Open Source Seed Systems

Seed is the soul of Agriculture. Locally adaptable agro-diversity based cropping patterns and timely availability of good quality seed in required quantities are essential for sustaining farming. Seed was 'community resource' carefully bred, conserved and evolved over thousands of years. Today the technological advances, market manipulations and the changing policies and legal systems have made it a 'commercial proprietary resource'.

The process of modernization of agriculture has deskilled the farmers making them passive consumers of industrial products including seeds. This has not only resulted in increased economic and ecological costs but also made farmers lose their control over their productive resources. This process has led to a monoculture of crops, production practices and food habits which had seriously affected the resource poor farmers and resource poor farms especially in rainfed areas on one hand and the health of the consumers on the other.

Selective breeding over millennia enormously expanded the genetic diversity of domesticated plants and animals. Humans domesticated over 300 species plants/trees and 72 animals for various needs till now and not a single species have been added to the list of domesticated biota in the past 3,000 years.

The process of modernization of agriculture has deskilled the farmers making them passive consumers of industrial products including seeds. Earlier farmers used seeds saved from their own produce. They have gradually become dependent of seed initially supplied by Government agencies, and later sold by companies. Farmers who were traditional seed keepers and developed agriculture over centuries, had lost the habit of selection and saving seed even in self pollinated crops. This has not only resulted in increased economic and ecological costs but also made farmers lose their control over their resources. This process has led to a monoculture of crops and varieties, production practices and food habits which had seriously affected the resource poor farmers and resource poor farms especially in rainfed areas on one hand and the health of the consumers on the other. India which had over 2.0 lakh varieties of rice and had separate lines for cultivation in every ecosystem now gets 85% of its paddy production from varieties with just 10 different backgrounds.

The dependence of farmers on the market can be gauged by the fact that even in crops like groundnut and paddy where varieties are popular, and in dryland crops like pulses, millets where good varieties are available, farmers who can reuse their own seed by saving selectively, farmers go to market for buying seed. An approximation says in highly self pollinated crops like black gram and green gram where only varieties are prevalent and seed can be reused, there is a market for about 10,000 tons/yr in one state. In groundnut which is also a self pollinated crop, the requirement is much higher. We are seeing farmers agitating for seed standing in long queues and fighting for the seed. All this market is mostly from the regular growers who can reuse the seed from their previous crop. Due to the demand, the companies are purchasing the seed from commercial crop, packing and selling them as seed.

Today seed is unavailable both in quantity and quality. All the public sector institutions, seed corporations and private companies put together do not supply more than 18 % of the total seed requirement. The truthful labeling clause under the Seed Act permits companies to sell any seed without certification by the seed certification agency. Fly-by-night seed companies have mushroomed in several parts of the country, taking advantage of seed shortage, and are packing whatever seed they can collect from threshing mills, market yard floors, etc. Most often, seed is supplied by the same dealer who supplies pesticide and fertilizer. The dealer is both the money-lender and buyer of the produce. Farmers who take everything on credit have neither the option of choosing brands or asking for the bill, which is essential in order to claim compensation in case of failure of crop expression.

The yield improvement in agriculture with new technologies owes largely to the introduction of new improved varieties in major crops and efficient crop management technologies. Government research institutes and public extension work played a major role in developing and multiplying the seed. The development of hybrids marked a new era in agriculture. These seed cannot be reused for sowing due to segregation, forcing the farmer to depend on the supplying agency every season. The creation of this market has brought several private and multinational companies into the seed business. The seed companies prefer to produce and market only the hybrids, which cannot be reused to have a perpetual market. Only crops like cotton, sunflower, maize, sorghum, pearl millet, castor and vegetables where hybrids are prevalent, have attracted the concentration of private companies. With the advent of Genetically Modified crops the problem further worsened as the few multinational companies have proprietary control over the technologies.

Kinds of Seed

1. Traditional varieties
2. Open Pollinated Varieties
3. Hybrids
4. Genetically Engineered seeds

The industrial agriculture has brought in various forms of control for corporate over seed. The new technologies like hybrids, GURT makes seed reusable and make farmer perpetually dependent on the industry. Similarly, downsizing of public research and extension and public seed corporations becoming defunct on one hand and the market mergers and acquisitions in seed industry on the other hand gave monopoly control for industry. The new legal frameworks both at national and international levels prevent farmers from reusing the seeds giving exclusive rights to companies over seeds and technologies used to develop them.

The new IPR (Intellectual Property Rights) regime will further worsen the situation as few people will get exclusive rights over seed and technology. In addition to existing technical restrictions on reuse of seed, legal restrictions will now apply (See *annexure II* for experience with Bt cotton).

The nature of property is called into question when some farmers and indigenous peoples reject the very notion of owning seeds or plants that they may regard as

sacred or as a collective heritage (Hurtado 1999[1], Salazar et al. 2007[2]). IPRs are actually a means of circumventing and obscuring the reality of *social* production and subsuming the products of social production under private ownership for the purposes of *excluding* others from use. How can they be anything but antagonistic toward social relations founded on cooperative, collective, multigenerational forms of knowledge production?

Several NGOs like Centre for Sustainable Agriculture, Deccan Development Society, Navadhanya, Green Foundation, Annadana, Timbaktu and movement like Beej Bachao Andholan and Hamara Beej Abhiyan etc have already created successful experiences in the area of seed banks in crops cereals, minor millets, oilseeds and pulses at village level. These banks focus on selection and reuse of quality seed by the farmers with a focus to maintain crop and varietal diversity. These seed banks will plan and manage the seed requirements in the village. Farmers would be trained on how to select and retain seed from their crops. Self sufficiency is achieved at the community/village level. However such efforts remained smaller for want of support from the governments and lack of response from the farmers at large. The main reasons for this situation are a) traditional seeds not meeting the expectations of the farmers and markets, b) lack of parallel research for making selections for improvement in characters, and c) lack of good institutional seed systems which can assure quality and supply.

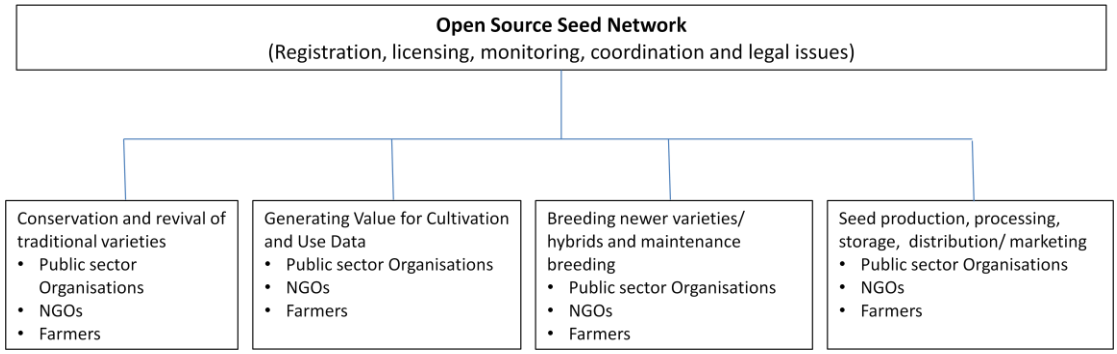
How do we go forward?

Given the seriousness of the problem we need to plan and evolve innovative processes, technologies and institutional systems which can help in conserving existing diversity, evolve newer lines, produce and meet the needs of the farmers. For this to happen we need to

a. Identify groups which conserve and revive traditional varieties, characterize and share with others.
b. Develop Value for Cultivation and Use (VCU) data for the existing traditional/improved varieties and hybrids in different agroclimatic and growing conditions using participatory varietal selection.
c. Develop newer varieties/hybrids based on their pollination/breeding behavior using participatory plant breeding.
d. Establish Community managed seed banks at village level which can be federated with an effective decentralized production, procurement, storage, distribution and marketing network in which 'Community Based Organizations' at village level plays the key role.

[1] Hurtado, Lorenzo Muelas. 1999. *Access to the Resources of Biodiversity and IndigenousPeoples*. Occasional Paper of the Edmonds Institute. Edmonds WA.
[2] Salazar, Rene, Niel P. Louwaars and Bert Visser. 2007. "Protecting Farmers' New Varieties:
New Approaches to Rights on Collective Innovations in Plant Genetic Resources." *WorldDevelopment* 35:9.

For this to happen, we need to build a network of organisations and individual farmers who believe in the principles of free sharing of knowledge and material.



Open Source Seeds

Open Source Seed System will be based on the logic that farmers are both users and innovators of technology, coupled with the idea of Copyleft or licensing under Creative Commons, Open Source License (OSL)or General Public License (GPL). The open source model can be applied for the development of plant varieties, or any other product used in farming, agro machinery and sharing of information and knowledge. Any existing or newly developed variety can be made available with a OSL/GPL or a similar document explicitly stating rights and claims. The varieties will be in the public domain or covered under Plant Breeders' Rights or as Farmer Varieties without restricting the rights of others to experiment, innovate, share, exchange, use or reuse the seeds. There will be no restriction on using this to develop new varieties or to experiment with but it is essential that the variety derived from this should also be available without any monopolistic claims and restrictions on further development.

To implement such a model there has to be a agency as **Open Source Seed Network** which can coordinate all players and activities and act as a nodal agency for bringing together breeders and farmers and for guiding farmers on aspects of conservation, data generation, participatory breeding, registration and licensing as Open source. There could be a common pool to which farmers can contribute and from which they can ask for samples; and this common pool of germplasm can also exchange materials with others under Material Transfer Agreements (MTAs) which have open source clauses.

The farmers and organisations involved will perform the following functions

a. **Conservation and revival of existing varieties:** Organise farmers and institutions interested in conservation to recover and retrieve seed varieties that were in use or that are still in use, and popularise them among farmers. This helps farmers not only in rediscovering old varieties, but also in preserving them. Mapping tools would be used to document existing seed diversity and share the information.

b. **Participatory Varietal Selection for Generating Value for Cultivation and Use data for existing varieties:** Farmer breeders across the country have evolved several varieties with specific characters to suit their needs.

Similarly, public sector research organisations have developed several varieties and hybrids which have great potential. If Value for Cultivation and Use data can be generated using Participatory Varietal Selection for these varieties along with traditional varieties, in various growing conditions farmers can make choices easily. Such data catalogues can be published and shared.

c. **Participatory Plant Breeding to evolve newer varieties:** Another solution is to develop new varieties/hybrids working with farmers, taking into account their specific needs and demands. This method – known as Participatory Plant Breeding –is a solution whose logic can be extended from the development paradigm of open-source and free software.

   Farmers have developed seed varieties by experimenting over centuries and sharing the improved varieties with others. As a result of this continuing experimentation, testing, selection, propagation and exchange, diversity was made possible. Participatory plant breeding tries to mix the best in modern science with the wisdom of farmers in order to develop varieties that are both farmer-friendly and meet the needs of different agro-climatic zones. Participatory plant breeding is also a learning process. Farmers evaluate seed varieties by various criteria and decide what to choose and which improvements to make.

   Participatory plant breeding can also be used to make traditional varieties more suited to meet the needs of today's farmers.

   These three methods are not exclusive choices. They can be used together to conserve biodiversity and to develop new varieties.

d. **Community Seed Banks, Community Seed Enterprises, Seed fairs, Seed Production and marketing:** The farmer cooperatives, individual entrepreneurs who are interested in producing and marketing the open source licensed Seed.

Making Public Sector as Partners in Open source Breeding

As a result of the opportunity to obtain more exclusive novel gene sequence and germplasm ownership and protection, the mindset of the public sector plant breeding community has become increasingly proprietary. This proprietary atmosphere is hostile to cooperation and free exchange of germplasm, and may hinder public sector crop improvement efforts in future by limiting information and germplasm flow. A new type of germplasm exchange mechanism is needed to promote the continued free exchange of ideas and germplasm. Such a mechanism would allow the public sector to continue its work to enhance the base genotype of economically important plant species without fear that these improvements, done in the spirit of the public good, will be appropriated as part of another's proprietary germplasm and excluded from unrestricted use in other breeding programs. The specific mechanism can be a

"General Public License for Plant Germplasm (GPLPG)[3]". Similarly, all the germplasm lines in NBPGR have to be brought under GPLPG.
Implementation of open source mechanisms such as the OSL/GPL could have significant effects consistent with both strategies of *resistance* and *creativity*. In terms of resistance, the GPL would[4]:

a. **Prevent or impede the patenting of plant genetic material**: A GPL would not directly prohibit patenting (or any other form of IPR protection) of plant genetic material but would render such protection pointless. The GPL mandates sharing and free use of the subsequent generations and derivatives of the designated germplasm. In effect, this prevents patenting since there can be no income flow from the restricted access to subsequent generations and derivative lines that it is the function of a patent to generate. Further, the viral nature of the GPL means that as germplasm is made available under its provisions and used in recombination, there is a steadily enlarging the pool of material that is effectively insulated from patenting. Enforcing the GPL against possible violators would not be easy given the resources necessary. But even the mere revelation of violations would have the salutary effect of illuminating corporate malfeasance and eroding the legitimacy of industry and its practices.
b. **Prevent or impede bioprospecting/biopiracy:** The GPL could be similarly effective in deterring biopiracy. Faced with a request to collect germplasm, any individual, community or people could simply require use of a materials transfer agreement incorporating the GPL provisions. Few commercially oriented bioprospectors will be willing to collect under those open source conditions. Again, enforcing the GPL against possible violators would not be easy, but instances in which "bioprospecting " can be revealed to unambiguously be "biopiracy" would contribute to public awareness and strengthen popular and policy opposition to unethical appropriation of genetic resources.
c. **Prevent or impede the use of farmer derived genetic resources in proprietary breeding programs:** Because neither the germplasm received under a GPL nor any lines subsequently derived from it can be use-restricted, such materials are of little utility to breeding programs oriented to developing proprietary cultivars. Any mixing of GPL germplasm with these IPR protected lines potentially compromises their proprietary integrity. Application of the GPL to landraces could therefore effectively prevent their use in proprietary breeding programs.
d. **Prevent or impede further development and deployment of GMOs**: The development of transgenic cultivars almost universally involves multiple layers of patented and patent-licensed germplasm. Moreover, all of the critical enabling technologies employed in genetic engineering are patented and their use restricted by licenses. Given the large investments that have been made

[3] Michaels, Tom. 1999. "General Public License for Plant Germplasm: A Proposal by Tom Michaels." Paper presented at the 1999 Bean Improvement Cooperative Conference, Calgary, Alberta.

[4] Jack Kloppenburg (2010) Seed Sovereignty: the Promise of Open Source Biology in Desmarais, Annette and Hannah K. Wittman (eds.), *Food Sovereignty: Theory, Praxis, and Power*. Fernwood Publishing.

and accompanying expectations of high financial returns, GMOS will not be developed if they cannot be IPR-protected. Any mixing of GPL germplasm with these IPR-protected materials and tools potentially compromises their proprietary status. Use of the GPL cannot itself stop the further development of GMOs, but it can impede it by preventing additional genetic resources from being drawn into the web of proprietary and IPR-protected materials.

In addition to its capacity for reinforcing *resistance*, the GPL may have even more potential for *creativity*, for the creation of effective space for the elaboration of transformative alternatives. Implementation of the GPL would help to:

a. **Develop a legal/institutional framework that recognizes farmers' collective sovereignty over seeds:** A major advantage of the GPL is that it does not require the extensive development of new legal statutes and institutions for its implementation. It relies on the simple vehicle of the materials transfer agreement that is already established and enforceable in conventional practice and existing law. It uses the extant property rights regime to establish rights over germplasm, but then uses those rights to assign sovereignty over seed to an open-ended collectivity whose membership is defined by the commitment to share the germplasm they now have and the germplasm they will develop. Those who do not agree to share are self-selected for exclusion from that protected commons.
b. **Develop a legal/institutional framework that allows farmers to freely exchange, save, improve, and sell seeds:** For farmers, the feature of the space created by implementation of the GPL that is of principal importance is the freedom to plant, save, replant, adapt, improve, exchange, distribute and sell seeds. The flip side of these freedoms is responsibility (and under the GPL, the obligation) to grant others within the collectivity the same freedoms; no one is entitled to impose purposes on others or to restrict the range of uses to which seed might be put. In the face of increasing restrictions on their degrees of freedom to access and use seed, application of the GPL offers a means for farmers to create a semi-autonomous, legally secured, "protected commons" in which they can once again work collectively to express the inventiveness that has historically so enriched the agronomic gene pool.
c. **Develop an institutional framework in which farmers and plant scientists work together in the development of new plant varieties that contribute to a sustainable food system:** The "protected commons" that could be engendered by the GPL can, and must, also encompass scientific plant breeders whose skills are different from but complementary to those of farmers. Many new cultivars will be needed to meet the challenges of sustainably and justly feeding an expanding global population in a time of energy competition and environmental instability. The open source arrangements that have undergirded the successes of distributed peer production in software could have a similar effect in plant improvement. If in software it is true that "to enough eyes, all bugs are shallow," it may follow that "to enough eyes, all agronomic traits are shallow." Participatory plant breeding offers a modality through which the labor power of millions of farmers can be synergistically combined with the skills of a much smaller set of plant breeders. The GPL offers plant scientists in public institutions a means of recovering the freedoms that they – no less than farmers – have lost

to corporate penetration of their workplaces. Public universities, government agencies, and the CGIAR system should be the institutional platform for knowledge generation based on the principle of sharing rather than exclusion. Public plant breeders, too, can be beneficiaries of and advocates for the protected commons.

d. **Develop a framework for marketing of seed that is not patented or use-restricted.** The GPL is antagonistic not to the market, but to the use of IPRs to extract excess profits and to constrain creativity through restrictions on derivative uses. Under the GPL, seed may be reproduced for sale and sold on commercial markets. By carving out a space from which companies focusing on proprietary lines are effectively excluded, the GPL creates a market niche that can be filled by a decentralized network of small scale, farmer-owned, and cooperative seed companies that do not require large margins and that serve the interests of seed users rather than investors. Seed sovereignty need not involve farmers alone, nor can it be achieved solely by farmers.

Seed sovereignty will be manifested as a system encompassing farmers, indigenous peoples, plant scientists, public scientific institutions, and seed marketers. GPL/ OSL/copyleft arrangements could plausibly constitute a legal/regulatory framework that could open an enabling space within which these different social actors could be effectively affiliated.

Ensuring quality: The OPSS network should take up responsibility of maintaining the quality of the seed on the lines of Participatory Guarantee System (PGS). The technical guidelines will be formulated and shared with all the members for all the crops. Mechanisms for effective implementation, technical support etc., will be provided by Network. All said, the network should gradually evolve money not only for self sustaining but to meet the compensatory requirements in case of exigencies.

Important guidelines

- we need to ensure that these should not lead to monoculture
- farmers should not be lured by high price (exclusive seed production always had problems which are evidently seen)
- cost of cultivation should not be increased compared to commercial cultivation, excessively
- we need to maintain the breeder seed in the network it self
- we need to achieve a balance between commercial production and seed production of the varieties, otherwise like many varieties get lost in the seed production chain and never commercialized
- Farmers' need to be explained not only about the techniques but the logic and science behind them.

Annexure-1

Basic Scientific Principles

I. Pollination type

a. **Self pollinated:** Plants where male and female parts are present in the same flower, mature at the same time and pollinate themselves. In crops like paddy, chickpea, groundnut flowers open after the pollination is over.

b. **Often cross pollinated:** Plants where male and female parts are present in the same flower but mature at different times tend to pollinate with other flowers on the other plants. The extent of cross pollination can vary between varieties depending on the maturity of its male/female parts.

c. **Cross pollinated:** In some plants the male and female flowers are different and present in the same inflorescence or in separate flowers on the same plant like in maize, bitter gourd or on different plants like in papaya. In these plants cross pollination occurs as a rule.

Self Pollinated	Often Cross Pollinated	Cross Pollinated
Paddy	Sorghum	Maize
Wheat	Cotton	Bajra
Chickpea	Red gram (Arhar)	Cucumber
Cowpea	Brinjal	Sunflower
Groundnut	Tomato	Castor
Green gram	Okra (Bhendi)	Bitter gourd
Soybean		Coriander and other seed spices
Sesame		Cabbage
Black gram		Sugarcane

II. Genetic Expression

a. **Heterosis:** When two plants of different genetic background are crossed, the resultant offspring's genetic expression would be better than the two parents. This is called as Heterosis. Heterosis is seen in cross pollinated and often cross pollinated crops and would be very less in self pollinated crops.

b. **Inbreeding depression:** When a plant is selfed, if it exhibits a remarkable decrease in genetic expression of characters it is called as inbreeding depression. It is high in highly cross pollinated crops like Maize, Sunflower, Castor etc.

III. Breeding type

a. **Open Pollinated Varieties** (or simply varieties) are the ones which breed true to type which means if the seeds from a plant are sown they produce plants with similar characters. They are largely produced by selfing or by

leaving a population of similar plant to cross among themselves. OPVs in cross pollinated crops having high inbreeding depression have poor genetic expression and do not perform better.

b. **Hybrids** are the ones which are produced by crossing parents with divergent genetic backgrounds to get the characters together in the off spring. The offsprings (F_1) do not breed true and the characters segregate in the next generation (F_2). Cross pollinated crops with high Heterosis perform better as hybrids as the parents are selectively chosen.

Varieties vs Hybrids?

In fact, the development of a hybrid or a variety starts by crossing two desirable parent plants. The resultant plants *i.e.,* hybrids will have higher vigor and the desirable characters of both parents (due to expression of dominant characters from both the parents in heterozygous condition). These seed are sold to the farmer as hybrid seed. In the next generation, the characters segregate and recombine which means the plants obtained from these seed will not have the same vigor and characters. Hence reuse is impossible. In the development of varieties, these segregating populations are taken further for six to eight generations and the best ones in each generation are selected. At the end, one can get an improved variety with all the desirable characters crossed and selected, and these then can be stable (owing to homozygous nature) and reused.

Is seed replace necessary in all crops?

a) The seeds of self pollinated crops like paddy, wheat, groundnut etc., can be reused without losing quality for at least three years. Whereas in often cross pollinated crops the quality deteriorates faster beyond second season. For OPVs in cross pollinated crops the seed quality cannot be maintained unless the isolation distances are maintained strictly. Therefore seed production for the crops would be based on their nature of pollination.

b) Self pollinated crops which are naturally homozygous (with similar parents) yield better as varieties than hybrids, whereas in cross pollinated crops which are naturally heterozygous (with dissimilar parents) like maize and castor, the hybrids yield better. In often cross pollinated crops if the inbreeding depression is low hence OPVs can be developed which can yield on par with hybrids if better parents are chosen.

c) When the highly cross pollinated crops having high inbreeding depression are self pollinated to produce homozygous varieties whose seed can be reused, the yields get reduced. Hence it would be better to produce hybrids in such crops. However, the farmers cannot reuse the farm saved seed and has to take up seed production in isolation to produce hybrid seeds. Farmer groups can have access to the parental lines and produce hybrids themselves. If one wants to reuse the seeds composites or OPVs with similar population can be developed however, their yields would be lower and maintenance would be difficult.

Crops in which hybrids are popular:

Field crops: Cotton, maize, sunflower, bajra, sorghum, castor, paddy
Vegetables: tomatoes, brinjal, chilies, bhendi, watermelon

Crops in which varieties are popular:

Field crops: paddy, chillies, oilseeds, minor millets, pulses, etc

IV. Volume of seed

a. Low volume seed: the seeds which are smaller/weigh lighter in size and/or are required in less quantity per acre. Eg. Tomato, brinjal etc. the seed requirement is only around 620 g/acre. In sunflower, castor etc. the seed requirement is only 2 kg.
b. High volume seed: in certain crops where seed size is bigger and weigh more seed quantity per acre is very high. Eg. In groundnut it is 40 kg/acre, Conventional paddy 40 kg/acre.

V. Seed Multiplication Ratio

Seed multiplication ratio is the amount of seed a crop can produce. This is based on the productivity of the seed crop and the volume of seed. For eg. The seed from one acre of groundnut can be used to sow 8 acres where as the seed from one acre of red gram can be used to sow 100 acres.

Crops	Seed Multiplication Ratio
Groundnut	8
Chickpea	16
Soybean	16
Wheat	20
Green gram/black gram	40
Cotton	50
Castor	60
Maize	80
Paddy	80
Red gram	100
Sesame	250

VI. Seed requirement of important crops (kg/ha)

Crop	Variety
Bajra	4
Bhendi	12-15
Blackgram	15-16
Brinjal	0.65
Cabbage	0.7-0.8
Castor	8-10
Cauliflower	0.7-0.8
Chickpea	50-65
Chilllies	0.65
Cotton	8-10
Greengram	15-16
Groundnut	120-180
Jowar	8-10

Korra	5
Maize	18
Ragi	3
Redgram	25
Rice	50
Safflower	7.5-10
Sesame	5
Sunflower	10
Tomato	0.5
Variga	8

VII. Major criteria for the companies for taking up seed production

1. **Hybrids:** seeds cannot be reused, therefore creates regular market for the seed
2. **Low volume seed:** crops where seed rate is low for easy transport e.g groundnut requires 120-180 kg/ha while tomato or chillies require only ½ kg.
3. **Monoculture:** Few varieties/hybrids which can be sold for all the region are more preferred than diverse seed which are location specific.
4. **High margin:** seeds which give more profits
5. **More control:** seeds developed using proprietary technologies which gives them exclusive control

Annexure-II

How IPRs work? A case of Bt cotton

Mahyco Monsanto Biotech Ltd (MMB) is a joint venture by Monsanto and Mahyco and owns and licences Mon-531 event of Cry1Ac and Mon of Cry1Ac and Cry2Ab. Patent exists only on Mon event but using the biosafety studies clause to get GEAC approval, MMB enters into licensing agreements and collects royalties.

Royalties:
Three hybrids of Bt cotton were introduced in India by Mahyco with licence from MMB in 2002. The prices were fixed at Rs. 1800 per packet of 450 g which can be used to sow in an acre. In 2005 Rasi and Ankur seeds which also developed Bt cotton in license agreement with MMB also got approval for their Bt hybrid seeds. The license agreements show that the Indian companies which entered into the agreement have to pay upfront Rs. 50 lakhs and an amount annually fixed by MMB, pay Rs 1200 on every packet and agree to not to enter into agreements with any other agency for a similar technology in future.

Andhra Pradesh government filed a case with MRTP Commission requesting that Commission to declare the agreements between Indian seed companies and MMB as void as it is leading to monopoly and increase in seed prices. MMB maintained that it is not monopoly as other events (for Nath seeds and JK agri genetics) were also approved. However, MRTP commission asked the state take action since the royalty collected is higher. As there was no law to regulate the seed prices, AP state government used its power of granting trade licenses under Seed Control Order. The prices of Bt cotton seed were fixed at Rs 750 a packet (450 gm) and Rs 925 in 2006 for Bt 1 and Bt 2 respectively. This was further reduced to Rs 650 and Rs 750 respectively in 2008. As the Agreement between MMB and Indian Seed Companies continues to exist and they still have to pay the royalty as demanded by the company.

The industry quickly changed the recommendation from one packet (of 450 g to two packets of 450 g per acre) which quickly doubled their business. MMB was collecting royalty of Rs 150 and Rs 225 on Bollgard-I and Bollgard-II respectively.

In 2010, the National Seed Association of India (NSAI), a body of seed companies association demanded that they should be allowed to increase the seed costs of bt cotton by Rs. 200/packet. Their main argument is that 'Farmers across the country earned Rs 25,000 crore, farmers in Andhra Pradesh realised Rs 4,000 crore after the introduction of Bt cotton. The farmers' income, which was at Rs 16,000 in 2006, has increased to Rs 36,000 in 2009'.

Mahyco Monsanto Biotech's sublicense agreement (the concerned page is enclosed) also has clauses which says any company entering into an agreement with MMB has to withdraw Cry1Ac (MON 531) based Bt cotton three years after the commercial approval of the Bollgard-II (with staked genes cry1Ac & cry2Ab (MON 15985) or five years after the first planting of the Bollgard-II.

Contamination:
In 2008, Government of India released Bt Bikeneri narma using event BNLA-601 jointly developed by UAS, Dharwar and NRCPB, New Delhi. A year later, the variety was put on hold and finally withdrawn from commercial cultivation in 2012. The reasons cited were the presence of Mon 531 event in Bt Bikeneri narma. If contamination is inevitable then how ICAR and SAUs working on the GM crops are going to market their GM crop varieties/hybrids in future?

Annexure-II

List of Probable Organisations/individuals

Open Source Seed Network: Central team should have experts drawn in from conservation and revival, farmer breeders, Participatory Plant Breeding, Farmers Seed Cooperatives/Producer Companies and Legal/Regulation.

Conservation and Revival

1. ICAR
2. Sahaja Samrudda
3. Debal deb
4. Natvar Saranghi

Generating VCU

1. Centre for Sustainable Agriculture-AP, Mah
2. Thanal-Kerala, TN
3. Sahaja Samrudda-Karnataka
4. Kheti Virasat Mission-Punjab
5. Chetana Organic-AP, Mah, Odisha

Participatory Plant Breeding/Farmer Varieties

1. Bioversity, CGIAR (Dr. Bhuwan)
2. Centre for Sustainable Agriculture-cotton and maize
3. UAS, Dharwar-cotton
4. Prakash Raghuvamsi-Wheat, Pigeanpea
5. Kongara Ramesh-Chillies
6. Rama Rao-Cotton

Seed Multiplication and Distribution

1. Sahaja Aharam Producers Cooperatives
2. Sahaja Samrudda Producers Company