The Human Right to Science:
new Directions for Human Rights in Science

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I would like to thank The Swiss Academies of Arts and Sciences and Leopoldina (Nationale Akademie der Wissenschaften) for this opportunity to address and engage with such an interesting groups of experts. As I am currently studying the issue of patents with respect to the human right to science, for me this conference is very timely.

My mandate, as you all know, derives from Article 15 of the International Covenant on Economic, Social and Cultural Rights (ICESCR) which recognizes the right of everyone: to take part in cultural life (Art 1(a)); To enjoy the benefits of scientific progress and its applications (Art 1(b)); and to benefit from the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author. (art 1(c)). It also calls for States Parties to take steps necessary for the conservation, the development and the diffusion of science and culture (Art 2), to respect the freedom indispensable for scientific research and creative activity, (Art 3); and to recognize the benefits to be derived from the encouragement and development of international contacts and co-operation in the scientific and cultural fields. (Art 4)

Part of the challenge I faced as the first mandate-holder in the field of cultural rights was that cultural rights as a whole remained underdeveloped, including the right to benefit from scientific progress and its applications, which, borrowing from Prof Lea Shaver, I refer to as "the right to science", and after this conference 'the human right to science'. This, even as scientific innovations change human existence in ways inconceivable even a few decades ago.

The human right to science had largely been considered in terms of the ability of science to advance the realization of other human rights, address "the needs common to all humanity" or in terms of the "potentially adverse consequences for the integrity, dignity and human rights of the individual". While the potential human rights implications of scientific advances must be considered, these do not suffice to define the scope of the human right to science; which I tried to explicate in my 2012 report.

Several questions arise in terms of the human right to science as outlined in art 15 of the ICESCR echoing UDHR Art 27 to share in scientific advancement and its benefits.

Question 1: Why are the rights to take part in cultural life and science juxtaposed?

Question 2: What are the scope, normative content and obligations of States for the human right to science? How is this different from Art 11 2(a) To improve methods of production, conservation and distribution of food by making full use of technical and scientific knowledge, by disseminating knowledge of the principles of nutrition and by developing or reforming agrarian systems to achieve the most efficient development and

utilization of natural resources; or Article 13 on health, providing for the creation of conditions which would assure to all medical service and medical attention in the event of sickness. (Art 13 (d)).

Question 3: How does the right to science & culture under Art 15 (a) and (b) relate to (c) To benefit from the protection of the moral and material interests resulting from any scientific, literary or artistic production of which s/he is the author? And related to this a fairly big and complex question

Question 4: How do intellectual property regimes and policies impact the human right to culture and science?

I first addressed the human right to science in my 2012 report. I have now further examined question 3 and 4 in my last report with respect to copyright and I am researching patents now. These are the four questions I will address in my presentation.

Question 1:

When I assumed my mandate, those reviewing Article 15 of the ICESCR inevitably considered the right to scientific progress and its applications separately from the right to cultural life: those approaching Article 15 from the perspective of science, tended to view the inclusion of culture as coincidental; those approaching it through a cultural rights lens simply ignored the reference to science altogether.

In contrast, I have argued that there is nothing coincidental in the juxtaposition of science and culture; the human right to science and culture must be read together and in conjunction with, in particular, the right of all peoples to self-determination and the right of everyone to take part in the conduct of public affairs. For article 15 relates to human creativity: the human pursuit of knowledge and understanding complemented with creative responses to a constantly changing world. The crux of the human right outlined in Article 15 of the IESCR is the right of everyone to benefit from the creativity of others while protecting the moral and material interests emanating from "any scientific, literary or artistic production". A prerequisite this is ensuring the necessary conditions for everyone to continuously engage in critical thinking about themselves and the world they inhabit, and to have the opportunity and wherewithal to interrogate, investigate and contribute new knowledge with ideas, expressions and innovative applications, regardless of frontiers.

More precisely, the right to participate in cultural life entails ensuring conditions that allow people to reconsider, create and contribute to cultural meanings, expressions or manifestations and ways of life in a continuously evolving manner. The right to science entails the same possibilities in the field of science, understood as knowledge that is testable and refutable, including revisiting and refuting existing theorems and understandings.

The link between the right to science and the right to culture can be further understood with regard to people's ability to "aspire". The ability to aspire, meaning the ability to conceive of a better future that is not only desirable, but also attainable, is an important cultural capability for aspirations are never merely individual exercises, they are informed by, and in turn inform, communities of shared cultural values and draw upon cultural heritage,

including accessible accumulated scientific knowledge. Aspirations therefore embody people's conceptions of elements deemed essential for a life with dignity, and human dignity lies at the very core of all human rights. This cultural capability to aspire therefore needs to be supported and developed, especially amongst the marginalized and vulnerable. New scientific knowledge and innovations increase the options available to people, thereby strengthening people's capacity to envisage a better future for which access to specific technologies may sometimes be pivotal.

I also agree with experts who after reviewing the preparatory work on the Universal Declaration of Human Rights and the International Covenant on Economic, Social and Cultural Rights, suggest that "the United Nations had come to envision the sharing of scientific and cultural knowledge as something that could unite an international community – a common task that would contribute to cross-cultural understanding and yield a more secure world." Consequently, these international norms require a public good approach to knowledge innovation and diffusion". This same idea can be found in the Constitution of UNESCO, to protect "the world's inheritance" including science and to encourage international "cooperation in all branches of intellectual activity".

The unity of the human right to science and culture is reflected in the 2009 Venice Statement on the Right to Enjoy the Benefits of Scientific Progress and its Applications which was the culmination of UNESCO-led discussions that involved academics, UN partners, including the OHCHR, the Committee on Economic, Social and Cultural Rights, WIPO and WTO. Participants stressed that access to the benefits of scientific progress not only allowed improving socio-economic situations, but provided opportunities to take a meaningful part in the life of communities, whether local, national or international. So, that's my answer to why science and culture are juxtaposed.

So that's my answer to Question 1. And if anyone has doubts it might be well to think of Leonardo da Vinci who epitomizes the interconnection between human creativity in the cultural and scientific fields. Acknowledging this inter-connection is important because it reminds us that human creativity is not limited to any particular region, or class or segment of society. Creativity is found everywhere and the real question is one of providing opportunities that enable it to flourish. Secondly, it is important to recognize that most creativity is the result of a collective rather than individual effort, and that Da Vinci only painted 5-6 paintings by himself. All the other great masterpieces are, in fact, the product of collective efforts.

Question 2: The scope, normative content and obligations of States of the right to science

'Science' must be understood to encompass all fields of inquiry, including social sciences, and include all research. Importantly, the "benefits" of science encompass not only scientific results and outcomes but also the scientific process, its methodologies and tools.

I have suggested the normative content of the right to science therefore includes

(a) The access to the benefits of science by everyone, without discrimination;

(b) Ensuring opportunities for all to contribute to the scientific enterprise in combination with freedom indispensable for scientific research;

(c) The participation of individuals and communities in decision-making; and

(d) An enabling environment fostering the conservation, development and diffusion of science and technology.

This implies the following:

A**ccess:** First of all, scientific knowledge, information and advances must be accessible to all without discrimination, meaning these must be both physically available and economically affordable. Secondly, access must be to science as a whole, not merely to specific scientific outcomes or applications. Amongst other things, access necessitates a right to science education, meaning an education that instills a spirit of scientific inquiry (or critical thinking in the social sciences) and enables children to be introduced to and informed about main scientific theorems and applications, as well as contesting views on particular theories, regardless of frontiers.

Creativity, whether in terms of cultural expressions or scientific engagements, as I said earlier, is not limited to any particular segment of society or professionals. The human right to science entails ensuring that **opportunities** are offered to everyone to engage in and contribute to the process of scientific inquiry, including in terms of agriculture & seeds, which is the focus of today's conference, and their creativity acknowledged (the right to attribution).

With respect to scientific applications and technologies, a core principle is that innovations essential for a life with dignity should be accessible to everyone, in particular marginalized populations. For instance the impact on human rights of scientific advances such as electricity, information and communication technologies (ICT), nanotechnology and synthetic biology can be significant.

One example illustrating the interconnection of culture and science, beyond health and food, is the increasingly important area of new information communication technologies, which not only influence culture, but have become such an intrinsic part of culture as everyday practice for so many people that they would find it impossible to operate or even conceive of cultural life without this technologically enabled communication with its own rules of social engagement. The human right to culture and science should be understood as including a right to have access to information and communication and other technologies and to and use these in self-determined and empowering ways.

The non-discrimination obligation fundamental to all human rights demands eliminating both *de jure* and *de facto* barriers, in particular, for marginalized populations, such as those living in poverty and with disabilities, the elderly, women and children. Consultative processes are required to identify the priority needs of such populations and targeted research by both public and private sector institutions should be facilitated to address these.

My 2012 report also explores the links the human right to science has with other human rights. Given the enormous impact that scientific advances and technologies have on the daily lives of individuals and peoples, it is crucial that the human right to science be read in

conjunction with the right of all peoples to self-determination which is Article 1 in both the ICESCR and International Covenant on Civil and Political Rights (ICCPR).[1] It is also closely linked with ICCPR article 19 on the freedom of expression, including the freedom to seek, receive and impart information and ideas of all kinds, regardless of frontiers,[2] and Article 25 on the right of everyone to take part in the conduct of public affairs, directly or through freely chosen representatives.[3] The United Nations Declaration on the Right to Development defines development in its preamble as the "constant improvement of the well-being of the entire population and of all individuals on the basis of their active, free and meaningful participation in development and in the fair distribution of benefits resulting therefrom."[4] This too, must be taken into consideration.

A key dimension of the human right to science ensuring individuals and peoples are able to make informed decisions about science and technologies after considering both the possible improvements offered by scientific advances and their potential side effects or dangerous usages. An important aspect of such discussions is determining what is to be regarded as "benefits" or "scientific progress" – again returning to cultural understandings. Considerations must be guided by instruments such as Limburg principle 11, stressing that popular participation at all stages is "indispensable";[5] Principle 10 of the Rio Declaration on Environment and Development, reiterating the importance of access to information and participation in decision-making processes; and the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters.

Finally, in terms of defining the human right to science, I propose the adoption of a public good approach to knowledge innovation and diffusion, and a reconsideration of the current maximalist intellectual property approach to explore the virtues of a minimalist approach to IP protection.[6] I believe it is essential to recalibrate those aspects of intellectual property norms that may present a barrier to the right to culture and science. Separately, I have stressed the need to establish greater coherence among the diverse and complex existing intellectual property regimes operative today. I have underlined the need to guard against promoting the privatization of knowledge to an extent that deprives individuals of opportunities to take part in cultural life and to enjoy the fruits of scientific progress. Such deprivation will unquestionably impoverish society as whole.

Questions 3 & 4

This brings us to questions 3 and 4 and challenges of reconciling intellectual property regimes with the right to science and culture. Of course IP law is a highly complex multi-

[1] Article 1 of both international covenants on human rights.
[2] International Covenant on Civil and Political Rights, art. 19.
[3] Ibid., art. 25.
[4] Declaration on the Right to Development, preamble.
[5] E/CN.4/1987/17, annex.
[6] See in particular Shaver, "The right to science and culture" (see footnote 6), pp. 128 and 159-160; Yochai Benkler, The Wealth of Networks: How Social Production Transforms Market and Freedoms, New Haven and London, Yale University Press, 2006, p. 36; James Boyle, The Public Domain: Enclosing the Commons of the Mind, Yale University Press, 2008, and Joseph E. Stiglitz, "Knowledge as a global public good", in Global Public Goods: International Cooperation in the 21st Century, Inge Kaul et al. eds., UNDP, New York, Oxford University Press, 1999, pp. 308–09.

faceted area of the law, and I have limited myself to exploring the issues arising for the human right to culture and science in terms of copyright and patent laws.

In my last report, I have suggested that the lens of the human right to science and culture offers a promising space for reconciling the unresolved tensions between intellectual property laws and human rights for article 15 of ICESCR ***simultaneously*** calls for the protection of the right to take part in cultural life, the right to enjoy the benefits of scientific progress and its applications, and the right to benefit from the protection of authorship. Striking an appropriate balance between the human rights principles of the right to science and culture on the one hand and the protection of authorship on the other, is essential, even if challenging.

Regarding copyright, the subject of my last report, there is a widely shared concern stemming from the tendency for copyright protection to be strengthened with little consideration to human rights issues. The tendency for trade negotiations to be conducted amid great secrecy, with substantial corporate participation but without an equivalent participation of elected officials and other public interest voices, adds to this concern. A human rights based approach to copyright issues, I believe is necessary, to focus attention on aspects that tend to be overlooked when copyright is treated primarily in terms of trade: i.e. the social function and human dimension of intellectual property, the public interests at stake, the importance of transparency and public participation in policymaking, the need to design copyright rules to genuinely benefit human authors, the importance of broad diffusion and freedom, not-for-profit production and innovation, and the special consideration for the impact of copyright law upon marginalised or vulnerable groups. From the human rights perspective, copyright policies must be judged by how well they serve the interests of human authors, as well as the public's interest.

I have emphasised that **intellectual property rights are not human rights**, and that this equation is false and misleading. Inherently linked to the status of being human, human rights can only apply to human beings. Being a legal person is not the same as being human. Simply put, non-human legal persons do not have the capacity of being born with human rights; human rights are inalienable to those who are human. Hence, the human right to protection of authorship requires that copyright policies be carefully designed to ensure that authors (and not only copyright holders) benefit materially and to ensure their moral interests. My report on copyright focuses mainly on artistic and cultural creativity, but the "diffusion" called for under Article 15 encompasses the dissemination of scientific knowledge and applications both within the scientific community and in society at large.

The right to science encompasses the right to freely communicate research results to others, and to publish and publicize them without censorship and regardless of frontiers. This of course intersects with copyright laws; as well as to form and join professional associations; collaborate with others in their own country and internationally. Other aspects of scientific freedom are respecting the autonomy of higher education institutions and the freedom of faculty and students to engage freely in scientific research and processes, express their opinions about the research, institution or system they work in, and fulfill their functions without discrimination or fear of repression by the State or any other actor.

The freedom of inquiry is vital for advancing knowledge on a specific subject, procuring data and testing hypotheses for some practical purpose, as well as for promoting further scientific and cultural activity. The diffusion of science is also a precondition for public participation in decision-making and essential for fostering further research, development and applications. However, in the area of science, copyright-holders are almost never the authors. Copyright can limit the creative freedom of others to build upon and adapt existing works by monetizing access to scientific findings and publications. Indeed subscriptions to scientific journals are so dear that even libraries and research institutions in developed and well–resourced countries are finding it difficult to maintain subscriptions. The interests of copyright holders often do not coincide with the interests of the authors; the former are interested in profits, the latter in having their ideas and research circulated as widely as possible and being recognized for their contributions. But copyright laws may and do end up prohibiting the human author from circulating her own creative work if the copyright rests with a subsequent right-holder, typically publishing houses. So how does one reconcile the right of a person to enjoy their own creativity as a bare minimum, with the restrictions on such enjoyment through copyright laws?

Of course, copyright laws do incorporate exceptions and limitations, preserving the freedom of the general public to use copyrighted works in certain ways without the copyright holder's permission. But national practices on copyright exceptions and limitations vary significantly, and the standard for judging whether a particular exception or limitation is permissible under international copyright law is not articulated with precision. The crucial challenge I see is that international copyright treaties generally treat copyright protections as mandatory, while largely treating exceptions and limitations as optional. Hence one of my key recommendations in my last report is to explore the possibility of establishing a core list of minimum required exceptions and limitations incorporating those currently recognized by most States, and/or an international fair use provision. I have also recommended that

- States further develop and promote mechanisms for protecting the moral and material interests of creators without unnecessarily limiting public access to creative works, through exceptions and limitations and the subsidy of openly licensed works.
- Models of **open licensing,** particularly important for the dissemination of scholarly knowledge, contributing to create a "cultural commons," in which everyone can access, share and recombine cultural works, including scientific findings should be encouraged in academic institutions, and strongly supported**.**
- WIPO initiatives to increase the availability of scientific and technical information in developing countries include the Access to Research for Development and Innovation programme. A priority in the WIPO Development Agenda "is to promote the role of IP rights in enhancing wider and more user-friendly distribution of content as a tool to promote innovation and scientific advancement as well as for reducing the "Digital Divide'", with "new models of communication and open access to educational resources and scientific literature, particularly via digital means, based on national and regional experiences." The Digital Divide remains a serious challenge, however, both in terms of access to technology but also the language of the internet excludes swathes of people even if they have the technical wherewithal.

The potential of intellectual property regimes to obstruct new technological solutions to critical human problems such as food, water, health, chemical safety, energy and climate change also requires attention. My 2012 report already foreshadowed some issues regarding patents and the human right to science. For instance, that from a human rights' perspective, a core principle is that innovations essential for a life with dignity should be accessible to everyone both physically and economically, in particular marginalized populations.

The relationship between intellectual property regimes and human rights has been most comprehensively addressed in the context of health, but is now receiving more attention in the contexts of the right to food and of climate change.

In all fields, affordability remains crucial and this may require delinking research and development costs from product prices, as proposed by WHO in its global strategy and plan of action on public health, innovation and intellectual property. Other models for delinking intellectual property protection and product prices consist of innovation inducement prizes that reserve a percentage of prize monies for individuals and institutions ready to share knowledge, materials and technologies for product development. When combined with open-source dividend reward programmes, this encourages collaboration rather than competition.[7]

Research is an issue in terms of which research is carried out and for whose primary benefit. Private sector research is almost always driven by a profit motive. Therefore diminishing role of the state in research and development and concomitant rising importance of private sector is of concern and deserves more attention and dialogue. This imbalance affects the nature of research and what topics are selected for PhD theses as well as other research when the funding is from large private sector companies interested in improving their product or the market share of their product. When research is primarily driven by a profit motive, the risk is that issues relevant to resource-poor populations or rare diseases including those affecting unique ethnic groups, or specific populations will be neglected. Some States have introduced consultative processes and mechanisms for identifying needs and taken steps to encourage research with a high social impact and participatory in priority areas such as food security, the environment, science and technology solutions to poverty, water management and particular diseases.

Incentives and purposive funding can promote appropriate research: For example, in the areas of health, food and the environment, innovation prizes preceded by a consultative process expand opportunities for smaller innovators who, otherwise, may have no access to funding. Such models can also bring together government, the private sector and philanthropic interests.

There are issues of **research or applications that can be harmful to people and violate human rights**. While this is largely related to health, issues also arise with respect to experimentation in agriculture, the environment and insects, for example. Hence, the Declaration on the Use of Scientific and Technological Progress stresses the importance of ensuring that the results of scientific and technological developments are used for the

[7] See http://healthresearchpolicy.org/content/open-source-dividend-prizes.

purpose of human rights and freedoms in accordance with the Charter of the United Nations and calls upon States to protect all strata of the population socially as well as materially, from possible harmful effects of the misuse of scientific and technological developments". Conducting research in a socially responsible manner in accordance with ethical standards is emphasized in article 14 of the Universal Declaration on the Human Genome and Human Rights. Here too, marginalized populations with limited financial or political power and scientific awareness run a greater risk of their rights being violated. While States have taken measures to oversee research methods and the conduct of science in the public sector, research practices of private institutions receive less scrutiny. This requires greater attention, particularly when companies undertake research that would be illegal in one country but which, owing to a lack of legal protections, are possible in another. As stressed by the Committee on ESCR, States have an obligation to take steps to prevent human rights contraventions aboard by corporations which have their main office under their jurisdiction, without infringing upon the sovereignty or diminishing the obligations of the host States.

Patents agriculture & the right to science:

With respect to patents, it is worth noting that the World Intellectual Property Organisation (WIPO) has stated that, "in order for the international patent system to continue to serve its fundamental purpose of encouraging innovation and promoting dissemination and transfer of technology, the right balance should be struck between the rights of technology holders and the rights of technology users for the benefit of society as a whole." So, there is an acknowledged need for rebalancing some aspects of existing systems.

Concern about **the tensions and possible conflict between the human right to science and intellectual property rights** has been particularly notable after the WTO TRIPS agreement and the TRIP +" agreements.

In the area of patents and agriculture, for example, it seems to me that IP rights are designed to protect the interests of particular legal persons. There seems to be some recognition either at the time of drafting or subsequently that these measures may be adversely affecting some people. This has led to attempts to mitigate the actual or potential negative impact, such as the flexibilities in the TRIPS Agreement, the Convention on Biological Diversity. But usually the measures to mitigate adverse impact seem inadequate and/or are poorly implemented. So while TRIPS provides for flexibilities, there is little use of these, despite WIPO's efforts to guide States. So we have the FAO Voluntary Guidelines to support the progressive realization of he right to adequate food in the context of national security. But please note this is *voluntary.*

I also believe that IP rights also presume particular operational environments/frameworks and therefore do not, in fact, adequately address a number of different scenarios that exist on the ground.

So consider the topic of this afternoon's session on seeds.

Article 9.1. of the **International Treaty on Plant Genetic Resources** for Food and Agriculture (2001, 127 state parties + EU) "recognize(s) the enormous contribution that the local and indigenous communities and farmers of all regions of the world, particularly those

in the centres of origin and crop diversity, have made and will continue to make for the conservation and development of plant genetic resources which constitute the basis of food and agriculture production throughout the world." Article 9.2 (a) speaks of protecting traditional knowledge, 9.2 (b) provides for a sharing of benefits and 9.2. (c) provides for "the right to participate in making decisions, at the national level, on matters related to the conservation and sustainable use of plant genetic resources for food and agriculture."

It is estimated that 87 percent of all small farmers in Asia (less than 2 hectares of land) produce the majority of the world's food.[8] Yet the patent and plant breeding IP legal frameworks seem ill-suited to benefiting smallholder farming. It is crucial to recognize that (at least) two parallel agricultural systems exist, and should continue to exist: the commercial seed system and the farmers' seeds (landraces) or informal systems. IP regulations and 'rights' however only focus on the commercial seed system, overlooking farmers or informal system on which the majority of the world's poor depends for food. Hence, in the words of the former Special Rapporteur for Food, Olivier de Schutter, "an excessive protection of monopoly rights over genetic resources can stifle progress in the name of rewarding it." The issues are (i) which systems of production current arrangements end up promoting and protecting; (Farmers' seeds system vs. commercial seeds protected by Patent and plant breeding laws.) (ii) which form of scientific progress should be promoted and (iii) to which kinds of knowledge and technologies should access be facilitated. Attempts to make available new high-yielding seeds, de Schutter maintains, "can have the perverse effect of threatening the ability of farmers' seed systems to expand or even be maintained," (p 307) and is complicated by genetic use restriction technologies, GURTS, making the reuse of seeds technically impossible, obliging farmers to buy new seeds every year or purchase the chemicals to reactivate the seeds, and the "package" deals commonly associated with the promotion of high-yielding varieties often include fertilisers and/or pesticides as well as credit. The pressure on poorly-resourced farmers to accept this is considerable, in part because credit is often not otherwise available. However the new inputs required for agricultural production of these varieties often renders them prohibitive.

The strengthening of IP rights can even constitute a direct impediment to innovation by farmers, since the preservation of agro diversity and the development of farmers' seed systems relies not only on the use of landraces (traditional non-PVP-protected varieties) but also on the saving, exchange or sale of harvested seeds. (p. 332) To address the current imbalance he calls for a shift in 'proprietary' view of plant genetic resources to one viewing genetic resources as a global commons. This resonates with a public good approach to knowledge, which I fully endorse.

The negative impact on the ability of small farmers to continue their systems of exchange and further development of seeds, I would add, also undermines people's ability to continue their cultural specific ways of life. The monetization of all social exchanges in communities undermines collective support systems and being able to pursue specific ways of life.

[8] UNEP, 2009; cited in Hans Morten Haugen, *"Food Worldwide IP Challenges",* draft made available to SR.

A major issue I see in terms of seeds and IP patents is that farmers' contribution to agro-diversity, which is recognized, is however based on DNA-unstable non-homogenous seeds yet current IP systems favour seed certification of DNA-stable uniform seeds. Seeds produced in the informal or farmers' seed systems can be more resistant to threats, such as droughts, and yield better results in specific eco-systems. The ability of local farmers to continue to maintain, transmit and further develop/ensure agro-biodiversity as a common public good, needs to be recognized and proactively supported; the informal systems need to be protected in parallel to protection of the seeds of the commercial seed system. In this the 1991 UPOV Convention has placed restrictions prohibiting the commercialization of varieties essentially derived from the PVP-protected variety, and undercuts the ability of farmers to exchange, further develop or sell seeds saved from the harvest of protected varieties. This is unfortunate as traditional varieties can often be combined successfully with modern varieties to produce new varieties that perform better in specific local environments.

Another problematic aspect pointed out by experts is the issue of patent thickets that push commercial seed companies into mergers and acquisitions in order to undertake further development which leads to a high concentration of ownership of seed patents. According to one estimate, 10 top seed companies represent 67 percent of the global proprietary seed market. (Monsanto alone accounts for 23%).

The current provisions of flexibilities under the TRIPS Agreement can be, and often are, side-stepped in bilateral agreements. The *sui generis* systems are often also inadequately developed.

Research Positive initiatives in the field of **agricultural biotechnology** include the multi-country Public Intellectual Property Resource for Agriculture, in which more than 40 public institutions seek to lower barriers created by intellectual property regimes and to facilitate technology transfer. Research is also encouraged by open-source experiments such as the Biological Open Source (BiOS) License, which offers researchers free access to key technologies provided that they share any improvements made to these tools under the BiOS open source license regime.[9]

In terms of seeds and the planets food security, a vital part of the human right to science is the **right of everyone to participate in the scientific enterprise**, without discrimination on any basis. Not only must barriers obstructing access to scientific research and opportunities for entering the science professions of certain sectors of society be overcome, there is evidence that providing access to scientific know-how and facilitating experimentation by concerned populations can result in more cost-effective context-appropriate technological innovations. (e.g. toilets in Mumbai) In terms of agriculture it is essential that farmers be included in research and development of seeds.

Bio-prospecting A separate, often-raised concern is the threat posed by "bio-prospecting" for traditional knowledge of indigenous peoples and other local communities. In response, some States are developing databases for the documentation and conservation of traditional knowledge. Interesting models for protecting traditional knowledge from misappropriation

[9] De Schutter

include the India Traditional Knowledge Digital Library (www.tkdl.res.in/tkdl/langdefault/common/), which provides national patent offices with access to 223,000 indigenous medicinal formulations. This has led to some patents being withdrawn and by 2012, more than 75 applications were withdrawn, rejected or amended. States such as, Brazil, Guatemala, Peru and Portugal, have given legal protection to the rights of indigenous peoples and local communities to their accumulated scientific knowledge. Further discussion is needed, however, on the modalities and conditions under which others should benefit from such accumulated knowledge, and how to allow further development and dissemination of such knowledge while safeguarding the moral and material interests of the individual or collective creators. While WIPO has been engaged in "text-based negotiations" for an agreement on an international legal instrument(s) which "will ensure the effective protection of genetic resources, traditional knowledge and traditional cultural expressions,"[10] progress on this seems uncertain.

Public consultations on scientific advances undertaken by some states are welcomed as good practice.

An enabling environment for the conservation, development and diffusion of science is essential.

Conservation requires the identification and safeguarding of scientific knowledge, products and tools, including literature, databases, specimens and equipment.

Development demands an explicit commitment to the development of science and technology for human benefit through e.g. developing national plans of action, adopting programmes to support and strengthen publicly funded research, developing partnerships with private enterprises and other actors, such as farmers in the context of food security, and to promoting the freedom of scientific research.

The **diffusion** of science is a precondition for public participation in decision-making and essential for fostering further research, development and applications. As noted by UNESCO open communication of the results, hypotheses and opinions of research lie at the heart of the scientific process, and also provide the strongest guarantee of accuracy and objectivity of scientific results.

Scholars question the economic effectiveness of intellectual property regimes in promoting scientific and cultural innovation. There is little if any evidence to support the assumption that scientific creativity is only galvanized by legal protection or that the short-term costs of limiting dissemination are lower than the long-term gain of additional incentives.

Equitable sharing of benefits and transfer of technologies The sharing of benefits as well as the transfer of scientific knowledge and technologies is inextricably linked to the human right to science.

Two UNESCO declarations addressing the field of biomedical research, its conduct, outcomes and applications provide a useful starting point. The Universal Declaration on Bioethics and Human Rights states that "benefits resulting from any scientific research and its applications

[10] WIPO submission, p.17.

should be shared with society as a whole and within the international community, in particular with developing countries". Article 15 recognizes **multiple forms of benefit-sharing, include** "special and sustainable assistance to, and acknowledgement of, the persons and groups that have taken part in the research; access to quality health care; provision of new diagnostic and therapeutic modalities or products stemming from research; support for health services; access to scientific and technological knowledge; and capacity-building facilities for research purposes". Benefit-sharing is addressed in almost identical terms in the International Declaration on Human Genetic Data, article 19. Part IV of the International Treaty on Plant Genetic Resources for Food and Agriculture also has important provisions in this regard.

In the end, I think we need to consider a few issues:

how best to ensure that the farmers seed systems which support agro bio-diversity can be protected and supported as well as commercial seeds; what synergies can, and must, be nurtured to ensure food security for all as well as to ensure the biodiversity essential for our collective survival

What measures are required to guard against bio-prospecting, how to ensure access to knowledge but on equitable terms of benefit sharing

What does the moral and material interest of authors mean when most people employed in commerce-linked research institutes sign over their creativity to their employers as part of their contract? Should there at least be some attribution?

And, what is the nature of research being promoted? How to ensure that sufficient support is available for research that is not driven by profit, but the needs of people? In this it is important to ensure an appropriate balance between public and private sector funding. We should also consider the capacity of a few thousand 'official researchers' to innovate as compared with the creativity of millions of farmers, and how best we can all benefit from everyone's creativity while ensuring their moral and material interests.

Thank you