

Need for innovative aptitude and mechanisms for Public Private Partnership and germplasm exchange

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Public-private partnership for commercialization is a collaborative effort between the public and private sectors in which each sector contributes to planning, resources, and activities needed to accomplish a shared objective. In the present context, it is an arrangement entered into between two or more parties, specifically a not-for-profit, publicly-funded institution, on the one hand, and a for-profit company (e.g., major national or multinational, research-based agribusiness firms), on the other. Profit-maximizing firms invest in research where marginal benefits exceed marginal costs, and thus they tend to partner only where adequate returns can be readily realized. Public institutions, on the other hand, are typically mandated to research topics of wider social significance with outcomes that possess public goods characteristics (non-excludability and nonrivalry), require longer time horizons to yield results, or cater to end-users with limited purchasing power or market access (Spielman and Grebmer (2004), Hall et al (2002), Harinarayana (2001). This paper is part of our earlier publication in Global Millet meet Seminar proceeding (Tonapi et al. 2013)

Challenges to the public- private partnerships

1. Public and private partners do not adequately account for and minimize the direct and hidden costs of a collaborative research investment.
2. Public and private partners are hindered by persistent negative perceptions of each other or lack of remedial actions when weakness is recognized.
3. Public and private partners are constrained by

the lack of creative organizational mechanisms to handle professionally the intersectoral competition for key assets and resources.

4. Public and private partners are impeded by the limited availability of information on successful working models of partnership.

Elements of commercialization

Despite the many types of public-private interaction and research collaborations, technology transfers, research networks, there is limited information on the commercialization and the models for commercialization. Commercialization is not a “one-size-fits-all” process. The nature and relative importance of the factors vary considerably among a small, an established company and of a large, multinational corporation (Rosenau, 2000). However, no matter the situation, two pivotal elements of this complex commercialization system for all not-for-profits, publicly-funded institutions are:

1. We need to identify market opportunities, carry out research, make investment choices, build networks with other people, and create businesses that function well. All of these are essential to commercialization.
2. Excellence is demonstrated when people conduct the highest-quality research possible, develop and attract the full range of skills needed for successful commercialization, create compelling cases to attract the investment needed to support commercialization

opportunities, and identify and act on the needs of customers and of partners in the supply chain that bring products and services to market.

3. Commercialization exposes to several risks that should be kept in mind when seeking commercial revenues. Firstly, when asked to pay for improved technology, many clients may decide to use their old technology instead. In commercial agriculture this typically indicates that the innovation is not worth much, but in semi-subsistence agriculture this may not be the case.
4. When research organizations are asked to raise some of their own revenues through commercialization, the temptation is to focus on activities that can be commercialized at the expense of those that cannot. At worst, research stations become state farms and researchers become farm managers or extension agents
5. Even if research policies clearly spell out that research organizations need to stay in research, the risk is that the drive for commercialization pushes them into activities that the private sector could do and out of those that it cannot. A requirement that a certain percentage of revenue needs to come from non-governmental sources may slowdown privatization of commercial activities such as seed multiplication, nurseries, or processing plants.

How to move?

1. For commercialization to play a positive role in agricultural research, it is vital to have a clear research policy and a broad understanding among policymakers and scientists on what commercialization can and cannot do, and what public-sector research institutes should and should not do in recovering costs.
2. Another precondition for success is a non-bureaucratic way of doing business, with appropriate incentive structures, flexible procedures, and close attention to client needs. Improvements in these are needed whether or not commercial cost recovery is a goal and deserve priority over the other measures discussed below.
3. Research organizations should be empowered and encouraged to enter into partnerships with private clients. They should have the legal right

to enter into binding contracts with the clients and have the mechanisms for handling such contracts.

4. Research organizations should take careful steps to create capacity in understanding the needs of their potential clients and in marketing their services. To do this without "converting first-rate scientists into third-rate salesmen," it may be advisable to recruit experienced marketing staff from the private sector.
5. Commercialization efforts should target only potential areas for commercial cost recovery. Otherwise, commercialization can cost more than it pays.
6. Plant breeders and research managers need to understand how intellectual property (IP) restrictions on germplasm and traits affect freedom to operate for a breeding program. Access to protected germplasm and traits is restricted and can only be used under some form of material transfer agreement or similar contract.
7. Protected materials have to be maintained under strict provisions of the contract. This adds to the cost of breeding, parent seed, and production programs. Moreover, maintaining separate versions and precise records of protected materials increases the number of seed lots that a program must maintain.

Formation of consortium

Each partner here brings value to the table with common objective. This partnership allows private sector seed companies to access the vast germplasm pool. The benefits of such a partnership will be evident in the form of new hybrids in various crops, development of specific parental lines and sharing based on contractual research, trait specific product development under joint research and joint ownership of intellectual property so generated.

Strategies & actions for decentralized licensing.

1. Identify trustworthy partners to negotiate
2. Fix royalties, terms and conditions
3. Use proven cultivar to leverage
4. Monitor activities of licensing agents

5. Stipulate records that need to be produced annually
6. Evaluate records periodically to ensure traceability and growth of licensed cultivars

Models for commercialization

1. Germplasm exchange
2. Nonexclusive license for providing breeder seeds of parental lines of hybrids
3. Non exclusive licensing of gene construct/ promoter and transgenic seed for its use or further development by the company
4. Exclusive licensing for export
5. Licensing of parental lines, trait specific genetic stocks and sale of segregating progenies
6. Agreement for providing breeder seeds for production of foundation, certified and truthfully labeled seeds by the companies
7. Non-exclusive license to use and practice the knowhow and process of manufacture of the bioformulation/product
8. R & D based agreement with non-governmental Organizations for crop improvements through sharing of material
9. Agreement with farmer's based organization for seed multiplication of varieties/ hybrids

Licensing charges

Based on the points emerging from discussions at seminar on "Strategies for commercialization of public bred hybrids in India", February 23-25, 2008, at JNKVV, Jabalpur and at meeting on licensing and commercialization of ICAR technologies of low volume high value crops, IHR, Bangalore, 29th July, 2008 (Koundal 2008, Seethrama et al 2008a and 2008b), following licensing charges and royalties on various products could be considered for deliberations. However, there cannot be fixed formula for any of the below mentioned categories. The upfront license fees and royalties can be flexible, and may be fixed depending on market structure, demand for specific product types, volume of production and turnover, the novel technologies used and ground level realities. Following categories of licensing charges are proposed for discussion:

1. For gene / promoter – Rs 5 lakhs as license fee and an annual royalty up to 5 per cent on the sale of commercialized product. Variable royalty percentages can be fixed depending on market demand, nature of the product and end-users' ability to pay.
2. For transgenic seed material in T3/ T4 stage- Rs 10 lakhs plus 5 per cent on the sale of commercialized product. The licensing institute will hold intellectual property rights on the licensed gene
3. For custom made-parental line-Rs 5 lakhs as license fee
4. For parental lines-Rs 3 lakhs for A line, Rs 1 lakhs for R line, and Rs 5 lakhs for both plus royalty at the rate of 3 per cent annually on finished commercial product
5. Trait specific advanced genetic stocks and inbred lines can have licensing fees ranging from 1 to 5 lakhs depending on value of crop commodities and trait categories.
6. For CMS line – Rs 5 lakhs as license fee for transfer of material (approx. 100 seeds for each line)
7. A onetime payment Rs 1.5 to 3.5 lakhs per segregating progeny from F2 to F6 generation
8. Crop based consortia could be created with annual fees to usher-in public private partnerships. The range of annual fees can range from 50,000 to 3 lakhs based on crop, trait and market specifics.
9. For hybrid seed production 2.5 % royalty on actual basis from public sector organizations (other than cost of parental seeds), and 4.5 % royalty over and above the cost of parental seeds from private organizations
10. For seed production of varieties to farmers – 1% royalty, for progressive farmers -1.5% royalty, and 2.5 % royalty for private organizations on actual seed production figures.
11. For hybrid seed production with private organizations: 4.5% royalty for field crops, 10 % royalty for vegetables
12. Nationally released varieties should retain their original nomenclature as per ICAR guidelines on IPR

13. In all the finished products the intellectual property of material will belong to licensing organization net revenue after deducting the 12.5% service tax goes to ICAR headquarters as per the Guidelines

Benefit sharing

1. Net revenue/benefit money available for sharing to be determined as per clause 11.4.1 of "ICAR guidelines for Intellectual Property Management and Technology Transfer/Commercialization" effective since Oct, 2006.
2. Net revenue/benefit money to be shared between scientist/inventor and other staff as per clause 11.4.3 of above mentioned Guidelines.
 - i. 60 % of the available money is to be shared among scientist and his team directly involved
 - ii. 25% of the available money to be shared by technical/supporting and administrative staffs
 - iii. 15 % of the available money to be shared by other staff in the Institute
 - iv. The originator of the work may be given 20% more of the equal share than the other Co-PIs
 - v. Scientist and technical staff who worked earlier in the project and the present technical staff may also be given share as per the Guidelines
 - vi. 25% of net revenue after deducting the 12.5% service tax goes directly to the institutes account and 15% of net revenue after deducting the 12.5% service tax goes to ICAR headquarters as per the Guidelines

Commercialization is a complex, integrated system anchored in the world of business. It has many components that come together in different ways. Commercialization is not the final stage of a neat, linear process of innovation. As scientists with an idea in a laboratory, we should imagine that, step by step, the idea matures into a product, service or process that enters the marketplace. This view of commercialization has to be focused on the science, technology and research behind innovation.

Seed industry viewpoints on public-private partnership

The country could achieve the targeted seed production of 258.87 lakh quintals as envisaged in National Seed Plan 2005. However there are certain mismatches in production. The Public - Private - Partnership (PPP) will help to produce the seeds of hybrids / varieties released recently by ICAR / SAUs which in turn helps to increase the productivity in crops. This can help to reduce the usage of farm saved seed and to minimise the mismatches. The Public - Private -Partnership plays a great role in technology development, sharing the location specific hybrids / varieties developed recently by public sector with private sector seed companies.

After introduction of liberalized "New Policy on Seed Development", in 1988, the Private Sector Seed Companies had expanded their research activities and some of them had collaborative arrangements with foreign companies. This has helped for free flow of germplasm material into the country from private companies abroad. In addition to this, CGIAR institutions like ICRISAT, CIMMYT, IRRI, AVRDC have also provided required germplasm lines to private companies. Till early nineties ICAR/SAUs were supplying germplasm material liberally to private sector seed companies. Subsequently this facility was discontinued by many of the ICAR institutes and SAUs. Consequent to this, the private companies started utilizing the germplasm material provided by ICRISAT, IRRI, CIMMYT and few national institutes like Directorate of Maize Research only. Some of the Private Sector seed companies are producing and marketing the hybrids of their own in many crops along with public bred hybrids of rice, sorghum, maize and pearl millet etc.

The private sector seed companies, particularly the medium and small companies which don't have recognition of DSIR, Ministry of Science and Technology, Government of India will have more advantage with PPP. These seed companies also have good marketing network. To enable the farmers to have access to the best hybrids developed by ICAR/SAUs in different crops it is highly necessary to develop relationship between public and private sector organizations leading to "Public-Private- Partnership."

The hybrids developed by ICAR/SAUs are to be marketed by Public and Private sector Seed Companies under an MOU/MOA. This will help for continuous flow of seeds of location specific, biotic and a biotic stress tolerant hybrid / varieties to the farming community which ultimately helps to increase productivity levels in different crops. The popular public sector hybrids in

different crops encompass hybrids in Maize (Ganga - 5, DECCAN 103, TRISULATHA, PEHM-2), Sorghum (CSH-9, CSH 14, CSH -16, CSH-13R), Bajra (BK -560, BJ -104, HHB 67, MH -179), Sunflower (APSH-11, KBSH -41, KBSH -44, NDSH-1, RSFH-1), Rice (KRH-2, Pusa RH-10, DRRH-2, SAHYADRI), Castor (GCH-4, GCH-5, DCH-519, GCH-7)

The MOU/MOA conditions must be liberal in trade related issues, to avoid unhealthy competition among companies. During the past five years, many companies have entered into MOU/MOA with ICAR Institutes / SAUs. The parent material of hybrids i.e.; A, B and R lines or female and male lines seed of the hybrids were provided by licensors.

Clause No.	Existing clause	Modification suggested
4	The Licensee agrees that it would use the given parent line(s) only for the purpose of commercial seed production and sale of the said hybrid and its marketing as per this agreement	The parents of the hybrids particularly 'R' lines to be permitted for marketing as a variety, if desired by the company. The royalty for such varieties is to be paid on par with Article 6.7 of SMTA of CGIAR, which is about 1.1% or 1.0 %. This goes a long way in commercializing public bred varieties.
5	The Licensee agrees that it would market the seed under the same name as given by the licensor.	In case the Licensee wants to use any exclusive denomination (brand name) to trade the licensed hybrid/variety, the seed packet should contain a visible statement "This hybrid is produced by using the parental lines licensed by ICAR/SAUs". This will help to avoid unhealthy competition among companies.
9&10	The Licensee agrees not to sub-license to produce/multiply/market the seeds of the said variety/hybrid to any other company including its own subsidiaries/associate companies operating in India or abroad. In case the Licensee desires to further sub-license the seed multiplication and marketing or any other use, of the said variety/hybrid, the Licensee agrees that it shall be done only with specific written permission /agreement with the licensor.	Licensee to be permitted to sub-license the product to its subsidiaries/associate companies operating in India. Some of the big national companies having share holding in other companies are selling popular products through all their associate companies. This will help for sale of large volumes of seed. Not to insist for specific permission from licensor, when marketed through its subsidiaries/ associates companies.
12	The Licensee agrees to be fully responsible for any complaint made /liability claimed by any affected party (ies) including farmers/ farmers organization/court decisions etc. and the licensor will not be responsible for any complaints/litigation.	The Licensor if required, to depute scientists to inspect the fields under complaint and to give the feedback to the company.
14	The Licensee agrees to pay upfront payment of Rs.....lakhs at the time of signing the MOA. On payment of above mentioned amount by the Licensee; the Licensor will supply 30 kg. seeds of the variety or The Licensee agrees to pay upfront payment of Rs.....lakhs at the time of signing the MOA and will pay royalty @4% on the total amount of net realization value (Net realization value =Invoice price-Dealers discount) of sale of hybrid seed produced subject to a minimum payment of Rs.....lakhs every year starting from the third season (second year) during the period under which MOA is in force. On payment of the above mentioned royalty every year by the Licensee ,which is mandatory, the Licensor will supply the seeds of parental lines of the hybrid(10 kg. of A line,5 kg. of B line and 5 kg. of R line)	Better to increase royalty instead of upfront payment and royalty. The middle level and small companies will be at a disadvantage, since they may not be able to pay upfront. To encourage the above two categories companies, it is better to charge royalty only.
17	The Licensor and the Licensee agree that this agreement is valid initially for a period ofyears from the date of signing the agreement, and thereafter, it is renewable for any further period on mutually agreed terms and conditions.	Agreement period to be valid for five years uniformly.

Sharing of breeding material with private sector seed companies

(a) Breeding material developed by the ICAR/SAUs.

Fully developed material (released and ready for release varieties/ hybrids/ parental lines) and advanced generation lines tested for specified traits in F5, F6 and F7 bulks to be provided on royalty payment basis to seed companies. The companies may be permitted to use these lines along with their lines to develop hybrids.

(b) Raw germplasm and new introductions.

Early generation pedigree bulks of F2, F3 and F4 to be provided to seed companies from which they will develop further lines. There should not be any restriction in sharing raw germplasm and exotic introductions. This material can be shared with the private sector on Non-Exclusive basis. The terms for sharing of credit and IPRs on products developed under joint program with a given seed company shall be decided prior to undertaking such research programs through an MOU. The private companies to be permitted to produce and market the public sector products by a popular name of its choice

Consultancy services to be provided to private sector seed companies.

Services of the Expert Scientists: Provision of short and long term consultancy including long term deputation of ICAR/SAU scientists to guide/assist private sector research and development programs to be considered. The scope of consultancy shall include project formulation, project implementation, project review, guidance and processing proposals to DBT etc. in case of transgenics. The Public Sector Institutes shall provide the services of a scientist of company's choice for consultancy and ensure that the same person's service is extended for repeated visits during the contract period. Problems of common interest to the industry will receive priority over those of individual companies. Both the parties shall respect the confidential nature of advice or information provided. Short term consultancy of one to two days for field visits for opinion seeking on field grow out test plots, providing guidance in seed production plots and to make evaluation of the hybrids /lines for tolerance to pests and diseases etc. to be provided.

Participation in technology transfer programs: The ICAR/SAU scientists to participate in technology transfer related programs such as field days, farmers meets etc. organized by the private sector, to enlighten farmers on latest crop production technologies.

Training on Seed Production: Training to the personnel of private sector to be provided through short term courses on subjects of their interest which would include, seed production technologies, DUS testing, IPR, hybrid breeding, maintenance breeding, molecular marker based screening /selection techniques, DNA fingerprinting, application of biotechnology tools for crop improvement, regulatory system for food/environment safety etc. This is being followed to some extent now. All the licensor institutes need to provide the above services.

Maintenance of parental lines and production of parental lines.

Maintenance of Parental lines is to be done by the originating breeder of public sector institute. The breeders of the private companies can be recognized as sponsored breeders and they can be entrusted with the job of breeder seed production of parental lines A, B and R where large quantities of F1 seeds are to be produced. However the maintenance breeding has to be done by originating breeder. The foundation seed is to be produced invariably by the private companies looking into their requirements, under the supervision of the breeder of the licensor.

Further support needed from ICAR Institutes / SAUs.

- Monitoring of genetic purity of the seeds of varieties/parental lines.
- Sharing of laboratory facilities for testing genetic purity and transgenic traits,
- Evaluating private sector hybrids / varieties, which are not included in ICAR trials for tolerance to pests and diseases and for quality of grain, at a reasonable and uniform cost to be fixed by ICAR.
- In case of hybrids, synchronous flowering parents with high seed yield potential to be developed and they should be free from seed production problems.
- In maize, hybrids with good tip filling, thin shank, orange coloured bold seed to be developed. The maize hybrids must also have specific tolerance to high temperature/ low temperatures at flowering, as per need of the locations.
- Prioritizing research on developing transgenic traits tolerance to abiotic stresses particularly to drought.

Public - Private Partnership to Develop Technology.

- The Central / State Government can collaborate for developing and testing of technology tolerant to pests / diseases / drought, with international institutes like ICRISAT, CIMMYT, IRRI, AVRDC and MNCs like Monsanto, DuPont and Syngenta.
- The hybrids / varieties / transgenic traits developed under the collaborative project to be made available to public – private sector research and seed organizations.
- The technology / transgenic traits developed under this project to be made available to the farming community at a reasonable additional cost. This also helps to integrate the transgenic traits into varieties.
- The collaboration can be led by ICAR, NSAI and AGRI-INNOVATE- ICAR's profit for company as a consortium to facilitate licensing of released and pre-released value added genetic stocks and also other technologies.
- The technical program and progress of the project is to be monitored by a Core Committee consisting of public and private sector research and seed organizations, other stake holders and officers of Ministry of Agriculture, Ministry of Environment and Forests, Science and Technology of Govt of India/ State Govts The committee is to function under the chairmanship of Hon'ble Minister for Agriculture, Govt. of India and State Govts.
- The mechanisms for much pending germplasm exchange be put in place for fast track development of hybrids and varieties to contribute to food and nutritional security and evergreen revolution.
- We propose that the nationally released hybrids and varieties bred at SAUs may have a tripartite agreement between SAU, ICAR institute and the company. We suggest that

85% revenue share may be given to SAUs and 15% to be retained by ICAR institute for final product, with appropriate adjustments for contribution in development and testing of products in the AICSIP programme. If a private partner is also involved, the suitable royalty and benefit sharing mechanism can evolved through mutual discussion.

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