically, agricultural growth depicts a stagnant picture of total crop and grain production till 1950s. The onset of green revolution that led to the introduction of high-yielding varieties (HYV) seeds rewrote the growth story of Indian agriculture. It increased the use of fertilizer and irrigation which resulted in a significant spike in production with the attainment of food security. Agriculture growth contributes 14% to the India's gross domestic product (GDP) and about 11% of its exports (Ministry of Agriculture, 2012-13). Graph 1, depicts the sectoral composition of GDP over the time period. Services sector contributes the most in the aggregate growth rate of the Indian economy, while the share of agriculture sector in the growth rate is decreasing with the passage of time.



Source: RBI³

³ Available at <http://dbie.rbi.org.in/DBIE/dbie.rbi?site=statistics>, accessed on 15/12/2013

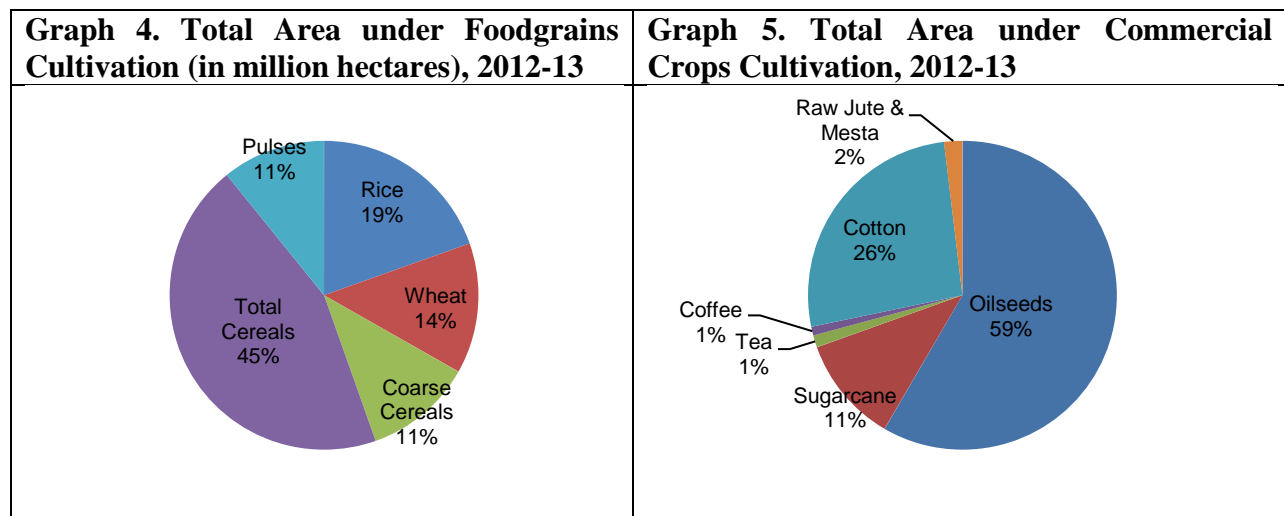
After 1980s, there has been expansion in cereal production and introduction of reforms in 1990 helped India to emerge as a net exporter of agricultural products. The decade after reforms brought in better technology in the agriculture sector by multinational players. Rise in institutional credit and government support improves the growth of the sector in the Indian economy and opens the door for innovation. Graph 2 shows that total production of food grains are increasing as India has become self-sufficient in food grains, however, the production of commercial crops are increasing at increasing rate after liberalization (Graph 3).



Source: RBI⁴

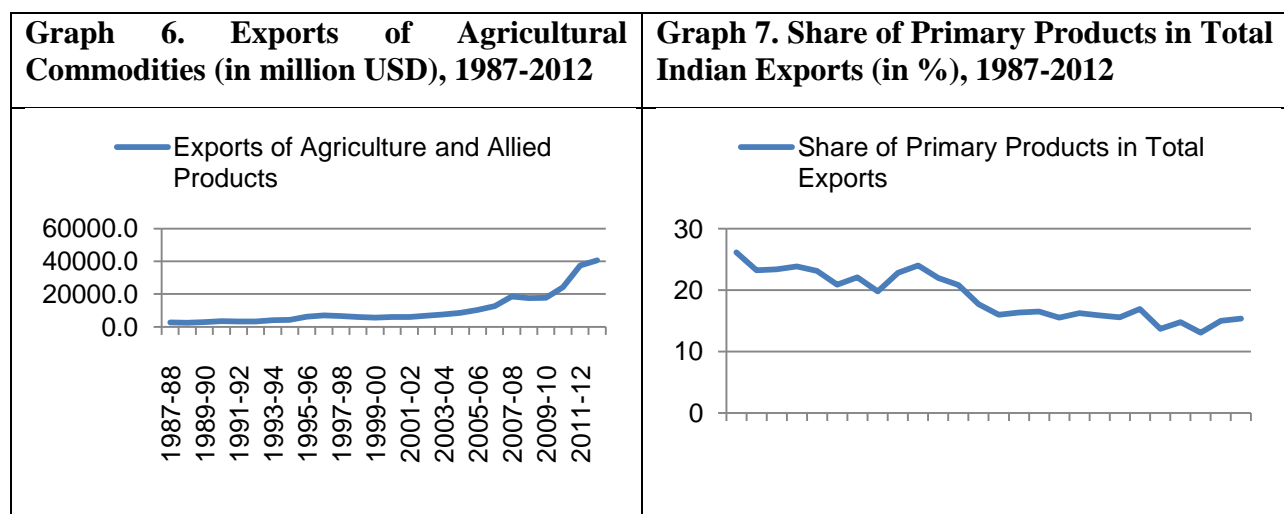
This clarifies that India is a major producer of commercial crops as it contributes more in the total exports of agricultural commodities. There are various crops which includes under the category of foodgrains and commercial crops. Graph 4 and 5 shows the total share of various crops under foodgrains and commercial crops cultivation. Cotton and Oilseeds dominates the area under commercial crop cultivation, whereas, rice, wheat and cereals shares the major area under foodgrain cultivation.

⁴ Available at <http://dbie.rbi.org.in/DBIE/dbie.rbi?site=statistics>, accessed on 15/12/2013



Source: RBI

Commercial crops support the total exports of agriculture and allied products, which shows a significant growth in recent years (Graph 6). In contrast, the percentage share of primary products in total exports is decreasing post liberalization (Graph 7).



Source: RBI

Reasons for the decline may be Indian agricultural commodities are less competitive in an external environment, lack of innovation which makes the exportable goods expensive. The contribution of innovation through traditional and scientific know-how in plant breeding, water-nutrient management, control of pests and diseases has led to substantial increase in crop productivity in India.⁵ Thus knowledge whether traditional or scientific has been the central focus of the agrarian society in India. Incidentally innovation through agriculture knowledge,

⁵ Committee on Agriculture, Cultivation Of Genetically Modified Food Crops –Prospects And Effects, Available at <http://bit.ly/1hHUYCB>, accessed on 15/12/2013

science and technology also holds the key to make Indian agriculture more progressive domestically and competitive internationally. However, in light of the findings about the long term side-effects of adopting intensive farming and the steady decline of GM technology, there is a need to revisit the idea of innovation.

The paper looks into the comparative advantage of Indian agriculture keeping in mind the increasing opportunities in International market for organic products. The study assesses the role of TRIPS agreement by analyzing provisions relating to agriculture and its regulation in India. In the later part of the paper analyses the scope of biotechnology and TK in the context of TRIPS agreement. The last section of the study provides a way forward.

Comparative Advantage of Indian Agriculture Sector

Over the millennia traditional wisdom and practices considering the subtle differences of soil and climatic conditions has helped evolve vast high yielding plant varieties. In 1970s, technological breakthrough has been the prime mover and spread of technological changes to wider areas and crops has been the main factor during 1980s. More than 50,000 varieties of rice are now produced in India; free holding rights allowed farmers to harvesting and reuse the seed of any rice variety leading to a healthy diversity. The interest of industries relating to biotechnology, pharmaceutical, cosmetic, health care industries has increased in the natural and organic sources of compounds, biochemical, herbs and agro-products. The resurgence in this TK)due to demand for new organic product market has stimulated its importance. Commenting on the background of agrarian economy in India the Technical Expert Committee (TEC) in its report to the Supreme Court (SC) observed, “India with its large biodiversity is a major center of origin of several crops and has arguably the longest continuous history in the world of high intensity agriculture which has formed the basis of an agrarian society that continues to grow and develop in the present day”⁶

⁶ Final Report of the Technical Expert Committee (TEC) in Writ Peition (Civil) No. 206 of 2005, Aruna Radrigues and Ors Vs. Union of India (SC)

India has unique repositories of TK, associated with medicinal plants. The TK is very important for bio-prospecting and development of new drugs. It needs to be preserved for perpetuity and posterity. In due appreciation of the needs for preservation of TK, the National Medicinal Plants Board (NMPB) has supported a project of National Innovation Foundation to “develop database of less common medicinal plants by way of compilation of associated traditional knowledge”. The project would encourage the protection of Patent Rights and IPR.

The traditional agricultural knowledge, science and technology (AKST) can help achieve a more sustainable development model. The current constrain is that TK is not systematically documented either in rural systems or modern publicity media.⁷ The progressive expansion of commercial-industrial relations in agriculture has put further strain on many small-scale farmers. Traditional farming in India is in direct competition from production systems that are highly subsidized and capital intensive, and thus able to produce commodities that can be sold more cheaply.⁸

TRIPS and TK

Unlike the efforts to recognize and encourage modern technological development by evolving different regimes of IPR protection, the TRIPS agreement completely ignores the contribution of vast cultural and TK to spur innovation. The resounding controversy around TRIPS is not as regard to what is included in the agreement as much as what is not included. The TRIPS agreement is conspicuously silent with regard to the need to equitable share benefits of knowledge related to biodiversity and its protection. As highlighted earlier patent can be granted for invention, product or process which is novel, inventive step and has industrial application but most TK fails this test for novel/new standard. The Article 1 of the TRIPS agreement also makes it sufficiently clear that members are not required a more extensive protection. As the agreement is based on MFN principle an extensive protection granted by one member is not necessarily protected by another. *Albeit* it does not stop members from extending extensive protection on basis of reciprocity as done in case of registration for wine/spirits by the EU. A justification to

⁷Gahukar, R.T., intellectual Property Rights and the Management of Traditional Knowledge in Indian Agriculture, journal of Knowledge Management Practice, Vol.11, No.2, June 2010

⁸ IAASTD, Agriculture at Crossroads

strengthen the current regime for forming a global register for TK can be found under Article 7 of the TRIPS.⁹

The situation is particularly alarming as the lack of protection for inventions derived from holders of TK is manipulated for private interests. For instance, the US granted patent on ‘use of turmeric for wound healing’, which was only withdrawn after protest from India, as the knowledge being part of community heritage and lacks novelty. Many developing countries are concerned over grant of such patents under TRIPS agreement over biological resources and associated TK of their local and indigenous communities as it legalizes bio-piracy. The absence of organizational and financial competencies to monitor and register such knowledge and grant compensation for commercial use effectively has left things in the hands of god.

To design a regime for recognizing and protecting the antiquity of TK and practices presents a unique challenge to the policy makers. For a diverse country like India, in a sense there is a direct relationship between maintenance of its biological diversity and cultural diversity. The loss of biological assets and TK has profound consequences and impact on the culturally diverse groups whose livelihood is depending on this system of shared information. The first priority should be given to collecting this information as the history of colonization and dispossession of people and adaptation of modern technology has made it difficult to identify knowledge and distinct biodiversity. There is an immediate need to identify crops with their center of origin in India as their genetic purity has been put at risk due to genes transfer owing to various reasons. These plant varieties are not only culturally significant but have ceremonial and medicinal value. The practice of bioprospecting by utilizing the resources offered by private sector on the principle of benefit sharing should be given a serious consideration. The conspicuous absence of any regulatory framework under the TRIPS agreement to address such issues is the only hindrance in way of worldwide recognition of communities over their common heritage. However, effective implementation of Convention on Biological Diversity (CBD) and other

⁹ The Article 7 of the TRIPS states the objective of “the protection and enforcement of IPR should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations.”

international standard setting developments can provide a potential framework for protecting traditional knowledge and biological diversity as IPR.

However, there exists an inherent conflict between TRIPS Agreement and CBD with regard to protection of TK. The TRIPS agreement under Article 27.3(b) obliges its members to protect plant varieties and genetic resources through an effective *sui generis* system, whereas protection under CBD is based on principle of sovereign rights of every national to exploit and protect its biodiversity. The WTO realized this conflict and the Doha Ministerial Declaration for the first time directed the TRIPS council “to examine, *inter alia*, the relationship between the TRIPS Agreement and the CBD, the protection of traditional knowledge and folklore...”¹⁰

Damodaran (2000) stated that parliament has enacted sui-generis legislation in the shape of the Plant Varieties Protection and Farmers Rights Act in 2001 for the protection of IPR in new plant varieties. This created favorable legal conditions for international partnerships in biotechnology research and development (R&D). Further the fact that these changes have been in consonance with the WTO-TRIPS has lent greater creditability to these changes. He argued, “*The implicit rationale for IPR protection is that they promote investments in plant breeding and bio-engineering. IPRs induce their own pattern of innovations. The time taken for R&D to fructify as innovations is a crucial aspect guiding investments. Often IPR regimes play a key role in influencing the time pattern of innovations.*”

In order to realize the maximum fruits of innovation an ideal IP regime should balance the incentive for investors with public interest. There is a need to nurture and redefine the established network of farmers, breeders, grassroots innovators and their system of knowledge in fields of agriculture.¹¹ As the TRIPS agreement is harmonized worldwide, there is a need to revisit the process of informal system of innovation. It is important to protect this traditional

¹⁰WTO, Doha Ministerial Declaration, Para 19 “We instruct the Council for TRIPS, in pursuing its work programme including under the review of Article 27.3(b), the review of the implementation of the TRIPS Agreement under Article 71.1 and the work foreseen pursuant to paragraph 12 of this declaration, to examine, *inter alia*, the relationship between the TRIPS Agreement and the Convention on Biological Diversity, the protection of traditional knowledge and folklore, and other relevant new developments raised by members pursuant to Article 71.1. In undertaking this work, the TRIPS Council shall be guided by the objectives and principles set out in Articles 7 and 8 of the TRIPS Agreement and shall take fully into account the development dimension.”

¹¹ R.A.Mashelkar, Intellectual Property Rights and The Third World

knowledge from biopiracy of the community heritage by providing them protection through a *sui generis* system.

Role of Biotechnology in the Agriculture

The term “biotechnology” is defined under Article 2 of the CBD as any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use. This definition is very wide and covers range of applications and methods to develop product and process involving living organisms or their derivatives. According to the report of Ministry of Agriculture in an inclusive sense “biotechnology includes traditional and local knowledge and the contributions to cropping practices, selection and breeding of plants and animals made by individuals and societies for millennia.”¹² Thus both development through TK and advances in modern biology in plant breeding can be covered by the term biotechnology.

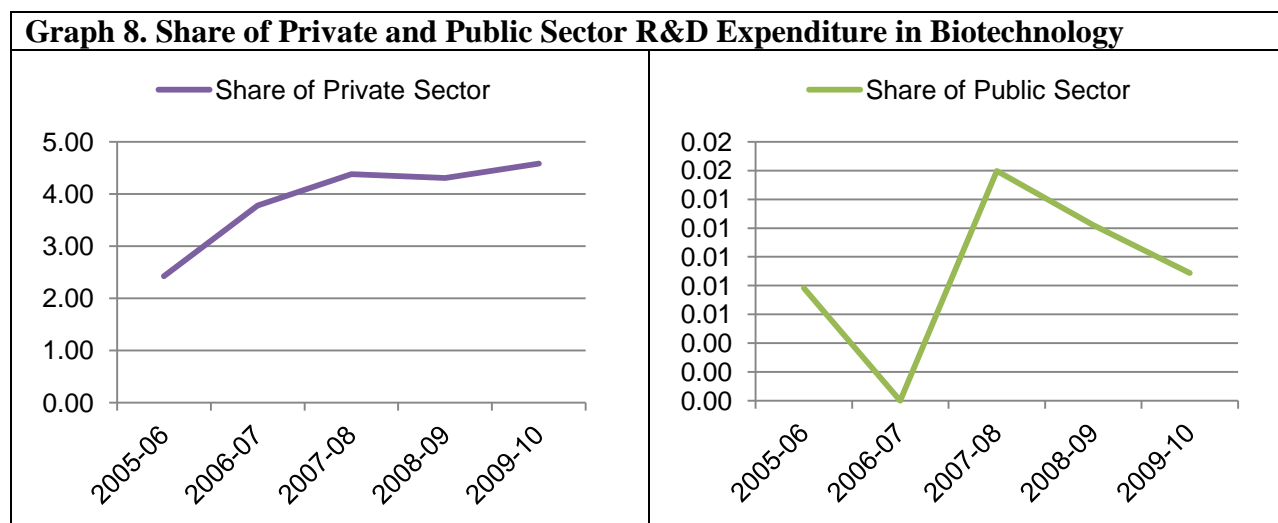
It is necessary to identify biotechnology that is appropriate for adaption and transfer. Many of the technology that is required for development of modern biotechnology is patented and their partnership and participation of private enterprises are also necessary. A study conducted on FDI R&D in Africa finds that TNCs tend to invest in R&D in those countries that “have a minimum domestic R&D capacity; provide legal and economic incentives for knowledge-based investments; and provide flexibility for local institutions to forge R&D partnerships.”¹³ In India there is an increasing trend towards private investment. However there is fear that allowing private participation may lead to monopolizing of seeds. Thus there is an urgent need to address regulatory deficit to usurp those fears. The regulations are needed in area of approving, clearing after assessment the results of such R&D development along with protecting the larger public interest. Graph 8 shows the share of R&D spending by public and private sector for the year 2005-2010 in India. It clarifies that R&D spending from public sector is fluctuating and

¹² *Supra* N 3

¹³ John Mugabe, Foreign Direct Investment, R&D and Technology Transfer in Africa: An Overview of Policies and Practices, Available at <http://bit.ly/18lpQWt>, accessed on 15/12/2013

considering the different agro-climatic conditions¹⁴ and limitations of private investors in developing technology for such diverse regions; more spending from public sector is also desirable.

Sreenath (2006) stated that the contribution of the public sector in plant breeding tends to decrease, the private sector investments concomitantly have increased. The private sector seed industries and plant breeders tend to extract reasonably viable financial returns on their investment in plant breeding research.



Source: Research and Development Statistics 2011-12, NSTMIS¹⁵

Mrinalini Kochupillai (2011) mentioned reasons for the private sector’s research focus on hybrids are: 1. Hybrids provide inherent trade secret type protection against competitors because their parental lines are not required to be disclosed and are difficult to identify by any process similar to reverse engineering in pharmaceuticals. 2. Hybrids also provide inherent protection against widespread seed-saving and resowing by farmers because of their biological incapacity to reproduce true to type. He further stated “under the umbrella of natural/biological protection, the contribution of the private sector, particularly in relation to sexually propagated cereal crops (and also some cash crops) has been significant and has been growing rapidly.”

¹⁴ There are 15 agro-climatic zones in India, some of them are very remote and not commercially viable for private investments, especially in those areas development through public spending in R&D to document and understand the needs of the region is desirable.

¹⁵ National Science & Technology Management Information System, Available at <http://bit.ly/1ks9VWt>, accessed on 15/12/2013

Biotechnology must be considered in a holistic sense to capture its true contribution to AKST and achieving development and sustainability goals. On the one hand, this may be resisted because some biotechnologies, e.g., genetic engineering, are very controversial and the particular controversy can cause many to prematurely dismiss the value of all biotechnology in general. On the other hand, those who favour technologies that are most amenable to prevailing IP protections may resist broad definitions of biotechnology, because past contributions made by many individuals, institutions and societies might undermine the exclusivity of claims. The policy stalemate in absence of credible regulatory framework has led to such divergent voices.

GM Crop and Agriculture

GM biotechnology is referred to any method to transfer gene beyond the normal barriers imposed by breeding and sexual reproduction is referred to as. The World Health Organisation (WHO) defines GM organism as “organisms in which the genetic material (DNA) has been altered in ways that do not occur naturally”. Broadly majority of GM crops currently have only two GM traits 1. Bt that focuses on reducing losses due to insect pests by generating pesticide production within cells of plant (e.g. Bt cotton to control bollworm); 2. Herbicide tolerance (Ht) to enable spraying of a pesticide to kill weeds but not the crop. Whereas biotechnology is widely accepted and practiced the use of GM crops in human consumption is highly controversial world-wide.

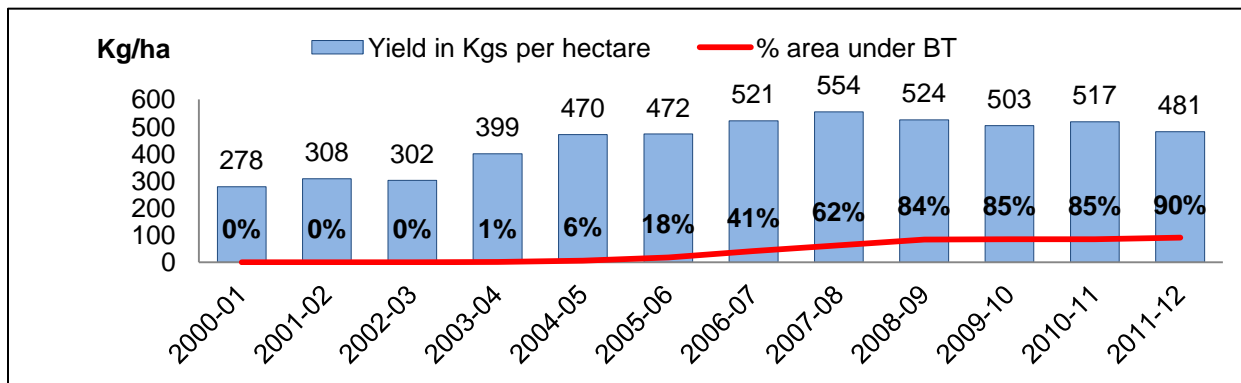
In India, the GEAC (Genetic Engineering Approval Committee) is the competent authority to approve or disapprove the release of GM foods in marketplace, including experimental field trials. The pending Biotechnology Regulatory Authority of India (BRAI) Bill, 2013 if approved will replace the GEAC. However due to many structural flaws the prospects of such happenings seems minimal. The main dilemma is what contribution can adaptation and use of GM crops can have to agriculture in India. There are already many studies to show that GM crops can have long term health, environment concerns and threaten bio diversity. So until any conclusive scientific findings are available its use in food crops and as fodder should be avoided. The lingering reasons for interest in this technology are of course its claims to be beneficial and cost

effective solution to the world's food crisis. However, its significant contribution to the resilience of small and marginal farmers is doubtful. The IAASTD report is of the opinion that agro-ecological approaches rather than GM can solve world food problem. The report has while analyzing the real economic benefits of such crops, finds that neither costs nor benefits are equally shared, with the poor tending to receive more of the costs than the benefits. As in the case of Bt cotton in India the high costs of seeds and stagnating yield has economic desperation leading to suicides of thousand farmers in the Vidarbha region. The following is the case study of Bt Cotton in India.

BOX 1: Recent example of GM Crop in India

The Case of BT Cotton

The first and only GM crop to be commercially cultivated in India is Bt cotton which is a patented product of Monsanto. Since its introduction in 2002 and commercial use in first 3 years when the area under cultivation was as little 5.6%, yield increased by 30%. But there is no significant increase in yield until 2011 when the cultivation area under Bt cotton touched 96% of the total cultivated area. The Bt cotton was however was hailed as a success story and positive financial returns were reported.



Source: Cotton Advisory Board data¹⁶

Yield before BT cotton expansion 69% increase from 2000-01 to 2004-05, while Yield during BT cotton expansion only 2% increase from 2005-06 to 2011-12.

The growth story of the Bt cotton was tainted after reports of farmers suicide started to come

¹⁶ Available at <http://bit.ly/19vCsFz>

from Vidarbha region, which was a major cotton growing area. Since then many independent reports have questioned the narrative of this growth terming the deaths as “GM genocides”. The Committee on Agriculture in its report on “cultivation of genetically modified food crops – prospects and effects” also visited Vidarbha to study the cultivation of Bt cotton. The Committee in its report mentioned, “farmers cultivated Bt cotton on a large scale because initial production was high given that the crop was pest resistant. However, eventually small and marginal farmers suffered losses because of high input costs and yield loss due to the development of resistance in the targeted pests. Moreover, the cultivation of Bt cotton caused traditional local cotton varieties to be wiped out. These factors combined with indebtedness caused 7,992 farmer suicides in the region between 2006 and 2011.”

Recently, the Maharashtra government has banned the sale and distribution of the genetically modified Bt cotton seeds of Maharashtra Hybrid Seeds Company (Mahyco), a partner of US multinational Monsanto, in the state with immediate effect for supplying inferior quality seeds. Many opponents of GM crops hailed the move as bold and congratulated government on not succumbing to the TNCs pressures.

The introduction of GM crops leads to contamination which is irreversible, the emphasis of the export market today is on organic production and there no real demand for GM crops. India with its rich diversity is ideally situated to meet the growing demand for organic food in the International market.¹⁷ The negative impact of GM crops on India’s agricultural exports is another important aspect that needs to be factored in while taking a decision in regard to introduction of GM crops. While support can still be found for use of modern biotechnology in the pharmaceutical and human health sector, the application of modern biotechnology in Indian agriculture should be avoided and emphasis should be on developing conventional biotechnology including by exploiting opportunities presented through TK.

One of the other purported advantages of the adopting GM technologies is less use of fertilizers. The rise in population is inevitable and thereby growth in agriculture. But high input farming

¹⁷ G V Ramanjaneyulu and Dilnavaz Variava, Genetically Modified Food & Crops, *Centre for Sustainable Agriculture* Hyderabad (2013)

will be damaging to the Indian economy. In the preceding years the fertilizer subsidy bill has been humongous; India's total subsidy bill, which is estimated at Rs 2,20,971.50 crore for the current fiscal¹⁸. Indian imports most of the fertilizers which also adds to the import bill, the dual dilemma that the Indian agriculture today faces is to either depend on TNC for seeds holding or apply intensive farming spoiling quality of soil and raising input costs. But as observed earlier adopting GM technology has long term disadvantages and it hardly add to the nutritional value of food. Conventional farming and non-GM technological holds the key that can provide a long term solution. Many successful experiments by using TK and practices have already been documented and are showing good results.¹⁹ But it is still on trial and wide scale production will require more efforts from government and benefits can only be realized in long run.

The need for such unstable GM technology can also be eliminated if due care is taken to avoid food wastage. The UN in its recent report on "Food Wastage Footprint: Impacts on Natural Resources" estimates that world-wide 1.3 billion tons of food is wasted each year is causing economic losses of \$750 billion and significant damage to the environment. It further states that cereal waste particularly that of rice, which is the main staple food in India, is a big problem in Asia. Comprehensive reforms in this regard can come to rescue for to remedy short term issues. The Ministry of Agriculture in its report also acknowledges the a large majority does not have access to food due to extreme poverty while colossal amounts of food grains, fruits and vegetables are being lost during post harvest storage. The Secretary, Department of Agriculture & Cooperation confessed that a saving of 10% in post harvest crops losses would mean 23 million tones of extra food grains.²⁰

¹⁸ Business Line, Fertilizer Subsidy: Fix it Right, July 19, 2013 Available at <http://bit.ly/18we0DF>

¹⁹ SAPPPLPP, Revisiting Traditional Knowledge Systems: Livestock an Integral Part of Agriculture, Nov 2009 Available at <http://bit.ly/1gS9vst>

²⁰ *Supra* N 3, the report recommend "the Government to come up with a fresh road map for ensuring food security in coming years without jeopardizing the vast bio-diversity of the Country and compromising with the safety of human health and livestock health."

TRIPS and Biotechnology

The foundation of IPR and its promotion is basically based on three arguments. First is the right to property based on natural rights theory that a person who is first connected to an object with an economic value should be entitled to appropriate it; secondly principle of distributive justice declares that an IPR in general and patents in particular are regarded as rewards that a society feels morally obliged to grant to whoever introduces a new invention or creation. Lastly is the approach of instrumentalism which conceives the idea of IPR as a tool that the society creates to attain its own objective.²¹ Essentially IPR is a market tool that countries allow in accordance to their own conditions and objectives. The role of IPR in agriculture sector is based on the principle of instrumentalism as the regulations of the TRIPS agreement mostly reflects the policy objectives of the select group of developed countries.

Historically, any protection of plant varieties was exempted from international practice in consonance with the traditional farmer's practice of saving and exchanging seeds. However with the technological progress many developed countries were able to breed new plant varieties and a protection was developed in context of International Convention for Protection of New Varieties of Plant (UPOV Convention). The need for this separate regime was in response to reluctance of extending patent protection to plant varieties; the realization for protection of plant breeders interest and effective non-application of conditions of patent for plant varieties.²² The most relevant article of the TRIPS agreement for agriculture sector is Article 27.3(b).

Legal Analysis of the Article:

The article states that members may exclude from patentability plants and animals and essentially biological processes for their production. But they shall not exclude micro-organisms, non-biological and microbiological processes. Further they shall protect plant varieties either by

²¹ FAO, Panel of Eminent Experts on Ethics in Food and Agriculture, at pp. 33, *Available at* <http://bit.ly/1gS9JA3>

²² Mohan Dewan, IPR Protection in Agriculture: An Overview, 15 February 2011 at pp. 133 "Patent is granted to those inventions which fulfill the patentability criteria of novelty, non-obviousness and utility; whereas plant variety protection (PVP) is granted to plant breeders for protecting generic makeup of specific plant variety having novelty, distinctness, uniformity and stability."

patents or an effective *sui generis* system or any combination thereof. The provisions of this article are to be reviewed.

Thus members excluding plant varieties from patent protection are imposed with an obligation to extend protection of an effective *sui generis* system. The debate on what can be termed as effective system ranges from adopting UPOV convention to granting plant breeders rights to farmers, breeders and researchers with regard to use and exchange of seeds and plant genetic materials (Maskus 2000). This provision thus has a substantial impact on the plant generic research, biological diversity, farmer's right and food security in India. India has evolved an IPR regime that simultaneously grants rights to both breeders and farmers. The Protection of Plant Varieties and Farmers Rights Act, 2001 (PPV & FR) establishes a unique system by extending the concept of Plant Breeders Rights (PBRs) to new varieties of breeders and to current varieties held by farmers. Considering the depleting agriculture resource base, fear of monopolies in food sector, public interest and environment India was wise enough not to blindly adopt the model UPOV, 1991. The PPV & FR law recognizes the right of farmer both as cultivator and conserver. It must be borne in mind that the efforts to evolve a system to protect plant variety began as early in 1991 it could not be realized after ratification of the TRIPS agreement.

The objective of the Indian law is to advance farmers rights as well as foster involvement of the private sector in biotechnology and seed research. In consonance of the objective the law provides protection to four varieties of plants. There are four types of plant varieties that the PPV & FV protects:

- New Variety,²³
- Extant Variety,²⁴
- Farmers Variety,²⁵
- Essentially Derived Variety (EDV).²⁶

²³ Variety means a plant grouping except microorganism defined by certain characteristics under the Act. It is new if it meets specified criteria.

²⁴ A variety available in India which is notified under Section 5 of the Seeds Act, 1966; or a farmers' variety; or a variety about which there is common knowledge; or any other variety which is in the public domain.

²⁵ A variety which has been traditionally cultivated and evolved by the farmers in their fields; or is a wild relative or land race of a variety about which the farmers possess the common knowledge.

²⁶ A variety predominantly derived from such initial variety, or from a variety that itself is predominantly derived from such initial variety, while retaining the expression of the essential characteristics that result from the genotype

The protection to such varieties is to benefit public, private and individual actors and stakeholders. The private actors are likely to benefit from the protection granted to the new variety; public sector from extant and essentially derived variety (EDV) and individual breeders and farmers from extant, farmers and if scientifically equipped EDV of plants. Extending protection of *sui generis* system to extant variety is especially evolved for Indian system to safeguard the traditional knowledge. It is an attempt on part of policy makers to extend the protection to existing varieties, thus it is exempted from establishing the novelty criteria. The farmer's variety is also unique aspect of the Indian law. The right to ownership of farmer's variety is an important an extension of the rights of private property and goes beyond the concept of benefit sharing as envisaged by the CBD. Apart from individual farmers the right to protection of farmer's variety can also be claimed by the community or group of farmers claiming to be the breeders of the said variety. The protection to other plant varieties is extended on four criteria which are novelty, distinctness, uniformity and stability and are subject to tests and assessment under regulations made by the authorities.

Once registered the law allows the breeder to save, use, sow, re-sow, exchange, share or sell his variety and can stop any persons using such variety without his permission. Similar to patent the essence of granting such protection is to reward the creator, encourage commercial breeding to improve plant varieties and to provide access to information of products and process to the society in lieu of such protection. Access to adequate information about quality of seed and its performance through proactive disclosure enables the user of the variety to claim compensation is situations the seeds/variety fails to meet the stated performance (Section 39.2). Better cooperation in Indian agriculture sector is essential for optimal protection of traditional breeds. Albeit the act is widely hailed as a progressive legislation, it faces a number of implementation issues Major efforts are required to encourage small farmers for innovation and registration of their plant varieties.

or combination of genotypes of such initial variety; is clearly distinguishable from such initial variety; and conforms (except for the differences which result from the act of derivation) to such initial variety in the expression of the essential characteristics that result from the genotype or combination of genotypes of such initial variety biotechnology must be judiciously applied.

Emergent Issues for India

Bio-piracy

Many biotechnological companies are searching for useful plant varieties and related substances that can be developed into a marketable commodity. This practice is generally referred to as bioprospecting. This bioprospecting and patenting of important TK without the permission and benefit sharing raises important ethical and legal issues. The examples of attempts of patenting the turmeric and neem tree from India for their medicinal and therapeutic properties are a prime example of such bio-piracy.²⁷ If such patent were to be granted TRIPS obligates all members to enforce them against their own people. Today as the demand for organic and natural product is on the rise many corporations world-wide are searching for plant varieties with medicinal or agricultural applications. This bio-piracy is now a serious problem for many developing countries.

Sreenath (2006) asserted that the modern IPR protection regime runs counter to the very basis of Indian agricultural ethos and tantamount to formalizing bio-piracy by commercializing traditional resources and indigenous knowledge of the native farming communities. Further, India has already been rudely jolted from its deep slumber regarding these changes when two NRIs sought patent for turmeric for its wound-healing properties which is common knowledge of the Indians. Similarly, tremors shook the scientific community when basmati, neem and Nap-hal wheat were patented.

With a view to control unauthorized access to the precious biological resources and knowledge associated therewith a National Biodiversity Authority was formed. The Biodiversity Act, 2002 in Section 3 stipulates that certain categories of persons shall not obtain any biological resources

²⁷ For example, since the 1970s U.S. and Japanese firms have been granted patents on a variety of products extracted from the neem tree. Yet the neem tree's pesticidal and medicinal properties had been known and used for centuries in India. Finally, when the W.R. Grace Company applied for a patent on a traditionally used pesticidal extract from the neem seed, over 200 non-governmental organizations from 35 countries challenged the application. The Texas company RiceTec received a U.S. patent on a minimally altered variety of Basmati rice, even though Basmati has been grown in India and Pakistan for generations and farmers were already exporting large quantities of the rice. In another case, when Thailand passed a law protecting traditional medicines in 1997, the U.S. State Department sent a letter to the Thai government challenging the legislation as a "possible violation of the TRIPS Agreement.

occurring in India or knowledge associated thereto for research or for commercial utilization or for bio-survey and bio-utilization without prior approval of National Biodiversity Authority. The categories include a person includes both foreign and Indian citizen of Indian and a body corporate, association or organization either incorporated or registered in India or any other jurisdiction and also any non-Indian participation in its share capital or management.

However, the lack of regulations at multilateral level is a cause for concern. Many developing countries led by Brazil, India, Peru and pushing for adding Article 29bis to the TRIPS agreement for mandatory disclosure. Whenever the invention concerns, is derived from or developed with biological resource and TK such disclosure is mandatory and non-compliance even in cases of false and fraudulent information can led to prevent the further processing of applications or the grant of patent; to revoke; to render unenforceable.

GM Labelling

The availability of GM food in the world food market is not hidden. The identification do such food however has become an emergent issue, especially for those countries who prohibit their consumption. The effect and consequence of ill identification of GM food is also prevalent domestically. Only in the last decade tones of cotton seed extracted oil from Bt cotton has gotten into the food chain.²⁸ The section 22 of FSSAI Act, 2006 stipulates a complete ban on import, sell and distribution of GM food in India.²⁹ Apart from that in order to avoid contamination all GM foodgrains are required to be labelled and segregated from non GM foodgrains right from the time of sowing in the field of harvesting, procurement in the *mandis* and storage in the godowns.

²⁸ *Supra* N 3, at para 6.148

²⁹ Section 22 of the FSSAI Act stipulates that ‘no person shall manufacture, distribute, sell or import any novel food, genetically modified articles of food, irradiated food, organic foods, foods for special dietary uses, functional foods, pharmaceuticals, health supplements, proprietary foods and such other articles of food which the Central Government may notify in this behalf’.

The spillover and contamination of GM food consumption has many side-effects on human and animal equally.³⁰ The labeling condition in case of GM seeds (in case of Bt cotton) are related to packing, labeling, physical and genetic description of the seeds, information on sowing pattern in packets. The lack of standard operation procedures (SOP) to segregation & identity preservation at procurement and storage point and separate storage infrastructure is a critical issue. The casual attitude of regulation and labeling of GM food products can lead to entry of contaminated imports and GM food in market. Even though health issues are addressed the consumer should have the supreme right to make an informed choice. The GM labeling is an important matter in view of human and animal health, consumer protection and rights.

The introduction and mitigation of impacts of alien plant variety/seeds can threatens the ecosystem habitat or species. The unpredictability in development and regulation of the GM food will have unintentional consequences. The future course of action on GM food should be based on precautionary principle set forth in Principle 15 of the Rio Declaration on Environment and Development. This precautionary approach should also be applied when considering eradication, containment and control measures in relation to alien species that have become established. Lack of scientific certainty about the various implications of an invasion should not be used as reason for postponing or failing to take appropriate eradication, containment and control measures.³¹

³⁰ According to the “Report on Animal Feeding on Bio-safety Studies with Biotechnologically Transformed Bt cotton Crop meal” there was increase in liver weight, testical weight and fat and RBC in blood and decrease in WBC in blood in the lamb fed with Bt. Cotton seed.

³¹ WTO, Matrix On Trade-Related Measures Pursuant To Selected Multilateral Environmental Agreements, WT/CTE/W/160/Rev.6, 4 October 2013, at pp. 84 “Guiding principle 7: Border control and quarantine measures 1. States should implement border controls and quarantine measures for alien species that are or could become invasive to ensure that: a. Intentional introductions of alien species are subject to appropriate authorization (principle 10); b. Unintentional or unauthorized introductions of alien species are minimized. 2. States should consider putting in place appropriate measures to control introductions of invasive alien species within the State according to national legislation and policies where they exist. 3. These measures should be based on a risk analysis of the threats posed by alien species and their potential pathways of entry. Existing appropriate governmental agencies or authorities should be strengthened and broadened as necessary, and staff should be properly trained to implement these measures. Early detection systems and regional and international coordination are essential to prevention ...”

Way forward

The share and dependence of developed countries on agriculture sector is very low, on the other hand large population in developing countries depends for their livelihood on the production and sale of agriculture goods. Agriculture also plays a central role in their way of life and sustainable practices may contribute on various social aspects. In India, the agriculture sector's contribution to GDP has shown a downward trend. But the sector is a major source of rural employment and provides subsistence to majority of the population. Therefore it will be unjust to measure the contribution only in economic terms. The IAASTD states that a multifunctional approach to implement AKST "will impact on hunger, poverty, improving human nutrition and livelihood in equitable, environmentally, socially and economically sustainable manner." In other words it holds the key for a sustainable future.

Indian experience with Bt cotton has shown it to be unsustainable in the long run. However another modern breeding technique called the marker-assisted selection (MAS) which involves traditional breeding is now seen a silver bullet of many problems.³² The ICAR has already developed varieties of Maize, Pearl Millet and Rice using this technology. The consumer acceptance of this technology will depend on its acceptance as an organic breeding program. The wisdom of TK practices of breeding and seed holding is also increasingly important. The global market for organic food is on the rise and India with its vast knowledge is ideally suited to fulfill such demands. The role of IPR such as trademarks, copyright, GI's along the organic food chain will be of considerable importance for protection and identification of products.

The study recommends promoting the use of flexibilities provided under the TRIPS to favor policies and laws that provides protection to indigenous plant varieties. The clarification of definition of microorganism should also be pursued at multilateral level to enable members to exclude from patentability for certain classes of technologies that are considered important for national interest. The study fallbacks on exiting literature which strongly that asserts the

³² Greenpeace, Marker-Assisted Selection: A non-invasive biotechnology alternate to genetic engineering of plant varieties, August 2009

promotion of biotechnologies will not only advance the national food security but also ensures substantial reduction in chronic and hidden hunger.

The study also finds that divergent ways of policy making and technological development casts a shadow on the future of food security in India. The study concludes that there is a need to develop credible statistics and scientific data so that the debate that precedes policy making is not based on flawed conceptions. The data suggests that there has been a steady decline in the share of primary products in the total exports of the economy. Similarly, the yield of Bt Cotton has become stagnant after an initial increase till 2004. After critically analyzing the reasons for current decline, the study suggests a relook at innovation by increasing the R&D expenditure in TK and biotechnology by private and public participation.

Further it looks into the challenges faced due to globalization and supports market liberalization of agricultural products. The natural consequence of such liberalization is that the practice of mutual recognition will be on rise and could dominate the agenda for developing technical standards. Therefore, spreading awareness among consumers through labeling and standard requirements will be essential. Apart from various precautionary measures, there must be a renewed impetus at domestic and international level to protect the biodiversity (common heritage) by maintaining a database of protected TK and geographical indication (GI).

Broadly, the study recognises that the contribution of knowledge in promoting production is getting increasingly important. Biotechnology holds the key for most potential advances in field of agriculture. In order to realize the real potentials it is absolutely essential to establish bio safety regulations. Such regulations need to implement at various levels from lab till the final consumption. The challenge for the policy makers now is to use TK and scientific research as a strategic resource. The goal should be to increasing competitiveness, sustain livelihood and prevent environmental damage from use of fertilizers and pesticides. The paper thus identifies and provides food for thought on this emergent issue of bio piracy and GM labelling.