Intellectual Property (IP) in Nigeria: Balancing Rights, Traditional Knowledge and Innovation in Developing Agricultural Biotechnology Systems

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Abstract

Purpose: *The research was carried out to look at an age-long conversation on the rights of creators of ideas and other products of the human intellect especially as it affects the bounds that define exclusivity of the ownership of derivable benefits and common goods from such products. Novel fields like agricultural biotechnology tend to elicit such influence owing to their dependence on a wealth of traditional knowledge/systems and native natural resources.*

Design/Methodology/Approach: *The methodology adopted was contextual analysis , which involved the review of publications on the subject matter, from library collections and the Internet.*

Findings: *The paper found that cloning of genes designed from the local environment and subsequent patenting of such pirated genes rob the nurturers of these materials of their ageless efforts. The ethics of rapidly accumulating of Intellectual Property Rights over germplasm and enabling technologies thereby has causing a rapid increase in transaction costs of acquiring Intellectual Property Rights (IPRs) also formed a crucial part of the discuss.*

Implication: *In view of the embryonic stage of the development of agricultural biotechnology in Nigeria and other developing agricultural systems, an unequalled opportunity presents itself for developing an Intellectual Rights system that ensures that the full benefits of innovation in this field is derived.*

Originality/Value: *The Paper concludes by proposing a process of just and equitable engagement of developing systems in the development of Intellectual Property Rights.*

Keywords: *Indigenous knowledge, Intellectual Property, Intellectual property rights, Innovation, Agricultural biotechnology, Traditional knowledge*

Paper type: *Contextual analysis*

Introduction

Contextual definition of the concept of IP in agriculture

Research is an expensive activity requiring intensive investment on the part of both the individual scientist and the research system. While it is sometimes argued that public good must underlie the drive to solve problems through research, it is a consensus that both the scientist and the system must be supported by a resourcing and reward system to ensure sustainability. Intellectual property rights represent the mechanism through which the efforts of those who solve problems through innovation are rewarded. Intellectual Property Right (IPR) as defined by the FAO (2001) is intangible right which grants an exclusive right to impede others to freely exploit an invention or creation. These rights exist in various forms like patents; trademarks, industrial designs or copyrights. Each form has different implications and grants different rights. Patents for instance confer exclusive rights to their holders by granting a legal monopoly on a novel and useful invention. Patent is a government issued grant which confers on the inventor the right to exclude others from making, selling, using or offering for sale, or selling the invention for a period of 20 years, measured from the filing date of the patent application (Nwogu, 2014).

In general terms IPRs refer to the creations of the human mind. These rights protect the interests of creators by giving them rights over their creations. Commission on Intellectual Property Rights (2002) describes it as the rights awarded by society to individuals or organizations principally over creative works: inventions, literary and artistic works, and symbols, names, images, and designs used in commerce. They give the creator the right to prevent others from making unauthorized use of their property for a

limited period. Intellectual Property is commercial innovations), and Artistic and Literary Property (cultural creations). Current technological developments are blurring, to some extent, this distinction, and some hybrid sui generis systems are emerging.

In its legal context, Yamin (2003) describes Intellectual property as referring to the category of intangible rights protecting commercially valuable products of the human intellect (Blacks Law Dictionary). The category comprises primarily trademarks, copyrights, and patent rights but also includes geographical indicators, trade-secret rights, publicity rights, moral rights and rights against unfair competition. Intellectual property also covers Plant Breeders Rights (PBRs) a sui generis form of intellectual property designed to reward commercial plant breeders. IPRs were designed to encourage innovation, creativity and knowledge dissemination in a commercial, industrial context.

Intellectual Property Rights are basic to the process of ensuring and protecting incentives that accrue to individuals and systems whose dogged inputs generate scientific and technological innovations for society. Describing its relevance to agriculture, with specific reference to agricultural innovation, Binenbaum et. al., (2003) pointed out that it has been the most critical form of protection for agricultural biotechnology and having the most effect on the freedom to operate within the innovation system, adding that intellectual properties can be protected by means of copyrights, trademarks, utility patents, plant breeders rights, and trade secrets. Intellectual property rights have a number of dimensions that are relevant here, including the requirements for obtaining the rights, the scope of what is protected, the geographical limits to the rights, and the duration of the rights. These dimensions vary according to the type of IP and the legal and administrative system of each country. While these are expected in the national innovation legal framework, Nigeria national agricultural research system hardly has a coordinated implementation mechanism that makes it possible for scientists to adequately own and protect their intellectual property. It is the opinion in some quarters that this is largely a result of the absence of a scientist-entrepreneur culture in the research system.

Establishing a firm system of patency makes development of a national IPRs policy effective and sustainable. This is because one of the most categorized as Industrial Property (functional commonly known set of IPRs are Patents. These are government issued grant which confers on the inventor the right to exclude others from making, selling, using or offering for sale, or selling the invention for a period of 20 years, measured from the filing date of the patent application. Patent protection for Nigeria patent extends only throughout Nigeria and its territories and possessions. Ibigbami, (2010) observed however that the Patents and Designs Act however does not provide for the meaning of patent.

Over the last twenty years or so there has been an unprecedented increase in the level, scope, territorial extent and role of IP right protection. Manifestations of this as chronicled by Commission on Intellectual Property Rights (2002) include:

i. The patenting of living things and materials found in nature, as opposed to man-made products and processes more readily recognizable to the layman as inventions
ii. The modification of protection regimes to accommodate new technologies (particularly biotechnology and information technology), such as the EU Biotechnology Directive or the
iii. Digital Millennium Copyright Act (DMCA) in the United States (US)
iv. The extension of protection into new areas such as software and business methods, and the adoption in some countries of new sui generis regimes for semiconductors and databases
v. A new emphasis on the protection of new knowledge and technologies produced in the public sector
vi. The focus on the relationship between IP protection and traditional knowledge, folklore and genetic resources
vii. The geographical extension of minimum standards for IP protection through the TRIPS agreement and of higher standards through bilateral and regional trade and investment agreements
viii. The widening of exclusive rights, extension of the duration of protection, and strengthening of enforcement mechanisms.

While IPRs are applicable to virtually all areas of innovation, Ibigbami (2010) described three areas

of importance of IP to Agricultural Biotechnology:

i. It gives legal backing to effective bio-safety regulations. It develops national biotechnology policy and biosafety bill for enactment.
ii. It gives rooms for effective vetting of applications for the purposes of receiving and handling Genetically Modified (GM) materials as well as carrying out research.
iii. It promotes laws that create an important government system that provides incentives for inventors or innovators for the development of new technology and ideas for the society.

Intellectual Property Rights and Agricultural Biotechnology Research

The protection of intellectual properly can be a mixed blessing. In the opinion of Pardey and Bientema, (2001), granting rights to intellectual properly provides incentives to innovate and to reveal new knowledge that may otherwise be kept secret. On the other hand however, the cumulative nature of agricultural research means that the proliferation of patents makes it increasingly difficult for public institutions and private starts-ups to be active participants in agricultural biotechnology research. This is further compounded by the fact that the needs of industry and agricultural progress are yet to be properly reconciled with the rights of indigenous peoples and poor farmers who have being age long custodian of the many of the many landraces on which biotechnology systems depend.

While the positive impact of the IPR systems on investment in agricultural research is not in question, FAO, (2001) raised a number of concerns as they affect developing systems like Nigeria:

i. The limits of patentability; the impact of patenting genes in the agricultural sector cannot be minimized.
ii. The patenting of enabling technologies that is, technologies that are essential for the practical implementation of a wide range of other biotechnological processions and products.
iii. The multiplicity of patents required to develop an agricultural product. This complicates the management of the research agenda.
iv. Patents of specific genes usually extend to the organism into which the genes are inserted thus bringing the entire organism under patent protection.
v. Concentration of the patent rights in few hands.

On the situation in Nigeria, Oyelaran-Oyeyinka and Sampath (2005) observed that researchers are very often unaware of the intellectual property dimensions of their research. In cases where they are aware, there seems to be a concern for immediate tangible gains (through publication of research results in international journals that may win them recognition and subsequent fellowships for short or long term stays in foreign laboratories), instead of patent protection that may be more useful in the longer run for the biotechnological system of innovation. Both a lack of venture capital and other such sources of private finance, as well as absence of risk-taking attitudes among researchers, contribute to the dearth of a culture of `academic entrepreneurship` Alhassan (2003), corroborating this assessment, comments that there is a dearth of knowledge on intellectual property rights issues by the National Agricultural Research System (NARS) in the sub-region, especially as this relates to plant products and technologies. Periodic national and sub-regional workshops should be held on the subject for the benefit of the NARS. Issues related to benefit sharing should be a component part of the training workshop. Resource staff from relevant international organizations like World Intellectual Property Organization (WIPO) and desk officers from agencies implementing IPR issues can be used in the training programs.

The challenge that could limit the mainstreaming of IPR issues in the NARS is the narrowing of the scope of agricultural biotechnology research in Nigeria by institutional deficiencies, especially inadequate infrastructure. Adeoti and Adeoti, (2003) described modern biotechnology research in Nigeria as limited to the areas of cell and tissue culture with an agricultural bias, adding that there is evidence of isolated cases of research in more advanced biotechnologies such recombinant DNA or genetic engineering, bioprocess technologies, bioinformatics, and cell fusion (molecular diagnostics). These latter categories are largely concentrated in International Agricultural Research Centers within the country. Alhassan, (2003) attributed the inability of institutes and universities within the NARS to undertake higher levels of research to a very poor infrastructural base, the availability of competent manpower notwithstanding. Effort at promoting

the use of agricultural biotechnology and maximizing its benefits for agricultural development in Nigeria must address these issues. It would also provide a springboard for the development of a more functional IPR system as it affects the development of biotechnologies.

Biopiracy and intellectual Property Rights in agricultural biotechnology

Biopiracy refers to the commercial development of genetic resources such as plants with food or medicinal properties or genes for resistance to disease without compensating the inhabitants or government of the area where the substances or materials were originally discovered. Describing the scope of biopiracy, Alhassan, (2003) explains that it could take various forms, including the undertaken cloning of genes designed from the local environment and subsequently patenting of such pirated genes. Since the International Union for the Protection of New Varieties (UPOV) provides for the protection of new plant cultivars, countries could also apply to join the plant cultivars developed by their scientists in cases where the new plant cultivars meet the UPOV criteria. To be eligible, plants must be:

i. novel
ii. uniform
iii. stable and
iv. must have a genetic name.

Some form of protection must be provided to recoup the cost of investment in the development of new agricultural products from the application of biotechnology, particularly where these products commercialized.

IPRs in developing innovation systems

Innovation and technology are generated locally. They however develop and spread without borders, with the benefits reaching beyond time and spatial limits. Intellectual property rights IPRs provide the framework within which nations and individual scientist are rewarded in the novelty course as the benefits of discoveries through their efforts and contributions are derived by others. The system that produces these technologies comprises individual scientists, R&D companies, public research organizations, native farming systems and multi-national research organizations. This is particularly so for biotechnology research, where there is a very thin separation between basic, applied and traditional research.

In describing the matrix relating private innovation systems, national research systems and individual scientists as it relates to IPRs, Glover and Yamin, (2003) stated that they allow innovators to claim exclusive rewards for each incremental step they have contributed and when genetic engineering is applied to plants, successive layers of IPRs accumulate over the plant material itself, as novel varieties with desirable traits are used as the basis for further R&D. The rapid accumulation of IPRs over germplasm and enabling technologies has caused a rapid increase in transaction costs, as IP owners have to be identified, licenses negotiated or disputes litigated. This, according to Glover and Yamin, (2003) has led to a number of consequences for the biotechnology sector, with implications for the conduct of agricultural research of relevance to developing countries, including:

i. Dramatic consolidation among biotech firms, keen to avoid lengthy negotiations for technology licenses and/or patent litigation.
ii. Hampering the exchange of data, plant material and enabling technologies among researchers in both public and private sectors.
iii. Increasing the costs of administering the IPR system, as patent offices have been inundated with applications from firms and universities seeking to build a defensive patent portfolio.

Understanding that development and use of modern technology holds the key to accelerating the growth of developing economies, Nwogu, (2014) describes technology as being always important to the economic wellbeing of any nation. In the 21st century biotechnology has generated interest, as well as concern, hence transfer of biotechnology is widely discussed and accepted in international economic relations and applied across several sectors of development. The push and pull forces of interests in the acquisition and use of these technologies as is the case with biotechnologies calls for a cautious application of IPRs. The benefits of these rights must be balanced along with the possibilities of their becoming a limiting factor to the development and diffusion of agricultural biotechnologies. This is particularly so for developing systems where the mechanisms where the social motif for research is still an important consideration.

For profit-driven stakeholders in the system, there is usually a conflict between their sole aim of profit making and the public and general good derivable from research. Glover and Yamin, (2003) further explained the intensity of the interests, stating that biotechnology companies argue that IPRs provide a vital incentive for investment in expensive biotechnological research and development, and provide the necessary safeguards to encourage them to commercialize their genetically engineered products in developing countries. Largely in response to industry pressure, harmonized standards of IPR protection have been agreed at the global level, chiefly through the World Trade Organizations (WTO) Agreement on Trade Related Intellectual Property Rights (TRIPs), which requires developing countries to implement strong domestic IPR regimes. Influential voices in international agricultural research and policy networks have also urged developing countries to implement TRIPs as part of a suite of enabling policies to promote agricultural biotechnology. However, claims that IPRs are essential prerequisites for innovation in, and technology transfer to, developing countries do not stand up to close scrutiny.

Highlighting the role of multinationals in the contest. Adenle et. al. (2012) observed that their placing strong IPRs on agricultural inventions including research tools have affected the development, adoption and diffusion of new innovation in developing countries. As a result, research tools that are needed for the development of subsistence crops are often not available. Some of the research tools used in modern biotechnology such as micro-propagation, marker-assisted breeding, mutation breeding and genetic engineering have produced different crop varieties in use today. These research tools are needed to overcome the inevitable crop production problems due to low yields, postharvest losses, drought, disease and insects in developing countries. Given the IPRs logjam that constrains these research tools, there is a need for innovative solutions to tackle food security problems. This position has a potential of limiting the deliverables that these developing economies can have in the ongoing development of agricultural biotechnology research and development.

IPRs and access to agricultural technologies in developing systems

Crop biotechnologies have developed incrementally over the past century, but progress has accelerated greatly over the last two decades leading to many important scientific achievements and impressive technological advances. A wide range of crop biotechnologies is available and some are increasingly used in developing countries, especially tissue culture based techniques (such as micropropagation), mutagenesis, interspecific or intergeneric hybridization, genetic modification, marker-assisted selection (MAS), disease diagnostics and bioprotection, and biofertilization (FAO, 2011). The implication of this development is a broadening of the options available for the technology-hungry agriculture in second and third world production systems.

There have been massive efforts on the part of governments and development partners to promote and increase access to innovation options for sustainable agriculture, oftentimes without commensurate consideration of rights that promote the development of the innovation system. This is premised on the fact that access to innovation is the only guarantee for reducing and possibly eliminating the current food crisis. According to FAO (2011) technologies to increase productivity and conserve natural resources should be accessible, appropriate and adapted to the needs of smallholders, and functional demand-driven extension systems are essential for making this happen. With a very active smallholder agricultural system, lack of sufficient access to modern biotechnologies has been considered a major hindrance in the ability of the sector in meeting its basic goals. Highlighting the pivotal role of biotechnology, Abah et. al., (2010) explained that modern agricultural biotechnology is one of the most promising developments in modern science. Used in collaboration with traditional or conventional breeding methods, it can raise crop productivity, increase resistance to pests and diseases, develop tolerance to adverse weather conditions, improve the nutritional value of some foods and enhance the durability of products during harvesting or shipping. Promising as it is, biotechnology can only be of benefit to farmers when the concerns around its accessibility is well taken care of. It is the a widely held opinion that with reasonable biosafety regulations and appropriate policies, biotechnology can be made accessible to small-scale farmers with little or no risk to human health and the environment. This position is corroborated by Adenle et. al., (2012) who stated

that agricultural biotechnology (e.g. genetically modified (GM) crop technology) is rapidly growing and has immense potential to contribute to sustainable agriculture in developing countries. However, due to the privatization and increased intellectual property rights protection, many people in the developing world find it very difficult to access modern biotechnology research tools (e.g. genetic engineering, micro-propagation, mutation breeding etc.) to improve agricultural productivity.

The Nigeria Agriculture Biotechnology Project (NABP) was designed to assist in building the framework for decision-making that will facilitate access to the opportunities biotechnology offers and will ensure the safe and effective application of this technology to improve agriculture (GAIN 2015). While the biotechnology regulations remains in formative various formative stages, Nigerian scientists, policy makers, farmers and other stakeholders have shown a general sense of optimism about the prospects of the technology. There is already a robust structure to ensure sustainable mainstreaming of agricultural biotechnology into the National Agricultural System. GAIN, (2006) outlines some important national agencies vested with the responsibility for the development and safe deployment of biotechnology for agricultural research and other purposes in Nigeria. These include:

i. National Focal point (Federal Ministry of Environment).
ii. National Biosafety Authority (NBA).
iii. National Biosafety Committee (NBC).
iv. National Biosafety Technical Sub-committee.
v. Institutional Biosafety Committees.
vi. National Biotechnology Development Agency (NABDA).

Robust as the structure is for the development of agricultural biotechnology. The development of very viable and effective IPR system remains the only means for ensuring a guaranteed participation by scientists in the system. It is important to note however, that IPRs could have a side effect of restricting the quantum of innovations that available to both researchers and farmers at an end-to-end basis. In addition to this, the cost of rewarding the original owners of intellectual property could translate in prohibitive rates for farmers who should benefit from the innovation system, leading to a slow-down in adoption and diffusion of biotechnologies that are expected to drive developing agricultural systems out of their rudimentary state. In the opinion of Yamin (2003) although in the long term, IPRs incentivize research and development they also go hand in hand with unsustainable, and possibly unsafe, forms of agriculture, make R&D more expensive, especially in developing countries and tend to reduce national developmental choices. To avoid or minimize these consequential, but deleterious outcomes, there must be a system that balances rights and reward with public good, especially in the case of developing agricultural systems.

Viewing it from the perspective of the points of origin of innovations, particularly as it relates to diffusion of technologies to developed research and production systems to developing ones, there is no gainsaying that an effective patent regime facilitates the transfer of technology from well endowed to the less privileged countries as the transferors of such technology are assured adequate protection of their rights in the transferring country. The underlying goal of a good patent system is the encouragement of development and growth. Patents law aims at protecting specific commercial and technological interest through the grant of inventions. Patent is one means of protecting inventions, especially from private research and development. This patent is regulated by patent law which operates within each country. The need for globalization and harmonization of intellectual property rights, patents rights inclusive led to the introduction of Trade-Related Aspect of Intellectual Property Rights (TRIPS) Agreement 1994. (Nwogu, 2014). This deliberate element in the spirit and intent of rights protection diminishes the inherent danger of keeping technologies from those who need them most, while ensuring that the developers of such technologies are not left unrewarded.

Nigeria Traditional Knowledge, biotechnology and IPRs

Traditional knowledge (TK) refers to a body of indigenous resources, which include techniques, information, animate and inanimate materials found in a somewhat exclusive nature to a community. Traditional Knowledge by its nature is a community property as its transmission is usually as a community cultural heritage. The issues of definition, ownership, and consequent rights are affected by the opaque scope of these resources. Commission on Intellectual Property Rights (2002) has documented the fact that livelihoods of indigenous peoples worldwide and

the conservation of biodiversity depend on the preservation and protection of TK and that Indigenous peoples and rural communities have developed an intimate knowledge of the use and functioning of biological and natural resources over centuries of close dependence on these resources. For developing countries, like the developed countries before them, the development of indigenous technological capacity has proved to be a key determinant of economic growth and poverty reduction. This capacity determines the extent to which these countries can assimilate and apply foreign technology. Many studies have concluded that the most distinctive single factor determining the success of technology transfer is the early emergence of an indigenous technological capacity (Commission on Intellectual Property Rights, 2002).

Traditional Knowledge is vital for life, health, food security and agriculture. It also forms the basis of cultural identity, contributing to social cohesiveness and thereby reducing vulnerability and poverty. Waziri (2014) observed that there has now been discovered a need to preserve and protect Traditional Knowledge (TK) from misappropriation especially because of its nature: It is usually neither written down, nor registered with any government agencies. It exists and is usually used based on a principle of open sharing, such that it is very susceptible to being poached by bio-pirates, who then acquire IPRs over the knowledge and deny access to the actual innovators and/or custodians of the said knowledge. The situation is not helped by the fact that existing western intellectual property laws support, promote, and excuse the wholesale, uninvited appropriation of whatever TK promises profit, with no obligation or expectation to allow the originators of the knowledge a say or a share in the proceeds.

Challenges of Implementing IPRs in Nigeria

Nwokocah (2012) identified a number of challenges facing IPR s in Nigeria. These challenges while not specific to agricultural biotechnology are very much applicable to it in every respect. First, the administration of IPRs in Nigeria is incapacitated by inadequate skill and incompetence. People involved in its administration are usually not experts. Secondly, the infrastructure for operation of the IPR Nigeria is still largely underdeveloped. Thirdly, the piracy and counterfeiting have become an important factor frustrating business development in Nigeria. Fourthly, after decades of independence, Nigeria has not made any significant change in its IP laws. The laws have remained outdated. Adekola and Eze (2015) in explaining the challenges arising from infringement of IPRs likened it to a car, which can be driven by only one person at a time, compared to an author who publishes a book which many people can read at the same time. They further stated that intellectual property is much easier to copy than to create. It may take many months of work to write a novel or computer program, but with a photocopy machine or computer, others could copy the work in a matter of seconds. Ineffective implementation of proprietary laws in Nigeria has made this scenario the experience of many scientists. Lack of basic infrastructure for detecting infringements has made tracking of rights protected research results or other innovations difficult. The result is that rewards that should make research attractive may not be fully enjoyed by scientists.

Recommendation

Rural Nigeria agriculture is still rudimentary to a large extent, with a considerable use of indigenous knowledge. At a time of high demand for genetic resources in biotechnology, traditional knowledge represents a significant asset to its owners if well harnessed. That is why in the estimation of Waziri et. al. (2014) Nigeria as a nation stands to benefit greatly from the protection of TK, as it promises to contribute to the economy of the country. In the light of the foregoing, Commission on Intellectual Property Rights (2002) suggested that in order for Nigeria to fully or at least mostly reap the economic benefits of its TK, it must:

i. Firstly, recognize the existence of TK within its borders and the fact that it is a very rich and bio-diverse nation, which can use its bio-diversity to better its economy.
ii. Secondly, recognize the rights and roles and positions of the indigenous peoples from whom this TK is derived, in the scheme of all things as related to the TK.
iii. Thirdly, take the steps necessary to enacting a sui generis law for the protection of its TK, taking into consideration the above suggested framework.
iv. Fourthly, ensure the proper enforcement and administration of the said law, hand

in glove with the local communities from whom TK is derived.

v. Lastly, add a stronger voice to the international campaign for laws that compel the protection of TK and make the sustainable use, preservation and protection of its TK a priority for it.

The sustenance of IK becomes all the more important owing to the fact that their nature and processes are intertwined with the traditional Nigerian farming systems within which they are found. It has however been observed that traditional farming was mainly based on freely exchanging, saving, collecting and replanting seeds among the farmers. But the introduction of IPRs, particularly for agricultural research tools and databases through different patenting systems could lead to the expression of concerns among different communities such as farmers, universities, plant scientists, industries, and governments particularly in developing countries as observed by Adenle et. al. (2012). Creating a structure that organizes the vast resources within this system would be a rather challenging task.

Commission on Intellectual Property Rights (2002) underscored the benefit of instituting IPRs for traditional knowledge, stating that protecting the rights of the owners of IK as with any other already accepted intellectual property right, creates a conductive climate for transfer of such knowledge, for research and development (R&D) and otherwise, through the security it offers to the owners of such knowledge, be they an entire community or individuals therein and protection of TK is also a means of attracting national and foreign investment, simply because these foreign companies and developed countries need the traditional knowledge for R&D and without the ease of bio-piracy, they are compelled to enter into legitimate partnerships with either the government or the people, such that benefits due are returned to the country and to the communities from which TK is derived and thereby generally boosting the economy of the country. It equally serves as a means by which cultural values and traditions and resources are preserved and used in a sustainable way, such as to continuously profit the country. It is property rights for IK s is a part of a broader definition of the human rights of the owners of such rights. It is an permissive infringement on the right of the Nigerian farmer if a structure is not created that channels the benefits of the vast indigenous wealth he possesses is not created and his indigenous knowledge systems protected from exploitation.

Conclusion

In view of the embryonic stage of the development of agricultural biotechnology in Nigeria and other developing agricultural systems, an unequalled opportunity presents itself for developing an Intellectual Rights system that ensures that the full benefits of innovation in this field is derived. It is also important to note that elements which sustain the innovation process, especially traditional knowledge and farming systems are not only preserved and protected but are engaged in through a sustainable resourcing process. This may hopefully assure the contribution of these developing agricultural systems in the evolution of a globally equitable agricultural system.

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