Indian J. Plant Genet. Resour. 34(1): 25–34 (2021)
DOI 10.5958/0976-1926.2021.00004.8

COMMENTARY

An Overview of Framework and Case Studies Related to ABS in Plant Genetic Resources

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(Received: 05 February, 2020; Revised: 15 September, 2020; Accepted: 30 March, 2021)

The global framework to ensure benefit sharing arising out of the use of plant genetic resources is covered under different regimes such as the Convention on Biological Diversity (CBD), the International Treaty on Plant Genetic Resources and the Nagoya Protocol on Access to Genetic Resources. Complying with the CBD, the Government of India enacted the Biological Diversity Act, 2002 and set up the National Biodiversity Authority, State Biodiversity Boards, and Biodiversity Management Committees to regulate access and benefit sharing while utilizing biological resources and traditional knowledge. This article aims to highlight some cases of access and benefit sharing related to plant genetic resources to understand how the access and benefit sharing mechanism is applied in relation to plant genetic resources. Suggestions for improvements are listed in the conclusions including documentation of farmers and public institution bred varieties.

Key Words: Benefit sharing, Biological Diversity Act, Convention on Biological Diversity, ITPGRFA Nagoya Protocol, Plant Genetic Resources, Seed Sector

Introduction

Access to and utilisation of genetic resources is undergoing a paradigm shift with the advent of a new international benefit-sharing regime. It is crucial for PGR workers to be aware of various mechanisms for access and sharing of benefits for utilisation of plant genetic resources keeping in view the provisions of various international and national regulations, the realization of farmers' rights, breeders' rights, and the rights of patent holders. The issues are becoming more complex in view of the rapid advances in biotechnology where using virtual genetic resources is a possibility now. The relationship between IPRs and benefit sharing appears to be especially complex in the seed sector, where the material (variety) is either protected under the plant breeder's rights (PBRs) or plant patents, depending on the different domestic legal systems of countries.

A. Global Framework for Benefit Sharing of PGR

Convention of Biological Diversity (CBD)

The Convention on Biological Diversity (CBD) is the starting point for understanding the global regime on Access and Benefit sharing (ABS). The CBD, which entered into force in 1993, has three main objectives: 1) the conservation of biological diversity 2) the sustainable use of the components of biological diversity 3) the fair and equitable sharing of the benefits arising out of the utilization of genetic resources (UNCTAD, 2014). The major provisions in the CBD focusing on benefit sharing can be found in Article 8(j), 15, 16 and 19 of the Convention.

Though Article 8(j) of the CBD promotes the sharing of benefits arising out of the utilization of traditional knowledge of indigenous and local communities, it leaves the responsibility to achieve this objective on the domestic policies of the member countries. Article 15 of the Convention stipulates provisions regarding access to genetic resources. Article 16 focuses on access to and transfer of technology and Article 19 deals with handling of biotechnology and distribution of its benefits.

The two main concepts in the CBD that link the legal ABS to the national level and the provider country are Prior Informed Consent (PIC) and Mutually Agreed Terms (MAT). Prior informed consent (PIC) refers to permission given by the competent national authority of a provider country to a user prior to accessing genetic resources, in line with an appropriate national legal and institutional framework. Mutually agreed terms (MAT) refer to agreements reached between the providers of

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genetic resources and users on the conditions of access and use of the resources, and the benefits to be shared between both parties. (https://www.cbd.int/abs/about)

ABS serves as a compensation mechanism between the providers and the users of plant genetic resources. A brief account of international legal instruments that shape ABS involving plant genetic resources is provided in the following section to assess the emerging global approach.

1. Nagoya Protocol

Triggered by the limitations of the voluntary Bonn guidelines in operationalizing ABS, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits arising from their Utilization to the Convention on Biological Diversity (The Nagoya Protocol, 2010) was adopted as a binding legal instrument to further facilitated access and sharing of benefits. The Nagoya Protocol sets out the rules and mechanisms for access to genetic resources and associated traditional knowledge (TK), and supports the fair and equitable sharing of benefits arising from their utilization. Along with the basic provisions of the CBD on ABS. The Protocol forms the central body of law that defines how the ABS system operates. The Nagoya Protocol rephrases and makes more concrete the objectives of the CBD pertaining to ABS (IEEP, Ecologic and GHK, 2012). Article 1 of the Protocol clarifies that benefit sharing includes appropriate access to genetic resources, appropriate transfer of relevant technologies, and appropriate funding. Accordingly, benefit sharing entails more than sharing a certain percentage of the profits when a product is developed on the basis of a genetic resource (Grieber *et al*., 2012). The Nagoya Protocol specifies that benefit sharing arrangements shall be established through MAT between the provider and user of genetic resources, thus on a contract basis. The Nagoya Protocol has also placed an ABS clearing house mechanism (ABSCHM) at its website https://www.cbd.int/abs/about/. All countries granting access to genetic resources upload the agreements on this site. In addition, procedures related to access from a country are uploaded at this ABSCHM for use by any researcher/entrepreneur https://absch.cbd.int/search/nationalRecords

2. ITPGRFA (The Plant Treaty)

The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), 2004, popularly called "the Plant Treaty" establishes a multilateral system of access and benefit sharing for plant genetic resources, whereby contracting parties agree to virtually pool a subset of the genetic resources of 64 crops and forages to be used for "utilization and conservation for research, breeding and training for food and agriculture" (Article 12.3(a)). The benefits from use of plant genetic resources are to be shared fairly through methods such as exchange of information, access to technology, capacity building, sharing of monetary and other benefits of commercialization. The Treaty establishes a multilateral system (MLS) where parties who benefit monetarily from materials from the MLS are to make a payment to a joint fund which can be shared with all parties. Further, a Standard Material Transfer Agreement (SMTA) has been included in the Treaty, which should contain the benefit-sharing requirement (Moore and Tymowski, 2005) under certain conditions.

B. Access and Benefit Sharing in India

National Biodiversity Authority

Complying with the global framework, India has enacted the Biological Diversity Act (BD Act), 2002. The National Biodiversity Authority (NBA) is the apex authority dealing with all the matters relating to implementation of the Act and the Rules. The BDA established a three tier system for regulating the access to biological resources in India. At State level, the State Biodiversity Board (SBB) performs similar functions and at local level, the Biodiversity Management Committees (BMC) have been established for the implementation of specific provisions of the Act and Rules. NBA owes the central responsibility for ensuring fair and equitable sharing of benefit defined in the Act. The quantum of benefit shall be based on the purpose of access. The approvals are granted on case-by-case basis. Illustrative examples under different application forms are described (http://nbaindia.org/uploaded/pdf/ABS_ Factsheets_1.pdf)

Form-1: Access to biological resources and/or associated traditional knowledge

The application is approved after consultation with local bodies from whose jurisdiction the biological resources and associated traditional knowledge will be accessed and ascertaining that the material is not related to species that are rare, endangered and threatened. After the approval, an ABS agreement is signed between the NBA and the applicant. Section 40 exempts 190 species that are designated as normally traded commodities

(NTCs). The material used in conventional breeding and traditional practices is also exempted.

Form-2: Transfer of research results to foreign nationals, companies, non-resident Indians for commercial purpose or otherwise

Though section 5 exempts collaborative research from the requirement of prior approval of NBA, but when there is transfer of research results, the information presented in the application is reviewed by an expert committee to ascertain the purport, relevance and authenticity of the application. In the ABS agreement signed under this category of applications, clauses are included to ensure no third party transfers occur.

Example: The Indian Institute of Spices Research has – transferred bacterium *Pseudomonas aeruginosa* isolated from internal tissues of black pepper to Laboratory of Phytopathology, Wageningen University, the Netherlands for evaluation of antimicrobial compounds from bacterial endophytes against major pathogens of spice crops such as ginger, turmeric, black pepper and cardamom.

Form-3: Seeking Intellectual Property Rights (IPRs)

Section 6 of the Act requires mandatory approval of NBA in case invention is based on any research or information on a biological resource obtained from India. It further imposes royalty or benefit sharing fee arising out of the commercial utilization of such rights. Section 6 (3) provides for exemption if any person makes an application under the Protection of Plant Variety and Farmers Rights Act (PPVFRA).

Example: An ayurvedic doctor from Pune, India, has applied for obtaining a patent for preparation of an ayurvedic anti snake venom comprising four medicinal plants. In the treatment of victims of snake bite, this anti venom tablet 'pinak' acts as a temporary relief instantly before victim is taken to the hospital. In this case, NBA has fixed the benefit sharing as "2% of the Gross sales or Gross revenue of the product derived from the use of biological resources accessed." On commercialization of the patent product and as per the conditions of the agreement, the applicant has paid two instalments towards royalty as benefit sharing to the NBA. It is pertinent to mention that this is the first of its kind in India under the BD Act.

Form-4: Third party transfer of the accessed biological resources and associated traditional knowledge

Applicable in case of transfers of biological resources and associated knowledge amongst different users of value chain of research or commercialization.

Example: The Energy and Resources Institute (TERI) has sent dried root powder and extracts of Chlorophytum species for isolation and characterization of Biologically Active Saponins from Chlorophytum species to UFR des Sciences Pharmaceutiques et Biologiiques, Dijon, France. The MTA has also been developed between TERI, India and University of de Burgundy, France. The material transferred under the project will be utilized for identification of saponin molecules and study of cytotoxicity of saponins. The cytotoxic saponins identified in the project may further be worked on to develop anti-cancer drug while the insecticidal saponins may be developed into suitable formulation for utilization as environment friendly integrated pest management programmes.

Though the BD Act as well as the rules referred to monetary and non-monetary benefit sharing, it is the NBA guidelines on ABS, 2014 that clearly specifies the kinds and the method of calculating monetary and non-monetary benefits. In most of the cases, monetary benefit sharing was preferred over non-monetary benefit sharing.

Non-Monetary benefit sharing may be in the form of grant of joint ownership of intellectual property rights to the National Biodiversity Authority, or where benefit claimers are identified, to such benefit claimers; – transfer of technology; location of production and R&D units in areas which will facilitate better living standards to the benefit claimers; association of Indian scientists, benefit claimers and the local people with R&D in biological resources and bio-survey and bio-utilization; setting up of venture capital fund to aid the cause of benefit claimers; payment of monetary compensation and non-monetary benefits to the benefit claimers as the National Biodiversity Authority may deem fit.

However, as per the guidelines on Access and Benefit sharing issued by NBA, following forms of non-monetary benefit-sharing options may be included. Options are- providing institutional capacity building – including training on sustainable use practices; transfer of technology or sharing of R&D results within Indian institutions/individuals/entities; strengthening of capacities for developing technologies and transfer of technology to India and/or collaborative R&D programs with Indian institutions/individuals/entities;

– contribution/collaboration related to education and training in India on conservation and sustainable use of biological resources; location of production and R&D units, and measures for conservation and protection of species in the area from where biological resource has been accessed, contributions to the local economy and income generation for local communities; – sharing of scientific information relevant to the conservation and sustainable use of biological diversity, including biological inventories and taxonomic studies.

Monetary benefit sharing

As per the ABS Guidelines 2014, the biological material of high economic value is used for research purposes, an upfront – payment may be required to be paid. The amount of which is to be decided between the applicant and the NBA. In case the access of biological resources is for commercial utilization, the benefit sharing may include an upfront payment of not less than 5% on proceeds of auction or sale amount, as decided by the NBA or the SBB. For transfer of results of research, if the applicant has received any monetary benefit, (s)he shall transfer 3.0 to5.0% of the monetary consideration to the NBA as agreed in the ABS agreement. For cases involving commercialization of IPRs obtained on inventions related to genetic resources, the applicant shall pay to the NBA monetary and or non-monetary benefit as agreed upon between the applicant and the NBA. Where the applicant himself commercializes the process/product/ innovation, the benefit sharing should be in the range of 0.2 to 1.0% based on sectoral approach, calculated in term of annual gross ex-factory sale minus taxes. If the applicants license the process/product/innovation to a third party for commercialization, they shall pay to the NBA 3.0% to 5.0% of the fee received, and 2.0% to 5.0% of the royalty amount received annually from the assignee based on sectoral approach. For transfer of research results to another party, the applicant is required to pay 2.0%to 5.0% of any amount or royalty received from the transferee throughout the term of the agreement. In case the biological resource has high economic value, an upfront payment may also be mutually agreed upon.

The Protection of Plant Varieties & Farmers' Rights (PPV&FR) Act, 2001

The PPV&FR Act, 2001 in India is a sui-generis system established in compliance with Trade Related Aspects of Intellectual Property Rights (TRIPs) to protect IPR on plant varieties. The Act also contains provisions for determination of benefit sharing. Upon registration of a plant variety, the Authority shall publish contents of the certificate of registration inviting claims for benefit sharing under section 23 read with rule 41. Any person or group of persons or firm or government or non-governmental organization shall submit its claim of benefit sharing to such variety in the prescribed manner and within the prescribed period. The breeder of registered variety is intimated about the same and he may oppose such claim. Upon hearing both the parties, the Plant Variety Authority shall determine the quantum of benefit sharing taking into account the following criteria namely:

a. The contribution of the claimant in selecting, conserving and providing the genetic material,
b. The contribution of such genetic material in providing one or more traits which conferred high commercial value to the variety, and
c. The contribution of such genetic material to impart high combining ability to the parents of the hybrid variety relating to benefit sharing.

While disposing of the claim under section 23(4) of the Act, the Plant Variety Authority shall take into consideration the following aspects for determining the quantum of benefit sharing:

a. The extent and nature of the use of genetic material of the claimant in the development of the variety relating to which the benefit sharing has been claimed;
b. The commercial utility and demand in the market of the variety relating to which the benefit sharing has been claimed.

The amount of benefit sharing to a variety shall be deposited in the National Gene Fund established under section 45 of the Act. Hence, the benefit sharing under PPV&FR Act is only monetary benefits. This form of recognition is for communities or individuals contributions towards popularizing local varieties and indirectly a mechanism of benefit to conservers of local diversity of crop plants. Another mechanism to benefit to local farmers and communities is registration of farmers/ communities can register a variety of local importance with good economical or quality traits and they are provided all rights under PPVFR Act as provided to the breeders of a new variety. So far, the

benefit sharing under the Act is recognized in the form of Plant Genome Savior Award and Recognition. Under the Indian Patents Act, it is mandatory to disclose the source or geographical origin of biological material in the specification, when the invention is based on use of biological material (Section 10). In case of non-disclosure or wrong details are furnished, it can be a ground for revocation of granted patent (Section 64). Sections 25(1)(k) and 25(2)(k) of the Patents Act make provision for pre-grant and post-grant opposition against inventions involving traditional knowledge. Similarly, Sections 25(1)(j) and 25(2)(j) of the Patents Act makes provisions for pre-grant and post-grant opposition for not disclosing or wrongly disclosing the source or geographical origin of biological material used in the invention. Furthermore, Section 64 makes provision for revocation of patents where the complete specification was anticipated by the knowledge possessed by local or indigenous communities in India or elsewhere, or if the complete specification does not disclose or wrongly mentions the source or geographical origin of biological material used for the invention.

Nevertheless, there is no mutual cooperation between the Patents Act and the BD Act in dealing with benefit sharing. The Patents Act does not talk about benefit sharing at any stage in the Act. Section 6 of the BD Act makes it mandatory for the IPR applications to obtain prior approval from the NBA before obtaining patents from the Patent Office within or outside India. This requirement is being implemented at the Indian Patent Office with the help of the Guidelines for Processing of Patent Applications relating to Traditional Knowledge and Biological Material issued by the Controller of Patents on 8th November 2012. However, there are instances wherein this requirement is not being taken seriously by the Patent Office itself. It was noticed that patents were granted on many occasions where the applicant has not obtained prior approval from the BD Act.

Certain case studies from around the world may shed some light on how sharing of benefits is in practice in other countries when compared to India.

C. Global Case studies on benefit sharing related to plant genetic resources

1. The Genetic Resources Recognition Fund of the University of California, Davis, USA (2004)

A wild rice species *Oryza longistaminata* from Mali is resistant to rice blight. Blight resistance was attributable to a section of DNA, found on a single chromosome, termed *Xa21*. The University of California (UC), Davis team identified and cloned *Xa21*. UC Davis filed a patent on the *Xa21* gene sequence. UC Davis entered into agreements licensing the gene to two agricultural biotechnology companies and will use the Genetic Resources Recognition Fund as a mechanism to share any resulting financial benefits. The Fund money was planned to be utilized for funding Fellowships for scholars from source countries such as Mali. Depending on the magnitude of the monetary benefits that arise from the commercialisation of *Xa21*, scholarships may be offered to students from Mali (a country of origin that originally provided the genetic resources in question). GRRF has no money in the Fund as of now; this will only accrue if the licensee companies commence sales of product incorporating Xa21. There could also be voluntary contributions, however contribution to conservation of wild species (*Oryza longistaminata*) is an indirect benefit through raising awareness of the importance of genetic resources for crop breeding efforts. This case is a purely voluntary initiative. Many institutions/ universities are engaged in commercialization of genetic resources in the field of plant genetic resources, but few have taken initiative to develop mechanisms for benefit sharing and thus it's a rare example. An important lesson learnt is that where benefit sharing is a new concept, it is simple to develop a mechanism that fits into the existing procedures and institutional structures**.** (http://www.cropgeneticsinnovation.org/genetic-resources-recognition-fund-grrf/).

2. The Teff case, Ethiopia

Ethiopia is the centre of origin and diversity for Teff (*Eragrostis tef)*. The Teff grain is gluten free, and it is increasingly desired in Western markets. It also has various other attributes of interest to the food industry. In 2004 , a ten year access and benefit-sharing (ABS) agreement was concluded for the breeding and development of teff between the Institute for Biodiversity Conservation (IBC), the Competent National Authority for ABS in Ethiopia- the Ethiopian Agricultural Research Organization (EARO), and the small Netherlands-based company Health and Performance Food International (HPFI). The central focus of HFPI was to develop teff products for Western markets in forms such as bread, sports bars and beer. The agreement stipulates an array of long-term benefits to Ethiopia which includes:

(i) an agreement by HPFI to pay the IBC – a lump sum of profits arising from use of teff genetic resources;

(ii) royalties to the IBC of 30% of net profit from the sale of seeds of teff varieties;

(iii) a license fee, linked to the amount of teff grown by HPFI or anybody supplied seed by HPFI; and

(iv) contributions by HPFI of 5% net profit, no less than €20,000 per year, to a fund named the Financial Resource Support for Teff (FiRST), established to improve the living conditions of local farming communities and for developing teff business in Ethiopia. For this, HFPI agree to provide:

- support to local Ethiopian farming groups to grow high yielding Teff varieties;
- coaching and teaching farmers 'improved agricultural practices';
- introducing tools to improve the seeding and harvesting of Teff in Ethiopia;
- the introduction of high yielding Teff varieties;
- implementing new standards for storage and cleaning Teff.

The agreement also involves the transfer of Dutch scientific knowledge and experience with product innovation to Ethiopia. HPFI will also share its research results on teff and will involve Ethiopian scientists in its research. To this end a research breeding program has been set up between EARO in Debre Zeit. Unusually, the agreement sets out a commitment by HPFI to create joint ventures with Ethiopian counterparts to establish teff businesses in Ethiopia.

Though HFPI contributed to the fund as per the benefit sharing agreement until 2017 no benefits had been distributed to farmers. This has been due in part to a lack of clarity about its governance. Implementation of the ABS agreement also remains thwarted by a decision of the Ethiopian government to ban teff exports. The reasons for this are to support Ethiopians small scale agriculture and to ensure adequate local supply of teff. According to HFPI, there is no shortage of teff, but there is resistance within Ethiopia to changing farming methods and increasing volumes produced.

The complexity of these factors, and their unintended negative impact on the ABS agreement, yields important lessons for other ABS agreements where the contract deals not only with the provision of access to genetic material, but also with the trade of it as a commodity. Finally, the process has highlighted the critical need for provider countries to develop ABS negotiating and administrative skills and to have ready access to information about markets and market potential (Bayou, 2005). However, no benefit was accrued practically and Ethiopia lost the rights to utilize and gain benefits from its own resources in countries where the patent was valid. The case was well in advance of its time and considered as pilot case for the Implementation of the CBD in terms of access and benefit sharing. A very small amount of benefit in form of cash (about 4000Euros) and a research project were the only concrete benefits generated.

3. Ball Horticulture and the South African National Biodiversity Institute

The South African National Biodiversity Institute (SANBI) is a public institution engaged in conservation, sustainable use and promotion of economic use of exceptionally rich biodiversity of South Africa. In 1999, SANBI entered into a Research and Licensing Agreement with the Chicago-based company Ball Horticulture. In terms of the agreement, SANBI was to supply Ball with different categories of "live plant material", including all horticultural groups as well as research expertise and knowledge of the plants and their habitats. For providing this service, SANBI obtained an annual research service fee and royalty in case of commercialization. In the event of profits being derived from the deal, a Biodiversity Trust Fund was intended to be established by the SANBI, for the purpose of capacity building in the local horticultural industry and for conservation and community development projects. Part of the agreement is for Ball Horticulture to present one technical seminar on ornamental horticulture a year and to host interns each year for training in Chicago by Ball. A significant result of this training is that increased selection and breeding take place in-house at SANBI, enabling improved material to be sent to Ball, which commands a higher royalty for SANBI and reduces the time the product will take to reach market.

Several lessons emerge from this case that is instructive. The difficulties that SANBI has faced in switching hats between being a public interest body and a commercial player are especially useful to learn from.

More positively, there is now increasing recognition of the role that SANBI can play in initiatives to investigate the sustainable use of South Africa's indigenous plants. The expectations of technology transfer are also significant. The lack of experience in developing agreements of this nature by either SANBI or Ball also yields important lessons. Legal expertise was, and continues to be, limited in this field, and this significantly affects the effectiveness of negotiating and drawing up fair and equitable benefit-sharing agreements. Lastly, the partnership that has developed between SANBI and Ball is considered a useful model from which to develop other ABS arrangements in the horticultural sector and is believed by those involved to be a more ethical and sustainable approach than a once-off collection agreement (Sarah Laiid, 2008).

4. Natura, Brazil: The Use of Traditional Knowledge and Community-Based Sourcing of "Biological Materials" in the Personal Care and Cosmetics Sector

Natura is a Brazil based company involved in sale of cosmetics, personal hygiene, and perfume products. In 2000, Natura formed EKOS Line, which prepared natural based cosmetic products the raw material of which is sourced majorly from communities around Brazil. Natura's partnerships with communities for the sustainable supply of raw materials, and its use of traditional knowledge to develop new ingredients or products, pre-dated Brazilian ABS legislation. Prior to any legal framework, the company established a package of benefits and equitable practices that included:

1. providing training and capacity-building in agricultural techniques, and equipment and other materials to add value to raw materials, in order to promote greater benefits within the community;
2. supporting and assisting with the development and administration of community associations;
3. seeking prior informed consent and payment before using any images of people from communities in marketing; and
4. setting up funds in communities through allocation of a percentage of net sales; this is seen as an investment Natura makes in particular communities, and has been established in only one community to date, Iratapuru, and another is pending.

The company distinguishes between different types of relationships and benefits that result for local groups:

1. *Access Agreements* for genetic resources and traditional knowledge that include benefit sharing in nonmonetary forms, as well as a percentage of net revenue;
2. *Local Development* projects that include investments made by Natura in specific communities to build local institutions and capacity, not tied directly to accessing genetic resources or traditional knowledge;
3. *Supply partnerships*, which do not involve ABS agreements but include support for production and harvesting of raw materials, and facilitation of links between communities and third-party processors, from whom Natura buys processed products such as oils or extracts.

The agreement between Natura and the community was non-exclusive and involves payment of royalties and an upfront payment to the Association. The agreement has been signed by Natura and concerned association but has not yet been approved by CGEN (the administering body for both existing and any new sourcing partnerships, and those that involve accessing traditional knowledge) given the complexity of the issue and lack of clear legal guidance on access and benefit-sharing associated with traditional knowledge. (Sarah Laird, 2008)

5. Access and Benefit-Sharing Agreements in the Commercial Development of Hoodia

The present case is a well-documented example wherein the poor and uneducated indigenous community had to employ a lawyer and put up a fight to an unwilling government owned institution in order to share the benefits.

The product in focus is an appetite suppressant extracted from Hoodia (*Hoodia gordonii*), a leafless succulent plant native to the Kalahari Desert in South Africa. The fleshy stem of Hoodia was chewed by the members of the San community of southern Africa on their long hunting and gathering trips to quench thirst and suppress hunger. They shared this traditional knowledge with a Dutch anthropologist who published his finding in a book and following the clue, the South Africa's - CSIR began carrying out R&D into the properties of Hoodia and identified the active ingredient named 'P57' and got it patented. Later CSIR signed a license agreement with Phytopharm, a small British company dealing in phyto-medicine and later with Pfizer, a

US based pharma-giant, for further development and commercialization of the patented technology. Unilever was also contacted to market Hoodia-based products as anti-obesity drugs and also as functional foods. All this happened without the knowledge and permission of the San community. This act of CSIR was severally criticized by media and when the San people came to know about this, they formed the Working Group of Indigenous Minorities in Southern Africa (WIMSA) with an aim to represent San communities across different regions of Africa and to negotiate for benefit sharing with CSIR, the government organization guilty of biopiracy. After a long discussion, CSIR agreed to acknowledge the role of the San community, their TK and signed a MoU, the key provisions of which are mentioned below:

1. The San communities are to receive 8 percent of all the milestone payments that are received by CSIR from the license firm, Phytopharm, so long as the drug is in clinical development over the forthcoming years.
2. Of all royalties received by the CSIR from Phytopharm as a result of the successful exploitation of products, 6 per cent go to the San people for the duration of the royalty period, or as long as the CSIR received financial benefits from commercial sales of the products.
3. Any IP arising from the use of the TK related to Hoodia and from the patents for P57 will remain vested exclusively with the CSIR, and the San Council to have no right to claim any co-ownership of the patents or products derived from the patents.
4. Both the parties will conserve the biodiversity and undertake best-practice procedures for plant collection.
5. The CSIR will lay the groundwork for further collaboration in bioprospecting.

The San Hoodia Benefit Sharing Trust was formed for proper channelling of fund flow and its management to improve the living condition of San community. There are several challenges to this agreement as San people don't receive any revenue from the sales of many Hoodia based products currently traded in the international market because such products are commercialized outside of the CSIR agreement (Srivastava, 2016).

6. Osyris project

Osyris quadripartite, commonly known as African sandalwood is the source of oil used in form of compounds in cosmetics, perfumery, food and flavouring industry. The derivatives are being used in the Osyris project. Aditi International, Mumbai collaborating with Docomo Oils PLC, is developing products with the involvement of South Omo- tribals of Ethiopia people. Ethiopian Biodiversity Institute (EBI) grants access based on PIC and MAT. The company invested over $ 3 million to start the industry and provided 125 Ethiopians permanent employment. In terms of benefits, the company paid US$ 50000 as upfront payment and agreed to pay 3.5% of net profit. A minimum of $ 2 million of foreign revenue will flow to the country and the Aditi International has pledged to pay 2% of the cost of all raw material purchased from the community to establish nurseries towards rehabilitation and sustainable use. Collection site association also receives 30% of the purchase price of the raw material as assistance to grow and support initiatives within their communities (UNDP-GEF 2018)

D. Indian examples of benefit sharing

India's engagement with Access and Benefit Sharing (ABS) issues emanated through the most discussed *'Kani case'* where the Kani tribe and their traditional knowledge relating to the use of a plant called Arogyapacha was discussed. The local communities were recognized and rewarded for providing the genetic resource and associated traditional knowledge that resulted in commercialization of a drug with anti-fatigue properties called 'Jeevani'. This experience of ABS pre-dates the entry into force of the CBD (NBA Factsheet). Some of the cases that are post-CBD are discussed below:

1. PepsiCo India

In 2007, the National Biodiversity Authority entered into two agreements with PepsiCo, one for commercial access and the other for third-party transfer of *Kappaphycus alvarezii*, a type of seaweed (a species of red algae) from the Gulf of Munnar area of Tamil Nadu; for exporting it to Indonesia, Malaysia and the Philippines for commercial utilization in the food and cosmetics industry. NBA received certain amount of money from Pepsico but failed to distribute it to the local community till 2010. The reason being the non-constitution of Biodiversity Management Committees by State Bio-diversity Board of Tamil Nadu in coastal villages to distribute the benefits accrued with 754 benefit claimers spread across 4 districts in Tamil Nadu. This case shows that even when revenue

is collected from companies, the distribution of benefits can be difficult. Further, there is also lack of clarity about how community development is to be assisted. The fact that the training given to women self-help groups constitutes an important benefit from this agreement is not justified as it is not clear whether the above said training was for skills for sustainability or was just to facilitate exports. This illustrates the inadvisability of relying on raw materials as a source of revenue and development for local communities.

2. Bio India Biologicals

In another case, the NBA collected certain amount of money from Bio India Biologicals for the export of 2000 kg of nee*m (Azadirachta indica)* to Japan. According to the NBA, members of the local community of Amarchinta village in Andhra Pradesh collected and dried the leaves "by undertaking a few special operations" before handing it over to the company for export. The NBA states that it has transferred a "part of the royalty amount" to the local biodiversity body in Amarchinta for "planting neem saplings and creation of awareness about biodiversity conservation (Dhar *et al*., 2014). The sale of neem abroad for a small amount of money seems counter to the very principles on which the issue of biopiracy has been raised. Simply transferring a small amount of money to the local community to plant neem saplings is not much benefit sharing. Criticism of this approach with regard to benefit sharing is being voiced in India, questioning the reasons why local communities have not been consulted and why benefits have not yet reached the communities (Bhutani and Kohli, 2010). In this case, as in the PepsiCo example, the focus has been on a commodity rather than on genetic resources. This gives rise to questions about the implications of dealing with commodities under ABS laws, rather than purely genetic resources as envisaged under the CBD. There are cases of spices varieties developed by ICAR using farmers' traditional knowledge but as the varieties were old and community possessing traditional knowledge is difficult to locate the strategy to be adopted to share the benefit. In another case, a private seed company utilized a farmer variety in wheat breeding program. One time monetary benefit was given to the farmer and submitted the legal acquisition certificate when application for plant variety protection is made for the variety developed. Farmer was neither entitled to any IP right nor was any royalty given for benefit arising out of commercialization.

Discussion and Conclusion

The mechanism of benefit sharing is complex in the agriculture sector, as the varieties are protected by plant breeder rights, which is different from the patents granted in other fields. The framework for sharing benefits exists under national and international convention/agreements. The spirit of such instruments has not been translated into domestic laws. There is a need to develop the technical and administrative skills to make of existing provisions by analysing available case studies. The case studies show that, although monetary benefits were gained by the use of biological resources, the non-monetary benefit sharing needs to be encouraged by the Authorities while determining specifics of benefit sharing. In fact, while dealing with access to community related genetic resources; non-monetary benefits would be a lasting benefit to the community and conservation of biodiversity in the locality or region. Osyris project of Ethiopia is the perfect combination of monetary and non- monetary benefits derived from the use of genetic resources simultaneously addressing the conservation concerns. However, very few such cases are available where benefit sharing mechanism is defined for the use of plant genetic resources. There are several cases where highly valuable public domain ICAR/SAU crop varieties (varieties notified under section 5 of the Seed Act which crossed 15 yrs protection granted under Seeds Act) were utilized in the breeding program by private seed companies. Being in the public domain, use of these varieties have no obligation for benefit sharing. Companies are known to make large profits, whereas the benefits are not flowing back to the breeding institutions or conservation effort either in monetary or non-monetary ways.

There is a need to develop a database of all existing plant varieties in India with data on original breeders and public sector organizations as well as farmers varieties which have bred these varieties. There is a provision in the PPV & FR Act for such a Plant Variety Register [Sub-section (1) of Section 13]. This database could not only serve as a 'prior art' for reference, it may also help in cases of disputes, in the future. The NBA shall include mandatory listing of farmers varieties in People's Biodiversity Registers envisaged for every local body or Biodiversity Management Committees. It is expected that ICAR take some measures to bring public domain varieties within the ABS framework. This will not only generate revenue for ICAR/SAU but will also pave way for an effective benefit sharing system.

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