Plants, Genes and Justice

An Inquiry into Fair and Equitable Benefit-Sharing

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Thesis

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Introduction

Introduction

We all depend on the extensive biodiversity found on this planet. The range of vegetation and varieties of plant life are of critical importance as they form the basis of the food chains that have nourished us throughout history. In addition to food products, a wide variety of products is directly or indirectly derived from plants, including (bio)fuels, building materials, soaps, cosmetics, pesticides and medicines. In respect of the last in this list, over 70% of humanity depends on plants as the primary source of medication, and, as well as this usage for traditional medicines, plants are also extensively utilized within the pharmaceutical industry, forming the basis of such widely used drugs as aspirin and taxol (Griffo & Rosenthal, 1997). Ten years ago, the global market value of products derived from plants and micro-organisms was already estimated at between 500 and 800 billion US dollars, a figure roughly equivalent to that for the annual global sales of petrochemicals, or the worldwide computer market (ten Kate & Laird, 1999, p. 1).

New developments and demands such as novel uses of plants in the bio-based economy, the adaptation of plants to new conditions (e.g. as presented by climate change), the emergence of new diseases, and the need for ever greater yields to feed a growing world population, lead to continuous searches for 'new' diversity that can be included in production systems. Where such searches are mainly focused at finding new traits within the existing plant species, biotechnologies vastly increase the scope of genetic diversity that may be used and speed with which it may be harnessed. Biotechnology is defined by the UN Convention on Biological Diversity as "any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use" (UNEP, 1992, Article 2) – a very broad definition encompassing everything from traditional beer brewing to cloning of higher animals. The term '*plant biotechnology*' is used in a more narrow sense, i.e. the use of molecular biology tools that focus on

the knowledge and use of plant "genetic material", the material containing "functional units of heredity" (UNEP, 1992, Article 2).

Plant biotechnology now has several sub-divisions and a wide and rapidly expanding set of associated applications. It is, for example, increasingly possible to map and study the entire genetic constitution of an organism (structural genomics), the genes and their function (functional genomics), the structure of the RNA (transcriptomics) and proteins (proteomics) and the whole network of metabolic pathways leading to actual functional products that the plant produces (metabolomics). With such knowledge it is possible to identify which genes code for particular traits of interest. In the case, for example, of gene(s) found to increase resistance to a particular disease to which crops are susceptible, the relevant material may be transferred to the crop through traditional plant breeding, or through marker assisted breeding, or through various forms of genetic modification (transgenesis), which involves the insertion of a gene into one species from another.[1]

With biotechnology creating new knowledge about and possible uses for plants and their genetic material, the *plant genetic resources* that can be found around the world have become more valuable as possible source material for new inventions and products. It is not just the plant genetic resources that are the locus of value in this respect, however, for to search randomly for interesting traits in plants would be an extremely costly and time-consuming task. Biotechnology companies and public researchers are also interested, therefore, in existing knowledge that can serve as possible leads to valuable characteristics in already identified varieties. Particularly interesting in this regard is the so-called *traditional knowledge* of the natural environment that indigenous communities have acquired over the centuries through their foraging, farming and development of new sources of sustenance, herbal remedies, plant-based fuels, etc. The term "traditional knowledge" is commonly used to refer to this broad mix of

[1] The technology of transgenesis has aroused much social and political debate, which will not be considered here. For an ethical reflection on the topic, see e.g. (Thompson, 2007).

knowledge, traditions, innovations and practices passed orally by the members of a community from generation to generation and managed by the community's own laws of custom.[2]

Laws of a different kind have entered the contemporary arena, however. The new products and scientific inventions derived from plant genetic resources and associated traditional knowledge are increasingly protected by *Intellectual Property Rights* (IPRs). IPRs such as patents and copyrights provide the creator of a particular invention or text with an exclusive but time-limited right to use and commercially exploit it.[3] Because of the high costs of biotechnology research and development, IPRs play an important role and are generally considered the primary means to recuperate investments in this field. Thus, during the last two decades, patent activity in relation to biological and genetic material has acquired an increasingly prominent position within the international patent system (Oldham & Cutter, 2006).

The issue arises, then, of how these IPRs on new inventions and products relate to the plant genetic resources and/or traditional knowledge from which they are derived, and who is to share in their benefits. Most often, the new inventions are produced in industrialized countries with the financial and technical capacities for extensive biotechnology research, which may not be the countries where these resources originate from. This becks the question whether (and how) compensation must be paid to the countries and communities that provide the knowledge and/or genetic resources. Such questions have become the subject of an increasing public and political debate around the world. This research project focuses on this discussion, and especially on questions concerning the sharing of the benefits of plant genetic resources and associated knowledge and how this relates to the increasing focus on IPRs in modern research and development.

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[2] More detailed information and descriptions of traditional knowledge and can be found in, e.g. (Twarog & Kapoor, 2004).

[3] For more information see, e.g. http://www.wipo.int/about-ip/en/ [Accessed 7 July 2009].

Benefit-sharing

Two major international agreements were negotiated over the past couple of decades setting out principles for the benefit-sharing of plant genetic resources, and remain the primary regulatory instruments in the field. The 1992 Convention on Biological Diversity (CBD) proclaims access to genetic resources to be subject to "sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilization of genetic resources with the Contracting Party providing such resources" (UNEP, 1992, Article 15.7). Besides monetary benefits, this includes access to and transfer of technology (Article 16), the exchange of information (Article 17), and technical and scientific cooperation (Article 18), with a special emphasis on biotechnology (Article 19) and the sharing of benefits derived from traditional knowledge (Article 8j). So far, 191 countries have signed and become parties to the CBD, committing themselves thereby to conserving genetic resources, promoting their sustainable use, and arranging for fair and equitable benefit-sharing.[4]

The CBD was followed in 2001 by the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR) of the UN Food and Agriculture Organization (FAO), and the CBD Bonn Guidelines in 2002. The ITPGR establishes a Multilateral System of Access and Benefit-Sharing that, while in harmony with the CBD, focuses especially on plant genetic resources for food and agriculture deemed to be important for global food security. The Bonn Guidelines, meanwhile, provide extra, voluntary guidelines regarding the Access and Benefit-Sharing (ABS) provisions in the CBD, aiming to "assist Parties, Governments and other stakeholders in developing overall access and benefit-sharing strategies, and in identifying the steps involved in the process of obtaining access to genetic resources and benefit-sharing" (UNEP, 2002, p. IV).

[4] See http://www.cbd.int/convention/parties/list/ [Accessed 7 July 2009].

Despite these guidelines, the ABS provisions of the CBD have not been successfully implemented: "ten years later, (…) fewer than 10% of CBD Parties had adopted ABS legislation, and virtually none of those claimed that their ABS arrangements were functioning effectively" (Tvedt & Young, 2007, p. 1). And with respect to the ITPGR, disputes over the practical implementation of the Multilateral System and its benefit-sharing component in particular continue today.[5] It is perhaps no surprise then that the current negotiations on an International Regime on Access and Benefit-Sharing, as called for by the parties to the CBD in 2002 and supposed to be completed no later than 2010, are progressing very slowly.[6]

An increasing number of studies have been made over recent years aiming to analyze the causes behind the current failures and difficulties.[7] Many of these focus on the legal, economic or other technical aspects that complicate any successful implementation of the ABS provisions. Others have examined the broader socio-political aspects involved in specific ABS agreements or with respect to particular stakeholders. Building upon this existing body of literature, this research project aims also to add an extra perspective, one oriented towards a consideration of *ethics*.

Very few studies of ABS have applied an ethical perspective to the subject, and most of these have only dealt superficially with notions of justice and philosophical morality. This seems rather strange given the usage of terms like "fair and equitable sharing" and the obvious centrality of ethics and ethical concerns in tackling the basic questions of benefit-sharing (who gets what, how is it distributed, and who decides). Some of these issues have been taken up in discussions about *human* genetic resources, especially in relation to the Statement on Benefit-Sharing of the Human Genome Organization (HUGO Ethics Committee, 2000) in 2000.

[5] The latest meeting of the ITPGR Governing Bodies (prior to the preparation of this work) dealt primarily with this issue. See e.g. (Finkel, 2009).

[6] See https://www.cbd.int/abs/ir/ [Accessed 7 July 2009].

[7] About a hundred articles and reports, for example, are listed on the CBD website (at https://www.cbd.int/abs/ir/0014.shtml?field=area&value=ABS [Accessed 7 July 2009]).

Ethical discussions in this regard have revolved around topics like prior informed consent, standards of privacy and issues of communication in research projects, and the ownership and commodification of human body parts.[8] Obviously, these issues are particularly relevant in the field of medical research, policy formation and decision-making, and only a few will be equally important with respect to plant genetic resources.[9]

Another relevant comparison may be drawn with the field of pollution control and climate change. In this area, the Kyoto Protocol and subsequent international negotiations on the global *burden-sharing* of emissions reduction and resulting development of a quota system have been subject to in-depth philosophical scrutiny, to the extent that a whole new discipline seems to have been created.[10] The contrast here with the place of ethics in the world of ABS is manifest. Neither the official documents nor most studies commenting on the notion of "fair and equitable benefit-sharing" as applied to plant genetic resources and repeatedly proclaimed in the aforementioned treaties seek to inquire into the ethical issues, let alone actually provide real explanation or offer definitions. We can only conclude that the philosophical discussion on plant genetic resource benefit-sharing thus far has been very weak.

Research questions

This thesis aims to address the lack of social and scientific debate on the ethical dimensions of benefit-sharing in the field of plant genetic resources, related knowledge and IPRs. This will be done, by investigating and exemplifying the normative positions and argumentations within the current debates on benefit-sharing, and by reflecting on the meaning of and possibilities for fair and equitable benefit-sharing. Rather than

[8] See e.g. (Sheremeta & Knoppers, 2007; Williams & Schroeder, 2004).

[9] E.g. the discussion on prior informed consent (see e.g. the Bonn Guidelines, Articles 24 - 40).

[10] See e.g. (Beckman & Page, 2008).

zooming straight into the myriad of specific, detailed difficulties related to the ethics of benefit-sharing, therefore, this study aims to begin from the start by asking what benefit-sharing is actually about and what it is supposed to accomplish.

In order to give direction and guide the research, the following questions are focused on:

1) When did the concept of benefit-sharing originate and for what purpose was it developed?
2) What are the major difficulties (practical, as well as ethical) that complicate the current negotiations on and implementation of benefit-sharing policies?
3) What normative positions and objectives are incorporated in the
    a. international legislation on benefit-sharing?
    b. benefit-sharing policies of international, national and local organizations?
    c. stakeholders' perceptions of benefit-sharing?
4) What is the relation between benefit-sharing and intellectual property rights: do they support or impede each other?
5) What is fair and equitable benefit-sharing and how might it best be realized?

Of the wide range of applications and research sectors encompassed by plant genetic resource benefit-sharing, those in the areas of agriculture and medicine are probably most important. It is the former that are considered in the chapters to follow where more specific applications of certain plant genetic resources and their users and providers are highlighted, with emphasis placed on the so-called plant genetic resources for food and agriculture or on the public agricultural research sector. Two main reasons for this are 1) that benefit-sharing issues with respect to medicinal plants and the pharmaceutical industry have already received relatively much attention in the literature, and 2) that there are particularly pressing problems with respect to ABS and the agricultural sector in the face of global food security, an area in which the public research sector plays a major role.

Ethical perspective

Our ethical reflection is strongly informed by a *pragmatist ethics*.[11] One central characteristic of this approach is that it does not start from an overarching moral principle or particular theory of social justice. Instead, it claims the freedom to apply existing moral principles and theories wherever they can contribute to the practical inquiry and ethical assessment of real-life questions and problems:

> *While consequentialists take collective happiness to be the moral touchstone, and deontologists the obliging character of moral norms, pragmatism revolves around the possibilities for living and working together. Pragmatism's primary concern is to facilitate the solving of problems and the settlement of conflicts emerging from our joint activities and practices in order to improve cooperation and enable peaceful cohabitation.* (Keulartz et al, 2002, p. 252)

A pragmatic, flexible and problem-oriented approach is badly needed to cope with the complex and dynamic character of the issue at hand. The socio-political debates, legal rulings, and scientific developments are in a state of continuous flux, constantly evolving and involving a broad, still increasing range of different stakeholders. One of the benefits of a pragmatic ethics in this respect is that it is as much interested in the *process* of (ethical) inquiry as in its *products*. Implicit in this shared emphasis is the need for decisions to be made on the basis of a careful consideration of all relevant ethical positions, claims and arguments, with all parties involved able to take a proper part in proceedings and have their say. This is not to assert that this is always possible, but it refers to the ideal situation of a "fair and open discourse" (Thompson, 2002, p. 215), which a pragmatic ethics always strives for. Furthermore, because ethical positions and standpoints are not always easily conceived of and expressed, a pragmatist ethics takes much effort in explicating normative

[11] The philosophical foundations and methodologies of this approach are thoroughly discussed in (Keulartz et al, 2002).

positions, assumptions and differences. Overall, a pragmatist ethics aims to facilitate public debate and decision-making towards possible solutions and/or compromises, appreciating that one single solution, the right answer, is often non-existent in the complex, multi-faceted and interconnected societies of today.

This is not to imply that a pragmatist ethics does no more than merely evaluate existing situations: indeed it also endeavors to devise alternative pathways for the future. Another important characteristic of a pragmatic ethics in this respect is described in terms of a "shift in emphasis from the *context of justification* to the *context of discovery*" (Keulartz et al, 2004, p. 18, [referring to Caspary, 2000]). Rather than focusing chiefly on the justification of certain moral judgments, that is, pragmatism also emphasizes "the importance of novel constructs and hypotheses with which emergent problems can be tackled" (idem, p. 18). On the basis of creative and heuristic thinking, new perspectives, alternative (moral) vocabularies, and possible lines of actions are formulated in order to find or create openings in the problems and conflicts of the day.

Methodology

The research questions listed above reflect the foundations of a pragmatist ethics, aimed as they are primarily at gaining insight into and clarifying the different (ethical) viewpoints, objectives and difficulties with respect to benefit-sharing. In order to acquire a sufficiently comprehensive and realistic overview of these issues the research has been based on a combination of inquiry techniques, involving desktop research, stakeholder interviews, site-visits, and international meetings and conferences. These include:

- An extensive study of the scientific literature, policy documents, minutes and news reports,
- Over 75 semi-structured interviews with stakeholders on location in Kenya, Peru and the Netherlands,

- Attendance at meetings of the CBD and its Ad Hoc Open-Ended Working Group on Access and Benefit-sharing, and a visit to the FAO,
- Participation in international workshops on ABS in Germany and India,
- Organization of an international conference in the Netherlands aiming to prompt public debate on public-sector intellectual property and benefit-sharing.

The three countries chosen as the sites for interviews and visits – Kenya, Peru and the Netherlands – were selected with the intention of gaining input from a diverse and diffuse group of stakeholders. Varying hugely in their socio-political and cultural make-up and each with its own views and interests in respect of benefit-sharing and plant genetic resources, these countries are also members of three different geo-political cooperation organizations (the African Union, the Andean Community, and the European Union). Within the three countries, representatives from various scientific, governmental, industrial and civil society organizations were interviewed, both with respect to their opinions about and experiences of benefit-sharing (in the conference room or on the ground), and in regard to their understanding of the objectives and problems of benefit-sharing in general.

At an international level, meetings of the CBD and the FAO headquarters were attended in order to gain a better appreciation – through observation, corridor-talk, and semi-structured interviews – of the international negotiations on ABS. This was complemented by the participation in two international workshops on ABS in Bremen (Germany) and New Delhi (India).[12] Together with the extensive literature research, these sources are believed to provide a broad and heterogeneous basis adequate for the purposes here of extracting general findings and conclusions.

[12] See http://www.feu.uni-bremen.de/downloads/Workshop/programme.pdf and http://www.ris.org.in/icgr_prg.htm [Accessed 7 July 2009].

In addition to research into the current state of affairs regarding benefit-sharing, the research project aims to search for and formulate possible solutions for the identified impasse and explore options that might promote fair and equitable benefit-sharing. Apart from some specific alternative pathways reflected upon in the following chapters, the aim is also to contribute to the promotion of public debate in this respect, especially with interaction between stakeholders. For this purpose, we organized an international conference at Wageningen University and Research Centre (Wageningen UR) in the Netherlands. Entitled "Reconsidering Intellectual Property Policies in Public Research: Sharing the benefits of biotechnology with developing countries", this conference invited stakeholders from the public and private sector, research funding agencies, and civil society to discuss possible tensions between the increasing application of IPRs in biotechnology research on the one hand, and access to knowledge and technologies for development purposes on the other. The main objective of the conference was to investigate how public research institutes in the developed world can prevent their IP policies from hampering innovation in poor countries and promote the sharing of their knowledge and technologies for the common good. This topic was chosen for its relevance in the Dutch context and many other developed countries.[13]

Structure

This thesis consists mainly of a compilation of articles that have either been published or accepted for publication in peer-reviewed journals. With the exception of Chapter 6, which consists of two papers published on the website of the Centre for Society and Genomics, this introduction and the concluding chapter.

[13] An earlier attempt to initiate debate on ABS policies and issues of biopiracy in the Netherlands was less than a complete success because few organizations have any experience or familiarity with these subjects.

Chapter 2 contains a historical overview of the origin and development of the concept of benefit-sharing in international law, and analyses the philosophical premises it incorporates. It proposes, furthermore, a distinction between downstream and upstream models of benefit-sharing and favors the latter in order to ensure that benefit-sharing can contribute to world food security and global justice.

Chapter 3 focuses on the different motivations and objectives that can be extracted from the current debates on benefit-sharing. Together with an analysis of the various ABS mechanisms that are in place or currently proposed, this results in the identification of six distinct approaches to benefit-sharing. The tensions and incompatibilities among these different approaches largely explain the difficult implementation and slow-moving negotiations on benefit-sharing today, as mentioned. The chapter concludes with a reflection on the major differences and a discussion of consequences and possible ways forward.

Chapter 4 builds upon these different approaches to analyze what is understood by the notion of fair and equitable benefit-sharing. Here, different principles of justice are reflected upon in relation to the various approaches to benefit-sharing. Several conclusions are reached and suggestions made in the light of these as to how a fair and equitable benefit-sharing mechanism might best be realized.

Chapter 5 concentrates on case studies, the position of two public research institutes, the International Potato Centre in Peru and Wageningen UR in the Netherlands, in order to analyze how they deal with the array of regulations, interests and perspectives that accompany the resources they work with. The chapter studies the institutions' own policies in this regard and reflects upon the optimum balance between the sharing and the protection of genetic resources, knowledge and technologies for organizations whose mission it is to serve the public interest.

Chapters 6 and 7 revisit the international conference on benefit-sharing and public-sector IP policies that we organized in Wageningen in 2008. Describing the central topic, Chapter 6 includes the conference start document and final report, while Chapter 7 is a viewpoint article that reflects upon the conference in light of the growing importance of economic value creation in public science. Special attention here is given

to the organizational process and the difficulties of bringing different stakeholders with clearly conflicting interests together in order to discuss complex problems and search for possible solutions.
Chapter 8 brings together the major findings of the preceding articles and reviews the research questions posed in this introduction.

Two

Vicissitudes of benefit-sharing of crop genetic resources: Downstream and upstream[14]

[14] This chapter is written by Bram De Jonge & Michiel Korthals and previously appeared as a scientific article in the Journal *Developing World Bioethics*, 2006, **6**: 144-157.

Abstract

In this article we will first give a historic overview of the concept of benefit-sharing and its appearance in official agreements, particularly with respect to crop genetic resources. It will become clear that, at present, benefit-sharing is primarily considered as an instrument of compensation or exchange, and thus refers to commutative justice. However, we believe that such a narrow interpretation of benefit-sharing disregards, and even undermines, much of its (historical) content and potency, especially where crop genetic resources are concerned. We argue that benefit-sharing should not be based merely on commutative justice but rather on a broader model that is also grounded in the concept of distributive justice. This has repercussions for the application of benefit-sharing, which we try to clarify by distinguishing between downstream and upstream benefit-sharing. Upstream benefit-sharing is not so much inspired by compensation for actions done, or the distribution downstream of benefits developed, but by the idea of shared decision-making on the research and development of resources fundamental to human welfare. Going upstream in the research process of crop genetic resources, and determining research agendas and improving crops according to the needs of the poor, benefit-sharing may well be a tool to contribute to world food security and global justice. We concretize our ideas on upstream benefit-sharing by introducing a set of criteria that determine the success of consultations on agricultural research agenda setting.

Introduction

One of the most pressing ethical issues in our world is the unequal distribution of such basic goods as health care and food supply. Repeatedly, world leaders have condemned this grave injustice and virtually every country has committed itself more than once to fight poverty and hunger. The Millennium Development Goals (MDGs) are the

most recent example of this. Their objective is to reduce hunger and extreme poverty by half by 2015 and to make substantial gains in health, education, social equity, environmental sustainability and international solidarity (UN, 2000). The eradication of hunger is thereby central, as the recent *State of Food Insecurity in the World 2005* report states that "hunger and malnutrition are major causes of the deprivation and suffering targeted by all of the other MDGs" (FAO, 2005b). However, there is a long way to go. The most recent estimates of the Food and Agriculture Organization (FAO) of the United Nations (UN) indicate that 852 million people lack sufficient food for an active and healthy life. An additional two billion people will have to be fed over the next 30 years, 90% of whom will live in developing countries. Not only chronic hunger but also the so-called 'hidden hunger' of micronutrient deficiencies causes many problems within developing countries. Billions suffer from this insidious form of malnutrition caused by the poor quality of, and lack of diversity in, their daily diets (FAO, 2004; FAO, 2005a). Given the current pace of international action, many doubt whether the MDGs will be reached in time, if at all. It is repeatedly stated that scientific research, by improving present crops, can contribute much to turn this tragic situation around. However, there are signs that modern molecular sciences, like biotechnology, do on the contrary contribute to a 'molecular divide' between rich and poor.[15]

This article is not about reaching the MDGs, the eradication of hunger, or the unequal distribution of basic goods. However, it is linked to these topics through its focus on plant genetic resources (for food and agriculture)[16] and the concept of benefit-sharing. Plant genetic resources

[15] Compare with Louise Fresco, adjunct director general FAO: "What we are witnessing is a molecular divide between developed and developing countries, between rich and poor farmers, between research priorities and needs, between technology development and technology transfer - in short, between the promise of biotechnology and its real impact" (Fresco, 2003a).

[16] We will focus primarily on the agricultural sector and thus on plant genetic resources for food and agriculture, or crop genetic resources for short. However, as crop genetic resources are part of the general category of plant genetic resources the latter will also be discussed.

are obviously related to food security as they are the building blocks of what people eat. Their use, management, exchange and development by scientific research are therefore of major importance to humanity and subject to several international agreements. The notion of benefit-sharing is adopted in these agreements, and is currently being negotiated within several fora.[17] It is however far from clear whether, and how, benefit-sharing is related to issues of hunger, or to the unequal distribution of basic goods. In this article we will analyze the use and application of the concept of benefit-sharing, particularly with respect to crop genetic resources. It will become clear that, at present, benefit-sharing is primarily considered as an instrument of compensation or exchange and thus refers to the Aristotelian notion of commutative justice. However, this model of benefit-sharing does not suit crop genetic resources. On the contrary, it has harmful effects on the agricultural sector as it obstructs the international transfer of genetic resources on which the agricultural sector historically depends. The likely outcome of this is that (especially) the poorest countries will suffer. Therefore, we propose an alternative model of benefit-sharing based on a broader model that is also grounded in the concept of distributive justice.

In the prevailing discussion on benefit-sharing the link between benefit-sharing and distributive justice has been rejected rather than supported. For example, with respect to the field of human genetics, Kadri Simm remarks that benefit-sharing is fuelled by feelings of injustice that refer to a larger background of current world inequalities, "be it inherited from colonization experience or the international establishment of market-oriented liberal capitalism that favours certain prominent players and regulations in the ordering of our world." (Simm, 2005, p. 37). However, she does not support this link between the concept of benefit-sharing and issues of global justice as she argues, "To my mind the problem is that a benefit-sharing framework is not able to respond adequately to those

[17] For example, The Ad Hoc Open-ended Working Group on Access and Benefit-Sharing of the Convention on Biological Diversity is at present negotiating an International Regime on Access and Benefit-Sharing.

concerns that surface from this larger background of injustice issues." (idem, p. 37).

We question this opinion on the unsuitability of a benefit-sharing framework for solving global justice problems because we also question the narrow interpretation of benefit-sharing (i.e. as commutative justice) on which it is based. We will discuss several factors that support our proposal for a broader model of benefit-sharing that also takes into account the concept of distributive justice. This shift has repercussions for the application of benefit-sharing, which we try to clarify by distinguishing between downstream and upstream benefit-sharing. Most existing mechanisms of benefit-sharing are downstream focused, at the end of the research and development pipeline. Upstream benefit-sharing is not so much inspired by the downstream distribution of benefits developed but by the idea of shared decision-making regarding the technological utilization of resources fundamental to human welfare. We will elaborate on some of the central issues related to this idea of upstream benefit-sharing and introduce three types of criteria (participation, transparency, and efficacy) as indicators of successful consultations. Of course, benefit-sharing will not be the solution for world hunger and inequality. It may however be a tool, or mechanism, to stimulate the development and distribution of basic goods in such a way that it contributes to global justice and helps to narrow the gap between rich and poor.

Benefit-sharing and the common heritage of mankind

The notion of benefit-sharing first appeared on the international scene during the 1970s. At that time benefit-sharing was closely related to the concept of the common heritage of humankind. Both concepts appeared for example in the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (UN, 1979), and during the negotiations towards the United Nations Convention on the Law of the Sea (UN,

1982).[18] In the former it was declared that the "Moon and its natural resources are the common heritage of mankind" and subsequently established a provision on the "equitable sharing by all States Parties in the benefits derived from those resources" discovered on the moon (UN, 1979, Article 11.1 & 11.7(d)). In the latter, it is stated that:

> *the area of the sea-bed…as well as its resources, are the common heritage of mankind, the exploration and exploitation of which shall be carried out for the benefit of mankind as a whole.* (UN, 1982, Preamble)[19]

The common heritage idea is rather difficult to define. Bartha Knoppers described it as that which, "argues against private appropriation in favor of sharing, administration in the common interest, benefits and burdens equitably distributed, equitable access, peaceful use and preservation for future generations." (Knoppers, 2003, p. 2). With respect to plant genetic resources, it appeared for the first time in the International Undertaking on Plant Genetic Resources (IUPGR) of the FAO. In its first Article, the document outlines that the "Undertaking is based on the universally accepted principle that plant genetic resources are a heritage of mankind and consequently should be available without restriction." (FAO, 1983). Through its resolutions in 1989,[20] it tried to achieve a balance between the interests of farmers as the historic, present, and future stewards and innovators of plant genetic resources on the one hand, and formal innovators as plant breeders and the biotechnology industry on the other. Therefore, it established the so-called 'Farmers' Rights' in order to, "allow farmers (…) to participate fully in the benefits derived (…) from the improved use of plant genetic resources, through plant breeding and other

[18] In *The United Nations Convention on the Law of the Sea (A Historical Perspective)* it is stated that "In 1970 the United Nations General Assembly declared the resources of the seabed beyond the limits of national jurisdiction to be 'the common heritage of mankind'." Available at: http://www.un.org/Depts/los/convention_agreements/convention_historical_perspective.htm [Accessed at 13 March 2006].

[19] With explicit references to "Common Heritage" in article 136, and to "Benefit-sharing" in article 140.

[20] Resolution 4/89 & Resolution 5/89.

scientific methods." (FAO, 1983, Resolution 5/89, final article). The notion of benefit-sharing came more and more to the foreground. However, the context in which it eventually appeared changed radically in the 1990s.

In 1992 the Convention on Biological Diversity (CBD) was adopted at the Earth Summit in Rio de Janeiro. The CBD has three main goals, namely: "the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources" (UNEP, 1992, Article 1). One of the most remarkable aspects of the CBD is that it turns away from the traditional understanding of genetic resources as the common heritage of humankind.[21] Instead it states that, "the conservation of biological diversity is a common concern of humankind" and it declares that "States have sovereign rights over their own biological resources." (Preamble).

There are several reasons why the idea of sovereign ownership took precedence over the concept of common heritage within the CBD. One was that, in the years leading up to the introduction of the CBD, a new and promising industry was emerging. The first experiments with genetic engineering had taken place and the stock values of the new biotechnology companies were mounting. To stimulate this development the United States (US) had, as the first country, opened the door for patent protection of biotechnology products including living organisms. This had stirred expectations of the potential use and value of the world's biodiversity, especially in poor but biodiversity-rich countries. At the same time, concern was rising over the protection and conservation of that biodiversity. The international environmental movement, which dominated the Earth Summit, considered sovereign rights over plant genetic resources a potentially strong tool for stimulating nature conservation in poor counties. The idea was that countries that own potentially valuable resources would take measures to safeguard and

[21] Resolution 3/91 of the *IUPGR* already states that "the concept of mankind's heritage (…) is subject to the sovereignty of the states over their plant genetic resources". The CBD takes the final step and abandons the notion of common heritage.

conserve those resources.[22] The 'grand bargain' of the CBD thus became the benefit of access to genetic resources (and accompanying traditional knowledge) for the emerging bio-industries in the North, in exchange for a fair share in the benefits of these technological developments for the South. All are in favor, ideally, of the conservation and sustainable use of the world's biological diversity.

Open access versus enclosure

Despite this major political success, there are some downsides to the CBD. One major point of criticism is that many countries consider their genetic resources as 'goldmines' that have to be protected against foreign parties. The CBD and successive Bonn Guidelines (UNEP, 2002) set up an 'Access and Benefit-Sharing' framework to regulate the flow of genetic resources between 'provider' and 'user' countries. What has happened is that most countries consider themselves providers and, thus, sellers of genetic resources, and are much less concerned with their own use and demand for these resources. As a consequence they have focused primarily on protection against abuse instead of facilitating access and developing creative benefit-sharing mechanisms. The international transfer of plant genetic resources has therefore declined dramatically since the ratification of the CBD.[23] This has had major consequences for the agricultural sector, which depends on extensive flows of genetic material around the world.

[22] In the CBD, genetic resources are actually defined as "genetic material of actual or potential value" (UNEP, 1992, Article 2).

[23] For example, "[The CGIAR] averaged 9782 acquisitions annually for the five calendar years before the CBD. In 1997 (…) the number of new accessions was only 563. The decline in the number of collection missions was even steeper" (Falcon & Fowler, 2002, p. 210).

To better suit the agricultural sector[24] the FAO adopted the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR) in 2001 (FAO, 2001). As one of its central benchmarks it states that:

> *In the exercise of their sovereign rights over their plant genetic resources for food and agriculture, states may mutually benefit from the creation of an effective multilateral system for facilitated access to a negotiated selection of these resources and for the fair and equitable sharing of the benefits arising from their use.* (FAO, 2001, Preamble)

As such, the ITPGR establishes a list of 64 major crops and forages that are freely accessible for breeders and researchers of member countries. Furthermore, the ITPGR includes an international fund for which payment is due when a commercial product is developed using resources from the Multilateral System.[25] The fund will especially be aimed at supporting small farmers in developing countries.

The ITPGR seems to refer back to the common heritage idea from before the 1990s. It is not only the creation of the Multilateral System that points towards this direction. The inclusion of the international gene banks of the Centers of the Consultative Group on International Agricultural Research (CGIAR)[26] under the realm of the ITPGR (FAO, 2001, Article 11.5), and the ITPGR's focus on Farmers' Rights also contain a similar message (Article 9). The former by securing and regulating the management of the international gene banks as a public good. The latter by reaffirming the "enormous contribution that…farmers of all regions of the world…have made and will continue to make for…food and agriculture production throughout the world" (Article 9.1). However, these references to the common heritage idea are rather peculiar in combination with the

[24] For more information on the complex negotiation history of the *ITPGR* and its relation to the CBD and other relevant Treaties see, e.g. (Stannard et al, 2004).

[25] Payment is voluntary if the commercialized product can be used without restriction by others for further research and breeding, it is compulsory if not.

[26] The CGIAR centers hold a substantial percentage (over 500.000 items) of the germplasm in ex-situ storage. For more info see: http://www.cgiar.org.

simultaneous confirmation of sovereign rights over plant genetic resources. The ITPGR appears to incorporate two opposite positions: one affirming sovereignty and appropriation; the other proclaiming open access and an ethos of sharing. This inconsistency has everything to do with the existing juridical and political context of intellectual property rights and world trade agreements.

The major legal instrument that regulates intellectual property rights on a global scale is the Trade-Related Aspects of Intellectual Property Rights Agreement of the World Trade Organization (WTO, 1994).[27] The Agreement's statement with respect to plant genetic resources is rather complex. In Article 27.3 it is stated that "plants (…) other than micro-organisms, and essentially biological processes for the production of plants (…) other than non-biological and microbiological processes" may be excluded from patentability. However, the article proceeds, "Members shall provide for the protection of plant varieties either by patents or by an effective *sui generis* system or by any combination thereof" (WTO, 1994). The TRIPS Agreement is of major influence to any benefit-sharing mechanism and there are a lot of debates on its relation to both the ITPGR and the CBD.[28]

Just as plant genetic resources were once part of the global commons, now intellectual property rights are pushing these commons more and more into enclosure. This not only happens directly when new plant varieties or biotechnological products are patented, it also takes place indirectly. Countries that are genetically rich try to protect these resources from foreign parties. In the face of increasing intellectual property rights, they try hard to develop their own access-restricting regimes. This has not only caused the downside to the CBD described above, it has also triggered the

[27] The WTO agreements took effect on 1 January 1995 and count 149 member countries (on 11 Dec 2005). However, member states have differing deadlines to ensure that their laws conform with the TRIPS Agreement, ranging from one to 21 years depending on their development status and the patent area involved.

[28] It is not in the scope of this article to go into depth with these debates. For more information see, e.g. (Van Overwalle, 2005).

protectionist features within the ITPGR. As a result, the Multilateral System of the ITPGR misses, for example, several staple crops. As one group chose to exclude a major crop in the hope of selling it bilaterally, other countries followed. In this way China excluded soybeans, Latin America withdrew groundnuts, and Africa excluded tropical forages (Falcon & Fowler, 2002).

The changing concept of benefit-sharing

The concept of benefit-sharing has not been static in the face of these developments. Originally, when benefit-sharing was linked to the common heritage idea, it was about common goods that are shared by all and to which everyone should have equitable access. Hence, benefit-sharing referred to a logic of *distribution* as the benefits and burdens of a common good should be equitably distributed. Now the idea of common heritage or common good is seen by many as more or less passé. Plant genetic resources are not purely in the public domain anymore. The original common good understanding has changed due to processes of privatization and environmental degradation. In the present light of appropriation and enclosure, benefit-sharing is often referred to as an instrument of *compensation* or *exchange*.[29] This seems for example to be evident within the CBD. The 'grand bargain' on which it is based implies access to genetic resources in exchange for a fair share in the benefits of their utilization. But the concept of Farmers' Rights, which is central to the IUPGR and the subsequent ITPGR, has also given rise to the idea of benefit-sharing as an instrument of compensation or exchange. As we have seen, Farmers' Rights were primarily established as a counterforce to the increasing importance of breeder rights and intellectual property rights. Farmers' Rights come down to the idea that the benefits derived from the latter type of rights are at least partly dependent on the contributions of

[29] Compare with, for example, (ten Kate & Laird, 1999).

farmers all around the world and should be shared accordingly, as a form of compensation.

The changing concept of benefit-sharing can aptly be described through the Aristotelian distinction between *distributive justice* and *commutative justice*. In short, commutative justice is corrective in transactions between two individuals or groups of individuals. It focuses on the equal or equivalent value of exchanges. Distributive justice instead deals with the fair distribution of something (wealth, goods, opportunities, etc.) among several people or parties. So, benefit-sharing was originally focused on distributive justice, but is now often referred to as an instrument of compensation or exchange. Can we therefore say that benefit-sharing should be primarily or exclusively based on commutative justice? We do not think that this should be the case. On the contrary, we believe that such a narrow interpretation of benefit-sharing would disregard and even undermine much of its (historical) content and potency. The way in which the model of compensation or exchange undermines the concept of benefit-sharing becomes clear by analyzing some of the criticism of the CBD's framework of Access and Benefit-Sharing.

The framework of access and benefit-sharing

We have seen that the CBD distinguishes between so-called user and provider countries of biological resources. The notion of benefit-sharing is hereby closely linked to the issue of access to these resources. This so-called framework of Access and Benefit-Sharing (ABS) is especially adapted to a certain group of genetic resources. These are mainly resources that are rare and geographically isolated and of interest to specific industries, such as the pharmaceutical industry. There are several examples of more or less successful ABS agreements between local communities, that traditionally use a specific resource, and foreign parties, that are interested in analyzing and developing that resource (and

accompanying traditional knowledge) into a profitable product. Thus, this framework is explicitly based on a model of compensation or exchange.

However, where plant genetic resources for food and agriculture are concerned, there are hardly any examples of existing ABS agreements. Instead, the whole idea of user and provider countries is highly criticized as it has obstructed international geneflows on which the agricultural sector historically depends (Falcon & Fowler, 2002). Brush is one of the authors who argue that the exchange model of benefit-sharing is, "largely metaphorical" and "inappropriate" where crop genetic resources are concerned (Brush, 2005). The idea that developing countries are the providers and developed countries the users of plant genetic resources is highly overestimated here. Nowadays, developing countries are more dependent on international flows of germplasm than developed countries (idem, p. 72). Besides, "No substantial market for [crop] genetic resources has ever existed" (Falcon & Fowler, 2002, p. 213), which makes it very difficult to estimate the value of specific contributions.

So, the ABS framework and accompanying model of compensation does not seem to suit the agricultural sector. However, some critics also argue that the framework of ABS is awkward with respect to the broader field of plant genetic resources. One of them is Safrin, who remarks:

> *The challenge presented to developing countries by the CBD is how to make a nonrivalrous, abundant resource and make it exclusive. How can nations prevent most, let alone all, genetic resources of potential value from leaving their borders? They cannot.* (Safrin, 2004, p. 665)

The difficulty is that plant genetic resources are most often abundant and non-exclusive goods that do not respect national borders. In addition, their value lies primarily in the genetic information they carry which is non-

rivalrous. These are all characteristics of a public good.[30] The ABS framework, which forces countries to arrange bilateral contracts regulating the transfer of plant genetic resources (as if they were a private good), incorporates some serious complications. For example, it can cause a 'race to the bottom' because a foreign party that is interested in access to certain resources will go shopping in different countries and negotiate the cheapest ABS agreement possible.[31]

It seems that the ABS framework can do more harm than good, particularly to the agricultural sector. Unfortunately, we have seen that the ITPGR does not succeed in (re) establishing an encompassing, open-access system for crop genetic resources. The likely outcome of this is that especially the poorest countries will suffer, as Falcon and Fowler remark:

> *We have no doubt that developed countries and the private sector will be able to secure the genetic resources they need. We are less confident that African countries, for example, will have the capacity and resources to negotiate arrangements abroad to obtain tropical legumes or wild relatives of cassava from Latin American countries, or even genetic resources of local importance from a neighbouring country.* (Falcon & Fowler, 2002, p. 212)

The ABS framework obstructs the free flow of crop genetic resources that are essential for food supply and food security. Besides, the model of

[30] Public goods are often described in contrast to private goods. Private goods are classified as rivalrous and excludable. Goods are rivalrous in the way that the consumption by one prevents others from enjoying the same good. They are excludable when non-owners can be excluded from consumption. Pure public goods instead are non-rivalrous and non-excludable. This means that the consumption by one does not affect the consumption of the same good by others. Furthermore, it is either technically impossible, or too costly, to exclude non-owners from consuming the good. There are also many goods that qualify as impure public goods. These goods are either non-rivalrous but excludable or non-excludable but rivalrous. The former are also named 'club-goods' as they are often non-rivalrous inside a group. The latter are called 'common pool resources' as they are accessible to all but subject to depletion or congestion (Kaul et al, 1999).

[31] Once a country tries to claim that it is, as the CBD states, the 'country of origin', it has to prove so in the face of millennia of evolutionary history (Petit et al, 2001).

compensation or exchange on which it is based is not adequate for most plant genetic resources that are not rare or geographically isolated. This undermines the whole idea of benefit-sharing as it undermines the hoped-for benefits in the first place. We would, therefore, argue strongly that benefit-sharing should not merely be based on a model of compensation or exchange and thus commutative justice, but rather on a broader model that is also grounded in the concept of distributive justice.

The ideas underlying benefit-sharing in the CBD and ITPGR

In the presently dominant understanding of benefit-sharing as commutative justice, it is not surprising that Kadri Simm, amongst others, argues that benefit-sharing does not fit well with distributive justice issues. She remarks that, “The notion of global public goods or the human rights discourse has a better chance in distributing the needed resources” (Simm, 2005, p. 38). But why should benefit-sharing be strictly separated from a global public goods or human rights discourse, or from the concept of distributive justice? By taking a closer look at the central objectives of both the CBD and the ITPGR it becomes clear that benefit-sharing is more than merely an instrument of compensation or exchange.

By focusing on the CBD’s and the ITPGR’s preambles one can get a good idea of the central objectives of both agreements. At first, both preambles show that the global public goods discourse, to which benefit-sharing was originally linked, is still of great importance. Both the CBD and the ITPGR emphasize that plant genetic resources (for food and agriculture) are the common concern of humankind. They stress “the importance of biological diversity for evolution and for maintaining life sustaining systems of the biosphere” and for “food security”. The subsequent affirmation that states have sovereign rights over their plant genetic resources does not make them the private owners of these resources but rather the stewards that “are responsible for conserving their biological

diversity and for using their biological resources in a sustainable manner" (FAO, 2001; UNEP, 1992).

Against this background, both agreements stress a broader context of benefit-sharing than one purely of commutative justice. The CBD's preamble refers to commutative justice as it speaks of the "desirability of sharing equitably benefits arising from the use of traditional knowledge, innovations and practices." However, it then states that:

> *conservation and sustainable use of biological diversity is of critical importance for meeting the food, health and other needs of the growing world population, for which purpose access to and sharing of both genetic resources and technologies are essential.* (UNEP, 1992)

This refers to an interpretation of benefit-sharing that focuses on meeting the essential needs of humankind independent of criteria of exchange or compensation.

The ITPGR's preamble refers to the concept of commutative justice as it relates benefit-sharing to the "past, present and future contributions of farmers in all regions of the world". However, farmers' contributions are especially acknowledged as being part of humankind's endeavors to secure food supply. It is stated that:

> *plant genetic resources for food and agriculture are the raw material indispensable for crop genetic improvement, whether by means of farmer's selection, classical plant breeding or modern biotechnologies, and are essential in adapting to unpredictable environmental changes and future human needs.* (FAO, 2001)

The ultimate objective is to secure food supply. It appears that benefit-sharing is mainly a tool for this objective as its application is linked to the Multilateral System and focuses on the redistribution of information, technologies, capacity-building and benefits from commercialization, especially in favor of developing countries and countries with economies in transition (Article 13). So, within the ITPGR, benefit-sharing is not

merely about compensation for contributions made, but rather about the distribution of the necessary means to secure sustainable agriculture and food security for this and future generations.

Commutative justice, distributive justice and benefit-sharing

Both agreements put special emphasis on the food and health needs of present and future generations. According to us, this emphasis justifies and calls for a broader model of benefit-sharing that is also grounded in the concept of distributive justice. Distributive justice is a complex concept. As stated before, it concerns the fair distribution of certain benefits (or burdens) among several parties. But how to define those benefits, and how to determine just criteria for allocation, are highly debatable issues. As a result, many divergent theories of distributive justice exist. With respect to the subject of distribution, some focus on income, wealth or opportunities. Regarding the issue of allocation one can discern criteria of entitlement, merit, need or equality (Miller, 1976). However, in the context of crop genetic resources, we believe that it is quite obvious what distributive justice, as a general objective, is or should be about. The central issue at stake is world food supply (and indirectly world health), and the principal criterion for allocation should be according to need. This criterion is somewhat controversial as again it is difficult to define ‘needs’. Yet, in the face of hunger and micronutrient deficiencies, any insistence on technical definitions seems to be flawed if not inhuman. The satisfaction of the fundamental need for food is a matter of justice (idem, p. 146).

To be clear, we are not arguing that benefit-sharing can, or should, be ruled strictly by the ‘needs norm’: as if every hungry person can be allocated a precise share of the benefits developed by, for example, a

biotechnology company. What we do want to say is that benefit-sharing should not merely be seen as an instrument of compensation or exchange, based on the concept of commutative justice. Instead, and in the face of the harsh reality that more than 800 million people are undernourished, benefit-sharing should also be grounded in the concept of distributive justice, as it can be a tool to improve food security.

When we take a closer look at the concept of benefit-sharing in relation to distributive justice, we find that the two have been linked before in the context of human rights. The Universal Declaration of Human Rights referred to the notion of benefit-sharing in 1948 as it states that "Everyone has the right…to share in scientific advancement and its benefits" (UN, 1948, Article 27). This right is reaffirmed in the International Covenant on Economic, Social and Cultural Rights (UN, 1966-1976, Article 15). In addition, the Covenant refers in its first Article by means of "the principle of mutual benefit" to some form of benefit-sharing with respect to "natural wealth and resources". In these contexts, the notion of benefit-sharing is not based on any form of compensation but on the equitable distribution of everybody's right to their own means of subsistence and to the benefits of scientific advancements. From here it is a small step to extrapolate the notion of benefit-sharing to other human rights endorsed by both agreements that call for an equitable distribution of such basic goods as health care and food supply. This does not mean that all human rights should automatically be linked to the notion of benefit-sharing. What it does mean is that benefit-sharing can also be interpreted as Castle and Gold remark as: "A mechanism through which to achieve either distributive justice or to satisfy international human rights law" (Castle & Gold, 2007).

What we have seen is that the notion of benefit-sharing was originally linked to the common heritage idea, and implied the equitable distribution of benefits (and burdens). With respect to plant genetic resources, the CBD and the ITPGR recognize that these resources are a "common concern of humankind" and are indispensable for "food security" and for "meeting the food, health and other needs of the growing world

population" (FAO, 2001; UNEP, 1992). Benefit-sharing should, therefore, still be linked to the concept of distributive justice and can be a tool to improve food security. The model of commutative justice, to which benefit-sharing is often related, can best be seen as a specific aspect of benefit-sharing that fits certain plant genetic resources and certain objectives. For example, it is a tool to counterforce the illegal appropriation of rare plant genetic resources and traditional knowledge of local communities by patent applications of foreign industries and research centers. However, by reducing the whole notion of benefit-sharing to an instrument of compensation or exchange, one would seriously undermine and disregard much of its (historical) content and potency. The next question is of course: How can the broader notion of benefit-sharing be put into practice and its potential be realized?

Downstream and upstream benefit-sharing

Most if not all existing benefit-sharing mechanisms are *downstream* focused, at the end of the research and development pipeline, as one party that supplies certain resources receives in exchange a share in the (hoped for) benefits of their further development and commercialization by another party.[32] Only after these negotiations over matters of commutative justice do questions of distributive justice arise, with respect to the fair distribution of the negotiated benefits. But what happens when, from the start, benefit-sharing is also grounded in the concept of distributive justice?

To answer this question properly, we first have to remind ourselves that the fair and just distribution of such basic goods as health care and food

[32] This includes milestone payments that can be paid well before any final products are developed as these payments are also downstream focused, anticipating the hoped for benefits developed later on.

supply is a pressing need, to say the least. The increasing gap between rich and poor with respect to food and health, both between nations and within nations, is one of the biggest concerns and a serious threat to global peace and welfare. The emerging molecular divide between rich and poor is not helping the present situation. With respect to crop genetic resources and the new biotechnologies, huge investments are made in the improvement of commercial crops and large-scale production applications for western markets. Unfortunately, these investments in crops and applications very often do not fit the needs of the poor, due to the large differences in agricultural and social factors between North and South. Benefit-sharing grounded in the concept of distributive justice should try to address this structural disparity. As such, it requires not only the downstream distribution of the results, royalties and technologies of successful research and innovations, but also that acceptable ethical decisions are made with respect to different interests and needs *upstream* in the research process. Upstream benefit-sharing would mean that the different stakeholders try to balance their interests with respect to the research priorities in the first place, taking into account the benefits that will be shared later on.

So the issue is not only one of dividing the cake into fair pieces but also of going upstream towards the initial decision-making processes that determine how the cake should look. The usual downstream models of benefit-sharing focus on the conditions for access to specific resources in exchange for the fair sharing of benefits from their utilization, whatever that utilization may be. Upstream benefit-sharing involves a broader approach, which includes the research agenda and process, and focuses on the possible applications and innovations of the original resources in relation to the needs and interests of the stakeholders involved. This is an important difference. For example, if a biotechnology company is developing an improved crop variety that is resistant to certain pests that are a hazard in many western countries, then the chance is very small that this new crop variety will be of any use to developing countries that have a totally different environment and agricultural system. Even though plant genetic resources from around the world are used in plant breeding programs, the research itself is often focused on those parts of the world

where most money can be made. The existing benefit-sharing framework in the CBD and the ITPGR emphasizes the sharing of information and technologies of research carried out. But what can developing countries gain from this when these research outputs and the underlying research priorities are simply not tailored to their specific needs?

Upstream benefit-sharing focuses on the research priorities throughout the development process. In this way, it is, for example, possible that within a particular plant breeding project several plant varieties are developed that suit different environmental circumstances and agricultural traditions. So on the whole, upstream benefit-sharing is not so much inspired by compensation of actions done, or by the downstream distribution of benefits and burdens of results developed, but by the idea of shared decision-making about the scientific and technological utilization of resources fundamental to human welfare. The ultimate target is the reduction of the gap between rich and poor with respect to the use of resources and the development and distribution of the accompanying science and technology, in particular in the field of food and health.

‘Going upstream’ presupposes that the cherished idea of the fifties, of a linear, continuous accumulation of knowledge, where researchers and managers do not have to decide upon alternative research programs, is not valid. And indeed, recent philosophy of science and social studies of science generally agree about the room for maneuver that scientists and managers have in deciding upon alternative research agendas (Jasanoff, 2005). Scientific and technological developments are steered by scientific and social interests, which raises the question whose interests are steering the scientific and technological developments that, in the end, produce the benefits? Or, to put it differently, what should be the research priorities that determine the benefits that, in the end, can be shared by whom? From the more abstract levels of research programs to the detailed and concrete research projects on the interactions between local variables, decisions always have to be made on the research priorities and the direction of the research process to be taken.

Determining research priorities upstream is a kind of co-evolution of science and society, or more precisely of scientific developments and normative decisions of what research is regarded as ethically and politically desirable, and feasible, for the poor. Therefore, an important question is how to involve the relevant stakeholders, particularly when one considers that one of the main groups of actors are poor farmers. With respect to "steering research in the right direction", Louise Fresco argues that:

> *In a globalised economy, the voices of small countries and poor producers and consumers often go unheard. I believe that scientists have moral responsibilities to speak for the weaker segments of society, because they sometimes best understand the likely results of not doing so.* (Fresco, 2001, p. 6-7)

We agree that scientists have a responsibility here, as do national and international policymakers. However, in order to speak for the weaker segments of society, scientists (and policymakers) should first speak *with* them to find out their food-related problems and research needs. This is one of the biggest challenges of upstream benefit-sharing.

Deliberation in upstream benefit-sharing

How to speak with farmers, often on the brink of starvation, on upstream research decisions, that is, how to find out what their needs are and to translate these into research priorities? How to set the agricultural technology agenda together with the poor? Normally, decisions on research priorities are made in the meetings of managers and scientists, sometimes with the input of politicians. However, to find out the needs of farmers who are confronted with problems of drought, decreasing yields of harvests, pests, etc., another type of solution is necessary. Moreover, farmers have, depending on their interests and social position, a plurality of research needs. Some want more research into how to improve local

crops, as in the case of cowpeas, which in African countries like Benin are rapidly being substituted by cash crops (like rice) that threaten the existence of local farmers. Others are in need of new types of biological pest management adapted to local circumstances. Top-level meetings on research priorities with government officials are not the solution in going upstream. Often these officials are interested in cash crops and turn into tyrants as they acquire what Pogge aptly describes "the international resource privilege" (Pogge, 2002, p. 113/142). Tyrants are accorded the right to sell natural resources like oil; multinational corporations often buy the rights to these resources, and the international community tends to treat these interactions as legitimate. The connection of deliberations with actors of civil society in upstream benefit-sharing goes against this privilege and makes it possible to include other actors, and to de-privilege governors. For an efficient and just method of going upstream, actors operating in civil society, like representatives of farmers, farmer organizations and movements, are to be consulted in upstream benefit-sharing (Korthals, 2004, p. 145-9).

However, not all types of debates and consultations on any subject and in any social context can do the job of setting research agendas. Time pressure, exclusion of important stakeholders, lack of expertise, fundamental and violent dissent, to name a few barriers, can hamper consultations and make them unproductive in improving agricultural research and experimentation.[33] Indications of success of consultations on research agendas can be categorized according to three criteria: participation, transparency, and efficacy. These are respectively connected to three aspects of deliberations, namely, their input, throughput and output.[34] With respect to the input of consultations, the most important issues are focused on participation: is everyone involved indeed participating? Is the agenda subject to discussion or has it been imposed from the outside? Do the participants have a framework for discussing the

[33] One remarkable barrier to the implementation of consultations in existing ABS agreements is the multiple consent requirements. See the discussion in (Safrin, 2004).

[34] Here we use distinctions developed by Scharpf in his analysis of legitimacy: (Scharpf, 1998).

ethical issues at hand or do they have to reconstruct a framework, and are they in the position to do this? Is the time span of the deliberation adequate or is the deliberation out of tune with societal developments? During the process (throughput) of the deliberation, it is important that relevant experts can be consulted and information acquired, and that discussions are transparent and free. Transparency is the main catchword for the process of deliberating on research priorities. With respect to the output, an important issue is how the results of the consultation are used: are they neglected and decisions made anyway, or are the results only used in a superficial way? Can the process of implementation be monitored and evaluated? Do the participants have any insight into what happens with the results of their deliberation? Are the results used in the way promised at the beginning of the consultation? These issues can be covered by the criterion of efficacy and efficiency. A barrier to efficacy is often unwillingness to implement the results of deliberations by authorities.

These three types of criteria can be used as indications of how much chance the consultations on upstream benefit-sharing have of succeeding. If it is foreseeable that they cannot be met, in case of lack of participation, transparency and/or efficacy, institutionalizing consultations is a very hard job, to say the least.

With respect to the groups involved in deliberating on upstream benefit-sharing, one should distinguish between co-producers and stakeholders (Grin et al, 1997). Co-producers are the groups directly involved in the final benefit of the envisioned scientific and technological end product, e.g. farmers, breeders, retailers, process industry, etc. Stakeholders are the groups heavily interested in upstream benefit-sharing, and have strong views and strong stakes in steering the final use, e.g. governments, consumers, and non-governmental organizations (NGOs). Although NGOs during the last decades have become heavily involved in policy and deliberation processes (Arts, 1998), their interests do not always coincide with local co-producers.

On a local level, co-evolution of science and technology can have close connections with communicative forms of extension because many forms of extension do try to improve local knowledge levels and applied technologies. An example of this is the farmer-field schools that Peter Kenmore started with the help of the FAO in relation to Integral Pest Management (IPM): “Their aims are to help farmers develop their analytical skills, critical thinking, and creativity, and help them learn to make better decisions” (Kenmore, 2002). From different sources, it can be shown that these schools can be seen as a way of developing the knowledge and skills of local farmers, and can have considerable impact on the improvement of their production. They score highly, both in accordance with measures of participation and of efficiency (Godtland, 2004). On a local level, participation is often complied with to a greater extent but this is not a guarantee that participation on the higher levels (or the other criteria of successful consultations) is covered. Pretty gives a good overview of the large number of experiments and research projects in which scientists and technologists experiment with local farmer cooperation in improving crops and cropping systems, they are not only aiming at improving skills of farmers (Pretty, 2002; Pretty, 2003).

On higher social levels, further removed from local areas, the consultations on upstream benefit-sharing can take different forms. One new issue is the reproducibility and communication of important findings of local researchers, for example, in how far a new potato variety or a new cropping system is generalizable beyond the local area. The three criteria, participation, efficiency and transparency are to be met in forms suitable to these higher levels. An example on the global level is the “Global Genomics Initiative” proposed by Acharya (et al, 2004). They summarize their proposal thus: “A global dialogue that would raise awareness, perhaps build consensus, and set the agenda for action is essential” (Dowdeswell, 2003, p. 4). However, only by encompassing the consultations on the national and local levels of research agenda setting, can upstream benefit-sharing on this high level reach its goal. When local farmer groups in a large area are concerned with improving varieties of cowpea or intercropping (the use of a combination of crops in improving

yields), and the higher levels decide upon improving Western crops or a monoculture, then there is something wrong with the participation. The further removed from the local application and the higher the social level, the more consultations run the risks of being inefficient, not fulfilling the aims that they are organized for, and not including the local actors that are most concerned. Therefore, the three criteria function as indicators of how far consultation processes on upstream benefit-sharing function or not. It is only through a careful process of deliberation on research priorities on the necessary levels and upstream in the research process, that science and technology development has a better chance to contribute to bridging the gap between poor and rich. This is what upstream benefit-sharing entails, and what its ultimate goal should be.

Conclusion

Originally, benefit-sharing was linked to the common heritage idea and referred to equitable distribution. In the present light of appropriation and enclosure of plant genetic resources, benefit-sharing is mainly an instrument of compensation or exchange. We have tried to show that this model of exchange and the framework of ABS on which it is based, seriously disregards, and even undermines, much of the content and potency of benefit-sharing, especially where crop genetic resources are concerned. In line with the ideas underlying benefit-sharing in the CBD and the ITPGR, we argue that benefit-sharing should not merely be based on a model of exchange and thus commutative justice, but rather on a broader model that is also grounded in the concept of distributive justice. The model of commutative justice can best be seen as a specific aspect of benefit-sharing that fits certain plant genetic resources and certain objectives. A broader notion of benefit-sharing that refers to distributive justice may well be a tool to contribute to the fair distribution of basic goods such as food supply and health care. To realize this potency, benefit-sharing has to move upstream in the research and development process and be subject to thorough structures of deliberation with stakeholders at local, national, and international levels. We introduced

three types of criteria: participation, transparency, and efficacy, as indicators of successful consultations. The ultimate target is the reduction of the gap between rich and poor with respect to the use of resources and the development of science and technology, in particular in the field of food and health. Of course, to reach this target much more is needed than the utilization of benefit-sharing alone. However, the wise and efficient application of benefit-sharing in its full gamut of compensation, distribution and deliberations, both downstream and upstream, is one step in the right direction. Fruitful initiatives of upstream benefit-sharing are already under way, and it would be a pity to disregard them.

Three

A diversity of approaches to benefit-sharing[35]

[35] This chapter is written by Bram De Jonge & Niels Louwaars and is conditionally accepted – in a shortened version – as a scientific article for the Journal *Global Environmental Politics.*

Abstract

Benefit-sharing is a complex and controversial policy concept. We claim that a major part of the controversy surrounding the sharing of benefits arising out of the use of genetic resources is based on the diversity of approaches to benefit-sharing. An overview is provided of six central motivations for benefit-sharing that can be extracted from the current debates with respect to plant genetic resources. The different mechanisms for benefit-sharing derived from these six motivations are analyzed, and their intended outcomes discussed. The paper aims at increasing insight in the different viewpoints and interests that people have in the debates about benefit-sharing and their interrelations. Furthermore, the overview makes apparent how these different approaches to benefit-sharing tend to undermine each other, insofar as they lead to conflicting effects or expectations. This article aims to expose and highlight some of these tensions and their underlying causes. Clarity and insight here is likely, we argue, to facilitate a more productive debate on benefit-sharing, and can inform and improve decision-making in respect of future applications of benefit-sharing, both at the national and international levels.

Introduction

Benefit-sharing is complex and controversial. Put briefly, it is an international policy concept that originated in the 1970s with the aim of regulating the distribution of certain resources and the benefits derived from their use (De Jonge & Korthals, 2006). Benefit-sharing in relation to plant genetic resources was first included in international law by the Convention on Biological Diversity in 1992 (CBD) (UNEP, 1992). It figures as one of three objectives of the Convention, alongside the conservation and the sustainable use of biological diversity. The CBD introduced the concept of national sovereignty over genetic resources as a means to regulate access to these resources. Access can be made subject to mutually agreed terms, including aspects of prior informed consent and the sharing of benefits arising out of their use. The CBD has been ratified by almost all countries,[36] which have established national competent authorities to implement the mechanisms.[37] Few countries, however, have effectively implemented these rights in the period since in such a way that substantial benefits are actually shared (Visser et al, 2005).[38]

Multiple aspects are complicating the successful implementation of Access and Benefit-Sharing (ABS) regulations. One aspect is that the use and transfer of plant genetic resources are dealt with in different policy sectors: environment, trade and agriculture. This has resulted in various international agreements with distinct objectives that are negotiated by different ministries in national governments (Petit et al, 2001). These are, amongst others, the aforementioned CBD, the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) of the World Trade Organization (WTO, 1994), and the International Treaty on Plant

[36] http://www.cbd.int/convention/parties/list [Accessed 13 April 2008].
[37] http://www.cbd.int/abs [Accessed 13 April 2008].
[38] See also http://www.cbd.int/abs/arrangements/ and http://www.wipo.int/tk/en/databases/contracts/index.html [Accessed 13 April 2008].

Genetic resources for Food and Agriculture (ITPGR) of the UN Food and Agriculture Organization (FAO) (FAO, 2001). Much debate and controversy results from the interplay of these different policy frameworks and the impact they have upon issues of access to genetic resources and benefit-sharing (Andersen, 2007; Dutfield, 2000; Sampath & Tarasofsky, 2002).

Another important aspect is that many different stakeholders influence the policymaking process. Because plant genetic resources are a component of biodiversity and form the basis of our food consumption and many other important products and industries (Rosendal, 2006b; World Resources Institute, 1992), the stakes for governments, business organizations and civil society groups are high (Laird, 2002; ten Kate & Laird, 1999). This results in a complex spectrum of diverging opinions and interests as to how ABS issues should be organized. Complicating factors in this respect are the huge cultural and socio-economic (power) differences between stakeholders involved (Greene, 2004; Vermeylen, 2007). The field of ABS is one in which representatives of a multinational corporation and an indigenous tribe may have to negotiate one agreement.

Because of these different policy sectors, multiple stakeholders and various cultural and socio-economic contexts involved, it is not clear what is exactly understood by this concept of benefit-sharing. When we started our research and had our first interviews, we soon found out that different ideas exist about benefit-sharing, about its underlying principles, its goals and the preferred mechanisms to reach these goals. Furthermore, more than one motivation and objective were linked to this concept by any interviewee. For this reason, we decided to analyze and distinguish the different *approaches to benefit-sharing* that can be extracted from the current debates around this concept.

So far, most studies on benefit-sharing have focused on practical problems or opportunities, and are aimed particularly at an evaluation of the few benefit-sharing policies that are currently in practice. This article serves a rather different end. We will present an overview of the main approaches

involved in order to contribute to a better informed and balanced debate in which policy-makers and other stakeholders are more aware of the various interests that are at stake. Interests that are not easily linked to separate stakeholder groups, as we will show, but which are referred to among the different stakeholders, often without them being clearly and explicitly differentiated. By doing so in this article, we hope to inform the current debate and shed more light on the major areas of contention involved. By comparing the different approaches in the second part of this article, the central stumbling blocks in the current ABS negotiations (both on the national and international level) will become apparent, showing why benefit-sharing is such a complex issue and why expectations are so rarely met. We will conclude with a brief reflection on possible ways forward, especially with respect to the ongoing negotiations towards an International Regime on Access and Benefit-Sharing within the framework of the CBD.

Methodology

The initial data for this overview have been derived from interviews with experts and stakeholders in Kenya, Peru, and The Netherlands, and some international organizations. This was augmented by further input via meetings and workshops, together with a survey of the literature, used primarily to ground the verbal reports and for referencing purposes.

The three countries represent three major geo-political cooperation organizations – the African Union, the Andean Community and the European Union – with their respective views and interests in plant genetic resources. In order to obtain a wide variety of stakeholders and their organizations in the debate, 77 semi-structured interviews were undertaken with people from government and related institutions, the scientific community, industry, and civil society organizations. Additional input came through attendance at meetings of the CBD and its Ad Hoc Open-Ended Working Group on Access and Benefit-Sharing, and a visit to the FAO. Plus two international workshops on Access and Benefit-Sharing

in Germany,[39] India,[40] and a national workshop with civil society organizations in the Netherlands. The study was conducted between March 2007 and July 2008.

Table 1: Number of persons interviewed according to sector (x) and country (y)

	Science	**Government**	**Civil Society**	**Industry**
Peru	**9**	**4**	**8**	**-**
Kenya	**6**	**14**	**9**	**2**
Netherlands	**6**	**3**	**-**	**3**
International Organizations	**6**	**4**	**-**	**3**

By linking the inputs from the verbal reports with the literature and policy documents, we identified six fundamentally different approaches to the issue of benefit-sharing in the field of plant genetic resources. These represent six distinct strains of argumentation or reasoning in which the concept of benefit-sharing is embedded, based on the following perceptions, or motivations:

- The South-North imbalance in resource allocation and exploitation
- The need to conserve biodiversity
- Biopiracy and the imbalance in intellectual property rights
- A shared interest in food security
- An imbalance between IP protection and the public interest
- Protecting the cultural identity of traditional communities

In order to detail the arguments informing the different approaches, the six sections that follow describe the basic motivations, established and proposed mechanisms, and intended outcomes of each of the different interpretations of benefit-sharing. Each section will start with a quote from

[39] http://www.feu.uni-bremen.de/downloads/Workshop/programme.pdf [Accessed 13 April 2008].
[40] http://www.ris.org.in/icgr_prg.htm [Accessed 13 April 2008].

one of the interviews that triggered our attention to this particular perspective on benefit-sharing.[41]

The following analysis should be regarded as an initial effort to structure the various arguments and perspectives involved in the current debates on benefit-sharing. The different approaches are not fixed entities and they relate to each other in many different ways and on many different levels. We are aware of the strategic potential of any structuring and framing of concepts, by ourselves and the various stakeholders involved, but that is exactly the reason why we have put up this analysis in the first place. As long as the various interests and perspectives involved are not clearly distinguished, the socio-political debate may not be clearly understood and anticipated upon. The pragmatic and deliberative ethics approach (Bohman & Rehg, 1997; Dryzek, 1990; Gastil, 2005; Keulartz et al, 2002) that is applied in this paper aims to improve the "rationality of public debate and decision making" and promote the "fair representation of all relevant arguments" (Keulartz et al, 2004, p. 19). By illuminating the various perspectives and arguments that are at stake with respect to a particular problem, this approach aims to contribute to decision making that, in the ideal situation, is guided by the force of the better argument rather than forces of power, money and the like (Apel, 1988; Habermas, 1991; Thompson, 2002).

[41] This is not to imply that the citied person is solely interested in that particular aspect of benefit-sharing.

Basic motivations, mechanisms and outcomes

The South-North imbalance in resource allocation and exploitation

> *"Experiences in my career led to this thinking that there is something not right in this relationship of biodiversity resources. Scientists come to our pristine areas, (…) and we help them get to the area, get to the information, and the benefit was like, why don't you stay one week more of your time and at least come to my class and teach things (…) there was the feeling that the exchange was not totally straight, there was always one side benefiting more than the other."* Policymaker, Andean Community (Peru).[42]

One major justification for benefit-sharing can be described, in general terms, as the transfer of plant genetic resources from the South to the North. Plant genetic resources have been distributed around the world for millennia, but some parts of the world are by nature richer in these resources than others. This is true for natural biodiversity, of which levels are higher in the diverse ecologies of tropical rain forests and mountain ranges – of developing countries – than in the much more uniform forests and grasslands of lower elevation temperate regions – of the wealthy countries (Faith, 1996). It is also true for agricultural biodiversity, notably in plant genetic resources, where the origins of almost all major crops have been located in a limited number of centres of diversity situated in economically poorer, developing regions of the world, especially in southern Asia, Latin America and northeast Africa (Vavilov, 1951). However, not all developing countries are rich in genetic resources; notably Africa (except the Horn) is poor in crop genetic diversity (Harlan, 1971).

[42] Respondent chooses to stay anonymous.

During the colonial period of the second half of the last millennium, the global distribution of germplasm entered the modern period of transportation as the gene-poor empires from the north started to import and collect the plant genetic resources (newly discovered species) from their gene-rich colonies, especially from those of the south (Juma, 1989). On the economic importance of plant genetic material and the global division of benefits through collection practices, Kloppenburg concludes that "It is no exaggeration to say that the plant genetic resources received as free goods from the Third World have been worth untold *billons* of dollars to the advanced capitalist nations" (Kloppenburg, 2004, p. 169; italics original). He is therefore of the opinion that "It is highly ironic that the Third World resource that the developed nations have, arguably, extracted for the longest time, derived the greatest benefits from, and still depend upon the most is one for which no compensation is paid. Indeed, it is not merely ironic, it is contradictory" (idem, p. 153).

The present-day practice of collecting germplasm is referred to as "bioprospecting" (Reid et al, 1993). Some consider the term bioprospecting inappropriate as it "assumes that prior to prospecting, the resources of desire were unknown, unused and without value" (Shiva, 2005, p. 16). The central point of the critique here is that under the present framework of bioprospecting, the collected germplasm is considered the raw material for further breeding and biotechnology applications, efforts that give value to a hitherto relatively valueless matter. In fact, however, the collected germplasm has often been preserved, managed and improved by the collective labour of generations of farmers and indigenous communities. The resources are not simply raw materials extracted from nature (Phillips & Onwuekwe, 2007).

Mechanism: National sovereignty over plant genetic resources

The flow of plant genetic resources from the countries in the South to those in the North has become the basis for the best-known model of benefit-sharing. In the 1980s, global resistance against the free use of germplasm originating from developing countries arose. The new

biotechnology industry was expanding rapidly and developed countries tried to facilitate this growth by expanding intellectual property rights to genetic material and living organisms. This stirred an appreciation – and expectations – in developing countries of the potential value of their plant genetic resources, which became an important input to the CBD (Macilwain, 1998). The CBD abandoned the assumption of plant genetic resources as a common heritage, declaring instead that "States have sovereign rights over their own biological resources" (UNEP, 1992, Preamble). The convention explicitly calls for "the fair and equitable sharing of the benefits arising out of the utilization of genetic resources" (Article 1). According to the CBD, benefit-sharing is primarily based on a bilateral model of exchange and compensation based on the sovereign rights that States have over their plant genetic resources. Poor countries are to be compensated for the contribution of their plant genetic resources (Rosendal, 2006a).[43] This model was further elaborated in the Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilization in 2002 (UNEP, 2002). Even though benefit-sharing is embedded in a Convention that aims also at the conservation and sustainable use of biological resources, the benefit-sharing aspect is nevertheless an independent basic objective of the CBD, which can thus be very well explained in terms of a purely political economy argument: developing nations should be able to reap the benefits of their biological resources (as they can with other natural resources such as oil and minerals) (ten Kate & Laird, 1999).

Intended Outcome: Equity in international economic relations

The fact that 1) the genetic resources are a natural resource of countries of the South which cannot be appropriated and traded by the country as part of natural wealth in the same way that can other natural resources such as oil or minerals, and that 2) the benefits from these genetic resources are largely accrued in the gene-poor industrialized countries of the North, is

[43] Nonetheless, the compensation model of the CBD only relates to the cross border movement of resources after the Convention came into force – i.e. 1992 or later, depending on the date of ratification of each country – and does not relate to resources that were acquired earlier.

an important motivation for benefit-sharing. Benefit-sharing is thus supposed to encourage equity in international economic relations, to be regarded as a compensation mechanism.

Table 2: Summary of Approach 1

Basic Motivation	Mechanism	Intended Outcome
The South-North imbalance in resource allocation and exploitation	National sovereignty over plant genetic resources	Equity in international economic relations

The need to conserve biodiversity

> *"At the end of the day, we still, I think, do not escape a common responsibility for caring for these resources. It is totally irrelevant, long term, for us to talk about access and benefit-sharing if the resources themselves are allowed to die."* Cary Fowler, Executive Director, Global Crop Diversity Trust.

A second and related rationale underlying the concept of benefit-sharing on genetic resources is the perception that investments have to be made to conserve biodiversity. In international agreements, the sharing of benefits derived from the utilization of genetic resources has always been connected to the conservation of these resources. The underlying assumptions are that 1) genetic resources have a global importance; 2) economic and environmental developments create pressures that work against the conservation of biological diversity (including deforestation, climate change, the modernization of agriculture and the globalization of plant and animal breeding); 3) countries where these pressures are most severe have least financial opportunities to counter them; and 4) benefit-sharing for the use of genetic resources can provide a sustainable source of funds, knowledge and technology to conserve biological diversity (Emerton, 1999; Henne et al, 2003; Rosendal, 2006a; ten Kate, 2002).

Even though benefit-sharing in the CBD has a focus on encouraging equity in international relations (see Approach 1), it is embedded in an agreement that concentrates primarily on conservation (UNEP, 1992, Article 1). The FAO International Treaty on Plant Genetic resources for Food and Agriculture (ITPGR) is more specific in regard to the link between benefit-sharing and conservation:

> *The Contracting Parties agree that benefits arising from the use of plant genetic resources for food and agriculture that are shared under the Multilateral System should flow primarily, directly and indirectly, to farmers in all countries, especially in developing countries, and countries with economies in transition, who conserve and sustainably utilize plant genetic resources for food and agriculture.* (FAO, 2001, Article 13.3)

Mechanism: Benefits to support conservation efforts

Contracting countries to the CBD have the obligation to conserve the biological diversity in their territory and they have the opportunity to share in the benefits. There is however no explicit link between the two, although it is assumed that revenues can contribute to conservation efforts (Byström et al, 1999; ten Kate, 2002).[44] The basic idea is that the CBD promotes the conservation and sustainable use of biodiversity by, on the one hand, creating incentives (i.e. the promise of benefit-sharing) for developing countries to protect their potentially valuable plant genetic resources, and, on the other hand, assisting them in gaining access to the means for conservation by promoting the flow of technology, information and financial resources (i.e. the content of benefit-sharing).

One may, however, also claim that benefits derived from systematic bioprospecting contracts may actually make it *less* necessary to conserve the resource. The chances of finding new genetic material after an ecosystem has been systematically screened are smaller than before the

[44] The Bonn Guidelines (2002) refer to this by stating that "Benefits should be directed in such a way as to promote conservation and sustainable use of biological diversity." (Article 48).

bio-prospecting mission. Similarly, when all genetic diversity within a crop has been sampled and stored in a genebank, less emphasis may be put on on-farm management of diversity. However, forward-looking governments will continue to conserve biodiversity and promote its continued evolution in situ for future generations to sample and research with new technologies and for new purposes.

Whether the funding strategy of the ITPGR will be able to generate enough funds to sustainably conserve crop genetic resources remains to be seen (Visser et al, 2005). The Global Crop Diversity Trust, which can be considered a supporting component of the ITPGR, is collecting significant amounts for the ex-situ component of the conservation strategy. The objective of this Trust is to be able to support the most relevant collections in order to keep them eternally available.[45] The ITPGR is very specific that non-monetary benefits also may significantly contribute to the goals of conservation and the sustainable use of crop genetic diversity (FAO, 2001, Article 13).

Intended Outcome: Conservation and the sustainable use of plant genetic resources

Both the CBD and ITPGR have clear objectives that aim to support conservation and the sustainable use of plant genetic resources. Benefit-sharing may provide the incentives and tools to conserve biodiversity. Large programs, such as InBio in Costa Rica, create a significant capacity for nature conservation and diversity-related research (Cabrera Medaglia, 2007). Linking these developments to eco-tourism seems to provide an effective longer-term financial capability to maintain the relevant forest reserves. The extent to which the ITPGR, with its more direct linkage of benefit-sharing to conservation, will manage to reach its conservation goals remains to be seen, but a first group of conservation projects is now being supported from the treaty's benefit-sharing fund.[46]

[45] http://www.croptrust.org [Accessed 13 April 2008].

[46] ftp://ftp.fao.org/ag/agp/planttreaty/noti/NCP_GB3_ppa09_e.pdf [Accessed 13 April 2008].

Table 3: Summary of Approach 2

Basic Motivation	Mechanism	Intended Outcome
The need to conserve biodiversity	Benefits to support conservation efforts	Conservation and Sustainable Use of PGR

Biopiracy and the imbalance in intellectual property rights

> *"If we want to have benefit-sharing we have to protect our traditional knowledge and medicine, but the current intellectual property regime is not working for that so we need a better regime. Now our problem is, when we speak we are not often heard. (…) it is really a matter of being allowed to sort our own thing out and for the world to accept the standards that we create, because it is really hard when all the time the standards have to come from the West, some of them are just not going to mix with the systems we have here."* Jennifer Orwa, Principal Research Officer; Wesley Ronoh, Marketing Officer; Robert Karanja, Research Officer, Kenya Medical Research Institute.

A third interpretation or context in which discussions on benefit-sharing take place concerns an asymmetry in allocations of Intellectual Property Rights (IPR) to and over plant genetic resources and related knowledge, and the subsequent acts or accusations of biopiracy (Shiva, 2001). Reviewing the way in which this asymmetry developed, we note that first, during the course of the 20th century, industrialized countries started to expand their IP systems to include new plant varieties and genetic material (Drahos & Blakeney, 2001; Dutfield, 2003b). In 1930, the Plant Patent Act of the U.S.A. provided exclusive rights to the breeders of most vegetatively propagated crops (Kloppenburg, 2004). In 1961, the national plant breeder's rights systems in a number of European countries were harmonized under the Convention on the Protection of New Varieties of Plants (1961), administered by the International Union for the Protection

of New Varieties of Plants (UPOV) as a means to encourage the development of new plant varieties and the international seed trade.[47] The initial Act was adapted to the changing needs of the UPOV member countries in 1972, 1978 and 1991, gradually increasing the rights of the breeders. From the 1980s onwards, it became possible in a growing number of countries to obtain patent protection on living organisms and components of heredity of these organisms and the methods and tools to manipulate these, which provide a much stronger legal protection (Rimmer, 2006). In 1995, when the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) was finalized and adopted by the newly formed World Trade Organization,[48] the IPR concepts of the industrialized countries became global.

The central issue now is that "the principles of western patent law unequivocally favour the biotech company rather than the indigenous community" (van den Belt, 2003, p. 237). Patents protect inventions that satisfy certain criteria, the most central of which are novelty, inventive step, and industrial applicability. For these reasons plants that have been used and developed by farmers and indigenous communities over centuries are not patentable; novel, derived or purified products are patentable, but these can normally only be obtained using technological and human resources beyond the capacity of such communities (Nature, 1998). In addition to claims over genetic resources, this argument introduces into the debate the Traditional Knowledge (TK) of farmers and indigenous communities (Hansen & VanFleet, 2003). Such TK may not meet the novelty criteria of IPR, and tends to be of a collective cultural nature not easily attributed to an individual IP holder (Koopman, 2005). This asymmetry in allocations of intellectual property rights was the basis of the concept of biopiracy, described as "the appropriation of the knowledge and genetic resources of farming and indigenous communities by individuals or institutions who seek exclusive monopoly control

[47] http://www.upov.int [Accessed 13 April 2008].
[48] http://www.wto.org [Accessed 13 April 2008].

(patents or intellectual property) over these resources and knowledge".[49] Examples and charges of biopiracy are currently central to many debates on benefit-sharing (Hamilton, 2006; Laird & Wynberg, 2008; McGown, 2006).

The main argument of an imbalance of intellectual property rights between the local developers of genetic resources and related knowledge on the one hand, and the formal sectors of research and development on the other, focuses on individuals and communities rather than on nations. Benefit-sharing is not a right in itself, it is based on inalienable rights that communities have on their resources, which should be at par with the strong intellectual property rights that inventors in the scientific community have.

Mechanism: Countervailing rights systems and user measures

Where the national sovereignty principle of the CBD is quite clear, the rights of indigenous communities over their genetic resources are difficult to capture in legal terms. Debates within the CBD over suitable concepts for and interpretations of its Article 8j[50] on indigenous and local communities, have been ongoing for many years.[51] Problems may include aspects of democracy (why would certain groups in the country have more rights than others?), demarcation (does a person in the city still belong to an indigenous community and is s/he allowed to share in benefits?), and representation (who can negotiate on behalf of the community?) (Schuklenk & Kleinsmidt, 2006; ten Kate & Laird, 1999). In the meantime, evermore examples of (alleged) biopiracy appear.

[49] Action Group on Erosion Technology and Concentration (ETC Group) website, http://www.etcgroup.org/en/issues/biopiracy.html [Accessed 13 April 2008].

[50] Article 8j: Each party shall "Subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices".

[51] http://www.cbd.int/traditional [Accessed 13 April 2008].

Communities that give access to certain resources hardly ever receive in return a share in intellectual property rights on the products developed out of these resources (Hayden, 2007). For these reasons, calls have been made for the establishment of indigenous and collective *sui generis* intellectual property rights systems. Proposals range from the creation of Traditional Resource Rights to shareholder arrangements. In the Onge Corporation all members of the Onge community in India become shareholders of one corporation that protects and controls their natural and traditional resources in accordance with modern IP legislation (Norchi, 2000). Traditional resources rights (TRR) are a *sui generis* system of legal rights that aim to protect both the tangible and intangible qualities of such resources as germplasm, knowledge and folklore, and even landscapes, through a "bundle of rights" taken from a variety of international agreements. Intellectual property rights are only one aspect of TRR because "Property for indigenous peoples frequently has intangible, spiritual manifestations, and, although worthy of protection, can belong to no human being. Privatization or commoditization of their resources is not only foreign but incomprehensible or even unthinkable" (Posey & Dutfield, 1996, p. 95). This is opposite to approaches that aim at maximizing benefits through the use of strong IPRs (Herold, 2003). Other methods here include the publication of community knowledge (a defense to patenting) (WIPO, 2002), and claims for geographic indications – e.g. as already used for wine, which could provide value to the genetic resource in the market (Correa et al, 2002).

At the international level, discussions related to intellectual property rights for indigenous communities continue at the Intergovernmental Committee on Genetic Resources, Traditional Knowledge and Folklore (IGC) under the auspices of the World Intellectual Property Organization (WIPO),[52] while agreement has been reached in the field of agricultural genetic resources through the Commission on Genetic Resources for Food and

[52] http://www.wipo.int/tk [Accessed 13 April 2008].

Agriculture (CGRFA).[53] The IGC is still discussing draft provisions for the enhanced protection of traditional knowledge against misappropriation and misuse.[54] The debate in the CGRFA, meanwhile, has produced an agreed formulation of the concept of farmers' rights in the ITPGR – as rights arising from "the enormous contribution that the local and indigenous communities and farmers of all regions of the world, particularly those in the centers 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" (FAO, 2001, Article 9.1). Contracting parties will promote farmers' rights by protecting relevant traditional knowledge, promoting the right to share in the benefits arising from the utilization of plant genetic resources for food and agriculture, and by enabling farmers to participate in decision-making (Article 9.2). In addition, Article 9.3 states that "Nothing in this Article shall be interpreted to limit any rights that farmers have to save, use, exchange and sell farm-saved seed/propagating material, subject to national law and as appropriate." Benefit-sharing for and by farmers is thus enshrined as a farmers' right.

Another proposal tries to move completely away from such rights discourses and towards legal measures aimed instead at the users of genetic resources and related knowledge. Proponents of such user measures intend to avoid the tendency of ABS regulations to block access rather than promote benefit-sharing (Tobin, 1997). One of the user measures that is currently being discussed in international bodies is disclosure of "origin", "source" or "legal provenance" (Barber et al, 2003). This measure holds that applicants for patents are required to disclose information regarding the origin of the genetic resources and traditional knowledge that are utilized within the patent application. A subsequent requirement could be to provide evidence of prior informed consent and mutually agreed terms (including benefit-sharing), which

[53] http://www.fao.org/ag/cgrfa [Accessed 13 April 2008].

[54] http://www.wipo.int/tk/en/consultations/draft_provisions/draft_provisions.html [Accessed 13 April 2008].

would then be a legal condition for any grant of IP protection. Failure to provide the required information would lead to the suspension of the application. In this way, the protection against biopiracy and the "soft law" requirements for benefit-sharing in the CBD could be backed up by the "hard law" of international IP legislation. Furthermore, the burden of proof would be shifted from the "weak" shoulders of indigenous and farming communities to the "stronger" shoulders of industrial companies and research centers.

Intended Outcome: Equity in legal rights over plant genetic resources

Different methods are described that try to counterbalance the perceived asymmetry in allocations of intellectual property rights in order to stop biopiracy. These examples form a central part of many discussions on benefit-sharing and are primarily concerned with a fight for recognition of the knowledge and resources that farmers and indigenous and local communities have managed, conserved and developed throughout centuries. The methods include several rights systems and user measures that aim to provide farmers and indigenous communities with the necessary legal rights over their plant genetic resources and related knowledge and products, so that they may be on a par with the strong intellectual property rights enjoyed by inventors in the scientific and industrial communities.

Table 4: Summary of Approach 3

Basic Motivation	Mechanism	Intended Outcome
Biopiracy and the imbalance in intellectual property rights	Countervailing rights systems and user measures	Equity in legal rights over PGR and related knowledge

A shared interest in food security

> "*The continued access to improved crop varieties for further breeding, that is the essence, I think, of benefit-sharing. (…) this is*

> *the 'in kind' benefit-sharing on which the agricultural sector is build."* Orlando de Ponti, Former Director of R&D, Nunhems, the Netherlands (translated).

A fourth interpretation of benefit-sharing is mainly related to the agricultural sector. Within this field, the genetic resources for food and agriculture have been distributed around the world for millennia. For a long time, they were generally considered the Common Heritage of Humankind, as formally recognized by the International Undertaking on Plant Genetic Resources for Food and Agriculture, a non-binding agreement under the FAO (FAO, 1983). This idea was strengthened by the state of affairs that had arisen whereby no country or even continent was self-sufficient in its agricultural plant germplasm (Flores-Palacios, 1997). While for example Latin-America has given the world, amongst others, the potato, tomato, cacao and maize, it has received rice and soybean from East Asia, wheat form West Asia, and coffee from Africa. Humans have probably been cultivating plant genetic resources through careful selection and breeding since the advent of agriculture (Fowler & Hodgkin, 2004). This has literally changed the food we eat. Today's tomatoes, for example, are unrecognizable when compared to their early predecessors, which were the size of a berry. Because of population growth and the continuous threat of diseases, insect pests, and environmental stresses, plant and animal breeding are never-ending challenges. The conservation and exchange of the world's genetic resources, the building blocks of further crop and breed development, is thus considered essential for global food security (Halewood & Nnadozie, 2008).

It is in this context that the agricultural sector, including the seed industry (ISF, 2007), is in general critical of the CBD and its bilateral model of access and benefit-sharing (Correa, 2003; Hardon et al, 1994). The main problem is that in implementing the CBD, most nation states focus primarily on the protection of their plant genetic resources, creating all kinds of barriers for exchange and increasing transaction costs. As a result, the number of new collection missions (Falcon & Fowler, 2002) and the international transfer of plant genetic resources (Fowler et al, 2001) have declined dramatically since the ratification of the CBD. A decreasing

exchange of genetic resources may seriously endanger food security in the long run. In addition, since most developing countries are net importers of genetic resources, the CBD's bilateral model of access and benefit-sharing is likely to hurt these countries most because they may have the greatest difficulties in negotiating and financing ABS contracts (Falcon & Fowler, 2002).

Mechanism: Facilitated access and exchange of plant genetic resources

The specific characteristics of genetic resources for food and agriculture were recognized by the CBD (Stannard et al, 2004), but it was not until 2001 that new international rules were designed to manage access and benefit-sharing for plant genetic resources for food and agriculture. In that year, the ITPGR set up a Multilateral System of Access and Benefit-Sharing that, while in harmony with the CBD, was better suited to the specific characteristics of the agricultural sector (FAO, 2001, Part IV). The multilateral system is based on a list of major crops and forages of which genetic resources under the control of the signatory governments are to be accessible under a standard material transfer agreement, thus avoiding the need for further negotiations.[55] It includes a financial mechanism in which payment is liable – to be placed into a fund – when a commercial product is developed using resources from the multilateral system and the genetic resources of that product are not available anymore under the same conditions, e.g. if it is patented or bound by technical or other legal restrictions. The fund is then linked to the benefit-sharing provisions that aim to facilitate "the exchange of information, access to and transfer of technology, capacity-building, and the sharing of the benefits arising from commercialization" (Article 13), in particular to help small farmers in developing countries. Furthermore, it is stated that the facilitated access to the plant genetic resources of the multilateral system

[55] The division of plant genetic resources that fall under the CBD or ITPGR is not completely clear because the latter refers to all plant genetic resources for food and agriculture but its multilateral system for which facilitated access has been arranged is based on a limited list of crops and forages. This means that governments can decide for themselves whether non-listed crops are exchanged under similar terms or whether access is provided under the CBD based regime.

"constitutes itself a major benefit of the Multilateral System" (idem). This reflects the idea of a common interest in food security as a basic rationale behind the system.

Even though the ITPGR is built on a common interest in food security, the member countries have certainly not decided to return to the common heritage principle. That would be at odds with the contemporary international environment of intellectual property rights, concerns about biopiracy and the sovereign rights that states have over their plant genetic resources. Indeed, many Southern countries did not include all their crops that are important for food security in the list of the Multilateral System (Falcon & Fowler, 2002) – possibly because they expect more revenues from selling them bilaterally under the CBD – while Northern countries resisted the introduction of restrictions on existing intellectual property legislation into the treaty and very few (only Norway thus far) have come up with voluntary contributions to the funding mechanism.[56] In fact, the only IPR-restriction in the Multilateral System is that intellectual property rights can not be claimed on germplasm "in the form received" (FAO, 2001, Article 12). It can therefore be argued that subsequent transformations of the germplasm may render it patentable. Indeed, several NGO's and farmer organizations are currently calling for the suspension of the ITPGR because it can, in its present form, be a vehicle for biopiracy (GRAIN, 2007a). Yet, despite these challenges, the ITPGR has established a new model of benefit-sharing based on the specific characteristics of the agricultural sector and a shared interest in food security.

Outside of the FAO, the perceived importance of promoting the use of genetic resources has also led to a regional agreement among the Nordic Countries in Scandinavia to grant access to their genetic resources using a very liberal contract which does not include benefit-sharing.[57] This approach contrasts with a number of other regional agreements, however,

[56] ftp://ftp.fao.org/ag/agp/planttreaty/news/noti005_en.pdf [Accessed 13 April 2008].
[57] http://www.cbd.int/doc/measures/abs/msr-abs-nr.2-en.pdf [Accessed 13 April 2008].

notably in the Andean and African regions, in which the collection of benefits appears to get preference over the food security argument (Louwaars et al, 2006).

Intended Outcome: Food security and sustainable agriculture

The objectives of the ITPGR are "the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security" (FAO, 2001, Article 1). The multilateral system of access and benefit-sharing that the treaty introduces supports this aim by facilitating the free exchange of plant genetic resources for food and agriculture, and by stimulating the provision of the means for sustainable agriculture, especially to small-holder farmers in developing countries. It does so by 1) providing access as a means of benefit-sharing; 2) stimulating non-monetary benefit-sharing, including the flow of information, capacity building and technology to the countries, and particularly to the farmers, that conserve and developed genetic resources; and 3) developing a funding mechanism that can support both monetary and non-monetary benefit-sharing. It should again be emphasized, however, that while these methods may favor and even target particular types of farmers, communities or nations, they are not so much based on the rights of these groups as on a common concern for sustainable agriculture and food security.

Table 5: Summary of Approach 4

Basic Justification	Mechanism	Intended Outcome
A shared interest in food security	Facilitated access and exchange of PGRFA	Food security and sustainable agriculture

An Imbalance between Intellectual Property Protection and the Public Interest

> *"Why should we patent a living organism (…) if it is for the common good for humans why should somebody own it? Why should somebody own a gene? We are struggling to get rid of hunger, how do you feel that you have all these resources within your region, you are watching people die but you are happy patenting and making money."* Jane Omari, Science Secretary, National Council for Science and Technology (Kenya).

A fifth rationale underlying benefit-sharing has to do with concerns about the rise of intellectual property rights in the field of plant genetics and its effects on the public domain. The general worry is that current intellectual property legislation may block the equitable sharing of benefits of modern research and development within society.

According to the World Intellectual Property Organization (WIPO), patents create incentives for innovation as inventors obtain recognition and commercial protection for their inventions. This then contributes to "the continuing enhancement of the quality of human life" (WIPO, n.d., p. 5). In addition, the inventor must disclose the patented invention to the public, so that others can gain the new knowledge and can further develop the technology. The formal goal of the patent system is thus to protect the intellectual property of inventors, and simultaneously to encourage innovation and the dissemination of its benefits into society. However, it is on this very matter that the present IP system is now highly criticized. One major complaint is that the IP system may trigger research and development (R&D), but cannot guarantee the dissemination of its benefits to all sections of society (Willison & MacLeod, 2002). Until now most research within the field of biotechnology has focused on commercial crops and medicine, and no serious investments have been made in the most important crops and diseases in developing countries (FAO, 2004; Global Forum for Health Research, 2004). Moreover, even when more products are eventually developed with applications for developing countries, it is feared that many people will be excluded from

using them because of the expensive patent royalties they will incur (Third World Network, 2001). Critics speak in this respect of a new divide between the developed and developing countries (Fresco, 2003b; Singer & Daar, 2001).

Another point of criticism of intellectual property protection is that since genetic material, knowledge and technologies can be protected, R&D in this field finds itself in an "anticommons trap". The "tragedy of the anticommons" is a scenario in which too many entities have rights of exclusion to a given resource, which makes the resource prone to under-use (Heller & Eisenberg, 1998). In such cases, innovation can be blocked because it becomes too costly for innovators to buy access to all the research material they need. An additional development that results from this state of affairs, at least in part, is the concentration of the biotechnology industry into few hands. Companies are tending to merge to acquire larger IP portfolios in order to bear the costs of expensive R&D trajectories and thereby facilitate further research – added to which, just a few multinationals nowadays dominate the market across the different economic sectors (pharmaceuticals, plant-breeding and agro-chemicals) in which biotechnology is involved. This global concentration of power in the new "life science industry" has created public concern that "a small, authoritarian minority is now dictating what kinds of research are permissible and which technologies and products should be available in the marketplace" (Kloppenburg, 2004, p. 314). The fact that the products involved are not mere luxury goods but some of the basic necessities of life has only increased public unease on this issue.

Mechanism: Stimulating technology transfer and knowledge sharing

Recently, several initiatives have been developed that try to correct the intellectual property / public interest imbalance and focus on ways to share the benefits of modern R&D more equitably. Worth mentioning in this respect are:

- The open source movement in biotechnology, as represented by the Center for the Application of Molecular Biology to International Agriculture (CAMBIA), which emphasizes new collaboration and

licensing tools to maximize the freedom to operate on biotechnologies and thereby to "empower both public and private sectors to develop health and agricultural products and processes of real relevance to all sectors of society".[58]

- The Public Intellectual Property Resource for Agriculture (PIPRA), which aims "to improve agriculture in emerging economies by decreasing intellectual property barriers and increasing technology transfer" in order to make sure that "technological innovations get to those who need it most".[59]
- The employment of Humanitarian Use Licenses, in which the right holder allows the use of the technology for specific uses in development – e.g. the license negotiated by Syngenta on Golden Rice that provides free of charge access to the product for resource-poor farmer earning less than US$10,000 p.a. from farming[60]; or, and more far-reaching, the license agreed by the partners in the Generation Challenge Program that provides such licenses for all technologies that the program develops (Barry & Louwaars, 2005).
- Public-Private Partnerships (PPPs), which are playing an increasingly important role in the fight against neglected diseases in developing countries especially – according to a Wellcome Trust report, pharmaceutical companies that had moved away from unprofitable research on neglected diseases are now returning to this area on a no-profit-no-loss basis (Moran et al, 2005), a success that warrants further research on the application of PPPs in the similar neglected field of orphan crops.

These initiatives are not directly related to the exchange of plant genetic resources and therefore are not often referred to in the literature on benefit-sharing. They are, however, aimed at finding ways in which to share the benefits of modern R&D more equitably by stimulating technology transfer and knowledge sharing. This is exactly what the existing models of benefit-sharing in the CBD and ITPGR aim to promote

[58] http://www.bios.net [Accessed 13 April 2008].
[59] http://www.pipra.org [Accessed 13 April 2008].
[60] http://www.goldenrice.org [Accessed 13 April 2008].

under the heading of "non-monetary" benefit-sharing. Non-monetary benefit-sharing provisions are often regarded an important aspect of any benefit-sharing policy (Byström et al, 1999; Raymond & Fowler, 2001), but the implementation of the existing provisions on both the national and international level has proven rather difficult so far (Visser et al, 2005). One major reason for this is that governments, which, for example, have to comply with non-monetary benefit-sharing provisions under the ITPGR, "have to rely on various stakeholders in developing, financing and implementing mechanisms for non-monetary benefit-sharing in order to meet this obligation" (idem, 2005, p. 4). This is why it is a good idea for policymakers to look for the benefit-sharing initiatives that are already being undertaken by the different stakeholders in society, and to search for ways in which to facilitate and support these initiatives.

Intended Outcome: Equity in distributing the benefits of research and development

The initiatives described above try to correct the imbalance between IP protection and the public interest by stimulating technology transfer and knowledge sharing. In so doing, they hope to re-establish an open and stimulating environment for innovation and development, for the benefit especially of those in need. Altogether, one can see that in reaction to the increasing enclosure and concentration of resources, a range of open source projects, partnerships and sharing tools is being created to make available the necessary means for innovation and development in and for developing countries. The ultimate aim is to create a more equitable distribution of the benefits of modern research and development.

Table 6: Summary of Approach 5

Basic Motivation	Mechanism	Intended Outcome
Imbalance between IP protection and the public interest	Stimulating technology transfer and knowledge sharing	Equity in distributing the benefits of research and development

Protecting the cultural identity of traditional communities in a globalizing world

> *"With every agreement on benefit-sharing, the economic benefit can be big or small, but most important is an outcome in respect of the indigenous knowledge. (…) The most important benefit for indigenous people is respecting the culture, after that, economic benefits."* César Sarasara, Director; Mercedes Manriquez, Legal Advisor, Confederation of Amazonian Nationalities of Peru. (partially translated)

A final perspective on benefit-sharing that plays a major role in the present debates on access and benefit-sharing is concerned with the cultural identities of traditional communities in today's globalizing world. This motivation comes close to that described in Approach 3, the imbalance in intellectual property rights and the fight against biopiracy. The difference between the two is, however, substantial. The major concern of Approach 3 relates to the growing influence of intellectual property rights used by the formal research sector and the means by which small farmers and traditional communities can protect themselves against biopiracy. In this section, we describe the opinion of many traditional communities that the concepts of access and benefit-sharing, and the (inter)national regulations on this matter, are in themselves already a form of globalization, one that encroaches on their traditional lifestyles and cultures. Instead of reacting to these foreign pressures, and in that act adapting to them, perspectives and initiatives that focus on the cultural identity of traditional communities are prioritised. The starting point here is the worldviews of the traditional communities themselves and an articulation of what they think that benefit-sharing should be about.

Traditional communities often have a different frame of reference to that of other interested parties in the ABS debate (GRAIN, 2007b). They not necessarily enter into discussions about ends, but constitute ends in themselves, as they are inherently included in and objects of its aims, such as conservation. Benefit-sharing may mean supporting the stakeholders who maintain it. Such support is essentially external, coming, for example,

from the national and international agencies, and it is within and between these agencies that the complex negotiations about ABS take place. This is a world away from the rural settings of the vast majority of traditional stakeholders (Vermeylen, 2007). Ultimately, what is at stake is the cultural identity of traditional communities.

The different perspectives of traditional communities and other stakeholders in the ABS debate are reflected in, for example, their different viewpoints on the concept of biopiracy. For some, access and benefit-sharing contracts are tools to stop biopiracy, to which end the CBD established its legal framework for bioprospecting (Dutfield, 2003a). Alejandro Argumedo, associate director of the indigenous NGO ANDES in Peru, has a radically different view. He claims that:

> *Contractual benefit-sharing is like waking up in the middle of the night to find your house being robbed. On the way out the door, the thieves tell you not to worry because they promise to give you a share of whatever profit they make selling what used to belong to you.*[61]

Another clarification of the problem at hand comes from Jack Beetson, an Aboriginal activist who fights for the rights of traditional communities in several parts of the world. He warns that traditional ways of life can be destroyed in the very effort of protecting them. Inviting indigenous communities to an international conference, to put on a suit and negotiate their interests in English, straight away asks them to abandon their traditional way of life. When talking about capacity building in this context, Beetson wonders whether this should be *aimed at* indigenous communities, or whether the negotiators from governments, industry and other institutions should not instead build their own capacity – their capacity to go to the communities themselves, sit with them and discuss the issues in their language.[62]

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[61] http://www.captainhookawards.org/biopiracy [Accessed 13 April 2008].

[62] Presentation at the International Conference on Access and Benefit-sharing for Genetic Resources (New Delhi, India, 6-7 March 2008).

Mechanism: Recognition for customary laws in ABS regimes

The concerns about the cultural identity of traditional communities have led to specific ideas about what benefit-sharing should be about, or how it should be incorporated in international and national legislation. Brendan Tobin, co-founder of the Association for the Defence of Natural Rights (ADN), has conducted several research projects at the United Nations University aimed at the role of customary law in ABS regimes. He argues that natural resources and the ways of managing the land are still governed by customary law and traditional tenure rights in many parts of the world, and that these customary laws and practices are often undermined by the adoption of culturally insensitive national legislation, leading to the erosion of traditional authority and social structures within communities. Tobin concludes from this that what is required within the present ABS debate is "the adoption of a wider and more expansive view of the nature, role and values of traditional knowledge and its relationship to traditional resource management systems" (Tobin, 2004, p. 7), with the ultimate aim of "ensuring the effective recognition, respect and enforcement of customary law in any international regime on ABS" (idem, p. 1).

Argumedo (NGO ANDES), who has been closely involved in setting up the Potato Park in the Peruvian Andes, speaks in this respect of reversing the ABS regime. The Potato Park is a centre of origin of potato diversity managed by six Quechua communities according to customary laws, including collective land tenure, community registers and resource management. In this way, the Potato Park aims to provide a truly effective protection of traditional knowledge, since it builds upon the practices and traditions of the communities themselves and incorporates all elements of that knowledge in situ. In 2005, the Potato Park signed an agreement with the International Potato Centre (CIP), one of the international agricultural genebanks, on the "repatriation, restoration and monitoring of agrobiodiversity of native potatoes and associated community knowledge systems" (GRAIN, 2005). According to Argumedo, this agreement reverses the traditional ABS regime because it puts the interests and customary laws of the indigenous farmers as central by 1) aiming to return to the local communities the samples of plant varieties and associated

knowledge once taken from them; 2) securing their access to the genetic resources of CIP, and ensuring that the genetic resources and knowledge remain under their custody and do not become subject to intellectual property rights in any form; and 3) recognizing the ability of the Andean farmers to conserve and develop the genetic resources for the benefit of their people and all mankind (Argumedo & Pimbert, 2005).

Intended Outcome: Preserving and restoring traditional communities and their cultures

The ultimate goal of the agreement signed between CIP and the Potato Park is the restoration and preservation of the rights and traditions of the indigenous communities in the park. This can be considered the general goal of those communities and related NGO's that wish to reformulate national and international ABS legislation according to their own worldviews, putting them into their own words and reconciling them with their own customary laws.

Table 7: Summary of Approach 6

Basic Motivation	Mechanism	Intended Outcome
Protecting the cultural identity of traditional communities	Recognition for customary laws in ABS regimes	Preserving and restoring traditional communities and their cultures

Reflection on major differences and consequences

Six distinct strains of argumentation in which the concept of benefit-sharing is embedded have been described. The different approaches are all valid, but they imply a range of different implementation mechanisms that in turn lead to widely different outcomes. If these outcomes were to point in roughly the same direction, it would be relatively easy to combine them in a common policy. We identify, however, significant friction between the different approaches in terms of their implementation, and a complex situation in analyzing stakeholder views and positions. This seems to explain the complexity of the current debates on benefit-sharing and their general lack of productive outcomes.

Table 8: Compilation of Approaches 1 to 6

	Basic Motivation	Mechanism	Intended Outcome
1	The South-North imbalance in resource allocation and exploitation	National sovereignty over plant genetic resources	Equity in international economic relations
2	The need to conserve biodiversity	Benefits to support conservation efforts	Conservation and sustainable use of PGR
3	Biopiracy and the imbalance in intellectual property rights	Countervailing rights systems and user measures	Equity in legal rights over PGR and related knowledge
4	A shared interest in food security	Facilitated access and exchange of PGRFA	Food security and sustainable agriculture
5	Imbalance between IP protection and the public interest	Stimulating technology transfer and knowledge sharing	Equity in distributing the benefits of research and development
6	Protecting the cultural identity of traditional communities	Recognition for customary laws in ABS regimes	Preserving and restoring traditional communities and their cultures

Different approaches leading to a joint policy?

Expectations

The six different motivations and intended outcomes may be all valuable in their own right, but they do appear rather incompatible. The controversies about economic inequalities between North and South as debated in Approach 1, for example, would need to be followed by very

significant levels of benefit-sharing before one could speak of equity. This logically leads to the rejection of any system that would provide for benefits satisfying (only) conservation needs as outlined in Approach 2. Differences in expectations regarding the magnitude of benefits at best blur the debate, and may lead to impasse.

Rights

Debates focusing on rights may be held at different levels: while the CBD primarily operates at the level of nation states, the issue of rights to and over genetic resources may give rise to debate at the sub-state level of communities that claim to have developed or be custodian to the genetic resources, as well as at the private level (company, individual) based on intellectual property rights (Approaches 1, 3 and 5). When claims of right are made over the same resources at different levels, tension or outright conflict ensues. Attempts to balance such rights may lead either to increasing total levels of rights (Approach 3) or attempts to jointly reduce them (Approach 5). Currently, the general trend is towards the former approach, notwithstanding its consequences. Increasing the control level of genetic resource rights and rights to/over traditional knowledge to bring them on a par with intellectual property rights leads to "hyperownership" by those who have or can (afford to) buy control of the genetic resources (Safrin, 2004). Such impacts of Approach 3 are unlikely to be compatible with facilitated access to genetic resources for food security (Approach 4), or with the protection of the public domain (Approach 5), or the recognition of customary laws (Approach 6). It is also far from clear how the scenarios leading to hyperownership would stimulate conservation (Approach 2).

Two meta-approaches

There is a basic division in the six sections between the three approaches (1, 3 and 5) that are driven by the perception of imbalance and a motivation to increase equity (albeit in different ways, at different levels and to different ends), and the other three (2, 4 and 6), which concentrate on alternative aims, primarily nature conservation, food security, and the preservation of traditional cultures. The intended outcomes of these two

groups are fundamentally different and can thus be regarded as constituting two types of meta-approach, which makes coherent policies on the basis of a combination of these different ways of addressing the subject extremely difficult.

Different mechanisms

The mechanisms by which the various objectives are to be reached are fundamentally different, and sometimes contradictory. The bilateral contract model that follows from the principle of national sovereignty may also be used at the level of community-rights. This cannot be expected to lead to equity, we may note, unless the conditions enjoyed by the negotiating parties at the national and the community levels are themselves equitable, i.e. when the suppliers and users have equivalent capacities (negotiating capabilities, information bases, and financial resources) with which to engage in conflict resolution (Albin, 2001). Such contract-based approaches are even more difficult, however, in the systems associated with purposes other than equity. Food security and conservation goals cannot be easily captured in contracts between two parties – the multilateral system of the ITPGR is contract-based but in a standardized form. Similarly, incompatibilities can be observed between mechanisms that aim primarily at monetary benefit-sharing and others that explicitly value non-monetary benefits, notably Approach 5 that concentrates on technology transfer, Approach 6 that aims to protect the cultural identity of traditional communities, and Approach 4 that identifies access to genetic resources as an important benefit in its own right.

Additional pressures: Another approach

New challenges are continually arising. Industry, for example, is following the international ABS negotiations with some concern, fearful of the negative consequences these may have on business (Laird & Wynberg, 2008). Companies do not oppose ABS measures in principle – as can be read in different statements from industry[63] – but they are worried about the lack of clarity and precision in the current regulations (Intellectual

[63] http://www.iccwbo.org/policy/ip/id2480/index.html [Accessed 13 April 2008].

Property Watch, 2006). They also worry about the possible introduction of inefficient regulations and unrealistic stipulations in future international policymaking on the issue. Disclosure measures are highly criticized for that reason, because "[patent] disclosure obligations enacted by CBD Members have had a documented chilling effect on bioprospecting and GR commercialisation. (…) mandatory patent disclosure regimes place at risk the very basis for the recoupment of investment" (ABIA, 2008, p. 3).

A major starting-point for industry is the argument that effective and competitive trade regulations, including strong intellectual property rights, are needed in order to produce the benefits to be shared (Herold, 2003). In general terms, the argument is that if industry is flourishing everybody will gain, whether through ABS contracts or direct economic growth. For that reason, industry is also pushing for simple and liberal access regulations to secure the easy availability of resources for its businesses.[64] This thus represents a new motivation in the current debates on access and benefit-sharing, one which reacts to the other motivations for benefit-sharing described above, and in obvious contradiction with some of them.

Table 9: Summary of Approach 7

Basic Motivation	Mechanism	Intended Outcome
Protecting the interests of the biotechnology industry	Liberal access, strong IP, and simple benefit-sharing regulations	Healthy industry for the benefit of all

Conclusion

It seems clear from this reflection that the differences between the various motivations for benefit-sharing are extensive and that the mechanisms that derive from these are not likely to yield one broad outcome that will satisfy the expectations of all involved in the debate.

[64] http://bio.org/ip/international [Accessed 13 April 2008].

Stakeholder analysis

What is the effect of all these different approaches with their colliding motivations and contradictory mechanisms on the international negotiations on ABS that are currently taking place within the Ad Hoc Open-Ended Working Group on Access and Benefit-Sharing of the CBD? To answer that question we might first see if we can classify the different stakeholders involved in these negotiations in accordance with the sections described above. Analysis of the complex state of the current debate would certainly be easier were it is possible to link each of the different approaches to a major stakeholder group in society. Unfortunately, however, such a one-to-one correspondence does not reflect reality. The presented scheme of motivations and mechanism of benefit-sharing is not simply a stakeholder analysis, and in fact stakeholders appear to pursue a mix of different aims and objectives in the debates on access and benefit-sharing:

- Indigenous communities are mainly concerned with biopiracy issues and their rights over their genetic resources and related knowledge (Approach 3). Within this, however, some communities do not oppose the use of strong intellectual property rights while others fear that IPRs and ABS regulations threaten their cultural identity (Approach 6). Also, most communities are highly interested in the conservation of biodiversity (Approach 2) and issues of food security (Approach 4).
- The FAO is primarily concerned about food security (Approach 4), but it also has a stake in conservation (Approach 2) and aims to stimulate technology transfer (Approach 5). In addition it has taken some measures to stimulate biotechnology (Approach 7) and to support traditional farmers and the preservation of their traditional cultures (Approach 6).
- Most governments of developing countries focus first on their national sovereignty over plant genetic resources (Approach 1). However, they differ widely in their attitudes towards the rights of indigenous communities (Approaches 3 and 6), conservation issues (Approach 2), intellectual property rights (Approach 5), food

security policies (Approach 4), and stimulating measures for bio-industry (Approach 7).

- Industry is primarily interested in liberal access and benefit-sharing regulations that create enabling conditions for biotechnology (Approach 7). Those industries with a close dependence on genetic resources are also concerned with conservation (Approach 2), and the plant breeding industry sees a certain level of social responsibility towards global food security (Approach 4). Most businesses are also willing to work within some sort of ABS framework "to overcome fears of intentional misappropriation" (Intellectual Property Watch, 2006) (Approach 3). The acceptable level of complexity of regulations related to such a framework depends heavily on the size of the corporations involved, providing the smaller corporations with the largest challenges. The size of corporations may also have an effect on their attitudes towards IP protection policies (Approach 5).

Conclusion

The schema presented in this article cannot be considered a mere stakeholder analysis on the basis of which we can order the different stakeholder positions. The fact that every stakeholder seems to have a mix of objectives and motivations with respect to benefit-sharing is likely to further complicate any possibilities of reaching consensus in the international negotiations on this matter. This begs the question of where – indeed, how – to go from here?

Ways Forward?

A worldwide standstill

The range of different, not infrequently opposing, conceptions about what benefit-sharing is and what its intended outcomes should be, together with the fact that the stakeholders involved pursue different combinations of motivations, has resulted in a worldwide standstill in the access and benefit-sharing negotiations, both at national and international levels. At the national level, governments have generally failed to arrive at effective ABS regulations that produce shared benefits. Also, the ABS contracts signed nowadays are few in number and the efforts to reach such agreements often lengthy and costly (Visser et al, 2005).[65] These problems were an important reason for the call for an International Regime on Access and Benefit-Sharing within the framework of the CBD. Progress in the international negotiations on such a regime has, all too predictably, been painfully slow over the last few years, notwithstanding a recently reconfirmed commitment to come to an agreement before the tenth meeting of the Conference of the Parties in 2010 (UNEP, 2008).

Searching for ways out

During the sixth meeting of the Ad Hoc Open-Ended Working Group on Access and Benefit-Sharing, a new approach was taken for moving the negotiations forward. To cope with all the differences involved, and to build trust among the different parties, the co-chairs distilled simple and concise building blocks from the submissions of the different parties on the main components of an international regime. Without making reference to the nature (e.g. binding or non-binding) or scope (e.g. including or excluding derivatives) of such a regime, each building block was agreed upon one by one, turning it into a brick of the international

[65] See also e.g. http://www.probenefit.de/projektverlauf/projektverlauf_en.html [Accessed 13 April 2008].

regime, or into a bullet point for further consideration (IISD, 2008). The obvious rationale behind this approach is the need to search for common ground between the negotiating partners, and effort revived the expectations of a positive outcome after the earlier breakdown of the negotiations in Granada (2006) and Montreal (2007).[66] The Conference of the Parties in Bonn, May 2008 reconfirmed this "careful" optimism (UNEP, 2008).

The search for common ground is essential for forward movement in the international negotiations on access and benefit-sharing. In this process, it is important that the different motivations and expectations of the stakeholders involved are clear. We have tried to show that there are several different approaches to benefit-sharing, which are pursued by different stakeholders in many different combinations. As long as these differences remain implicit, unstated, no joint outcome of negotiations is to be expected. When persons with widely differing views on a concept debate without making their basic perceptions clear, they are bound to fail to come to an agreement. Essentially, they are discussing different things, talking at cross-purposes, and there is no commonality on which to agree to begin with. The overview presented in this article can be a tool to map the different interpretations of benefit-sharing and reflect upon the major contradictions involved. Clarity and insight on these differences can inform and improve decision-making in respect of future applications of benefit-sharing at both national and international levels.

Some possibilities

It appears that an appropriate balance needs to be sought between the different motivations for benefit-sharing and their intended outcomes if a consensus is to be reached among countries and among stakeholders within nations. In the likely event that an agreement on this balance fails to materialize, a pragmatic approach may have to be pursued which creates different ABS mechanisms for different types or uses of genetic

[66] http://www.iisd.ca/process/biodiv_wildlife.htm [Accessed 13 April 2008].

resources in different contexts. Creating a specific approach for agricultural plant genetic resources within the overall framework of the CBD, the ITPGR may be considered a first step in this direction. Other important initiatives are needed, for example in creating a balance between rights to/over genetic resources and knowledge at the individual, community and national levels, but without rushing into a situation of hyperownership. Ultimately, a menu of ABS options can be incorporated into international legislation in order to balance the voices of private companies, traditional communities and nation states on a case-by-case basis. Provided, of course, that clear and effective regulations on procedures and compliance are put in place that take into account the special needs of developing countries and their communities (Tvedt & Young, 2007).

A more pragmatic approach may also incorporate initiatives that so far have not been included in traditional models of access and benefit-sharing within the framework of the CBD. The overview in this article presents different possibilities in this regard. In Approach 5 for example, several initiatives are described that aim to facilitate the sharing of knowledge and transfer of technology, such as the open source biotechnology movement and public-private partnerships. The agreement between CIP and the Potato Park in Peru outlined in Approach 6 represents a new form of benefit-sharing that stimulates both nature conservation, food security and the preservation of traditional communities. The remarkable aspect of these initiatives is that they have all been initiated by groups in society, without the help of the governments that are presently negotiating the International Regime on Access and Benefit-Sharing. We therefore recommend that governments take good notice of the benefit-sharing initiatives that are already being undertaken by different stakeholders in society, and search for ways to support and facilitate them.

Conclusion

The global debate on equitable benefit-sharing is complex and has not resulted in an effective implementation of access and benefit-sharing policies since the concept was formalized in international law in 1992. In this article, we have shown that there are fundamentally different approaches to the concept of benefit-sharing. The observed distance between the basic motivations which direct stakeholders' arguments explains the knot in which the debate has found itself entangled for over fifteen years now, since the signing of the CBD. Our analysis shows that the different motivations lead to widely differing mechanisms for benefit-sharing and significantly different expectations of the nature and value of the benefits that are to be shared. Opportunities to cut through the knot are reduced, moreover, insofar as the different approaches cannot be simply translated into stakeholder positions. Stakeholders often assume to employ a combination of two or more different approaches.

This overview of different approaches does, however, not only explain the current deadlock in national and international ABS negotiations, it also gives indications for what has to be done to overcome it. A first step is increasing insight in the different viewpoints that people have in order to contribute to a better informed and balanced debate in which policy-makers and other stakeholders are more aware of the various interests that are at stake. By presenting the different interpretations and perspectives that can be distracted from the current debates, this paper aims to facilitate the "fair representation of all relevant arguments" and improve the "rationality of public debate and decision making" (Keulartz et al, 2002, p. 256). From here, it is still a long way towards an International Regime on Access and Benefit-Sharing that incorporates and balances all the different perspectives. We therefore recommend a pragmatic approach that takes on board not only the divergent interests of the various stakeholders, but also their creative ideas and initiatives for new models of benefit-sharing.

Four

What is fair and equitable benefit-sharing?[67]

[67] This chapter is written by Bram De Jonge and is submitted as a scientific article to the *Journal of Agricultural and Environmental Ethics*.

Abstract

"Fair and equitable benefit-sharing" is one of the objectives of the UN Convention on Biological Diversity and the FAO International Treaty on Plant Genetic Resources for Food and Agriculture. In essence, benefit-sharing holds that countries, farmers and indigenous communities that grant access to their plant genetic resources and/or traditional knowledge should share in the benefits that users derive from these resources. But what exactly is understood by "fair" and "equitable" in this context? Neither term is defined in the international treaties. A complicating factor, furthermore, is that different motivations and perspectives exist with respect to the notion of benefit-sharing itself. This paper looks at six different approaches to benefit-sharing that can be extracted from the current debates on "Access and Benefit-Sharing". These approaches form the basis of a philosophical reflection in which the different connotations of "fair and equitable" are considered, by analyzing the main principles of justice involved. Finally, the various principles are brought together in order to draw some conclusions as to how a fair and equitable benefit-sharing mechanism might best be realized. This results in several recommendations for policymakers.

Introduction

Since 1992, 191 signatories to the Convention on Biological Diversity (CBD) have committed themselves to "the fair and equitable sharing of the benefits arising out of the utilization of genetic resources" (UNEP, 1992, Article 1). This figures as one of three objectives of the Convention, along with the conservation and the sustainable use of biological diversity. Put briefly, the benefit-sharing objective holds that countries (and communities) granting access to their genetic resources (and traditional knowledge) should receive a share of the benefits that users derive from these resources. But what is to be understood by *fair* and *equitable* in

relation to benefit-sharing, however, is unclear. Neither term is defined in the Convention, and, given the continuing negotiations on an International Regime of Access and Benefit-Sharing, many will indeed agree that there remain "widely divergent views on what constitutes fair and equitable benefit sharing and how best to promote it" (Artuso, 2002, p. 1355).[68]

The United Nations Environmental Program admits that "whether the sharing of benefits is 'fair and equitable' is a question that (…) depends on the value system upon which the judgment is based" (UNEP, 1998, p. 9). However, as Byström and colleagues argue, it should be possible to reach consensus on certain criteria and conditions necessary for establishing a fair and equitable benefit-sharing relationship, for otherwise "it is difficult to envisage how the CBD provisions in this respect could ever be meaningfully implemented" (Byström et al, 1999, p. 26). Following their attempt to launch a list of such criteria and conditions, a number of studies have analyzed the standards of "fair and equitable" in different case studies and Access and Benefit-Sharing (ABS) agreements (Mulligan, 1999). Most conclude, however, that much is still to be done, for example because fair and equitable benefit-sharing "too often constitute merely pious rhetoric and remain unrealized in the field" (Laird, 2002, p. 418); or because when an ABS agreement is made, it is possible that "significant inequities in knowledge and power between indigenous peoples and companies" will result in definitions of fair and equitable benefit-sharing "that are predominantly shaped by the latter." (Vermeylen, 2007, p. 423).

This article aims to contribute to this ongoing project by linking the concept of benefit-sharing to different principles of *justice*, initiating a philosophical discussion on the meaning of fair and equitable benefit-sharing. To facilitate such discussion, the present work will not focus on a particular ABS agreement or case study, but instead build upon the different approaches to benefit-sharing, as identified by (De Jonge & Louwaars, Forthcoming). Providing an overview of the assumptions,

[68] For a brief, official outline of the Convention and subsequent negotiations, see the introduction at the CBD website, at: http://www.cbd.int/abs/regime.shtml [Accessed 8 May 2009].

perspectives and arguments employed in the current debates on plant genetic resources, that study identifies six distinct approaches to benefit sharing, each with its own central motivation and objective (and preferred mechanism(s) by which to realize that objective). Employment of this overview facilitates an analysis of the different conceptualizations of "fair and equitable" at play in the contemporary arena of benefit-sharing negotiations.

The six approaches to benefit-sharing distinguished are characterized by their central motivation, thus:

- The South-North imbalance in resource allocation and exploitation
- Biopiracy and the imbalance in intellectual property rights
- Protecting the cultural identity of traditional communities
- A shared interest in food security
- The need to conserve biodiversity
- An imbalance between intellectual property protection and the public interest

These approaches form the basis of a philosophical reflection and will be discussed in parallel with different principles of justice in the following sections. The aim is to provide more insight into the meaning of "fair and equitable benefit-sharing" and, ultimately, to draw some conclusions on how a fair and equitable benefit-sharing mechanism could best be realized

Commutative justice and the characteristics of plant genetic resources and traditional knowledge

A first approach to benefit-sharing is based on the imbalance in the allocation and exploitation of plant genetic resources between developed

and developing countries. Our world is rich in biodiversity, and although threatened, this diversity remains the basis of human life and something from which, clearly, we all benefit. Still, some parts of the world are by nature richer in these resources than others; also, historically, some parts have benefited more from these resources than others. The current situation is that many developing countries are rich in biodiversity, while many developed countries are considered biodiversity-poor (Faith, 1996; Vavilov, 1951). The rise of biotechnology has only reinforced the practical implications of this asymmetry, especially as it is the gene-poor industrialized countries that most have the capacity to invest in the biotech industry and benefit from the new ways of exploiting the world's biological resources. This resulting imbalance is an important motivation for benefit-sharing. Indeed, it is the basic rationale behind the ABS model in the CBD. This model can best be described as a compensation mechanism, requiring that developing countries be compensated for the contribution of their biological resources. Fair and equitable benefit-sharing, then, comes down to *fair compensation*, where "each party gives one thing and receives another, with a focus on the equivalence of the exchange" (Schroeder, 2007, p. 207). In philosophical terms, this can best be summarized by the Aristotelian principle of *commutative justice* or justice in exchange (Ritchie, 1894).

So, commutative justice refers to fair compensation and focuses on the equivalence of a transaction between two parties. In the context of ABS, the parties involved in the exchange, or transaction, are the providers and the users of plant genetic resources and/or traditional knowledge (TK). It is, however, not always clear who the legitimate users and providers of these resources are, because the resources have *non-rival* and *non-excludable* characteristics. Non-rival means that the use and consumption (of the resource) by one person does not prevent others from enjoying the same resource or good; and non-excludable indicates that it is difficult or simply impossible to exclude others from consuming the resource in question.

Commutative justice is relatively easy to realize when a resource is rivalrous and excludable in nature. Food products or a barrel of crude oil, for example, go from one hand to another, and an equitable arrangements for their exchange need not be overly complex. A plant, and even the minuscule combination of biochemicals that make up its genes, have a similar character. But every gene is at the same time a "basic unit of heredity", which by directing the production of RNA, determines the "synthesis of proteins that make up living matter and are the catalysts of all cellular processes." (Kleinedler, 2005). Genes are carriers of *information*, which is continuously reproduced and is, obviously, the locus of value of plant genetic resources (Parry, 2005). But information is a non-rival resource and plants are non-excludable, insofar as they normally grow and multiply in vast quantities across countries and continents. It is rather hard, therefore, to envisage how the genetic information contained in any specimen (or part thereof) of a particular plant species could become subject to a fair and equitable exchange between two parties.

The CBD aims to solve this problem by "Recognizing the sovereign rights of States over their natural resources" (UNEP, 1992, Article 15.1), and refers to the "country of origin of genetic resources" (Article 2) in order to more specifically define the so-called "user and provider countries" involved. As several studies have shown, however, the country of origin of a particular genetic resource is very difficult to determine (Petit et al, 2001), and the ability to exercise national control over the movement of genetic resources virtually impossible (Safrin, 2004). But how should a just exchange of the valuable, but primarily intangible properties of genetic resources (and traditional knowledge) then be organized? The most suitable mechanism for this seems through the application of Intellectual Property Rights (IPRs), since such rights aim to protect and control the exchange of "items of information or knowledge" (WIPO, n.d., p. 3).

IPRs are designed to protect a variety of intangible assets, such as literary and artistic works, scientific discoveries and industrial design, or, more generally "inventions in all fields of human endeavour" (WIPO, 1967). In

their natural form, plant genetic resources are, of course, no human inventions and consequently cannot be protected by IPRs. In many countries, however, it is possible for an individual, company or other institution to apply for such rights upon developing a new plant variety,[69] or even when just a single gene or genetic sequence has been isolated and its function specified (Drahos & Blakeney, 2001). The state of affairs is thus that (developing) countries in which the genetic resources occur naturally cannot protect these resources with IPRs, but the inventions based on those genetic resources can be so protected – which occurs especially in (developed) countries with a liberal IPR system and strong biotechnology industry.

This discrepancy is the central concern in a second approach to benefit-sharing, which focuses on the imbalance in IPRs and subsequent acts of "biopiracy". The term "biopiracy" was coined by the North American Action Group on Erosion, Technology and Concentration to refer to the "appropriation of the knowledge and genetic resources of farming and indigenous communities by individuals or institutions who seek exclusive monopoly control (patents or intellectual property) over these resources and knowledge".[70] In addition to the fact that IPRs cannot be employed to protect natural plant genetic resources, most indigenous groups and farming communities are generally unable to apply such rights to their traditional knowledge and technologies. Even though these are human inventions, the traditional lifestyle and production methods of communities are typically ineligible for IP protection.

Patents, for example, protect inventions that satisfy criteria such as novelty, inventive step, and industrial applicability. These criteria are specifically designed for a competitive, industrial context. Traditional knowledge is developed in a cultural context, and tends not to meet the criteria of novelty and inventive step in that it is often "communicated and applied openly" (Koopman, 2005, p. 527). In addition, the collective

[69] See e.g. http://www.upov.int/index_en.html [Accessed 8 May 2009].

[70] At: http://www.etcgroup.org/en/issues/biopiracy.html [Accessed 8 May 2009].

character of most traditional knowledge prevents it from being easily attributed to an individual IP holder (Roht-Arriaza, 1997). Thus, IPRs do not seem to support a fair and equitable exchange model of plant genetic resources and related (traditional) knowledge. On the contrary, as is clear from the above definition of biopiracy, IPRs may be regarded as a primary vehicle for unfairness and inequity.

So what does all this say about the possibilities for realizing fair and equitable benefit-sharing on the basis of commutative justice? The answer to this question is not very promising. Plant genetic resources are a valuable resource for many developing countries but, because of their non-rival and non-excludable characteristics, cannot be appropriated and traded in the same way as can other natural resources, such as oil or minerals. To secure a fair share of the benefits that derive from the use of these resources abroad, a provider country must either protect all its plant genetic resources (and genetic information) from crossing its borders, or it needs to track and negotiate a share of the benefits of all usages of its resources in all countries of the world – and this only provided that it can prove that it is the country of origin of these resources. Farmers and indigenous communities encounter similar problems when attempting to protect and control their traditional knowledge (from regional and national as well as international interests), and they are likely to have even less means to prevail. Conclusion: it is practically impossible for providing countries and communities to secure a fair exchange of the plant genetic resources found within their territory, or the traditional knowledge present in their culture.

But any transaction involves two parties, so if a just exchange of these resources is indeed to be realized then it follows that the users (and user countries) need also to be an active party in the arrangements. Unfortunately, so-called “user-side measures” have mostly been neglected in the international negotiations and country legislations on ABS. The predominant idea is that provider countries should put their ABS legislation in place and users act in accord with this while collecting resources in those countries. But as the foregoing has shown, this strategy

does not really suit the resources in question. Furthermore, the lack of user-measures has resulted in a situation in which "users who do not know or disclose the source country of the resources they are using are not required to engage in any benefit sharing or substitute activity" (Tvedt & Young, 2007, p. 130). This loophole has rendered the current system of access and benefit-sharing very ineffective and, obviously, unfair.

One of the few proposals that aims to counter this loophole is that of a "disclosure measure", to be included in patent applications worldwide (Tobin et al, 2008). This would require applicants for patents to disclose information regarding the origin, source or legal provenance of the genetic resources and/or traditional knowledge utilized within the patent application (Barber et al, 2003). This would establish a legal liability for compliance with ABS conditions on the user side. It is, however, uncertain whether such an initiative would really make a difference to the problem at hand. There is first an issue of coverage, as the proposal does not pertain to all non-patented resource applications – but the main question, again, is how it would be practically possible to track the origin or even source of, for example, every parent line used in a new tomato variety which has built upon centuries of cross-breeding. Or how patent officers could verify such information.

This disclosure measure does, however, have one advantage, which may suit the link between plant genetic / traditional knowledge resources and benefit-sharing much better. We have already seen that the specific characteristics of these resources make a benefit-sharing model based on their physical exchange very difficult: user-oriented measures such as the disclosure of origin indicate that benefit-sharing responsibilities could as well be invoked by the *utilization* of such resources (and benefits arising there from), instead of their specific exchange. But if benefit-sharing is not tied to a transaction between two parties, then how can we decide to whom the benefits should go and what a fair and equitable distribution would be? Questions of how a fair division of a certain good can be realized amongst a group of recipients belong to the domain of *distributive justice*. This domain has a much broader usage and tradition in philosophy than

commutative justice and different theories of distributive justice present different guidelines as to how such division should look and who the *legitimate recipients* would be.

The principle of entitlement and issues of procedural and cognitive justice

Distributive justice is primarily concerned with how to "render to each his due" (Miller, 1976, p. 21). The main question is, of course, how to decide what a person's (group's or country's) "due" exactly is. The principle of *entitlement* holds that someone's due is that to which one has a right or is entitled to. The aforementioned sovereign rights and intellectual property rights over plant genetic resources and related knowledge can thus be considered entitlements that may guide the fair and equitable allocation of benefits. We have already seen, however, that these rights are extremely problematic in this respect: since the resources in question have non-rival and non-excludable characteristics they are not easily defensible as items of property (Thompson et al, 1994), which means that it is far from obvious that it is possible to clearly specify the subsequent entitlements on which a fair distribution of benefits could be based. Furthermore, intellectual property rights appeared to be considered a vehicle for biopiracy instead of fair and equitable benefit-sharing.

Still, there are many who argue that such entitlements need to be established because without reference to private (or community) ownership and intellectual property, the resources in question should be considered public goods for which no compensation or benefit-sharing can be demanded (Hamilton, 2006). One may be hopeful that philosophy can help in this respect, for example by deciding on how and when resources become *ownable*. Indeed, many philosophers have shed light on and done

battle over the ontological status of property, and lately, several studies have focused on this topic in relation to the new biotechnologies and genetic resources (Górski, 2005; John, 2000). However, I am inclined to agree with Thompson's conclusion that "the philosophical case for recognizing intellectual property rights in genes, sequences and genetic processes is mixed, and that no thoroughly decisive arguments can be brought to bear either way." (Thompson, 2007, p. 253).

Nevertheless, it can be argued that the concept of biopiracy does presuppose that intellectual property rights exist and that the problem of biopiracy does not lie with these rights as such, but with their current organization. Take for example the aforementioned criteria for patent protection. According to these criteria one cannot legally apply patents either to plant genetic resources in their natural state, or to any knowledge, invention or product already established before the new patent application is made. The problem is that the traditional knowledge and other inventions (e.g. plant varieties) of many communities are not documented and therefore not known to the patent office examiners checking for any "prior art" relevant to new applications – so a patent can easily be granted to an invention that free-rides upon such knowledge and resources. A subsequent problem is that traditional communities rarely have the means to go through the complex and costly procedures to challenge that patent in court (Hamilton, 2006). Here then, the problem lies not with IPRs per se, but with the "failure of international patent systems to recognize the contributions (e.g. the prior ownership) of indigenous farmers" and the "disparity between the access of the rich and the poor to legal services." (Thompson, 2007, p. 256).

This conclusion points to another principle of justice, namely *procedural justice*. More commonly referred to in jurisprudence than in philosophy, this principle aims especially at the *accuracy* of legal processes and the *participatory rights* of those involved; these must be satisfied in order for a procedure to be considered fair (Solum, 2004). Even though procedural justice is not concerned with the allocation of benefits (i.e. distributive justice), it is equally important in the context of fair and equitable benefit-

sharing as it focuses on the fairness of the processes through which this is realized. Fair procedures within the international IPR system are necessary to realize a fair and equitable benefit-sharing mechanism, which will otherwise continue to be seriously undermined so long as the system favors the powerful (e.g. biotech companies) rather than the weak (e.g. indigenous communities) (van den Belt, 2003).

Procedural justice is also especially important since ABS negotiations at both the international and local level involve such diverse stakeholders as national governments, international NGOs, traditional communities and multinational corporations. These stakeholders have access to widely diverging levels of financial and legal resources, and thus, power. These differences, and particularly the special needs of developing countries and traditional communities – but also of minority groups (e.g. women) within countries and communities - in this regard, have to be taken into account if fair and equitable benefit-sharing agreements and regimes are to be realized (Albin, 2001; Alvarez-Castillo & Feinholz, 2006). It is for this reason that the CBD has established some initiatives and funds to support traditional communities.[71] Their active involvement in national and international negotiations remains an issue of concern, however, for which there are many reasons, including such basic problems as a lack of resources (money, personnel, etc.) with which to participate in negotiations, language barriers, and a lack of established (lobbying) links with state representatives, the primary decision makers. In fact, the fundamental issue at stake here can better be described in relation to a third approach to benefit-sharing, which is essentially concerned with the cultural identity of traditional communities in a globalizing world.

The cultural differences between traditional communities and other parties in the ABS negotiations are substantive. Many indigenous communities have fundamentally different worldviews and conceptions of benefits, sharing and property from our “western” ones. The notion of genetic resources, for example, derives from a modern technical development and

[71] See e.g. http://www.cbd.int/traditional/general.shtml [Accessed 8 May 2009].

so just does not exist in many traditional cultures. The rapid expansion of modernization threatens many of these cultures and the ABS framework is itself, of course, a form of globalization. Therefore, in order to make sure that ABS regulations do not constitute an extra pressure on traditional communities, forcing them to adopt foreign standards and demands, one has to take their ideas about how benefit-sharing should be organized seriously into account. This may take the form of including the customary laws of such communities in ABS agreements (Tobin, 2004), or it might imply that their right to be left alone is respected if they do not want to be involved in such agreements.

The importance of taking into consideration differences in culture and even worldviews during ABS negotiations may more aptly be described with reference to the principle of *cognitive justice*. This principle is particularly referred to in the field of science democratization (Leach & Scoones, 2006; van der Velden, 2009). Recognizing the plurality of knowledge systems, it aims to secure the equal treatment and representation of different ways of comprehending the world. As such, cognitive justice goes beyond the focus on fair processes and equal participation in procedural justice, underscoring the "constitutional right of different systems of knowledge to exist as part of dialogue and debate" (Visvanathan, 2005, p. 92). In the context of ABS, this means that the different cultures and conceptions of things like plants and benefits need to be equally represented in a dialogue in which one does not dominate another.

In line with this, it must be acknowledged that many traditional communities find the link between benefit-sharing, IPRs and the subsequent commodification of resources particularly problematic. Whereas land tenure, private property and capitalism are central notions in Western culture, many indigenous communities consider that land and related resources can belong to no human being. Or as they state, "patenting and commodification of life is against our fundamental values and beliefs regarding the sacredness of life and life processes and the reciprocal relationship which we maintain with all creation." (Tauli-

Corpuz, 2004). Returning to the concept of biopiracy, Hamilton observes indeed that "what is problematic for many contesting biopiracy is not necessary who owns it, or who will benefit, but that the debate is framed in these terms to begin with." (Hamilton, 2006, p. 173). Access and benefit-sharing agreements are, therefore, considered by many indigenous peoples' organizations to "simply coerce Indigenous peoples into participation in the economic exploitation of their knowledge and resources" (IPCB, 2004), and those entering into such agreement are advised to "carefully evaluate the political, social, and cultural costs" (Reihana, 2006, p. 11).

It is not only these cultural differences that need to be taken into account. On a socio-political level the marginalized position of many traditional communities and minorities may warrant further measures. When analyzing the statements of different indigenous peoples' councils and organizations, one soon learns that the CBD is just another forum where these groups (have to) fight for their basic human rights (UN PFII, 2007). One such statement proclaims, for example, that "without recognition of Indigenous peoples' rights to control access to both their genetic resources and Indigenous knowledge, no benefit sharing process will be fair and equitable" (GRAIN, 2007). The statement refers to the lack of land rights and self-determination of traditional communities in many countries, which gives a completely different dimension to their demands for benefit-sharing.[72]

So, traditional communities are likely to have not only a different understanding of some of the central notions underlying ABS, but also an agenda that goes beyond that of many of the other stakeholders involved. These differences, together with the imbalances in negotiation capacity, have to be respected and observed if fair and equitable benefit-sharing arrangements with such groups are to be established. Here, the principle of entitlement, with its obvious link to intellectual property rights, seems not

[72] In light of this, it may even be necessary to reassess the current division in the CBD between plant genetic resources that fall under the sovereign rights of States and traditional knowledge that belongs (subject to national legislation) to local communities.

to be the best standard by which to guide the allocation of benefits. And it is in this context that the principle of *desert* can be of use.

Principles of desert, need and equity

According to the principle of desert, a person's due is not based on one's entitlements but on what one *deserves* in light of one's actions. There are different desert-based principles regarding what should count as the basis for deserving (Lamont, 1994; Miller, 1976), but in the context of ABS one's *contribution* to the conservation and/or development of a certain plant or product seems most relevant. Employed thus, the principle of desert can enable the sharing of benefits in proportion to the contributions of specified groups or individuals without making reference to intellectual property rights. Furthermore, the Bonn Guidelines[73] refer explicitly to this principle of desert in stating that "benefits should be shared fairly and equitably with all those who have been identified as having contributed to the resource management, scientific and/or commercial process" (UNEP, 2002, Article 48).

One issue related to this principle is that of how to classify or quantify different contributions. Obviously, it is very difficult to decide upon the *relative contribution* of different parties involved in the creation of a new drug or crop variety: what, for example, is the contribution of an indigenous community in the Amazon that for centuries has nurtured a medicinal plant in relation to that of a company that has invested millions of dollars in a commercial cleansing gel of which one ingredient is derived from that plant?

[73] The Bonn Guidelines are a non-binding document adopted by the Conference of the Parties of the CBD in 2002 with the aim of assisting parties in organizing and developing ABS agreements and policy-making.

The current transaction model of ABS in the CBD seems to imply that some sort of *prize tag* can be attached to plant genetic resources, traditional knowledge, and the contributions of those that nurture and develop them. Many consider this approach problematic for several reasons, for example because there is no historical context or precedent, a market system for these resources has never existed in the past (Falcon & Fowler, 2002). On the contrary, the values of plant genetic resources and related contributions are matters of deep dispute: where some negate the value of wild plants and landraces for the biotechnology industry and commercial breeding (Wolfe & Zycher, 2005), others speak of the "green gold" and "untold billions of dollars" that these industries have already earned from such resources (Kloppenburg, 2004; Sharma, 2005). There is, however, another treaty that refers to fair and equitable benefit-sharing in relation to the principle of desert but without building upon a market-based transaction model.

The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR) of the UN Food and Agriculture Organization (FAO) states that fair and equitable benefit-sharing is "fundamental to the realization of Farmers' Rights" (FAO, 2001, Preamble). These rights are based on the "enormous contribution that the local and indigenous communities and farmers of all regions of the world (…) 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 9.1). The ABS mechanism of the ITPGR introduces a Multilateral System of Access and Benefit-Sharing that establishes a list of major crops and forages that are freely accessible to farmers, breeders and researchers of member countries (Part IV).

The Multilateral ABS System of the ITPGR is germane to a fourth approach to benefit-sharing, one that is primarily concerned with our shared interest in food security. Based on the understanding that no country or even continent is self-sufficient in its plant genetic resources for food and agriculture, this approach prioritizes a benefit-sharing model

that facilitates access and exchange of genetic resources essential to food production across the world. The ITPGR states, indeed, that the facilitated access to these resources "constitutes itself a major benefit of the Multilateral System" (FAO, 2001, Article 13.1). Furthermore, it goes on to state that the benefits accruing from this system, be they in the form of information, technology or money, "should flow primarily, directly and indirectly, to farmers in all countries, especially in developing countries, and countries with economies in transition, who conserve and sustainably utilize plant genetic resources for food and agriculture" (Article 13.3).

This contribution of farmers in developing countries and around the world is central to benefit-sharing in the ITPGR. In this general form, however, it does not (and cannot) serve as a concrete allocation principle. While recognizing the contributions of farmers, the sharing of benefits that arise from the multilateral system is aimed at supporting the main objectives of the treaty, namely food security and sustainable agriculture.[74] Indeed, a first group of conservation projects is now being supported from the treaty's benefit-sharing fund.[75] The ITPGR distribution of benefits seems, therefore, to be guided by another principle of justice, namely the principle of *need*.

Holding that goods should be distributed in accordance to people's needs, the principle of need is again subject to different interpretations of its basic concept – what should be considered as "needs". Happily, however, this is not overly problematic in this case as most interpretations agree at least on the inclusion of the basic material necessities for human life, like food, shelter and medical care. Indeed, we might refer here to the Universal Declaration of Human Rights (UN, 1948). These "ideal rights" are directed towards providing a minimum standard of decent living, and should not, therefore, be confused with "entitlements" (Feinberg, 1970, p. 255). Obviously, the ITPGR is particularly concerned about the *fundamental need* for food security, to which fair and equitable benefit-

[74] See Appendix F of the ITPGR on the priorities of its Funding Strategy.
At: ftp://ftp.fao.org/ag/agp/planttreaty/funding/fundings1_en.pdf [Accessed 8 May 2009].
[75] http://www.planttreaty.org/funding_en.htm [Accessed 8 July 2009].

sharing is linked in its principal objective (along with sustainable agriculture – Article 1.1). Furthermore, with the repeated references to developing countries and countries with economies in transition, to which the benefits of the multilateral system should primarily flow, the treaty acknowledges the *special needs* of these countries and their farmers in respect of this objective.

A similar connection between benefit-sharing and the principle of need can be found in the CBD. The CBD Preamble, for example, states that "conservation and sustainable use of biological diversity is of critical importance for meeting the food, health and other needs of the growing world population, for which purpose access to and sharing of both genetic resources and technologies are essential" (UNEP, 1992). The need to preserve our biodiversity – as reflected in the first two of the three listed objectives – is central to the whole CBD and constitutes a fifth approach towards benefit-sharing. Although the first two objectives are not explicitly linked to fair and equitable benefit-sharing, the third objective, it is generally considered that the prospect of benefit-sharing constitutes an important incentive for developing countries to protect their potentially valuable plant genetic resources, and that benefit-sharing operates as an instrument which assists these countries in gaining access to the means for conservation by promoting the flow of technology, information and financial resources. So even though benefit-sharing in the CBD is set up as a model of commutative justice, it employs the distributive justice notion of need: both in relation to the universal requirement to conserve biodiversity in order to meet fundamental needs of humankind, and with respect to the special needs of developing countries and traditional communities in so doing.

The principle of need thus has an important role in both the ITPGR and CBD. Yet, the multiple references to the special needs of developing countries point also to another principle of distributive justice, namely the principle of *equity*. The principle of equity aims to inform and/or modify general rules such as the distributive justice principles discussed, in order to take account of *morally relevant differences* in particular situations. It

seeks to provide ethical decisions in such situations by holding that "equals should be treated equally, and unequals unequally" (Barry, 1965, p. 152). The relevance of this principle to our inquiry into fair and equitable benefit-sharing is manifest: poor countries and communities deserve extra support in order to satisfy their fundamental needs, protect their resources and entitlements in the international IPRs system, and also raise their negotiation capacities. The principle holds that due to the *existing inequalities*, extra efforts have to be undertaken if a fair and equitable benefit-sharing mechanism is to be realized.

There seems, however, to be a tension between the principles of need and equity introduced here and those of commutative justice and entitlement discussed earlier, along with the recently considered principle of desert. Even though the latter two (entitlement and desert) do not involve a specific exchange between two parties (as commutation does), the sharing of benefits according to all these three principles is directed to those that have specific claims based upon certain rights they hold and/or particular contributions they have made. In essence, parties receive *compensation*. The principles of need and equity, however, do not work like this. They focus instead on the distribution of benefits to those who need them most. So the question is which of these two directions or purposes of benefit-sharing is most important?

At first sight, the idea of compensation seems crucial to the whole ABS debate. Indeed, developing countries and communities strongly resist the free and uncompensated use of their biological resources, which were originally considered the common heritage of mankind (De Jonge & Korthals, 2006). This resistance was a major driving force for the incorporation of benefit-sharing in the CBD in the first place, and it continuous to be the main motivation behind accusations of biopiracy and the call for (binding) benefit-sharing provisions in international and national legislation. So, the idea of compensation is very important in the context of benefit-sharing, but can the same be said about the focus to distribute benefits to those in need?

Yes it can. The main reason for this is that one can argue that a benefit-sharing model which aims to compensate or reward parties for their contributions would not be needed in a just and fair world, or even in the affluent countries of today. With respect to health care, for example, Schroeder argues that in many Western societies a "viable and essentially fair exchange model is already in existence between the health care industry and human research subjects" (Schroeder & Lasén-Díaz, 2006, p. 140). DNA donors with a particular disease can expect to receive direct benefits from research and development based on (their) DNA in the form of (potentially) therapeutic treatments and medicines that are generally quite accessible through the health care (insurance) systems in their countries. Furthermore, indirect benefits can be expected through jobs and wealth generated by the industries involved. In this case, an extra benefit-sharing mechanism to reward donors for their contributions is unnecessary.[76] The main issue is that in an ideal world, it "does not matter" who provides the blood or traditional knowledge that lead to new inventions "as long as we all have access to the benefits of their use" (Schroeder & Pogge, 2009).

For many people in this world, however, this ideal situation is non-existent. On the contrary, some two billion people lack access to essential medicine (Hollis & Pogge, 2008), millions die from preventable diseases every year (WHO, 2008). The figures are similar with respect to food and agriculture: in 2007 the number of chronically hungry and undernourished people rose to 923 million (FAO, 2008, p. 9), and most farmers in developing countries (i.e. most farmers in the world) lack access to improved seeds and other agricultural inputs. A large proportion of people in the world simply do not have access to the products and benefits of modern research. Not even to those goods that can save their lives. It is against this background that the demands for benefit-sharing become obvious and, indeed, justified (Schroeder & Pogge, 2009). The principles

[76] This may, of course, be different if excessive profits are made from the donor contributions.

of need and equity are not just relevant to the concept of benefit-sharing – they are elemental.

A sixth, and final approach to benefit-sharing relates to this aspect of human poverty, focusing on the imbalance between intellectual property protection and the public interest. We have already seen that IPRs provide exclusive rights to the creators of such intangible assets as knowledge, inventions and scientific discoveries. In biotechnology, IPRs play an important role and many consider them a major trigger for research and development in the field (Oldham & Cutter, 2006). So far, however, this research and development has hardly benefited the poor because it is primarily aimed at commercial markets where IP can generate revenues (FAO, 2004; Global Forum for Health Research, 2004). Furthermore, the growing numbers of IPRs may block access to new biotechnology tools and products as it becomes too expensive for private organizations and state institutions in developing countries to pay the multiple royalties and purchase the necessary licenses to make use of them (Atkinson et al, 2003). In this context, a fair and equitable benefit-sharing mechanism is not concerned with compensating parties for their rights held or contributions made, but aims primarily to stimulate a more *equitable distribution* of the benefits of modern research and development.

Towards a fair and equitable benefit-sharing mechanism

So, what does all this tell us about the central question, how a fair and equitable benefit-sharing mechanism can best be realized? One of the main outcomes is that fair and equitable benefit-sharing is not merely about the mechanics of an ethical distribution (or exchange) of benefits. Before anything else, we need to consider two important *prerequisites* that have to be satisfied if a fair and equitable benefit-sharing mechanism is even to have a chance of being properly developed and sustained.

One relates to the socio-political power differences between the different stakeholders in ABS negotiations at both national and international levels. For this reason, the principle of procedural justice, with its emphasis on fair and accurate processes and equal participation, certainly needs to be emphasized. This means, amongst other, that investments in the negotiation capacities, knowledge base, and provision of access to legal services of developing countries and traditional communities especially is and will be a long term necessity. It is important to realize that ABS is not an issue for national governments and international organizations alone, but includes the involvement of many non-state actors at all levels, from the local to the international. Careful analysis of the complex relationships between these stakeholders, and especially between national governments and traditional communities (e.g. regarding their respective rights over specific resources), is required in order to facilitate a fair process and equitable outcome of negotiations.

Closely related to this issue are the substantive, cultural differences and worldviews involved. Most important here is to realize that stakeholders may have radically different conceptualizations of the world (cosmos) and completely different understandings (if any at all) of such central notions as genetic resources, property and sharing. The principle of cognitive justice aims to emphasize the equal status of these different conceptions as a starting point for debate and genuine dialogue. This would, for example, imply that the link between benefit-sharing and intellectual property rights is weakened or, at least, not taken for granted. If a party to a particular ABS agreement is uncomfortable with the application of intellectual property rights to their resources or the products derived from them, this should be respected and other forms of product protection considered.

Moving beyond these two preconditions, we can make the generalization that, despite the evident diversity of approaches to the concept, benefit-sharing aims to realize some form of *compensation* and of *equity*. These two ideas were found to be fundamental to benefit-sharing. Together with the more specific objectives of biodiversity conservation and food

security, this give us some indications as to how a fair and equitable benefit-sharing mechanism might best be organized.

The main conclusion to be drawn is that the current exchange model of ABS in the CBD, and subsequent focus on commercial transactions and contracting in ABS policies, is not the best way forward. There are several reasons for this. One is that the resources in question often do not fit a two-party exchange model. Of course, in some cases a specific provider and user can be discerned, who can then mutually negotiate the desired ABS contract. But these are the exemption. Because of the non-rival and/or non-excludable characteristics of plants and related (traditional or genetic) information, it is practically impossible for providing countries and communities to control their movement and, therefore, to secure their fair exchange.

This situation is particularly problematic because, up until now, the responsibility for benefit-sharing has largely been left to the national governments and local communities of developing countries. But many of these have very little capacity (and many other priorities) to put ABS policies in place, let alone to track the movement of all their biological resources and traditional knowledge. Furthermore, many of these resources have long since left their territories and can, for example, be found in botanical gardens, genebanks and libraries around the world. This state of affairs, where the resources in question are extremely difficult to monitor, already widely dispersed, and user measures are almost non-existent, has created many loopholes in the current system of ABS. Indeed, if a user-party is not literally collecting its resources in a provider-country (under a Material Transfer Agreement), then it is soon unclear what benefit-sharing obligations, and to whom, are required, which simply means that no benefit-sharing will take place.

Another problem with the current transaction model of the CBD is that most attention (and expectation) is and has been paid to commercial contracts as the primary way to put the ABS policies in practice. Here, the problem is not only that there has never existed a market for plant genetic

resources and traditional knowledge, but also, and more pressingly perhaps, that commercial mechanisms leave very little room to incorporate broader, social goals, such as securing human needs and equity. Furthermore, food security and conservation goals also are not easily captured in contracts between two parties. Added to the fact that the focus on commercial contracts is oblivious to the alternative worldviews of many traditional communities, we have to conclude that the current ABS model of the CBD is in need of fundamental revision.

How then should (or can) a fair and equitable benefit-sharing mechanism be organized? An alternative model, briefly mentioned above, might focus on the *utilization* of resources as the trigger for benefit-sharing rather than their specific exchange. Tvedt & Young (2007) have made a detailed study of the central requirements for an ABS system that would build primarily on the utilization-trigger. Three important steps towards such a system that can be extracted from this study are: First, the development of clear and effective legislation in the user countries, which involves various disincentives for non-compliance and incentives for compliance. Second, the definition of exact conditions for benefit-sharing, such as a clear start and end point for benefit-sharing obligations, and "internationalized mechanisms" that regulate the collection and distribution of "orphan shares" if the source country or country of origin is unknown or undisclosed. And third, the development of clear standards for the valuation of resources and benefit-sharing in order to provide a concrete basis for the whole system and prevent unrealistic expectations and uncertainties for both providers and users.

Obviously, such a model faces many practical challenges, but in emphasizing the responsibilities for benefit-sharing at the *user side* it starts with an important advantage. If users and user countries are serious about benefit-sharing and commit themselves to the corresponding objectives in the CBD and ITPGR, they have to work towards the realization of those objectives. In fact, the principle of equity holds that the strongest parties have the biggest responsibilities in this regard. This implies, for example, that "if the experiential data on ABS to date indicates that it has not been

financially beneficial to developing countries, the Contracting Parties have an obligation to make it beneficial, rather than to drop it as an unpromising concept" (Tvedt & Young, 2007, p. 94). So, in contrast to the current situation, we have to conclude that the developed countries and parties must take their responsibility and *make* the system work.

Other advantages of an utilization model vis-à-vis the current ABS system of the CBD are that it does not focus on the movement of plant genetic resources,[77] and that it demands the sharing of benefits irrespective of whether a specific ABS contract is attached to them. Tvedt and Young hold that determining whether "the user took an action that is considered to be the 'utilization of the genetic resources' [is] a question that can be answered objectively and documented by evidence" (Tvedt & Young, 2007, p. 59). This will only be possible if the Contracting Parties to the CBD manage to clearly define exactly which activities do and do not constitute a utilization of genetic resources. If realized, this would mean that a clear entry point for when the ABS system applies can be defined. Together with the proposed user measures, this could cut out many of the current loopholes in the system and secure that benefit-sharing does actually take place.

The establishment of the requisite legislation is obviously an important step towards fair and equitable benefit-sharing. Although it does not in itself say anything about what a "fair and equitable" benefit-sharing arrangement is or should look like, if one takes into account that many developing countries and communities are frustrated with the historic and continuing use of "their" plant genetic resources and traditional knowledge without receiving anything in return, then one can imagine that the *guaranteed* implementation of benefit-sharing provisions is more than

[77] Unfortunately, Tvedt & Young (2007) focus primarily on plant genetic resources and do not discuss the same model in relation to the utilization of traditional knowledge. This topic will need extra research and attention because an utilization model for traditional knowledge needs to take into account the right of the knowledge holders to prior informed consent, which means that they need to be consulted *before* their resources are actually utilized.

just a good move in the right direction. It is, in fact, a necessary precondition for fair and equitable benefit-sharing and crucial first step towards its realization.

A second step then is to establish clear standards for the valuation of resources and contributions and, thus, benefit-sharing. As argued, this valuation should not be based on commercial criteria alone, but needs to be informed by the broader objectives of benefit-sharing. First, it would be necessary for the international community to agree on some minimum standards for benefit-sharing, so as to provide a concrete basis for the whole system and facilitate the collection of the so-called orphan shares into an international fund. At the same time, however, the challenge is to leave enough room for the multiple objectives and perspectives as reflected in the diversity of approaches to benefit-sharing. What could be developed, therefore, is a "menu of ABS options", which would lay out, next to the minimum standards of benefit-sharing, several forms of sharing information, technology and capacity.[78]

Ultimately, one has to decide how, and to whom, the benefits should be distributed in a fair and equitable way. This article has discussed the main allocation criteria that can be employed in this respect. It has been shown that *entitlements* can set clear standards for distribution, but with respect to plant genetic resources and traditional knowledge it is often unclear who their legitimate right holders are. If the (group of) right holder(s) to a particular resource is well-defined, then the user and provider parties can mutually negotiate the benefit-sharing terms and process (taking into account, of course, the standards set by the international community on, for example, issues of procedural and cognitive justice, compliance, and the minimum standards for benefit-sharing). And where resource right holders are not well-defined, one may opt for a multilateral approach in which the benefits are distributed according to a combination of the other

[78] Both the CBD and ITPGR already pay a lot of attention to such non-monetary benefit-sharing options. The ITPGR, furthermore, includes provisions for an international fund and a standardized Material Transfer Agreement with specific benefit-sharing percentages. The utilization model can connect to and draw from these initiatives.

principles discussed – one could, for example, set allocation criteria that aim to *compensate* regions or groups of people (countries, communities) in accordance to their (historical) *contributions* to the *conservation of biodiversity* and *food security*, and with special attention to those with particular *needs* in this respect.

Conclusion

Despite the fact that "fair" and "equitable" benefit-sharing is not defined in the international treaties in which it appears, discussion of the relevant principles of justice in this article has resulted in some rather specific recommendations on how such mechanism can best be realized. One major conclusion is that the current, bilateral exchange model in the CBD is in need of a major overhaul. It should be replaced by a system that has more room and ability to support the broader objectives of benefit-sharing, and less loopholes that undermine the benefit-sharing provisions in the first place. Several allocation and procedural principles have been discussed that can inform a fair and equitable benefit-sharing mechanism, and the utilization model seems a promising framework upon which to build in this respect. Ultimately, the international community has to come to an agreement on the exact terms and provisions of a fair and equitable benefit-sharing mechanism, and considerable investments (and compromises) from all parties will be needed to move forward successfully from the current stalemate that the international community has found itself in. Crucially, the developed countries and parties have to realize that they have the biggest responsibility to make the system work.

Five

Between sharing and protecting: Public research on genetic resources in the year of the potato[79]

[79] This Chapter is written by Bram De Jonge and previously appeared as a scientific article in the Journal *Genomics, Society & Public Policy*, 2008, **4**.

Abstract

Countries, companies and farming communities are increasingly involved in issues of sharing and protecting plant genetic resources, (traditional) knowledge and technologies. Intellectual Property Rights and Access and Benefit-Sharing policies currently regulate the transfer and usage of much of this genetic material, information and related production, which is employed in multiple research projects involving public research institutes. Strikingly, not much is known about how these institutes deal with the transfer and usage regulations. And what, furthermore, *are* their responsibilities while serving a civil society in which there is such a range of diverging interests in and opinions about such regulations? In order to shed more light on these questions, two public research institutes will here be studied, the International Potato Centre in Peru and Wageningen University & Research Centre in the Netherlands. These institutes are both heavily involved in research into genetic resources, knowledge and technologies related to the potato, and work together with a wide spectrum of stakeholders that have a direct interest in the sharing and/or protection of these resources. The two institutes are continuously weighing up the various stakeholder interests in their attempts to strike a balance between policies geared towards sharing and those aimed at protection. It will be argued that public research institutes must dare to share, and that they need to develop new ways of sharing and protecting in order to adhere to their mission and best serve the public interest.

Introduction

The international landscape with respect to plant genetic resources has changed dramatically over recent decades. Regarded as the “common heritage of mankind” until the 1980s (FAO, 1983), with patents on plants and other living organisms mostly forbidden (Louwaars et al, 2005), plant genetic resources are now described in terms of ‘hyperownership’, in

which "exclusive ownership and restrictions on the sharing of genetic material are the international norm" (Safrin, 2004).

Initially, industrialized counties started to expand their Intellectual Property (IP) systems to include new plant varieties and genetic material in search of new markets and to stimulate economic growth. Not much later, however, developing countries became aware of the (potential) value of their plant genetic resources and started to resist the free flow of genetic resources from their territories. With the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) of the World Trade Organization (WTO, 1994), the IP concepts of the industrialized countries received global recognition, and in 1992 the Convention on Biological Diversity (CBD) abandoned the common heritage idea, declaring instead that "States have sovereign rights over their own biological resources" (UNEP, 1992, Preamble). Significantly, the CBD also demands "the fair and equitable sharing of the benefits arising out of the utilization of genetic resources" (Article 1) – i.e. the providers of plant genetic resources and traditional knowledge should be compensated for their contributions to the products developed by the users of these resources.

Now, Intellectual Property Rights (IPRs) and regulations of Access and Benefit-Sharing (ABS) set the conditions under which plant genetic material can be accessed and transferred. Clearly, different parties have different interests when it comes to protecting or sharing plant genetic resources and related knowledge and technologies. But what exactly are the interests of public researchers and their institutes in this respect, and what are their responsibilities while doing research for the common good?[80] These questions will be explored by examining the specific positions and environments of two public research institutes in their work related to the third most important food crop in the world, spotlighted by the UN Food and Agriculture Organization (FAO) in 2008: The International Year of the Potato.

[80] The terms 'common good' and 'public interest' are not strictly defined here, being used to refer to the general notion that public research institutes should work for the benefit of society as a whole.

The public sector plays an important role in the research and development of the potato, in both developed and developing countries. We will focus here on the International Potato Centre (CIP) in Peru, where the potato originated (Spooner et al, 2005) – and Wageningen University and Research Centre (Wageningen UR) in the Netherlands, the world's foremost supplier of certified seed potatoes.[81] Working in very different contexts and with a wide, representative range of stakeholders, these two institutes illustrate well the current situation facing public bodies in their exposure to a variety of opinions and pressures related to the sharing and protection of potato genetic resources, (traditional) knowledge and technologies.[82]

Sharing for the common good?

A good example of the tradition of sharing and collaboration in public science in order to produce benefits for society as a whole is the Consultative Group for International Agricultural Research (CGIAR), of which the International Potato Centre (CIP) in Peru is a member. The CGIAR is an internationally funded, collaborative partnership of fifteen international agricultural centers that aims to achieve sustainable food security and reduce poverty in developing countries. In its mission statement, the CGIAR states that:

> *The new crop varieties, knowledge and other products resulting from the CGIAR's collaborative research are made widely*

[81] http://faostat.fao.org/ [Accessed August 2008].

[82] In addition to policy documents, news reports and scientific literature, input for this analysis comes from an international conference organized in Wageningen on April 11, 2008, together with a total of 33 interviews conducted with individuals from research institutes and other (non-)governmental organizations in Peru and the Netherlands between April 2007 and September 2008 (names and affiliations of the interviewees are included if permission was granted; otherwise only the affiliation is mentioned).

> *available to individuals and organizations working for sustainable agricultural development throughout the world.*[83]

Sharing for the sake of food security

An important task of CGIAR is to maintain international genebanks to "preserve and make readily available the plant genetic resources that form the basis of food security worldwide".[84] It is supported in this endeavor by the FAO, which declared the International Year of the Potato to raise awareness of the importance of this crop, and of agriculture in general, in addressing issues of global hunger, poverty and threats to the environment. Both organizations, CGIAR and FAO, cherish the rationale that in agriculture no country, or even continent, is self-sufficient in plant genetic resources (GFAR & IPGRI, 2000). Everybody depends on the genetic diversity found in other countries, and the continuous exchange of plant genetic resources is vital in fighting new pests and feeding a growing world population. The FAO International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR) aims to support this global exchange with the Multilateral System of Access and Benefit-Sharing (FAO, 2001), which establishes a list of major crops and forages – including the potato[85] – which are freely accessible to member countries under a standard material transfer agreement.

It is in this spirit that CIP director Dr. Anderson sees the job of the institute as to "produce global public goods that will contribute to the alleviation of hunger and poverty (…) and share the benefits of the genetic resources that we conserve" (Anderson, 2003). The primary beneficiaries of this sharing she cites are the broader research community, the national agricultural research systems, and the farmers and farming communities. A complicating factor in this mission, however, is that CIP is based in a country that does not univocally support it.

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[83] http://www.cgiar.org/who/index.html [Accessed August 2008].
[84] http://www.cgiar.org/who/index.html [Accessed August 2008].
[85] With the exemption of one species, the *Solanum phureja*.

Peru and the fight against biopiracy

In contrast to the sharing rationale of CIP and FAO, Peru is primarily interested in the control and protection of its plant genetic resources in order to reap their benefits. Indeed, Peru and her neighbors in the Andes established the Andean Community which designed the Common Regime on Access to Genetic Resources for just this purpose in 1996. Creating a legal framework for the collection of genetic resources in the Andean Region, the Common Regime states that the Andean Community Member Countries "exercise sovereignty over their genetic resources and their by-products and consequently determine the conditions for access to them" aiming to ensure a "just and equitable participation in the benefits of the access" (Andean Community, 1996, Articles 5 & 11).

The central idea is that Peru has much to gain from its genetic resources, the region being a 'centre of origin' for many plant and animal species, including the potato, tomato, coca and alpaca. Mrs. Rosell of the National Council of the Environment, the agency responsible for ABS in Peru, expresses the Peruvian argument thus:

> *If you want to develop an invention and you are using somebody else's screws you pay for the screws, [so] if you are using somebody else's genetic resources why don't you pay for them?* (personal communication, 2007)

When biological resources or related traditional knowledge is taken and commercialized without permission one often speaks of 'biopiracy'. For some policymakers in Peru, CIP's genebank collections could be "one of the main sources of 'leakage' of genetic materials" (Correa, 2003, p. 804). CIP has indeed been faced with accusations of biopiracy – in respect of which, states a communication officer at CIP, "we have to answer questions on the centre's policies and activities on a regular basis" (personal communication, 2007).[86]

[86] E.g. questions were raised when traditional Peruvian varieties of Yacon from the CIP genebank ended up in Japan, where new commercial varieties were being developed

A different outlook on genetic resources

Another group in Peru that follows the sharing and collecting activities of CIP with a critical eye are the farming and indigenous communities in the Andes. Potato crops have been cultivated here for more than 8000 years, with some 5000 varieties currently being grown.[87] The natural characteristics of these potatoes are strongly interwoven with the cultural and spiritual life of the Andean communities. Several initiatives aiming to protect and sustain this natural and cultural diversity have recently been set up, including the Indigenous Coalition Against Biopiracy in the Andes, a Peruvian coalition that made the news in 2007 after sending a letter to the multinational Syngenta protesting against its patent on a genetic method that could be used to stop potatoes from sprouting unless a chemical was applied. The letter expressed concerns that this 'terminator technology' threatened the region's biodiversity, cultural traditions and food security. Furthermore, it stated that:

> *We feel greatly disrespected by corporations [which], by making a single genetic alteration to a plant, claim private ownership to it as their invention, despite the fact that these plants are the result of thousands of years of careful selection and breeding by indigenous peoples and local communities around the world.* (IIED, 2007)

The fight against biopiracy and call for benefit-sharing of the Andean communities is different from that of Peru as a country, however. These communities want to make their own rules, according to their worldviews and traditions, and resisting against all outside, intruding forces. To many Andean communities the Peruvian State is just another one of these forces, along with the international genebanks that come to take their "genetic heritage" without giving anything in return (Argumedo & Pimbert, 2005, p. 10). According to Dr. Argumedo, associate director of the Association for Nature and Sustainable Development (ANDES), the national and international ABS regulatory system "reduces all things into genes and

(ETC Group, 2001; GRAIN, 2001). In this case it transpired that CIP had transferred the material at the request of the Peruvian Ministry of Agriculture.

[87] http://www.potato2008.org/en/index.html [Accessed August 2008].

commercial commodities that then can be traded", which has nothing in common with the way indigenous communities manage their land and resources:

> *When you don't take into consideration how local people perceive the resources, the way they understand the so-called genes and seeds, you just impose a new paradigm that will only serve the interests of research organizations and corporations.* (personal communication, 2007)

Competing interests

So what does – should – CIP do in response to this regional/national and local opposition to its mission to collect and share genetic resources in the name of the common good? In general, the public research sector is far from positive about the current ABS climate and tries to stay away from it. A recent, CBD-linked, report states that "Researchers in both academia and industry express significant concern about the negative impact ABS is having upon basic science and upon traditions of trust and collaboration among scientists" (Laird & Wynberg, 2008, p. 128). In the report, one researcher argues that "both academic researchers and companies today are reluctant to access genetic resources overseas for fear of '…becoming part of a very dangerous socio-political environment in which anyone can claim they are biopirates at any time'" (idem, p. 122). The report also acknowledges that many academic researchers do not take the CBD seriously, "and while paying lip service prefer in practice to 'ask forgiveness rather than ask permission.' Some see the new obligations as too burdensome and expensive in time and funds" (idem, p. 124).

Indeed, the current situation is far from satisfying. The global exchange of plant genetic resources has decreased dramatically since the ratification of the CBD.[88] In Peru, the acquisition of new genetic resources "essentially

[88] CGIAR's annual admissions, for example, averaged 9782 for the five calendar years prior to the CBD, a figure which dropped to just 563 in 1997, with the drop in the number of collection missions being even sharper (Falcon & Fowler, 2002).

came to a halt in 1994, primarily as a result of the conflicting natures of the international, regional and national laws" (Anderson, 2003). Despite the fact that Peru has ratified the ITPGR, which should ease the way for the collection and exchange of the potato resources, it is still unclear exactly which national regulations apply (Correa, 2004; Ruiz, 2003).[89] In such a "policy vacuum (…) it is easy for anxiety and suspicion to proliferate", confirm Rosenthal and Katz (Rosenthal & Katz, 2004, p. 463). They conclude, however, that researchers should work to overcome this situation and develop effective collaboration:

> *The research community needs to demonstrate that this work can be done in a flexible and accommodating manner that recognizes the environmental and socioeconomic context in which these organisms exist, or we will lose access to them in the near term through politics, and eventually through extinction.* (Rosenthal & Katz, 2004, p. 465)

New ways of sharing for the public interest

CIP and the broader public research community have a responsibility to work towards a solution of the present situation where fears about the misuse and disagreements about the sharing or protection of genetic material are rife. A first step towards a solution is for research institutes to

[89] For example: The Dutch gene bank CGN, part of Wageningen UR, organized an expedition collecting wild potato varieties in Peru in 1999 – i.e. after the CBD and the Andean Regime on Access to Genetic Resources came into force and before the ITPGR. The expedition was organized together with CIP, the Peruvian National Institute of Agrarian Research, and the National Research Support Program 6 of the US, and permission was granted by the Peruvian Ministry of Agriculture. Agreed was that all four partners would receive the same seed accessions. At the end of the expedition, however, a conflict had arisen between the Peruvian Ministries of Agriculture and the Environment about the export permission of the collected material. Due to the legal uncertainty this caused, CGN and its US partner decided to leave the country without the collected seeds, which were left behind. Now, almost 10 years later, the director of CGN Dr. Visser is still trying to get the accessions to the Netherlands: "Since Peru has ratified the Multilateral System of the FAO Treaty, which includes the potato, this should be legally possible but the practical circumstances are still uncertain" (personal communication, 2008).

listen and be open to the opinions of the stakeholders they are working with, or for. Since the mission of CIP is to support developing countries and their farming communities, it would make no sense to simply ignore or dismiss their views. A second step, then, would be to reassess the exact meaning of CIP's tradition of sharing genetic material in the name of the public good, because it has become clear that the free, international exchange of resources that originated in the Peruvian Andes is not necessarily considered to be in the best interest of the country or its indigenous communities. And this is exactly what CIP has been doing in recent years.

When, in 2004, Peru established the National Anti-Biopiracy Commission to develop "actions to identify, prevent and avoid acts of biopiracy with the aim of protecting the interests of the Peruvian State" (WIPO, 2005, p. 3), CIP became a member; it now helps the Commission in its technical research. With respect to the protection of traditional knowledge and potato resources of small farmers, CIP developed a catalogue of native potato varieties grown by eight farming communities in the Huancavelica region. CIP and the communities, in collaboration with the Peruvian patent office, collected botanical information and traditional knowledge about the varieties, together with details about their genetic make-up and portraits of the families that grow them (CIP & FEDECH, 2006). According to one person involved, this initiative has several important benefits, since it is a tool "to hold onto the knowledge, to protect the intellectual property of farmers, and to raise self-esteem of the involved communities: they now manage their own databases" (personal communication, 2007).

Another example is the 2005 Repatriation Agreement that CIP signed with the Potato Park, a centre of origin of potato diversity, co-founded by ANDES and managed by six Quechua communities, which aims to protect the "collective bio-cultural heritage" of Andean communities, by building upon the practices and traditions of the communities themselves within their natural environment (Argumedo & Pimbert, 2006). The Agreement announces the repatriation of traditional potato varieties in the CIP genebank back to the indigenous communities of the Potato Park.

Furthermore, it establishes a collaborative effort to conserve, monitor and develop agricultural biodiversity by linking the in-situ conservation at the Potato Park with the ex-situ conservation practices of CIP. In the Agreement, CIP recognizes the customary rights and responsibilities through which the indigenous communities manage their land and resources, in line with which the centre aims to "Ensure that genetic resources and knowledge remain under the custody of the communities and do not become subject to intellectual property rights in any form." (GRAIN, 2005).[90]

These examples show that CIP is well aware of the variety of perspectives on the sharing and protection of genetic material. It respects these perspectives and tries, where possible, to help the Peruvian state and farming communities protect their resources against misuse. Furthermore, it continues to find new ways of sharing for the public good – i.e. ways of sharing that suit its environment: the centre works together with the Peruvian government and patent office and shares with them its technical expertise, and it collaborates with farming communities and provides them with different products, knowledge and genetic resources. Of course, the centre still aims to collect new potato varieties and facilitate their international exchange for the sake of food security, but it does so within the limits set by its host country and the communities it intends to support. Thus does CIP build a relation of *trust* – of the type that might well be a

[90] At present, CIP and most other CGIAR centers consider intellectual property issues mainly a defensive necessity. On the issue the director of CIP states: "Our primary objective here is to protect the physical and information assets that have been developed as global public goods and guarantee that they remain in the public domain" (Anderson, 2003) But according to the conclusions of a CGIAR Science Council report, this approach no longer suffices. "In order to respond to the increasing needs for IPR guidelines, tools and services, the CGIAR should strengthen its overall capacity in these areas […] Inaction is no longer an option." (CGIAR Science Council, 2006, p. 8). It still has to be seen what IP policy the CGIAR centers will eventually adopt and what consequences this will have for CIP's agreement with the Potato Park. For reasons of clarity and scope this debate on IPRs within the CGIAR, and on ABS issues at Wageningen UR, have not been included in this article.

prerequisite to overcoming the present impasse in the collection and exchange of plant genetic resources.

Protecting for the common good?

So far, what has been described is a situation in which a public research institute, whose mission it is to stimulate the free exchange of potato resources for the public interest, finds itself in an environment that does not support that same goal and instead has to deal with the protection of what stakeholders consider to be their genetic resources or heritage. The opposite situation occurs when a public research institute aims to protect certain genetic resources, knowledge and technologies for the common good, but with consequences that can go against this objective – a situation that will be analyzed in relation to the potato research at Wageningen University and Research Centre in the Netherlands.

Wageningen UR is a framework of cooperation between a university (Wageningen University), a university of professional education (Van Hall Larenstein), and several specialized research institutes organized under the umbrella of a non-profit, private institute (DLO Foundation). This has created a structure in which education is combined with fundamental, policy-oriented and applied research. Together, the mission of Wageningen UR is "to explore the potential of nature to improve the quality of life" (Wageningen UR, 2008, p. 4).

Public research to support the private sector

An important reason for Wageningen UR to protect certain resources is that the institute aims to support the Dutch private sector – to assist it in attaining "the most competitive position possible" (Wageningen UR, 2007, p. 21). The potato sector represents an important part of Dutch

agriculture, with an export value of seed potatoes worth €300 million a year and of starch potatoes and processed products up to €1.5 billion a year (CSG & Wageningen UR, 2008, Presentation Prof. Stiekema). Indeed, the Netherlands has become the global market leader in the development of new potato varieties and the export of certified seed potatoes, and has a large share in the export market of potatoes for consumption and processing.

Mr. van Winden of the Dutch Ministry for Agriculture, Nature and Food Quality acknowledges that the Dutch government aims to "create favourable preconditions for the sector" in order to "help the Dutch breeding sector to retain its leading position in potatoes and other crops" (van Winden, 2007). One precondition is to support research and innovation by funding public-private collaborative research projects. An example is the Technological Top Institute Green Genetics (TTI GG), an institute led by the commercial partners which, in close collaboration with public institutes, notably Wageningen UR, has established a strategic research agenda to "develop and apply genetic information for the creation of crops with improved performance and improved quality".[91] Because the main objective is "to convert knowledge developed in the program into value for the Dutch economy" (TTI GG, 2005, p. 12), intellectual property protection plays an important role within this research program. This means, for example, that the public research partners are bound to regulations on confidentiality over research results and only allowed to publish after the valorization of knowledge has been considered and, if relevant, intellectual property protection applied for (TTI GG, 2007).

Valorization strategies

According to Prof. Visser, head of Plant Breeding at Wageningen UR, these issues are well organized within the research project and the interests of public researchers secured: Intellectual Property Rights (IPRs) have simply "become part of the game" in public research (personal

[91] http://www.groenegenetica.nl/pro1/general/start.asp?t=about [Accessed August 2008].

communication, 2008). In fact, public funding organizations are not only supporting public-private partnerships, but are also increasingly promoting the application of IPRs in public research itself. Organizations like the Technology Foundation STW and the Netherlands Genomics Initiative (NGI) – both part of the Netherlands Organization for Scientific Research (NWO) – aim to combine high quality research with its social application, a mission which has resulted in a strong focus on valorization and an important role for IP policies.

NGI funds the Centre for BioSystems Genomics (CBSG), another public-private partnership in which Wageningen UR collaborates with Dutch industries (through the complete chain of potato breeding and processing). The Centre's aims include unraveling the genetic code of potato plants "to reduce the use of chemical pesticides and improve product quality for consumers and industry" (CBSG, n.d.). NGI has set targets for the Centre at 25 patents, 20 licenses and 2 spin-off companies by 2012 (Heselmans et al, 2008a). Thus NGI aims to go "[from] knowledge to the market: from concept to product or company", in order to "get the most out of genomics".[92] Indeed, according to one valorization officer, if a public researcher were to discover a new genetic trait that stimulates resistance to an important disease but publish before patenting, the discovery might not be developed further, precisely because it could not be protected in the marketplace and investments recuperated (personal communication, 2007).

But Wageningen UR also has its own reasons to develop an effective valorization and IP policy. In order to "generate value from knowledge" (Wageningen UR, 2008, p. 18), the institute has established the Wageningen Business Generator (WBG), to "identify promising opportunities and turn them into thriving businesses".[93] According to Wageningen UR's Dr. Louwaars, one reason for the institute to invest in intellectual property strategies is to generate extra income, especially since

[92] http://www.genomics.nl/Valorisation.aspx [Accessed August 2008].
[93] www.wbg.wur.nl [Accessed August 2008].

genomics and biotechnology research is extremely expensive and funding bodies hardly ever finance the total costs of a research project. Other reasons are to maintain a position at the frontier of science through maximizing its own freedom to operate, and to remain attractive for market parties and acquire research contracts and partnerships (CSG & Wageningen UR, 2008, Presentation Dr. Louwaars). In other words, an extensive IP portfolio can both strengthen one's bargaining position in the market place and reduce the possibility of one's research agenda being blocked by the intellectual property rights of others.

Uncertainties

We conclude that Wageningen UR aims to protect certain resources and research results in order to 1) support the economically important potato sector, 2) meet the terms of funding organizations and stimulate the valorization of research outcomes, and 3) strengthen its own financial and strategic position so as to perform cutting-edge science. All these reasons are likely to support the public interest. Still, there are several uncertainties about whether the protection of research outcomes in public science *is* the best way forward and whether this is, indeed, for the common good.

At the practical level, it is not an easy task to develop an efficient and profitable IP and valorization strategy. Wageningen UR now has to establish effective methods of identifying and then promoting commercially promising innovations, including the negotiation of corporate IP contracts. This is a process only complicated by the disinterest in intellectual property issues of many public researchers. According to one researcher at Wageningen UR, intellectual property issues are often very complex and fall completely outside the expertise of most researchers, for which reason many consider dealing with them a trying business. (personal communication, 2007). Another practical point of uncertainty is a doubt about whether IPRs will, in fact, generate much income, especially when the costs of filing a patent are known to be high. One study shows that American universities received, on average, only

0.56% of total revenues from their patenting strategy in 2003 (Benkler, 2006, p. 340).

At the theoretical level, issues range from philosophical questions about the patentability of living matter (Marchant, 2007; Schonmann, 1998) to reflections on the possible incompatibilities between the call for valorization and the traditions of disinterestedness and independence in public science (Busch et al, 1991; Rhoten & Powell, 2007; van den Belt, Forthcoming). The biggest worry, however, is that IPRs go against the public interest because they can block access to research tools and results and thereby hamper innovation instead of stimulating it (So et al, 2008; Boettiger & Bennett, 2006; Heller & Eisenberg, 1998). Agricultural research can be particularly vulnerable to this because much research is "based on pre-existing plant material, and each incremental improvement now brings with it a number of IP and germplasm constraints that have accumulated in the plant material" (Atkinson et al, 2003, p. 174). The fear is that developing countries especially will suffer from this.

Research for development

This issue was the central theme of a one-day symposium at Wageningen UR organized in the context of the International Year of the Potato. The symposium built upon a recent statement by Mr. Koenders, Minister for Development Cooperation:

> *I would also urge Dutch universities and research institutes to adopt institutional IP policies that take account not only of valorisation of knowledge and incentives for researchers, but also the importance of access to knowledge and freedom to operate for development purposes.* (Koenders, 2008, p. 7)

The key issue is twofold. On the one hand, an increased focus on valorization can steer public research towards profitable research areas like commercial farming – away, that is, from the low or no profit crops of small farmers, especially in developing countries. On the other hand, IPRs can block access to biotechnologies and related knowledge, especially for

parties that have no resources to negotiate and pay for access licenses and patent royalties. During the Wageningen UR symposium, CIP biotechnology advisor Dr. Ghislain confirmed that his centre experiences severe difficulties with accessing IP-protected knowledge and technologies:

> *The transfer of proprietary biotechnology from the private sector (…) has never been so difficult, not to say impossible, (…) the public sector is still transferring proprietary technology but with increasing difficulties and restrictions.* (CSG & Wageningen UR, 2008, Presentation Dr. Ghislain)

The rector of Wageningen UR, Prof. Kropff, agreed at the symposium that the institute has to take these issues into account because it wants to support the Millennium Development Goals – and thus to make knowledge and technology available for developing countries – but it also aims to generate income and spin-off companies by applying intellectual property rights. A possible strategy in this respect is one applied in 1996, when researchers from Wageningen UR transferred a patent on a molecular technology to modify cassava to a Dutch company through a Humanitarian Use License that ensured the royalty-free use of the technology for food security goals and local use, but not for the world trade in starch (Heselmans et al, 2008b). One complicating factor here is that Wageningen UR shares most of its intellectual property with other research partners, so "the question how to transfer that IP and make it available for developing countries is something that we have to discuss together with those partners" (CSG & Wageningen UR, 2008, Panel discussion Prof. Kropff).

New ways of protecting for the public interest

So, the main question is how public research institutes like Wageningen UR can balance protection with sharing for the common good. Protecting public research outcomes with still stronger and broader IPRs is not likely to be in the public interest, but neither is the rejection of any form of IP protection in public research. The real challenge lies in deciding on the

optimum form and amount of IP protection in order to "support innovation for the benefit of society" (Pompidou, 2007, p. 3), which is the ultimate goal of IP regimes and the mission of most public research institutes.

In order to reach that balance, according to the International Expert Group on Biotechnology, Innovation and Intellectual Property (IEGBIIP), public research institutes need to turn away from two "faulty assumptions" that currently characterize IP policies generally, namely "that since some intellectual property is good, more is better; and that IP is about controlling knowledge rather than sharing it" (IEGBIIP, 2008, p. 13). Rather, IP protection should be seen for what it is:

> *(…) a cog in a large system of innovation that brings researchers, universities, companies, government, non-governmental organisations, patients and technology users together to create, improve, disseminate and use new practical knowledge.* (IEGBIIP, 2008, p. 13)

IEGBIIP pleads for a new era of intellectual property protection, which "stresses sharing and collaboration instead of increased protection, leading not only to greater levels of innovation, but better access to new products and services" (IEGBIIP, 2008, p. 8).

A first step towards such an era is to stop putting IPRs on a pedestal, as if, for example, the amount of patents acquired says something about the success of a research project. Instead, funding organizations and public research institutes should look for ways of measuring success that relate directly to their public missions, e.g. the number of partnerships and research platforms in which the institute participates, the number of trainees, or the scope of dissemination of research results. From an ethical perspective, public research projects should surely be judged by their success in enabling global access to their research results for development purposes.

A second step, of course, is to start formulating IP policies that stimulate collaboration and knowledge sharing for the benefit of society.

Wageningen UR is now in the process of developing an IP policy and should look seriously at promising examples in this regard. One such is the white paper issued by a group of universities in the US (California Institute of Technology et al, 2007), which offers guidelines for universities in formulating license agreements with the private sector that facilitate the broad dissemination of university-generated technologies *and* allow the scientific community to conduct further research and development of the licensed material. Another example is the Public Intellectual Property Resource for Agriculture initiative, which brings together public sector intellectual property to make agricultural technologies available to innovators around the world.[94]

Wageningen UR has also built itself experience in this matter, however, as with the cassava license referred to above, the question is whether and how this strategy can be turned into general policy. Given that Wageningen UR shares much of its IP with other parties, decisions have to be negotiated. A complicating factor in such negotiations, according to Prof. Visser, is that "if you want to have a say in the IP management of a research project, you have to bring something to the table" (personal communication, 2008). This means, for example, that the public partner has to share in the costs of the research project and its IP strategy, which can be financially problematic for cash-strapped public institutions. Wageningen UR should, therefore, initiate serious consultation with its research partners and the Dutch government and public funding organizations, in order to reflect on the desired role of IPRs within public research and work together towards new ways of protecting for the common good.

Between sharing and protecting

Manifestly, the two public research institutes described operate in a complex environment in which different stakeholders – including the

[94] http://www.pipra.org/ [Accessed August 2008].

institutes themselves – have diverging interests in, and opinions about the sharing and protection of plant genetic resources, related knowledge and technologies. For public research institutes charged with serving the public interest, finding the right balance between sharing and protection is no easy task. In the case of CIP, we have an institute which is primarily concerned with the global exchange of plant genetic resources for the sake of food security but situated in a country that does not consider this sharing rationale to be in its primary interest and where concerns about biopiracy are widespread. To simply reject the Peruvian position as counterproductive because Peru is as dependent on foreign plant genetic resources as any other country would be to miss the point. Mrs. Rosell agrees that we all have benefited from the former tradition of free exchange of plant genetic resources, but asserts that "there are some that have benefited more" and now "we want some compensation for the contributions of Peru" (personal communication, 2007). It is not that the benefits of sharing go unacknowledged, but rather that the benefits of protecting may appear to be more substantial (to say nothing of perceived historical injustices).

Self-interest

It is not only gene-rich countries and communities that choose to protect their genetic material in order to reap the benefits and preclude misappropriation. Industrialized countries, biotechnology companies and public research institutes set up IP policies for similar reasons. The basic rationale that underlies most decisions about sharing or protecting is rather simple: sharing carries more risk, is more insecure. Protection is a defensive stance in which one holds on to and enjoys the benefits from what one has; sharing gives away the competitive advantage of exclusive access for the promise of benefits that are often indirect and insecure, because they depend on the actions of others, who may even misuse or misappropriate what is shared.

An example of the academic dimension of the defensive stance can be described with respect to the Potato Genome Sequencing Consortium

(PGSC), coordinated by Wageningen UR. The Consortium aims to sequence the complete potato genome by the end of 2010 in order to "meet the world's food needs in the future".[95] The project is based on "an open information policy where all data is intended to be freely shared between the partners and the scientific community at large".[96] In such 'community resource' projects, however, scientists might be data users or data producers (or both). The former are interested in rapid access to all data while the later can be reluctant to put their genome sequences into an open database *straightaway*, fearing that others might use the data in publications before the providers themselves have been able to publish and take credit for their work (Foster & Sharp, 2007).

In 2003, the Wellcome Trust organized a meeting to discuss this issue, which concluded that the "scientific community will best be served if the results (…) are made immediately available for free and unrestricted use," but continued by stating that "it is crucial that the scientific community recognizes and respects the important contribution made by the scientists" (Wellcome Trust, 2003, p. 3), and going on to urge resource users to acknowledge resource producers and cite data sources. Nevertheless – and importantly, I would suggest – the Trust does come with the additional recommendation:

> *Resource producers should recognize that even if the resource is occasionally used in ways that violate normal standards of scientific etiquette, this is a* necessary risk *set against the considerable benefits of immediate data release.* (Wellcome Trust, 2003, p. 4, emphasis added)

Dare to share

In order to promote sharing as beneficial to the wider community, academics and the academic community are urged to take the risks of sharing. A recent CBD-linked report similarly recommends gene-rich

[95] http://www.potatogenome.net/ [Accessed August 2008].
[96] http://www.potatogenome.net/ [Accessed August 2008].

countries and communities not to "sacrifice the invaluable benefits of scientific collaboration (…) out of fear that commercial research cannot be adequately regulated or monitored" (Laird & Wynberg, 2008, p. 130). In this context, Safrin points out that developing countries have repeatedly maintained that they would "completely open up access to raw genetic material within their borders (…) if developed countries would place improved genetic material in the public domain" (Safrin, 2004, p. 672).

The overall message of these examples is that it takes something extra to share. The benefits and risks of sharing depend on the actions of others, like their willingness to reciprocate and potential to misuse resources. Sharing means vulnerability. But as the benefits of sharing for the wider community can be considerable, these risks and uncertainties should sometimes be set aside. For research institutes whose mission it is to serve the public interest, this is exactly what they should do. Even while they are continuously searching for the best balance between sharing and protecting plant resources, knowledge and technologies, the contemporary situation demands that research institutes reconsider their policies in order to develop new ways of sharing – and protecting – for the common good. In a time of hyperownership, public research institutes have a responsibility to show that the current trend of enclosure and protection of genetic material and knowledge can be overcome by daring to share.

Conclusion

CIP and Wageningen UR are situated in totally different environments, but both interact with a range of stakeholders that have strong and diverging interests in respect of the sharing and protection of the plant genetic resources, knowledge and technologies the institutes work with. While CIP aims to promote the sharing of potato genetic resources throughout the world for the sake of food security, Wageningen UR is concerned with supporting the Dutch potato sector. CIP is also, however, confronted with a society that is deeply ambivalent about the sharing goal and where concerns for biopiracy proliferate, while Wageningen UR has

to ensure that its IP and valorization strategies do not impede its research for development goals. It is clear that public research institutes have a difficult job in balancing their sharing/protecting policies in order to cope with the variety of interests involved.

This task is, furthermore, set against the current situation of hyperownership, in which countries, companies and indigenous communities alike fear for their resources and aim to protect them. Public institutes like CIP and Wageningen UR thus have to *collaborate* with stakeholders from the starting point of respecting their protectionist interests. In order to work towards new ways of operating that support both their direct environment and the global community, however, these and other public research institutes should pay attention not to overly protect their own resources. The negative dynamics of hyperownership can only be overcome if all parties take reciprocal steps towards a more open system (Safrin, 2004), but someone has to take the first step. In order to fulfill their mission and serve the common good, public research institutes should not hesitate to take that first step and dare to share.

Six

Reconsidering intellectual property policies in public research: Start document & report of a symposium[97]

[97] This chapter is written by Marianne Heselmans, Bram De Jonge, Wietse Vroom, and Niels Louwaars, and previously appeared as two separate documents (Start document and Report) on the website of the Centre for Society & Genomics, The Netherlands (http://www.society-genomics.nl/publicaties.html).

Start document: Sharing biotechnology with developing countries

Innovators often have to obtain scores of licenses before they can introduce their biotechnology product destined for poor farmers. The process costs a lot of time and money and does not guarantee success. In this way Intellectual Property Rights can block innovation in developing countries. The question for public research institutes is how they can prevent their intellectual property policy from hampering innovation in poor countries. The most promising strategies so far are 'humanitarian licenses' and 'open source biotechnology'.

By 1995, the Papaya Ringspot Virus (PRSV) had almost completely devastated the papaya industry in Hawaii. Thus there was an enormous need to introduce a disease-resistant papaya. The transgenic papaya developed by Cornell University in New York and Hawaii University had already shown excellent resistance in field trials, so the Papaya Administrative Committee (PAC) in Hawaii asked the American law firm Nixon Peabody to analyze the patent landscape, and negotiate licenses. At least ten licenses seemed to be needed, and the law firm encountered serious problems, but eventually the negotiations succeeded. Nixon Peabody and PAC were able to explain that the true beneficiaries were small papaya growers, and where sympathy for the growers was not sufficient, the United States Department of Agriculture (that created PAC) was helpful. As the USDA is an important regulatory agency, the licensors wanted to remain in the USDA's good books so as to avoid jeopardizing approvals for their own projects. All license agreements were completed by April 1998 and distribution of transgenic papaya seeds started in May 1998 (Goldman, 2007).

Access becomes more difficult

This case, extensively described in the IP Handbook of Best Practices (www.iphandbook.org – free access), demonstrates how difficult it has become to introduce a 'small' crop developed using modern biotechnology. But in this 'best practice' at least, the negotiators succeeded. This was due to a number of factors: The Papaya Administrative Committee had enough money to pay a vested law firm, they received assistance from the influential USDA, and this papaya, developed in 1992, has fewer IPR's than more recently developed transgenic varieties. In many other cases - rarely described in the literature - the negotiators did not succeed, or didn't even start due to lack of money, legal expertise and time.

As biotechnology becomes more complex, the number of IPR's - and the risks of infringing them - increases. A cursory search of plant-related utility patents shows that patents filed under the United States Patent and Trademark Office (USPT) plant classification have increased steadily from 5 in 1981 to 777 in 2006 (Yancey & Stewart, 2007). About 45 patents and 6 material transfer agreements alone are associated with the famous vitamin A enriched Golden Rice. These patents are owned by approximately 30 companies and public institutions. Another example is the International Vaccine Institute in Seoul, devoted to bringing vaccines to the poor. It makes use of at least six distinct technology fields for the plant-derived vaccines they produce: engineering of antigens, antigen production and accumulation in plants, genetic transformation of plants, selectable marker systems (for the identification of plant cells that have successfully taken up the DNA), transcription regulatory elements (to ensure that the introduced genes are expressed in plants), sub-cellular targeting systems and bioprocess engineering for extraction and processing. All these areas are protected by scores of patents, confidential information agreements, and material transfer agreements.

Access to IPR is not only a problem for transgenic crops. Conventional plant breeders are also increasingly making use of molecular technologies.

Both these (enabling) technologies and the databases with (genomic) information are often protected.

Two problems for the creators of products

The increasingly complex patent landscape has led to two major problems for the creators of products for neglected markets. The first is the expensive process of analyzing the IPR landscape: which patents and other agreements do they need licenses for, and what are the chances of obtaining them? In many cases, searching for a biotechnology patent has become an inexplicably frustrating process. There is no streamlined, universal approach for searching for patents filed at the various patent offices. The three main repositories of English language filings – the European Patent Office (EPO), the US Patent and Trademark Office (USPTO) and the World Trade Intellectual Property Organization's Patent Cooperation Treaty – offer databases with online search tools that all work differently, even displaying different results. To make it worse, each patent of interest must be downloaded and printed one page at a time – even though it may be 100 pages long, and although patents and patent applications are disclosed, license agreements are often not. As researchers from the University of Tennessee conclude in Nature Biotechnology of November 2007: "Add to the mix defensive patenting, a complex classification system and a lack of information available on the license status of certain technologies, and it becomes difficult to know what privately developed technologies are available for use by researchers" (Yancey & Stewart, 2007).

An even more serious problem is obtaining all licenses free, or for a price that the innovator can afford. In the case of the Hawaiian papaya, Michael Goldman from Nixon Peabody describes the bottlenecks: "All licensors were sympathetic to the need to introduce a transgenic, disease-resistant papaya in Hawaii", he writes. "However, each had its own strategic interest, which needed to be protected" (Goldman, 2007). Most public institutions did not, at that time, have an institutional policy of, or experience with, licensing out and were reluctant to proceed with setting a

corporate-wide strategy based on a license for a very small crop. Some were concerned that the deal with the Papaya Administrative Committee would dictate the terms for future licenses on more important crops. In addition, when the licensors saw that large, well-known fruit packing companies were members of PAC, questions were usually raised as to who was being aided by the licensors. So PAC had to explain a lot about the papaya industry. What made the negotiations more difficult was that many of the individuals working on business development for the licensors were very busy, and did not have much time for such a small crop with its potentially small economic return.

Dilemma for public institutes

The universities and the National Agricultural Research Institutes (NARS) are now confronted with a dilemma. Researchers – also in the South – have been increasingly stimulated to protect their knowledge. With a stricter patent policy, financers hope to recoup the investment in research, and stimulate private-public cooperation and 'valorization'. For instance, the Netherlands Ministry of Education, Science and Culture wants to stimulate patents on universities with a new measure: researchers will receive a part of the return from their own patents for private use, in order to keep top quality scientists in the public sector. Also the private sector – increasingly collaborating with universities – tends to lean toward stronger Intellectual Property protection (The World Bank, 2006).

However, public institutions also want to assist poor countries. The Wageningen University and Research Centre's 2007-2010 Strategic Plan states that they want to "both strengthen international cooperation in the field of research and education, and take a more serious look at the possible international applications of existing knowledge" (Wageningen UR, 2007). So on the one side researchers have to protect their knowledge, and on the other they have to share their knowledge in support of development goals. This issue was recently put on the agenda by the Netherlands Minister of Development Cooperation, Bert Koenders, at the 'Knowledge on the Move Conference' in The Hague on 28 February

(2008). This ministry is a strong proponent of sharing knowledge. "In relation to developing countries, access to knowledge is more important than possession of knowledge", Koenders stated. He would also "urge Dutch universities and research institutes to adopt institutional IP policies that take account not only of valorisation of knowledge and incentives for researchers, but also the importance of access to knowledge and freedom to operate for development purposes" (Koenders, 2008). The EU is also paying attention to this problem. A workshop at the International Rice Research Institute (IRRI) this year – sponsored by the EU – will address the issue that formal intellectual property right protection may impede the transfer of advanced technologies from EU public research to developing countries.

Adapting the patent policy

So there may be several reasons for public research institutes to reconsider their own intellectual property policy, but what can they do to prevent developmental goals from being hampered by this policy. In the United States, each of the top four public recipients of U.S. patents in 2004 states 'public benefit' as an explicit goal in its patent policy. For instance, the California Institute of Technology (135 patents) has formulated it thus: "(…) If there are innovations or discoveries that result in the filing of patent applications and the acquisition of patents, the Institute intends to serve the public interest by prudent and appropriate efforts to transfer the technology to those who will facilitate public use".[98] And the Massachusetts Institute of Technology (132 patents) writes: "(…) It is in the context of public service that M.I.T. supports efforts directed toward bringing the fruits of M.I.T research to public use and benefit".[99]

Such general policy statements are needed to adapt the usual Intellectual Property strategy in an institute, but they do not provide insight into the management of a specific project. When a Dutch public-private

[98] See http://www.ogc.caltech.edu/Patent_Policy.htm [Accessed March 2008].

[99] See http://web.mit.edu/tlo/www/community/guide4.html [Accessed March 2008].

consortium starts breeding a Phytophthora resistant potato, or when an international consortium starts sequencing the banana, how can these consortiums formulate an IP strategy that doesn't hamper the development of crops for neglected markets? Out of the international debates in the past twenty years, two concrete strategies have emerged: Humanitarian Licenses and Open Source Biotechnology. Neither option infringes current IPR law, have been practiced, and are being developed for biotechnology.

Humanitarian Licences

Humanitarian Use Licenses (HULs) have always been part of IPR law. Governments are even allowed to force HULs, when they think a specific patent blocks a public goal, but they seldom use this right. According to Wikipedia, Humanitarian Use Licenses "set the conditions for the provision of access to innovations for people in need on a royalty-free basis or at lower costs."

Universities offer several examples of humanitarian IP management. In 1996, the Wageningen University has transferred a patent (on a molecular technology to modify cassava) to the Dutch company Avebe. However, the university has ensured that the cassava technology can be used royalty free for food security goals and local use, but not for the world trade in starch. The Cornell University has transferred its ring-spot-virus-resistant papaya to Haiti and Thailand. And the most cited example is Golden Rice. The inventors of the technology (University of Freiburg) licensed their invention related to golden rice to Greenovation, a biotech spinout company, owned by the inventors themselves. Greenovation then exclusively licensed its Golden-Rice-related patents to AstraZeneca (now Syngenta). However, in the licensing arrangements, a humanitarian-use clause was used to commit the inventors to donating their technology to the poor. The arrangement allows for the granting of licenses to any bona fide research organization for the development of Golden Rice. The rice can be used royalty free and allows farmers to earn up to US $10,000 per year from its sale. Higher sales would require farmers to acquire a

commercial license from Syngenta. Other companies holding Golden-Rice-related patents also agreed to the same arrangement.[100]

Multinationals have already shown willingness to segment markets - they facilitate access to some of their technologies in poor countries. Examples include not only Golden Rice, but also the successful commercialization of the transgenic, insect-resistant hybrid eggplant and the transgenic, disease-resistant groundnut in India. Both are orphan crops, developed with royalty-free licensed technology from Monsanto. In the case of the groundnut story, an agreement was penned for non-exclusive licensing of the so-called Coat Protein technology. The licenses are free of royalties and upfront payments to public institutions planning to develop the varietal groundnut, but they include upfront payments and royalties for companies planning to develop hybrid groundnut cultivars.

High transaction costs

Companies can win greater esteem from the public by accepting humanitarian licenses and, in some cases they also appear to use humanitarian licenses to open up a new market, for example by including specific obligations in the license. Hence humanitarian licenses may also be favorable for the donator. However, humanitarian licenses alone will probably not provide a solution for the long term, because of the high transaction cost involved with the need to arrange so many different licenses for an individual project. The market is already responding to this problem. Several initiatives aim at supporting technology transfer and lowering transaction costs for the creators of poor farmers biotechnology products. For example, the International Service for the Acquisition of Agri-biotech Applications (ISAAA) and, more recently, the African Agricultural Technology Foundation (AATF) have both been established to provide a broker role between technology users and providers. The ISAAA - financed by companies, foundations and governmental institutes - has brokered several transfers, including the transfer of local varieties of

[100] See http://www.goldenrice.org/ [Accessed March 2008].

potato from Monsanto to Mexico, as well as the transfers of ring-spot virus resistant papaya from Monsanto and the delayed-ripening papaya from Syngenta - both in Southeast Asia. However, neither the goodwill of the multinationals, nor the mediation by such organizations can provide a structural solution. These broker organizations do indeed reduce the transaction costs for the creators of products aimed at poor farmers, but barely reduce the total transactions costs.

Formats for humanitarian licenses

Transaction costs may be reduced by services designed to help steer clients to information and access to patented technology, some of which are for free. For instance, PatentMonkey (www.patentmonkey.com) offers free database searching, only charging fees for more extensive services. There are several non-profit organizations that specialize in helping underserved communities in the developing world. The Coalition for Patent Fairness (www.patentfairness.org) is an advocacy group working to reform innovation-stifling practices and address patent litigation issues.

Public institutes could lower transaction costs by accepting a format for humanitarian licenses that could serve as a standard in all cases. Consortia of research institutes could develop a clause in the consortium agreement that automatically grants a humanitarian license to all users of a certain category in a similar manner as the ‘Golden Rice’ contract. Such a clause has been developed by the participants of the Generation Challenge Programme, a program of the Consultative Group on International Agricultural Research (CGIAR). The partners in this program collectively work to use genomic techniques to increase the accessibility of genebank collections and to improve crop productivity in drought-prone environments (Barry & Louwaars, 2005).

Open source biotechnology

Another solution may be open databanks and pools of biotechnologies made freely available for humanitarian use. Databanks could list technologies, identify the owners and provide information on the specific licensing terms for each listed technology, including type of license, field of use and the intended beneficiaries for the use of the technology. One of the organizations working on this is the Public-Sector Intellectual Property Resource for Agriculture (PIPRA), based in the US. This organization, funded by the Rockefeller and McKnight Foundations, identifies and develops approaches for encouraging technology managers to adopt humanitarian licensing models, and helps its members (through 40 institutes in the North and the South) access new agricultural technologies (Atkinson et al, 2003). PIPRA analyzes the members' IP policy (on request), gives IP management workshops and has recently released the "IP Handbook of best cases". The initiative also involves the development of a database to pool the IP assets (patents and licenses) of the participants.[101]

The public plant biotechnology institute CAMBIA based in Australia (www.cambia.org) develops technology for its own open technology bank, named BIOS. The technology has been patented, but is free under the terms of the group's "Biological Open Source Licence". Anyone using the technology has to contribute the improvements they make to the core toolkit – a model similar to the general public license used in open-source software. The CAMBIA technology includes a version of the important GUS technology, called GUSPLUS, and Transbacter, which bypasses the established and heavily patented transformation process for transferring genes into plants.[102]

A second, more recent initiative (in an even newer branch of technology) is the open bank of the BioBricks Foundation. The BioBricks Foundation is a not-for-profit organization founded by 'synthetic biologists' from

[101] See http://www.pipra.org/ [Accessed March 2008].

[102] See http://www.cambia.org/ [Accessed March 2008].

MIT, Harvard, and the University of California. This foundation encourages the "development and responsible use of technologies based on BioBrick™ standard DNA parts that encode basic biological functions". Everyone is invited to use the free DNA sequences, and to collaborate in building this bank. To stimulate participation, the foundation organizes an annual competition for student teams, called the International Genetically Engineered Machine competition (Igem). Each university team is obliged to put the DNA parts they have used for the Igem competition into the open source.[103]

Are the public institutes really confronted with a dilemma?

Studying these initiatives, a second question may emerge: are the public institutes really confronted with a dilemma? The Association for the Advancement of Science (AASS) in the United States anticipates that at least some types of humanitarian IP strategies will have little or no impact on licensing revenues for the technology creator. As Amanda Brewster from the AAAS put forward in the IP Handbook, "Whether that will be the case may depend on whether humanitarian licensing becomes commonly practiced and accepted" (Brewster et al, 2007). The same will probably be true for collaborating with open databanks. When biomedical scientists Harold Varmus, Patrick Brown and Michael Eisen put forward their idea of high quality, free PLoS journals in 2000 many scientists were skeptical, but since the start in 2003, an increasing number of leading scientists have started to publish in a PLoS journal. Now, a publication in a PLoS journal has almost the same impact-factor for a research group as a publication in Science or Nature.

[103] See http://bbf.openwetware.org/ [Accessed March 2008].

Figure 1: Conference Program

	Chair: **Julian Kinderlerer** (TU Delft)
	Defining the problem and setting the scene
10:00 – 10:15	Prof. **Julian Kinderlerer** *Welcome* (TU Delft)
10:15 – 10:45	Dr. **Henk van den Belt** *Defining the problem: How has intellectual property protection in biotechnology evolved?* (Wageningen UR)
10:45 – 11:15	Dr. **Marc Ghislain** *Defining the problem: The case of international potato research for development countries* (International Potato Centre, Peru)
11:45 – 12:15	Dr. **Niels Louwaars** *Developments in institutional IP policy: the case of plant sciences* (Centre for Genetic Resources; Wageningen International**)**
12:15 – 12:45	Dr. **Ard Cools** *Developments in institutional IP policy: The case of the Dutch Technology Foundation* (Dutch Research Council; STW-NWO)
	Current practice and pathways to possible solutions
14:00 – 14:30	Prof. **Willem Stiekema** *Current practice: The case of CBSG* (Centre for Biosystems Genomics)
14:30 – 15:00	Prof. **Steve Hughes** *Possible solutions: Open-source biotechnology* (CAMBIA; Egenis centre for Genomics in Society)
15:30 – 16:00	Dr. **Kyle Jensen** *Possible solutions: Public sector Intellectual Property Resource for Agriculture* (PIPRA)
	Reflection on the problems and proposed solutions: Panel discussion
16:00 – 17:00	Chair: Prof. **Michiel Korthals** (Applied Philosophy, Wageningen UR) Panel members: Prof. **Martin Kropff** (Rector, WUR), Dr. **Sjefke Allefs** (Agrico Research), **Geoff Tansey** (Consultant), Dr. **Victoria Henson-Apollonio** (CGIAR CAS-IP)

Report: Increasing access to biotechnology results[104]

Formulating a general patent policy that satisfies all stakeholders will not be easy for Wageningen University and Research Centre (WUR) and other public institutes. The different interests at stake within the organizations were very clearly apparent at the workshop 'Reconsidering Intellectual Property Policies in Public Research', held on 11 April (2008) in Wageningen. The following is a report of the main discussions and findings of the workshop.

Intellectual property protection is caught in between the need for valorization of research outcomes, and the wide availability of these outcomes. For example, biotechnologists regard patents as a crucial tool in acquiring research contracts. Added to that, they can help safeguard a top position in research rankings and may boost income. Using patents as 'currency' – to remain attractive for market parties – is a worldwide trend, and it is very difficult not to go along with it, because research funding bodies including the Dutch government organizations such as STW and NWO currently promote patenting of research results. For instance, those funding the Wageningen Centre For BioSystems Genomics (CBSG) have set a target of obtaining 25 patents, 20 licenses and 2 spin-offs – all in the coming five years.

However, as a public organization, Wageningen University and Research Centre has a mission to contribute to agricultural development in poor regions, and this goal may be hindered by the fast growing number of patents. Rector Martin Kropff formulated the dilemma during the closing debate: "The millennium goals are important for us, they are part of our

[104] This symposium has been funded by the Centre for Society and Genomics in The Netherlands.

strategy, and technology has to be available for developing countries. But we also have to follow the current system of IPR, for instance because we want to generate spin-out companies." While the rector did not yet have a concrete answer, he promised that the existing policy group on Intellectual Property Rights at WUR would take into account the outcomes of this symposium.

Liability: bottleneck for the patent holders

Research institutes devoted to poverty reduction indeed face increasing difficulties in obtaining the biotechnology they want, stated Marc Ghislain, biotechnology advisor at the potato institute CIP in Mexico. "Today", he concluded in his speech, "the transfer of proprietary (bio)technology from the private sector (…) has never been so difficult, not to say impossible." According to Ghislain, public institutes are still transferring proprietary technology, but are encountering increasing difficulties. He gave the example of potatoes bred at CIP using a parent with engineered PLRV resistance (acquired in 1993). This technology could not be provided to India due to lack of response from the technology holder. A second example concerned a Bt gene construct for insect resistance; the company has refused to provide this construct due to liability and reputation risks.

In the last decade, it has become more difficult to obtain (humanitarian) licenses, and liability of the patent holder is a major cause at present. The patent holder cannot fully control what happens with his genes or enabling technology, and he fears brand name damage in the case of misuse or bad product performance. What makes this worse is that according to the Cartagena protocol on Biosafety, the patent holder is likely to be liable for financial claims in case of damage caused by transgenic technology.

In addition, the patent-holder may fear that licensing to several institutions in the South decreases the patents' value and jeopardizes negotiations with commercial partners. The requesting institutes often have weak infrastructure and weak funding, and they lack expertise on Intellectual

Property issues which worsens their credibility. Added to that, many public institutes devoted to poverty reduction lack a clear definition of the end-product(s) that they want to produce, and they may not be able to guarantee that only resource-poor farmers will commercialize the products. It is therefore clear that institutes devoted to poverty reduction, including the CGIAR institutes, will have to elaborate a clear patent and R&D policy if they are to increase their credibility in the eyes of the patent holders.

Lowering the transaction costs

Nevertheless, Ghislain and some other professionals at the workshop expected that humanitarian licenses for these poverty-reduction-institutes can at least partly solve the dilemma. Victoria Henson-Apollonio, IP advisor for the CGIAR institutes, asked why public institutes shouldn't formulate a general policy that guarantees some sort of a humanitarian license or freedom to operate for these institutes in all patent negotiations. This could be realized with clauses that prevent misuse. For instance, a clause such as that used by the Wageningen University in the cassava project in 1996: the cassava technology can be used royalty free for food security goals and local use, but not for the world trade in starch. Similarly, CGIAR's Generation Challenge Programme uses a consortium agreement in which the use of humanitarian licenses has been standardized for all projects under the program. The advantage of such arrangements is that they lower the transaction costs, which can be a significant hurdle for humanitarian licenses. Wageningen UR is party to this consortium.

An alternative approach to lowering the transaction costs for humanitarian licenses was presented by Kyle Jensen of PIPRA - the Public sector Intellectual Property Resource for Agriculture. PIPRA is an IP management office, started by the land-grant universities in the USA, which facilitates the transfer of technology to developing countries. PIPRA aims to pool the currently fragmented intellectual property in the public sector and making it easily available through a database. This way, any person interested in a specific technology can easily find out whether

it is publicly available, and from which institutes. While many participants agreed that this initiative is promising, Jensen acknowledged that the patent pool has had limited impact so far. PIPRA has therefore extended its activities to Intellectual Property research, capacity building and the creation of packages of available proprietary technologies that together constitute a valuable asset for research in the South (e.g. transformable vectors).

Geoff Tansey was, however, critical towards the capacity building program within PIPRA. He questioned the role of intellectual property protection in developing countries more fundamentally. The Intellectual Property system has been developed from a Western perspective, with rules that suit Western countries. By accepting this international patent system (signing the TRIPS agreement), developing countries no longer have the chance to copy technologies, which was crucial for developed countries in the past. Therefore, according to Tansey, capacity building can also be regarded as a way of promoting acceptance of this Western system.

Open source for fundamental research

The social scientists presented many arguments in favour of patent pools and open source strategies, such as that of PIPRA and CAMBIA in Australia. Henk van den Belt from the Applied Philosophy Group at WUR reminded the audience that we should not necessarily take for granted the science ethos behind the current patenting strategy. In 1942, Robert Merton defined the “ethos of science” then as “communism, universalism, disinterestedness and organized scepticism” – totally different from the current ethos, in which biotechnologists are stimulated to file patents for commercial reasons.

Van den Belt and other social scientists also suggested economic reasons for adopting open source strategies: the proliferation of patents upstream (genes, DNA fragments, research tools) hinders innovations downstream (e.g. drugs, transgenic crops). Besides, the transaction costs to obtain

freedom to operate are very high, the patents are only profitable for the biggest potential 'blockbusters', and they cause market under-investment in public goods.

Steve Hughes, a social scientist from Exeter University, pointed out how disappointingly low the revenues are that American universities receive from their patenting strategy: only 0.56 % of their total revenues come from licensing and royalties. He suggested that patenting no longer fits the current 'network' character of genomics research. A highly interconnected network of dozens of research groups will be more productive if there are many soft ties rather than hard property rights. The patenting system does not mesh with the latest ideas about innovation either. In the new innovation strategies, all stakeholders (institutional, professional and individual, including farmers) 'co-generate' knowledge and innovation. In such a learning and interactive network, patents can be very unproductive.

Some professionals at the meeting therefore proposed putting all research financed by public money in an open source domain. However, most participants were not convinced about the advantages of such a general policy. Farmers – also poor farmers – can benefit from patented technology, for instance, because patents can stimulate local business to bring those technologies to the market. This is why the potato institute CIP in Peru – financed with public money – applies for Intellectual Property in some cases. For innovation, it will be more important to put the results of fundamental research in an open source domain than the products and the results of more applied technologies, according to some participants.

Access to non-patented technology

Kyle Jensen already noted that simply having a patent pool is not sufficient for transferring technology, and therefore, PIPRA is getting more involved in outreach activities such as capacity building. Victoria Henson Apollonio suggested to include also non-patented technologies in the technology pools that PIPRA offers. "The patented part of the knowledge is relatively easy to find", she said. "But all other knowledge,

and especially the knowledge that is important for low-tech solutions, is often not available."

The access problem not only concerns the untraceable low-tech solutions, but also the fact that scientific articles are often either untraceable or too expensive to read (because they are published in expensive journals). Considering that, so far, most knowledge developed within public research institutions have not been patented, the lack of access must have other causes than the patent policies alone. The rectors of the Dutch universities have recognized this broader access problem, said Martin Kropff, and they will evaluate this point in the coming months.

A final point is that access to technology, material and knowledge – patented or free – is often not enough for innovation to take place in poor regions. For instance, breeders are free to use planting material protected with (only) plant breeders rights. However, breeders in developing countries seldom use this material for further breeding. Institutes in the South also need opportunities, funding and expertise to be able to use open-access knowledge and technology. This means that public institutes have to do more than just adapt the current Intellectual Property Policy: they need to teach PhD students from the South, collaborate in innovation projects and participate in other ways in capacity building in the South. Therefore, they must continue to invest money in North-South research, some professionals remarked.

Epilogue

In 2007, the European Patent Office (EPO) published a report, called "Scenarios for the future". This report questions the validity of the current patent system for biological products, and illustrates the unclear impact of patents in innovation. It also acknowledges the significant differences between innovation in biological materials and industrial products, and opens the door to a differentiated understanding on how a system for intellectual property protection can serve best innovation (EPO, 2007). Because the report comes from EPO, the statement can have important

consequences for the legal and policy environment in which public research institutes such as Wageningen University and Research Centre (WUR) have to operate, and therefore for the problems that have been discussed in this workshop. The issues discussed show that public research institutions in the North should carefully reflect on the role of public funded research and the institutional settings in which such research takes place. Initiatives such as PIPRA and CAMBIA may provide some guidance in this process. In addition, requirements set by research funding organizations concerning valorization of research need to be reassessed.

The workshop has emphasized the complexity of the IP debate and the various approaches that can be taken to increase the 'freedom to operate' for researchers in developing countries. Overall, the conference has made clear that the patent discussion needs to be placed in a wider context. Liability issues, weak infrastructure and a lack of control over production processes at most public research institutes in the South seriously weaken their credibility in the eyes of patent holders willing to provide technologies via humanitarian licenses. High transaction costs and the difficulty of finding useful technologies – both patented and non-patented - further complicate the access to technology. As such, it became clear that access to intellectual property is only a precondition for a wider strategy in which capacity building and institutional partnership can truly contribute to the development in the 'South'.

Seven

Valorizing science: Whose values?[105]

[105] This chapter is written by Bram De Jonge & Niels Louwaars and previously appeared as a viewpoint article in the Science & Society Series on Convergence Research in *EMBO Reports*, 2009, **10**: 535-539.

Valorizing science: Whose values?

Valorization — essentially, the creation of economic value — has become a new maxim of modern research, in particular for areas with a strong link to technological development. This trend is a result of the growing influence of the market economy in public policy, which has asserted that public investments into science should generate returns that benefit the economy. Indeed, research managers are evaluated increasingly on the basis of various economic outputs — similar to the bonus-driven contracts of financial managers — which can include the number and value of patents and license contracts, the number and value of research contracts, and the number of publications. This growing emphasis on valorization goes hand-in-hand with the concept of 'the enterprising university' (Williams, 2003).

The growing emphasis on intellectual property (IP) rights as crucial elements in the valorization trend, their exploitation, and the inevitable secrecy that is required to protect them, clash with the traditional scientific values of openness, transparency and the sharing of knowledge. Moreover, too strong a focus on exploiting the economic benefits of research impinges on potential societal benefits, particularly those that would improve conditions for poorer communities or developing countries. This discussion, about the use of knowledge generated by public research, is one of the tensions between science and society, and is an important target for convergence work to reconcile different views. However, as our experience has shown, there are major challenges to convergence, notably when stakeholders might not easily agree on the problem to be resolved.

The trend towards valorization remains strong. Consider, for example, the Netherlands Genomics Initiative (NGI), which was established in 2002 by the Dutch Government "to get the best from genomics" and "to ensure that

society and economy benefit from the breakthroughs enabled by genomics".[106] NGI sets ambitious goals for its research projects, which are funded by the government to the value of €280 million. In addition, NGI expects to receive around €220 million in investments from industry, academia and research institutes between 2008 to 2012. The research program has set itself a task of producing 370 invention disclosures, 185 patent applications, 150 licenses, €45 million in investments from private parties and 16 spin-offs.[107]

In a similar manner, Wageningen University and Research Centre (Wageningen UR, the Netherlands) — comprised of Wageningen University, Van Hall Larenstein University of Professional Education and several research institutes — considers itself to be an enterprising university promoting "science for impact" (Kropff & Kalwij, 2008), and generating "value from knowledge" (Wageningen UR, 2008). To this end, Wageningen UR established the Wageningen Business Generator (WBG) with the intention to "identify promising opportunities and turn them into thriving businesses".[108]

Such strategies bring science closer to society, and respond to the view that scientific endeavor can no longer be separated from society because science and society affect each other in many ways (MacKenzie & Wajcman, 1985; McGinn, 1991). The trend towards economic valorization can be seen as an extra dimension in this continuing integration of science and society. The primary idea behind it is that the private sector is more closely linked to society and its needs, and is therefore better suited to making science work for society by creating new products, services and applications.

But, is this focus on economic indicators and progress the optimal policy for science to contribute to society? Moreover, is it good for the advancement of science itself? Bart Penders and co-authors (Penders et al,

[106] www.genomics.nl [Accessed 21 February 2009].
[107] http://www.genomics.nl/valorisation/ [Accessed 21 February 2009].
[108] www.wbg.wur.nl [Accessed 21 February 2009].

2009) have argued in this Science & Society Series that the profound changes that have taken place in the research environment since the 1960s "raise the relevant question of how to shape the interaction between science and society". The trend towards valorization feeds into this interaction and must be subject to its reflection.

The focus of funding agencies and public research institutes on economic benefits is the result of policies that began in the 1980s. In particular, both President Ronald Reagan's administration in the USA and Margaret Thatcher's government in the UK markedly reduced public expenditure and increased the influence of the private sector in all areas of society, including research. The protection of IP seemed crucial both for creating effective linkages with the private sector and for universities to generate income from research.

The Bayh–Dole Act in the USA, which was adopted in 1980 and allows universities and research institutes to economically exploit their IP , is generally considered to mark the beginning of the valorization of publicly funded research; it "overturned the presumption that publicly funded research could not be privately owned or exploited" (Hope, 2008). It even managed to replace — or, at least, to weaken — the basic maxim of the manner in which science has advanced historically. According to the philosopher Karl Popper (1902–1994), the advancement of science is based on conjecture and refutation: new insights and theories are considered to be valid for as long as they have not been proven wrong. However, this approach only works in an 'open society' with guaranteed access to information and research tools that allow others to attempt to confirm or refute scientific findings (Popper, 1969). The increasing focus on valorization through patents and licenses therefore puts constraints on the open access to, and use of, information, thus jeopardizing Popper's views of scientific advance. In particular, a US Federal Court decision in 2002 has since restricted the 'research exemption', which had previously

allowed public research with no direct commercial goal to circumvent intellectual property rights.[109]

Moreover, the growing protection of the raw materials of science — knowledge, tools and genetic material — raises the danger that research and development might fall into an 'anticommons trap'. This term refers to the "tragedy of the anticommons" (Heller & Eisenberg, 1998), in which too many entities have exclusive rights to a given resource, with the effect that this resource becomes underused. Exclusive rights in the form of patents can hinder innovation, as innovators might find it too costly or even impossible to use the knowledge or research material that they need — a situation that would not serve the needs of either science or society. A related cause for concern is ongoing company mergers, which are driven, in part, by IP portfolio strategies. Mergers reduce the number of players in the market and discourage newcomers, and the concentration of power in only a few hands makes it more difficult to acquire licenses on IP protected technologies (Kloppenburg, 2004).

Conversely, it can be argued that 'open science' cannot serve the strategic needs of modern societies. In this context, the NGI can again act as an example. The NGI is funded by the Dutch Government, which decided to invest the revenue it receives from the exploitation of natural gas reserves in the 'knowledge economy'. Under the traditional research model, published knowledge is not bound by national borders or any other borders. However, a government that makes investments to secure and increase the prosperity of a nation will favor strategies that predominantly benefit its economy and other players within its borders. As investments in genomics and other biotechnologies are very cost-intensive, the focus on IP protection and the involvement of the private sector is therefore a rational strategy.

So, should society be bothered about losing some of its academic freedom when, in return, it obtains significant funding for a research environment

[109] John Madey v. Duke University: 307 F.3d 1351 (Fed. Cir. 2002).

that is specifically focused on supporting its economic goals? A major argument against such a deal is the fact that not all of society's goals and objectives are economic. In the context of the current valorization trend, we might well wonder whether we are exchanging the traditional ivory tower built on the pretence of 'pure' science for a fortress constructed on the foundations of market philosophy.

The traditional role of scientists — as researchers who work to advance science in order to serve the public good — is still very much alive. At a local and national level, this role might indeed coincide with a country's economic goals, but the same might not be true at a global level, where 'science valorization' has a different connotation. Globally, values do not simply relate to national economic competitiveness but instead to global societal objectives, notably the reduction of poverty, hunger and child mortality. The UN Millennium Development Goals (MDGs) have been established to address these challenges and science is expected to have a crucial role in achieving the goals (Juma et al, 2005).[110] Nations, as well as organizations, have subscribed to the MDGs, and universities have committed to contribute their knowledge, research capacity and technology through education, collaborative research and technology transfer. How then, can the economic valorization and public–private partnerships relate to supporting the MDGs and the poor?

IP, in fact, has a crucial role in this regard. The main goal of patents is to promote investments in innovation by giving the innovator a time-limited exclusive right to commercially exploit their invention. Second, patents aim to promote technology transfer because the value of IP tends to increase with wider commercial use of the invention. The questions, then, are how efficient are IP rights in promoting innovation for the poor, who do not constitute an effective market; and to what extent do they drive up the transaction costs or even block technology transfer, especially for commercially less interesting applications?

[110] www.un.org/millenniumgoals/ [Accessed 21 February 2009].

Molecular biology, for example, has both enormous economic and societal potential. It can be used, for instance, to develop crops suited to the needs of farmers in developing countries or to produce medicines and vaccines to tackle diseases that predominantly affect the poor. However, the products of molecular biology, genomics or biotechnology have so far hardly benefited poorer countries and their citizens because the technology is primarily used to develop products that are either too expensive or targeted to the particular needs of wealthy populations (Fresco, 2003b; Singer & Daar, 2001). Supporting one societal goal might therefore be to the detriment of another societal objective. Market mechanisms might not work well for non-commercial objectives, but universities are expected to serve both at the same time. This dilemma was formulated by the Dutch minister for Development Cooperation who urged "Dutch universities and research institutes to adopt institutional IP policies that take account not only of valorisation of knowledge and incentives for researchers, but also the importance of access to knowledge and freedom to operate for development purposes" (Koenders, 2008).

In response to this call, a conference was organized at Wageningen UR in 2008 under the title "Reconsidering intellectual property policies in public research — sharing the benefits of biotechnology with developing countries" (Heselmans et al, 2008a). The meeting was co-organized by the Centre for Society and Genomics (CSG, the Netherlands), which is funded by the NGI to provide "insight into the relationship between society and genomics, while at the same time stimulating the dialogue between all stakeholders involved".[111] The conference brought together participants from fields as diverse as plant sciences, development studies, research and intellectual property management, the private seed industry and civil society. As such, it was an example of the 'convergence work' that the CSG and its researchers try to practice. As Peter Stegmaier wrote in the introduction to this Series, convergence work is "the joining of research with dialogue, analysis with advice, different academic disciplines with one another and with non-academic practices, and communication with

[111] www.society-genomics.nl [Accessed 21 February 2009].

critique, in order to realize and balance the interests of various stakeholders" (Stegmaier, 2009).

The conference took up this challenge by bringing together presentations from a broad range of perspectives on the topic: the changing trends of intellectual property management at Wageningen UR; the perspective of public funding organizations on the valorization of research outputs; the limited freedom to operate as experienced by researchers in developing countries; current practices of IP management in public–private partnerships; and potential strategies to increase the freedom to operate for 'research and development'. Many issues and perspectives came to the fore.

On the one hand, various attendants pointed out the 'incentives' that push universities towards economic valorization. First, funding bodies implement the valorization policies through inclusion of economic parameters in their contracts. Universities are eager to participate in large programs such as the NGI for both academic and financial reasons; the sheer size of the program allows them to develop and use research capacity in terms of equipment and human resources that other funding mechanisms would be unable to finance. By participating in the NGI , however, universities have to comply with the economic indicators. Second, universities also invest in economic valorization for their own purposes. For example, they apply not only for patents to generate additional income, but also to strengthen their position in public–private partnerships. Third, there is a herd mentality: everybody seems to invest in IP these days, so public research organizations do the same in order to maintain their position at the frontier of science and to maximize their freedom to operate. As Marc Ghislain from the International Potato Centre (CIP, Peru) pointed out, the result is that "[t]he transfer of proprietary biotechnology from the private sector […] has never been so difficult, not to say impossible, […] the public sector is still transferring proprietary technology but with increasing difficulties and restrictions."

However, defining the problem and then discussing pathways to possible solutions, as the conference program stated, turned out to be a bigger problem than we had envisaged. It became clear that for many participants, the whole topic and most of the problems were new. Some questioned the whole idea that IP rights might obstruct research for development; as patents are only temporary rights, eventually everybody can benefit from the innovation. Others could see possible downsides of the current patent system with respect to blocking the freedom to operate for development purposes, but did not consider these relevant for their particular research area in which 'soft' IP rights, such as plant breeder's rights, are used. In addition, many other issues that could complicate the transfer of knowledge and technologies to developing countries were brought to the table, such as liability issues, especially in the case of genetically modified organisms; lack of necessary infrastructure and capacity in poor countries; or even the difficulty of accessing scientific information published in expensive journals.

Convergence work focuses on problems that transgress scientific and social disciplines. In order to come to workable solutions for such problems, it is necessary to involve different stakeholders and disciplines. However, before these people can work together, they first have to agree on what is the exact problem. What one group considers to be a problem might be business as usual for another, even within the same institute. Valorization officers, for example, who are evaluated solely on the number of patents and revenues earned, are likely to have a different perspective on IP rights than researchers who focus on the MDGs or scientists in more fundamental areas of research, who are concerned primarily about their freedom to operate. Moreover, the actions of one group might cause problems for another.

It is a paradox that interdisciplinary problem solving cannot begin before there is a general agreement that there might be a problem at all, and that parties see no point in getting together in the first place in the absence of such an agreement. Indeed, simply by stating our perception of the problem, we made some of the invited stakeholders appear embarrassed or

attacked, and they distanced themselves from the conference. Convergence work, when it is really needed, is extremely sensitive and value-laden.

The next challenge is to keep the debate going. The fact that stakeholders from various areas have different interests and may even speak separate languages makes it hard to engage and continue a productive debate. Convergence takes time, and requires effort and flexibility from all the stakeholders involved. People who feel that the status quo is not a problem for them, or people who feel that their attitudes and interests are being challenged will not be too eager to invest time and resources, and are likely to leave the debate. Indeed, the debate that began in Wageningen soon lost momentum and the WBG, which was proposed by the University management to address the dilemmas, was disbanded soon after the conference, which made it particularly difficult to continue the debate. However, almost one year after the conference, some research projects on the roles of IP in reaching the MDGs, including the importance of university policies are now taking off. In this regard, the links established during the conference with the 'open source' and 'patent pool' mechanisms of CAMBIA and PIPRA will be further examined.[112]

Valorization of research by universities is an issue that requires the convergence of a wide variety of views. Without clear and workable mechanisms to merge the commercial interests of universities and their private partners with the societal goals of reducing poverty, universities are caught between a rock and a hard place. This issue includes a wide range of normative choices and attitudes. It is crucial to defining the role of public institutions, the priorities of managers at different levels within these institutions, and to the role of individual researchers and of their research in society. If universities and governmental funding agencies want to remain public organizations, they need to expand their definition of valorization to include various societal values, not just economic ones. This will allow them to balance opposing goals and to translate these into

[112] www.cambia.org; www.pipra.org [Accessed 21 February 2009].

strategies that take a clear position on their relationship with the commercial sector. But, doing so will require continued input and dialogue between the various stakeholders, as well as a proper reflection on the broader definition of valorization in order to develop mechanisms that are able to match differing goals in patenting and licensing strategies.

Eight

Towards Justice in Benefit-Sharing

Introduction

Five articles and two documents related to an international conference have been presented as the major results of this research project on benefit-sharing in the field of plant genetic resources. Every chapter includes its own conclusions, which will not be reproduced in similar detail in this final chapter. Rather, the main goal here is to bring together the major findings and to consider the general conclusions that can be derived from this collation. This will be done by returning to the research questions originally posed in the introduction of this thesis. These were:

1) When did the concept of benefit-sharing originate and for what purpose was it developed?
2) What are the major difficulties (practical, as well as ethical) that complicate the current negotiations on and implementation of benefit-sharing policies?
3) What normative positions and objectives are incorporated in the
    a. international legislation on benefit-sharing?
    b. benefit-sharing policies of international, national and local organizations?
    c. stakeholders' perceptions of benefit-sharing?
4) What is the relation between benefit-sharing and intellectual property rights: do they support or impede each other?
5) What is fair and equitable benefit-sharing and how might it best be realized?

The origin and development of benefit-sharing in international law

The first research question that we posed, regarding the beginnings of the concept of benefit-sharing, is dealt with in Chapter 2. Originally, we discover, benefit-sharing was linked to the notion of a common heritage of humankind. The earliest international treaties that refer to benefit-sharing do so in respect of the equitable distribution of the benefits derived from resources discovered on the moon and the deep seabed (UN, 1979; UN, 1982). These resources were considered not to be the property of any State, organization or individual, and their exploitation was to be carried out so as to benefit humankind as a whole. Benefit-sharing, therefore, started out as an idea about common goods to which everyone should have equitable access. The sharing of benefits refers here to a logic of distribution, insofar as the benefits of a common good should be equitably distributed.

It was not, however, until the introduction of benefit-sharing in the Convention on Biological Diversity (CBD) in 1992 that the concept became well-known and operative at both international and national levels. Here, benefit-sharing relates to biological resources, which previously had also been generally considered a common heritage of humankind. The CBD emphasizes, however, that "States have sovereign rights over their own biological resources" (UNEP, 1992, Preamble). It declares, furthermore, that access to genetic resources should be subject to "sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilization of genetic resources with the Contracting Party providing such resources." (Article 15.7).

Sovereign ownership versus common heritage

Through the CBD, States can regulate access to their resources and negotiate the accompanying benefit-sharing conditions. Benefit-sharing is thus considered a compensation mechanism between the providers and the users of plant genetic resources. Notably, this new understanding of benefit-sharing was a reaction against the common heritage idea to which it was formerly linked. In the years preceding the conclusion of the CBD, poor but gene-rich developing countries had become increasingly dissatisfied with the free and uncompensated use of their biological diversity. With the rise of the new biotechnology industry and accompanying intellectual property regulations in industrialized countries, genetic resources became more and more valuable but their benefits accrued largely in the gene-poor, developed countries. The Access and Benefit-Sharing (ABS) framework of the CBD opposes this imbalance as an iniquity, by regulating for a part of the benefits that users derive from genetic resources to flow back to the original providers.

The CBD itself is primarily aimed at the conservation and sustainable development of the world's biodiversity. The benefit-sharing component is generally considered instrumental to these broader objectives as it creates incentives for developing countries to conserve their biodiversity (the promise of benefit-sharing), and at the same time assists these countries getting access to the means for conservation (the content of benefit-sharing). Thus, in theory, the CBD creates a win-win situation. Indeed, it is often described as a 'grand bargain' between the rich and poor parts (or parties) of the world: the fast growing bio-industries in the financially rich but gene-poor developed countries would benefit from access to the genetic resources of the financially poor but biodiversity-rich developing countries, which in turn could benefit from a share in the benefits (information, technologies, profits) accrued from these industries. And all promoting, ideally, the conservation and sustainable use of biodiversity.

In this respect, the affirmation of the CBD that plant genetic resources fall under the sovereign rights of States seems well chosen. One argument

supporting this approach is that were the resources still to be considered part of the common heritage of humankind, it would be logically impossible to demand compensation for access. On the contrary, it might well be argued that if resources are commonly owned then "Who gets to use them should not depend on accidents of space and time" (Risse, 2005, p. 17). This involves the idea that countries which happen to be rich in certain resources ought to no more than grant, facilitate and regulate access to them by those that do not.

Another argument for sovereign rights over plant genetic resources is that it may prevent a "tragedy of the commons" (Hardin, 1968), in which private gains ultimately become a universal loss. If everybody has equal access to a common, but limited resource, and countries and individuals acting primarily in their self-interest are motivated to maximize use of the free resource, even to the point that it is exhausted, then the resource will be lost, even though this will not actually be in anybody's long-term interest. Such a scenario is, of course, particularly pertinent in respect of genetic resources given the increasingly vulnerable state of the world's ecosystems housing its biodiversity – the pressing need to conserve which being, after all, the reason why the CBD was developed in the first place.

But is this classification of plant genetic resources really well chosen? Certainly, the on sovereign rights based bilateral exchange model of ABS had a serious drawback which soon became apparent as, shortly after the signing of the CBD in 1992, a rapid decline was observed in the international transfer of plant genetic resources for food and agriculture, and the number of new collections. The main reason for this was that many countries prioritized the protection of their plant genetic resources against misuse, which created all kinds of barriers for exchange and increased transaction costs. Furthermore, the immature status of the new ABS regulations in combination with the growing number of allegations of biopiracy scared away many potential users and collectors. This is widely considered detrimental to agriculture and food security because crop improvement has always depended significantly on extensive flows of genetic material around the world.

Another difficulty with the sovereign rights model of the CBD is that biological diversity and plant genetic resources do not fit a national ownership model very well. Living organisms such as plants grow and multiply in large numbers and their seeds can travel across vast distances. Their valuable content lies especially in their DNA, which can be found in any part of every specimen. Furthermore, this DNA can be translated into information (i.e. the genetic sequence) which can in turn be disseminated through the internet – and then utilized even without the user ever having access to the plant itself. These non-rival and non-excludable characteristics (Chapter 2 & 4) mean that plant genetic resources cannot be appropriated and traded by a country in the same way as can other natural resources, such as oil or timber.

But doesn't this difficulty merely restate what was an important motivation behind the ABS framework in the CBD in the first place? It is precisely because plant genetic resources were originally considered a common heritage of humankind, and still have many characteristics (of a public good) that suit this conception, that the current model of benefit-sharing as a compensation mechanism was established. Indeed, the ABS system does only attempt to assure that countries receive some compensation for the use of their plant genetic resources because the resources can otherwise so easily be – and were being – exploited 'for free' (especially by those with strong technical capacities).

Plant genetic resources for food and agriculture

In light of the harmful effects of the CBD on the agricultural sector, the Conference of the Parties of the CBD invited the UN Food and Agriculture Organization (FAO) to develop an alternative system for plant genetic resources related to food and agriculture. This resulted in the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR). Originally, the FAO had declared that "plant genetic resources are a heritage of mankind and consequently should be available without restriction" (FAO, 1983), a position that could no longer be maintained

after the introduction of the CBD. Instead, the ITPGR installed a Multilateral System of Access and Benefit-Sharing (FAO, 2001, Part IV) which included a list of major crops and forages freely accessible under a standard material transfer agreement, thus avoiding the need for bilateral negotiations. Through this system, the international transfer of the included resources has increased again, now amounting to over 440,000 accessions in one year (IISD, 2009a).

The recovery of resource transfers might be regarded a sign of the treaty's success, but not everybody agrees. Many developing countries are concerned about the benefit-sharing component of the ITPGR, which has received rather less attention to date. Most developed countries, mainly supported by the seed industry, emphasize that access to the resources "constitutes itself a major benefit of the Multilateral System" (FAO, 2001, Article 13). In Chapter 5 mention was made of the acknowledgement by Mrs. Rosell of the Peruvian ABS agency (CONAM) that everybody has benefited from the former tradition of free exchange of plant genetic resources for food and agriculture. Tellingly, however, she also concluded that "some have benefited more" and now "we want some compensation for the contributions of Peru" (personal communication, 2007). This indicates that the treaty may well be unsustainable without an operational benefit-sharing mechanism, as many developing countries will pull out if access is not fairly balanced with benefit-sharing.[113]

It was only after my field studies in Peru and Kenya that I fully realised how essential this demand for compensation in the current ABS debates actually is. Whereas in the first article (Chapter 2), which is based on policy documents and literature studies alone, no distinction is made between the focus on compensation and the bilateral exchange model of ABS in the CBD, in my later work, I have come to the conclusion that what is really problematic about the current framework of ABS in the CBD is not the underlying idea of compensation per se, but the way in

[113] This was a central point of discussion during the Third session of the Governing Body of the ITPGR. Ultimately, it was decided that US$116 million should be put into the ITPGR benefit-sharing fund for the period July 2009 to December 2014 (IISD, 2009b).

which it is organized – i.e. the bilateral exchange model. Several reasons for this are discussed in the course of this thesis, which brings us to the second research question, that of the major (practical and ethical) difficulties which complicate the current negotiations on and implementations of benefit-sharing policies.

Difficulties complicating ABS negotiations and implementations

One major problem is the difficulty, or impossibility, for (developing) countries to secure a fair exchange of their plant genetic resources. Firstly there are the aforementioned characteristics of these resources, which prevent countries from monitoring and controlling all their movements. Furthermore, the CBD conditions relate only to the cross-border movement of resources after the treaty came into force. This means that countries may have no legal basis on which to demand compensation for the use of their resources by foreign companies and institutes, as much of their plant wealth has long since left its native territory and is now to be found dispersed in botanical gardens and gene banks around the world. This, together with the lack of user-measures in almost all countries, has resulted in the current state of affairs where users who do not know or do not disclose the source or origin of the resources they utilize, do not have to comply with any benefit-sharing provision.

Other difficulties relate to the likely case that a particular genetic resource is shared among multiple countries. The questions then are how to decide who gets what share of the benefits – i.e. which is the country of origin, or, how to prevent a race to the bottom as the party interested in the resource tries to negotiate the cheapest ABS agreement possible. In addition, there has never existed a substantial market for these resources,

which compounds the difficulties inherent in determining values for resources and measuring relative contributions. Yet another, and related, problem is that many developing countries lack the informational, legal and financial negotiation capacities enjoyed by their counterparts in the developed world (national governments in the international negotiations and (multinational) companies in individual ABS agreements).

Traditional knowledge

And this is only half of the story. Thus far, we have merely looked at the main ABS issues at the level of countries and with respect to plant genetic resources. In both the CBD and ITPGR, benefit-sharing is also directed to farming and indigenous communities, and traditional knowledge. With respect to traditional knowledge, the CBD states that each country, subject to its national legislation, shall "promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices" (UNEP, 1992, Article 8j). The ITPGR recognizes the "enormous contribution that the local and indigenous communities and farmers of all regions of the world" have made for conservation and food security, which forms the basis for Farmers' Rights (FAO, 2001, Article 9). National governments are encouraged to promote these rights, which include the "protection of traditional knowledge" and the "right to equitably participate in sharing benefits arising from the utilization of plant genetic resources for food and agriculture" (idem).[114]

Many of the difficulties experienced by (developing) countries in their desires and attempts to protect and secure benefit-sharing for their plant genetic resources are experienced also by traditional communities in

[114] The other components are the "right to participate in making decisions, at the national level, on matters related to the conservation and sustainable use" of plant genetic resources", and the "rights that farmers have to save, use, exchange and sell farm-saved seed/propagating material, subject to national law and as appropriate" (Article 9).

relation to their traditional knowledge. In contrast to the knowledge that is developed by companies, universities and research centers, traditional knowledge often does not fit the requirements for intellectual property (IP) protection, which means both that it cannot be protected in the marketplace and compensation for its use cannot be demanded. The main reason for this is that traditional knowledge is often openly and collectively developed in a communal environment, a socio-economic setting and cultural milieu which is very different from the competitive and industrial context of 'formal' knowledge development and the corresponding IP protection standards. In addition, most other problems described above apply equally to traditional knowledge and communities. For example, the difficulty of deciding and quantifying who gets what share of the benefits if the knowledge is shared among different communities, and the lack of the legal and financial capacities necessary in order to negotiate a fair ABS agreement or challenge in court a foreign patent that free-rides upon their knowledge.

Different interests

The parallels between developing countries and traditional communities do not mean, however, that they are fighting the same fight. On the contrary, Chapters 3 to 5 discussed the positions of traditional communities and showed that some of them consider their national government as much a foreign party against whom they have to protect their resources as any other. For that reason, and because of the material realities also of their often marginalized social and political position, the ABS demands of such communities are often critical of those of their national governments. This becomes evident, for example, in the repeated statements of indigenous peoples' organizations that protest against the strict division in the CBD between traditional knowledge (which belongs to the communities), and plant genetic resources (which fall under patrimony of the State).[115] One such statement, for example, proclaims

[115] And traditional knowledge, it should be noted, is even then still "subject to national legislation" (Article 8j).

that "our rights include rights over genetic resources, both those that are associated with our Indigenous knowledge, and more broadly to all genetic resources that originate in our territories, lands and waters whether or not associated directly with Indigenous knowledge" (UN PFII, 2007, p. 8).

Obviously, ABS is just another forum where many indigenous people have to fight for their rights.[116] This brings not only socio-political issues to the ABS negotiation table, but also many cultural aspects that need to be taken into account. Many traditional communities have a completely different understanding of such basic notions as 'sharing' and 'protecting', and of the plants and knowledge that are its subject matter. For this reason, it is feared that while aiming to support traditional communities, the national and international ABS regulations tend in reality to lure them into adopting foreign standards and beliefs, or just simply impose these upon them. What is at stake for many indigenous peoples' organizations is the cultural identity of their communities and their traditional ways of life. This is what they want to be protected. In the context of ABS, this means that these communities and organizations want to at least contribute to setting the agenda, to be able to make their own demands for national and international ABS policies according to their own worldviews and customary laws.

[116] See in this respect the United Nations Declaration on the Rights of Indigenous Peoples (at http://www.un.org/esa/socdev/unpfii/en/drip.html [Accessed 15 July, 2009]). The international ABS negotiations are also considered by some indigenous peoples' organizations as a positive opportunity to bring these matters to the attention of the international community and open national debates.

A diversity of normative positions and objectives of benefit-sharing

Clearly there are many different understandings of what benefit-sharing is or should be about. This refers to the third question that we formulated in the beginning of this research project, regarding the normative positions and objectives that are to be incorporated in international legislation on benefit-sharing, the benefit-sharing policies of international, national and local organizations, and stakeholders perceptions of benefit-sharing. This issue has primarily been considered in Chapter 3, in which seven different approaches to benefit-sharing that can be extracted from the current debates on this issue are distinguished (including, indeed, international legislation, organizational policies and stakeholder perspectives), presented here as Table 1.

Table 1: Summary of the different approaches to benefit-sharing

	Basic Motivation	**Mechanism**	**Intended Outcome**
1	The South-North imbalance in resource allocation and exploitation	National sovereignty over plant genetic resources	Equity in international economic relations
2	The need to conserve biodiversity	Benefits to support conservation efforts	Conservation and sustainable use of PGR
3	Biopiracy and the imbalance in intellectual property rights	Countervailing rights systems and user measures	Equity in legal rights over PGR and related knowledge
4	A shared interest in food security	Facilitated access and exchange of PGRFA	Food security and sustainable agriculture
5	Imbalance between IP protection and the public interest	Stimulating technology transfer and knowledge sharing	Equity in distributing the benefits of research and development
6	Protecting the cultural identity of traditional communities	Recognition for customary laws in ABS regimes	Preserving and restoring traditional communities and their cultures
7	Protecting the interests of the biotechnology industry	Liberal access, strong IP, and simple benefit-sharing regulations	Healthy industry for the benefit of all

Five of these approaches to benefit-sharing (number 1, 2, 3, 4 and 6) have already been discussed, and the differences between them comprise an essential part of the difficulties frustrating the current negotiations on and implementation of ABS. One important reason for this is, as discussed in

Chapter 3, that the various approaches lead to widely different and easily conflicting outcomes or expectations. An extra complicating factor is that the different approaches are pursued by different stakeholders in many different combinations, often without any clear and explicit differentiation. The two approaches not yet considered (number 5 and 7) might best be described in connection with the fourth question posed in the introduction, regarding whether the relation between benefit-sharing and intellectual property rights is complementary or oppositional. This issue was a focus of debate especially in Chapters 5 to 7.

The relation between benefit-sharing and intellectual property rights

The complex relationship between benefit-sharing and intellectual property rights has been a central sticking point in most ABS debates. For several stakeholders involved, the link between benefit-sharing and intellectual property rights (IPRs) is obvious and intrinsic even. Especially the industrial sector has claimed that without strong IPRs, no benefits in the biotechnology sector can be secured, and thus no benefit-sharing can take place. Some have even maintained that extra benefit-sharing regulations as set by the CBD are unnecessary or even undesirable because industry fares best – and thus produces more benefits for society – with liberal regulations that concentrate on facilitating access to resources rather than imposing bureaucratic benefit-sharing conditions. In fact, one might go further and argue that the IPR system be considered itself a benefit-sharing mechanism, insofar as it aims to stimulate the development and distribution of inventions, and demands the disclosure of patents, by securing for the inventor temporary intellectual and commercial rights.

This argument, however, is seriously questioned in this thesis, the main objection being that IPRs cannot secure the dissemination of benefits to all sections of society, and especially not to those that do not constitute a profitable market. Quite the contrary, IPRs may well drive up transaction costs or even block technology transfer, especially for people, communities, institutions and States even unable to call on the resources and legal expertise with which to negotiate access to the protected materials. To some, it is exactly this situation that justifies and necessitates the demand for benefit-sharing, which should stimulate and move us toward a more equitable distribution of the benefits of modern research and development.

IP and local communities

Another contradiction with respect to the link between benefit-sharing and IPRs relates to the protection of the traditional knowledge (and genetic resources) of indigenous and farming communities. On the one hand, several initiatives and proposals have emerged that aim to strengthen the legal rights of these communities over their knowledge and resources, as a balancing mechanism designed to offset the strong IPRs enjoyed by inventors in the scientific and industrial communities. In this way, it is hoped that the communities will be able to protect their resources against misappropriation (biopiracy) and demand a fair share of the benefits from those wanting to use them. On the other hand, however, many indigenous peoples' councils and organizations have emphasized how the very conception of 'property' in relation to living organisms or the (sacred) knowledge about them does not sit well in their worldviews, or is just plain incomprehensible. These groups do not want to apply IPRs for the protection of their resources and warn, furthermore, that those "who agree to benefit sharing must accept that patent laws will govern the ownership of the products derived from their genetic resources" (GRAIN, 2007).

It follows from this that even those who oppose patents seem to accept the inextricable link between benefit-sharing and IPRs. Hopefully, we have made clear in this thesis that this should not be the case. It cannot be

denied that patents play a major role in the biotechnology sector these days, and that IPRs and benefit-sharing influence and impact another in many different ways, and on various levels – something that has to be reflected upon when applying either of them.[117] Nevertheless, and crucially, this does not and should not imply that benefit-sharing *need necessarily* be dependent on, or even linked to patents or other forms of IPRs. If a fair and equitable benefit-sharing agreement is to be arranged with a party that strongly opposes the application of IPRs, this must be respected. And industry itself, the main player in the world of IPRs, has already proven that there are several alternatives to standard IP protection in research and development – which involve trade secrets, first-to-market strategies, and different forms of licensing, including the open source initiatives discussed in Chapters 3 and 6.

Here, it is important to note that if, for example, a traditional community is against the application of IPRs, it should not be inferred from this that they do not desire their resources to be protected, in order to prevent misappropriation or to reap their benefits. Similarly, there is no reason why parties that strongly invest in their IP portfolio cannot still fulfill their benefit-sharing obligations and enable a fair(er) distribution of their products around the world. Just as benefit-sharing and IPRs are not inextricably linked, the protection and the sharing of one's resources do not have to be mutually exclusive.

[117] Or even when applying none of them. Here, one may think of a researcher who publishes his or her findings on the traditional uses of certain plant genetic resources without prior consent of the knowledge holders and governmental officials of the community/country in question – because this knowledge will now be openly disseminated, the possibilities for IP protection and benefit-sharing can be seriously undermined.

Fair and equitable benefit-sharing

But what does all this say about fair and equitable benefit-sharing, about what it is and how it could best be realized, the fifth and final question that we set in the introduction? This was specifically dealt with in Chapter 4, although all other chapters have to some extent reflected on this question as well. Obviously, the different approaches to benefit-sharing entail different perspectives on what fair and equitable benefit-sharing is and/or how it should be realized. Clarity and insight on these differences, provided by Chapters 3 to 5, is an important prerequisite for its realization, as they contribute to a better informed and more balanced debate in which the different parties have an increased awareness of the various interests in play and benefits at stake. Analysis of such differences has to continue, especially to ensure that the perspectives and interests of minority and/or underprivileged groups (e.g. women) are properly recognized.

Beyond recognition of these different perspectives, some general conclusions have been drawn on the central issue of definition and the way ahead. Manifestly, the current exchange model of ABS in the CBD is in need of fundamental change. One of the main reasons is that because (developing) countries and communities cannot control or track the movement of their resources, a mechanism that links benefit-sharing obligations to the exchange of these resources can never be fair and equitable. As an alternative, the utilization model was proposed, in which benefit-sharing is triggered by the utilization of resources. In Chapter 4 it was shown that such a model has the potential to set a clear entry point for benefit-sharing obligations and ensure that benefit-sharing does indeed take place. This is, obviously, a crucial first step towards fair and equitable benefit-sharing.

A second step would be the development of a set of well-defined, minimum standards of benefit-sharing in tandem with a broad and creative

menu of benefit-sharing options. The former are needed to create clarity and a concrete basis for the whole system. Although they are likely to be formulated in monetary terms, they should not only reflect market-based criteria but also take into account the broader objectives of benefit-sharing (supporting nature conservation, food security, equity, etc.). These minimum standards are also needed to regulate the collection of benefits into an international fund in cases where the provider of the utilized resources is unknown or undisclosed (or in dispute). The establishment and enforcement of such minimum standards of benefit-sharing may in turn promote the development and implementation of other, more advanced benefit-sharing models. For example, when companies have to obey certain monetary standards of benefit-sharing it may become more attractive for them to invest in the sharing of information and technologies that they already possess. Such forms of benefit-sharing in kind should be encouraged and facilitated by the benefit-sharing menu since they have the potential to be very valuable and efficient in terms of the broader objectives of benefit-sharing.

Upstream benefit-sharing

Whether in-kind forms of benefit-sharing can indeed become valuable and efficient depends primarily on the context and perspectives of the party receiving them. This issue was particularly discussed in relation to the concept of upstream benefit-sharing, in Chapter 2, according to which parties to a particular ABS agreement try to balance their interests with respect to the research in the first place, taking into account the benefits that are anticipated to be shared later on. This in contrast to the usual ‘downstream models’ of benefit-sharing, which merely focus on the conditions for access to specific resources in exchange for a share in the benefits of their utilization, whatever that utilization may be. The concept of upstream benefit-sharing, that is, emphasizes the need for shared decision-making on the research priorities and during the research process, with the aim of improving the use and benefit of the resulting knowledge and technologies for all parties involved.

The need for upstream deliberations in benefit-sharing agreements is particularly pressing given the current state of affairs in which developing countries and communities hardly share in the benefits of the new biotechnologies. Despite the often-heard promise that biotechnology can contribute much to the poor in terms of improved crops and medicines, new products have, in fact, mainly focused on commercial markets and not on the major crops and diseases in developing countries (FAO, 2004; Global Forum for Health Research, 2004). More research is needed on how this new biotechnology-divide can be counteracted,[118] but a fair and equitable benefit-sharing system should aim to contribute to that objective.

Procedural justice

The idea of upstream benefit-sharing is strongly related to the principles of procedural and cognitive justice as described in Chapter 4. A fair and equitable benefit-sharing system can only be realized if all parties concerned have equal opportunities to participate in transparent negotiation processes, at all levels local, national and international. This implies, among other things, that serious efforts have to be undertaken to facilitate access to the international ABS negotiations (and individual ABS agreements) for representatives of farming and indigenous communities, and to support their ability to participate actively. The principle of cognitive justice holds, furthermore, that the alternative worldviews and perspectives of such communities are respected and treated as equal positions in dialogue. The fact that many traditional communities find themselves in a marginalized socio-political position only heightens the attention and extends the support that needs to be afforded to them in this respect.

The principles of procedural and cognitive justice are important prerequisites for fair and equitable benefit-sharing, but they do not say anything about the distribution of benefits itself. In line with the different approaches to benefit-sharing, a combination of allocation criteria would

[118] See e.g. (Vroom, 2009).

appear to offer the best prospects. Pursuing this avenue, benefits could be distributed with the aim of compensating those groups, countries or regions that have made considerable contributions to the conservation of biodiversity and promotion of food security – thinking particularly of centers of origin/diversity, and with extra attention for those with special needs in this respect – thinking particularly of marginalized and impoverished peoples. Such general criteria are especially relevant for the distribution of benefits that have been collected by an international fund. In case of individual ABS agreements, the parties involved may want to make their own decisions in this respect. But again, these decisions (and the preceding negotiation process) should carefully observe the procedural principles and minimum standards of benefit-sharing discussed above.

The need for continued deliberation and cooperation

Obviously, there are many practical and ethical difficulties and questions that have gone unremarked here, or have been mentioned only in passing, and which will need further research and reflection. More than that, however, what is needed is continued and extensive deliberation and cooperation between the various parties involved. At an international level, officials from the different countries, together with representatives from the indigenous, farming, industrial and scientific communities (and others), will have to decide on the basic standards and organization of a fair and equitable benefit-sharing system. Benefit-sharing is first and foremost a policy concept created by the international community and which, consequently, must be further developed and decided upon by that community. It will then be the wide range of interested parties and organizations worldwide – actors and stakeholders varying from multinational corporations and national governments to local communities and individual scientists – who will jointly have to implement subsequent regulations and make fair and equitable benefit-sharing operational. And not just when involved in specific ABS agreements, but also with respect to framing the institutional policies and arrangements for their companies, universities and community leadership structures that direct day-to-day work, attitudes and interaction.

This latter issue was discussed particularly with respect to the public research sector in Chapters 5 to 7, where the way and extent to which public research organizations are confronted with strong and widely diverging views and interests was illustrated. Even within the research institutes themselves, there are different and easily conflicting views and objectives regarding the sharing and protection of the plant genetic resources, knowledge and technologies they work with. Given the present context, in which many groups, from industry to governments and indigenous communities, are primarily concerned about the protection of their resources, research institutes, it is argued, need to develop new ways of sharing and protecting and, ultimately, dare to share. This implies that they develop clear and effective ABS and IP policies that are carefully attuned to the interests of the different parties they are working with while at the same time also leaving the institute enough room to share and disseminate its knowledge and capacities for the common good.

In this respect, substantial investments in consultations among the different stakeholders are clearly necessary. The International Potato Centre in Peru, for example, needs to continuously invest in its public image and trust building in order to allay concerns of biopiracy and improve its freedom to operate when it comes to new collection activities. The Wageningen University and Research Centre in the Netherlands, for its part, has to discuss and negotiate its IP policies with the research partners and the funding agencies that co-own or set the targets for its research outputs. The international conference organized in Wageningen on IP policies in public research indicated that such consultation and deliberation activities are far from easy.

For this conference, discussed in Chapters 6 and 7, we invited a broad range of stakeholders with the aim of discussing, or at least initiating discussion about how public research institutes can prevent their IP policies from hampering innovation in poor countries. Instead of mapping the problem and then start a search for possible solutions as we had envisaged, however, the discussion largely failed to get beyond defining

the problem. Because of the divergence of interests of the various stakeholders involved, it was difficult to agree on the problem itself, let alone how to fix it. What is a problem for one party can be business as usual or even a major objective for another, even within the same institute.

Fair and equitable burden-sharing

This situation may not be so surprising, as it points to a common and well-known dynamic: those who experience or are subject to a particular problem are often not those who cause (intentionally or otherwise) or who can prevent the problem. But this logic is absolutely crucial with respect to fair and equitable benefit-sharing, because those who claim and/or need it the most tend to be dependent for its operation on those who claim/need it the least. For many researchers, organizations and countries in the developed world, the realization of fair and equitable benefit-sharing is simply not perceived as something that is in their direct self-interest. On the contrary, due to the complex and unclear status of much of the current (inter)national body of ABS regulations, fair and equitable benefit-sharing is regarded by many as a cost, to be reduced and kept to the minimum. This is reflected in the troublesome international negotiations so far, and also, moreover, in the disinterest and aversion even shown to ABS and the current socio-political environment it entails on the part of many parties in the public and private research sector (Chapter 5).

At this moment, we can conclude that the levels of interest shown and commitment made by many developed countries and interested parties are in stark contrast to the substantial investments necessary in order to realize a fair and equitable system of benefit-sharing as discussed in this thesis. They stand similarly far removed from the position developed in Chapter 4, that it is the developed countries and their associated parties which have the biggest responsibility to make the system work. Of course, also developing countries and communities must invest the necessary means to come to fair and equitable benefit-sharing, but, as Shue has stated, “among a number of parties, all of whom are bound to contribute to some common

endeavour, the parties who have the most resources normally should contribute the most to the endeavour" (Shue, 1999, p. 537).

This statement is based on the principle of equity, fundamental to the concept of benefit-sharing, which holds that equals should be treated equally and unequals unequally. This means that as long as there are large inequalities between the different parties involved, an unequal distribution of benefits awarded to the weakest parties (and burdens falling to the strongest) should be promoted. This would imply, for example, that developed countries bear most of the costs of the negotiation process and development of international mechanisms (without receiving a stronger say during negotiations in return); that the current international IP system be modified in order to protect and support traditional knowledge holders, who currently have least opportunities to secure and defend their rights; and that public and private research institutes agree with significantly higher benefit-sharing standards and percentages than has been the case thus far.

It must be clear that benefit-sharing entails burden-sharing, so if fair and equitable benefit-sharing is to be realized then the burdens also have to be shared, fairly and equitably. This research project has aimed to show some of the major steps that need to be made and issues that have to be taken into account in order to work towards this objective. If countries really want to commit themselves to fair and equitable benefit-sharing, then this is what it will involve. The same goes for the public and private research sector. Where the former can be held accountable to their public mission and responsibilities in this regard, the latter will often wait for the regulations to be set by their governments. But also the private sector has its social responsibilities here and must understand that the current regulatory uncertainties and social controversies will not improve without their willingness to develop and comply with fair and equitable benefit-sharing policies.

The world becomes smaller as countries, organizations and individuals from around the world are increasingly confronted with the results of

others' actions and interests. Whether it is the use of plant genetic resources, the level of carbon emissions, or the way we fight a global disease or financial crisis, international reciprocal agreements and solutions are increasingly being sought. This is a relatively recent development, and an enormous socio-political and ethical challenge. In the face of these challenges in the field of benefit-sharing and plant genetic resources, the current lack of philosophical reflection certainly needs to be rectified. This thesis has aimed to stimulate debate and reflection on some of the main ethical challenges involved, and to provide insights and directions that bring us closer to a fair and equitable outcome. Altogether, it seems that the current attempts to implement benefit-sharing constitute a new step of the world community towards global justice, and it should be nourished and supported as such.

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Summary

Introduction

Since the advent of biotechnology, plant genetic resources have become more valuable as possible sources for new products and inventions. With knowledge about the genetic make-up and functioning of a plant, biotechnologists can identify and isolate genes with interesting traits which, after long research trajectories, may result in new medicines, improved crops or other products. The initial leads towards such new products are sometimes provided by the traditional knowledge that local and indigenous communities have acquired about their natural environment over centuries. At the other site of the spectrum, Intellectual Property Rights (IPRs) play an important role in stimulating the research and development process of new biotechnologies and products, by providing innovators with time-limited exclusive rights to exploit their inventions. Altogether, the biotechnology industry has grown rapidly over the last decades. The question, however, is whether also we have all benefited from it.

Unfortunately, we have to conclude that, as with most other new industries and technologies, biotechnology has not provided many benefits to the poor up to now. Notwithstanding the repeated promises that biotechnology can – and will – improve global health and food security, almost all research to date has focused on the development of medicinal and food products for commercial markets, mostly in the developed world, with very few serious investments having been made in order to tackle the major diseases and improve crops in the poorer parts of the world. This is despite the fact that many of the genetic traits that are used in new products and biotechnologies find their origin in the enormous biodiversity of developing countries, and/or the rich knowledge of this diversity of local communities in these countries. For this reason, developing countries and indigenous communities have become increasingly vocal in demanding compensation for the use of their plant resources in the new biotechnology industry.

This demand became backed by international law in 1992, as the UN Convention on Biological Diversity (CBD) declared that access to genetic resources is subject to "sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilization of genetic resources with the Contracting Party providing such resources." (Article 15.7). With respect to the knowledge, innovations and practices of traditional communities, the CBD also proclaims that each country, subject to its national legislation, shall "encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices" (Article 8j). Since then, a total of 191 countries have become signatories to the Convention and committed themselves to these objectives. Few of these, however, have implemented this legislation effectively in such a way as to actually enable and facilitate the sharing of substantial benefits. Furthermore, the negotiations on an International Regime on Access and Benefit-Sharing, which was called for by the Parties to the CBD in 2002, are progressing very slowly.

What are the reasons for this lack of progress in the national implementation and international negotiations on Access and Benefit-Sharing (ABS)? This question has been subject of discussion in a growing number of studies that aim to analyze the legal, practical, or socio-political difficulties involved in current ABS regulations and agreements. Very few studies, however, have focused on the ethical problems and challenges. Even though questions about who decides which benefits are to be shared with whom and in what way are obviously ethical concerns, the current problems with ABS have rarely been approached from an ethical perspective. This research project aims to improve this situation by investigating and initiating debate on some of the ethical dimensions of benefit-sharing in the field of plant genetic resources, related knowledge and IPRs, with special attention given to the agricultural and public research sector.

Taking a pragmatist ethics point of view, this research project focuses primarily on analyzing the normative positions and argumentations within the current debates on benefit-sharing, and reflecting on the meaning of, and possibilities for, fair and equitable benefit-sharing. Direction and guidance for the project are facilitated through research questions focusing attention on: the origination of the concept and purpose of benefit-sharing; the major difficulties complicating the present situation in respect of benefit-sharing policies; the normative positions and objectives incorporated in international legislation, organizational policies and stakeholders' perceptions of benefit-sharing; the relationship between benefit-sharing and intellectual property rights; and the question of fair and equitable benefit-sharing itself.

The research is based on extensive literature studies, complemented with over 75 semi-structured interviews in Kenya, Peru and the Netherlands, and visits to meetings of the CBD, the UN Food and Agriculture Organization (FAO), and international workshops on ABS in Germany and India. Furthermore, an international conference was organized in the Netherlands to examine and discuss with relevant stakeholders the impact of IPRs on the possibilities for public research institutes sited in developed countries to share their knowledge and technologies with partners in poorer countries. Altogether, this has resulted in five articles that have been either published in or submitted to peer-reviewed journals, and two conference documents, which together with an introductory and concluding chapter are presented in this thesis.[119]

[119] Other related material – an article in the journal *New Genetics and Society* (Korthals & De Jonge, 2009), one book chapter (De Jonge & Louwaars, 2009), and several publications in popular media and specialist magazines – has not been included.

Vicissitudes of benefit-sharing of crop genetic resources: Downstream and upstream

Following an introductory first chapter, Chapter 2 sets out with a historic overview of the origin and development of the concept of benefit-sharing in international law. We see that benefit-sharing was initially included in international treaties on the moon (1979) and the sea (1982), in which it was linked to the notion of a common heritage of humankind and referred to equitable distribution – i.e. distributive justice. Because the resources of the moon and deep seabed were considered not to be the property of any State or individual, it was decided that the benefits that are derived from those resources should be shared with humankind as a whole. With its introduction in the CBD, however, benefit-sharing has mainly become an instrument of compensation and refers to the idea of commutative justice – i.e. justice in exchange. Based on the principle that countries have sovereign rights over their own biological resources, States can regulate access to their resources and negotiate the accompanying benefit-sharing conditions. It is shown, however, that this model does not suit most plant genetic resources – and certainly not crop genetic resources. On the contrary, it has had harmful effects on the agricultural sector insofar as it has functioned to obstruct the international transfer of genetic resources on which the agricultural sector historically depends.

In order to better meet the needs of the agricultural sector, the FAO developed a Multilateral System of Access and Benefit-Sharing, which was introduced in the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR) in 2001. In line with the general objectives of the ITPGR, but also of the CBD, we argue that benefit-sharing should not be based merely on the idea of justice in exchange, but rather on a broader model, one that is grounded also in the concept of distributive justice. This has repercussions for the application of benefit-sharing. By

distinguishing between ‘downstream’ models of benefit-sharing, in which benefits are shared at the end of the research and development pipeline, and models where ‘upstream’ in the research process stakeholders try to balance their interests with respect to the benefits that will be shared later on, we show that benefit-sharing may well be a tool to contribute to world food security and global justice.

A diversity of approaches to benefit-sharing

Chapter 3 provides an overview of, in total, seven fundamentally different approaches to the issue of benefit-sharing in the field of plant genetic resources. The approaches portray the different ideas that exist about benefit-sharing, about its underlying principles, its goals and the preferred mechanisms to reach these goals. These different approaches are based on the following perceptions, or motivations:

- The South-North imbalance in resource allocation and exploitation
- The need to conserve biodiversity
- Biopiracy and the imbalance in intellectual property rights
- A shared interest in food security
- An imbalance between IP protection and the public interest
- Protecting the cultural identity of traditional communities
- Protecting the interests of the biotechnology industry in ABS negotiations.

By comparing the different approaches in the second part of this chapter, the major stumbling blocks in the current ABS negotiations (at both national and international levels) become apparent. This comparative analysis shows that the variety of motivations leads to widely differing mechanisms for benefit-sharing and significantly different expectations of the nature and value of the benefits to be shared. A further complicating factor in this is that the different approaches cannot be simply translated one-to-one into stakeholder positions. Stakeholders often assume to

employ a combination of two or more different approaches. However, by explicating the different approaches, the article aims to increase insight into the different viewpoints that people and institutions adopt, in order to contribute to a better informed and more balanced debate in which policy-makers and other stakeholders have a raised awareness of the various interests involved and issues at stake.

What is fair and equitable benefit-sharing?

Chapter 4 builds upon these different approaches insofar as it aims to investigate what exactly is understood by “fair” and “equitable” benefit-sharing, and how a fair and equitable benefit-sharing mechanism might best be realized. The different approaches to benefit-sharing outlined form the basis of a philosophical reflection and are discussed in parallel with the main principles of justice involved. These include the principle of commutative justice and, under the domain of distributive justice, the principles of entitlement, desert, need and equity. In addition to these criteria that may guide the allocation of benefits, the principles of procedural and cognitive justice also are discussed, as essential to the promotion of fair and equitable benefit-sharing.

An important conclusion resulting from this reflection is that the bilateral exchange model of ABS in the CBD is in need of fundamental change. At present, it is practically impossible for countries and communities to secure a fair exchange for the plant genetic resources found within their territories, or for the traditional knowledge present in their culture. As an alternative, a model is proposed in which benefit-sharing obligations are not based on the specific exchange of these resources, but on their utilization. An advantage of such model is that it emphasizes the responsibilities for benefit-sharing at the user side. This is further supported by the principle of equity, elemental to benefit-sharing, which

holds that the strongest parties have the biggest responsibilities to make a fair and equitable benefit-sharing mechanism work.

Between sharing and protecting: Public research on genetic resources in the year of the potato

Chapter 5 analyses the policies and environment of two public research institutes working with potato genetic resources, the International Potato Centre (CIP) in Peru and Wageningen University and Research Centre (Wageningen UR) in the Netherlands. The two institutes are situated in totally different environments, but both are increasingly confronted with an array of (inter)national regulations, interests and perspectives that surround the genetic material, (traditional) knowledge and technologies with which they work. While CIP, as member of the Consultative Group for International Agricultural Research (CGIAR), aims to promote the sharing of potato genetic resources throughout the world for the sake of food security, it is situated in a country that is deeply ambivalent about the sharing goal and where concerns about biopiracy proliferate. Wageningen UR, on the other hand, is concerned with supporting the Dutch potato sector but it has to make sure that its IP and valorization strategies do not impede its research for development goals.

Both institutes are continuously weighing up their own interests and those of the various stakeholders they work with in order to strike a balance between policies geared towards sharing and those aimed at protection. However, in the present context where poor but gene-rich countries and communities, as well as industrialized countries and biotechnology companies are all mainly concerned with protecting their resources in

order to reap the benefits and preclude misappropriation, it is incumbent on public research institutes to dare to share. For that purpose, they have to develop new ways of sharing and protecting in order to adhere to their mission and best serve the public interest.

Reconsidering intellectual property policies in public research: A symposium

Chapter 6 contains the start document and report of the international conference on "Reconsidering Intellectual Property Policies in Public Research: Sharing the benefits of biotechnology with developing countries" organized at Wageningen UR in April 2008. The start document describes the increasing role of IPRs in biotechnology research and the difficult process that public research institutes face in seeking to obtain access to IP protected materials while working on biotechnologies destined for the poor. The problems involved range from analyzing complex IPR landscapes to negotiating free or affordable access licenses with parties that have little to gain from such deals. At the same time, however, public researchers are also increasingly stimulated to protect their own knowledge and inventions – so an important question for public research institutes is how they can (and should) go about preventing their IP policy from hampering innovation in poor countries.

These issues were discussed at the international conference, which brought stakeholders together from fields as diverse as plant sciences, social and development studies, intellectual property offices, research funding organizations, the private seed industry, and civil society. The report describes the various discussions, presentations and main findings of the conference, which also focused on possible strategies to help public research institutes to secure their freedom to operate in the field of

research for development, such as patent pools, humanitarian licenses and open-source biotechnology.

Valorizing science: Whose values?

Chapter 7 is a viewpoint article that reflects further upon the current trend towards valorization, i.e. the creation of economic value, in public research. It asks, more specifically, whether the focus on economic indicators is the optimal policy for science to contribute to society, or for the advancement of science itself. Hereby, it looks back on the Wageningen conference and its central subject matter, but now with special attention given to the organization process and the difficulties of bringing different stakeholders together to discuss complex problems and their possible solutions.

The issue of valorization in public research involves a wide variety of easily conflicting views and interests, which requires continued input and dialogue between the different stakeholders in order to come to workable solutions. It is shown that this is not always easy to accomplish, for example because stakeholders may already disagree about the problem definition itself: a problem for one group may be a triviality or even benefit for another, and this even within the same institute. But as the current valorization trend influences and impresses upon the role of public research itself, the research institutes as well as individual researchers will have to invest the necessary time and effort to reflect on their impact and (long term) implications.

Towards Justice in Benefit-Sharing

Chapter 8 is the concluding chapter that brings the major findings of this research project together. Without repeating all the conclusions of the separate chapters, it aims to give an overview by reflecting on the research questions set out at the beginning in Chapter 1 and the general conclusions that have come out of this. Given the many practical (and ethical) complexities involved, and the easily diverging interests and perspectives when it comes to the sharing and/or protection of plant genetic resources, (traditional) knowledge and intellectual property rights, we can predict that benefit-sharing will continue to arouse much discussion and debate in the years to come. In this thesis, some fundamental changes to the current exchange model in the CBD are proposed in order to move away from the current deadlock in the international ABS negotiations, and to work towards a fair and equitable outcome. It must be clear that benefit-sharing entails burden-sharing, and that a successful implementation of fair and equitable benefit-sharing requires the continued commitment of all stakeholders involved on the international, national and local levels. But with such commitment, benefit-sharing can set a new standard of justice in how countries, companies, public research institutes and indigenous communities interact with each other.

Samenvatting

Planten, Genen en
Rechtvaardigheid
Eerlijk zullen we alles delen?

Introductie

Sinds de opkomst van de biotechnologie zijn planten nog waardevoller geworden als bron van genetisch materiaal waaruit nieuwe uitvindingen en producten ontwikkeld kunnen worden. Met kennis van de genetische samenstelling en functionering van een plant kunnen biotechnologen genen identificeren en isoleren met interessante eigenschappen, wat na langdurig onderzoek kan resulteren in de ontwikkeling van nieuwe medicijnen, verbeterde gewassen of andere eindproducten. De eerste leidraad voor dergelijk onderzoek is soms afkomstig van de ‘traditionele kennis’ die inheemse gemeenschappen en traditionele boeren hebben vergaard van hun natuurlijke leefomgeving door de eeuwen heen. ‘Intellectueel eigendomsrechten’ spelen een grote rol in het stimuleren van onderzoek en het ontwikkelen van nieuwe biotechnologieën en producten doordat zij de uitvinder de exclusieve rechten verschaffen voor de exploitatie van een uitvinding gedurende een bepaalde tijdsperiode. Al met al is de biotechnologie industrie enorm gegroeid gedurende de laatste decennia. De vraag is echter of we er ook allemaal van profiteren.

Helaas moeten we concluderen dat, zoals met veel nieuwe technologieën het geval is, biotechnologie nog niet veel voordelen heeft opgeleverd voor arme mensen. Niettegenstaande de herhaalde beloftes dat biotechnologie de wereld gezondheid en voedselzekerheid kan – en zal – bieden, heeft bijna al het onderzoek zich tot op heden gericht op de ontwikkeling van medicijnen en landbouwproducten voor commerciële markten, met name in het Westen. Er is relatief zeer weinig geïnvesteerd in de belangrijkste ziektes en gewassen in de arme delen van de wereld. Dit ondanks het feit dat veel van het genetisch materiaal dat gebruikt wordt in de nieuwe producten en biotechnologieën zijn oorsprong heeft in de enorme biodiversiteit van ontwikkelingslanden, en/of de rijke kennis van die diversiteit van lokale gemeenschappen. Om die reden zijn ontwikkelingslanden en inheemse groepen steeds mondiger geworden in

het eisen van compensatie voor het gebruik van hun plant genetische bronnen in de nieuwe biotechnologie industrie.

Deze eis werd kracht bij gezet door internationale regelgeving in 1992, toen de VN biodiversiteitsconventie (*Convention on Biological Diversity*, verder CBD genoemd) verklaarde dat toegang tot genetisch materiaal onderworpen moet zijn aan een eerlijke en gelijke verdeling van de resultaten van onderzoek en ontwikkeling, en van de baten voortvloeiend uit het commerciële en ander gebruik van het genetisch materiaal, met het land dat het materiaal geleverd heeft (Artikel 15.7). Met betrekking tot kennis en innovaties van traditionele gemeenschappen verklaart de CBD dat ieder land, afhankelijk van de eigen wetgeving, de gelijke verdeling van voordelen (*benefit-sharing*) die voortvloeien uit het gebruik van die kennis en innovaties moet stimuleren (Artikel 8j). Sindsdien hebben 191 landen de CBD ondertekend en zich gecommitteerd tot bovenstaande doelstellingen. Weinig landen hebben deze regelgeving echter geïmplementeerd op zo'n manier dat substantiële voordelen gedeeld (kunnen) worden. De onderhandelingen over een internationale regime van toegang en batenverdeling, oftewel '*access and benefit-sharing*' (verder ABS genoemd), die zijn begonnen in 2002, maken bovendien weinig vooruitgang.

Welke redenen zijn er voor deze trage vooruitgang op het gebied van de nationale implementatie en internationale onderhandelingen over ABS? Deze vraag is het onderwerp van een groeiend aantal studies die de juridische, praktische, of socio-politieke knelpunten beoogt te analyseren met betrekking tot bestaande regelgeving en ABS overeenkomsten. Weinig studies richten zich echter op de ethische problemen en uitdagingen. Ondanks het feit dat vragen zoals 'wie bepaalt welke baten worden gedeeld met wie en op welke manier' bol staan van ethische kwesties, zijn de huidige problemen rond ABS nog nauwelijks benaderd vanuit een ethisch perspectief. Dit onderzoeksproject tracht deze situatie te verbeteren door onderzoek te doen naar, en het initiëren van debat over, enkele ethische aspecten van *benefit-sharing* met betrekking tot plant genetisch materiaal, gerelateerde kennis en intellectueel

eigendomsrechten. Daarbij wordt speciaal aandacht gegeven aan de landbouwsector en publieke onderzoeksinstellingen.

Vanuit het standpunt van de pragmatische ethiek richt dit onderzoek zich met name op het analyseren van de normatieve posities en argumentaties binnen het huidige debat rond *benefit-sharing,* en het reflecteren op de betekenis van, en mogelijkheden voor, '*fair and equitable benefit-sharing*'. De onderzoeksvragen richten zich op de oorsprong van het concept *benefit-sharing*; de voornaamste praktische en ethische knelpunten met betrekking tot de huidige onderhandelingen en implementatie van ABS beleid; de normatieve posities en doelstellingen die geïncorporeerd zijn in internationale regelgeving, institutioneel beleid, en opvattingen van belangengroepen over *benefit-sharing*; de relatie tussen *benefit-sharing* en intellectueel eigendomsrechten; en hoe *fair and equitable benefit-sharing* het best gerealiseerd kan worden.

Het onderzoek is gebaseerd op uitgebreide literatuurstudies, aangevuld met meer dan 75 semi-gestructureerde interviews in Kenia, Peru en Nederland. Daarnaast zijn enkele CBD bijeenkomsten, de VN Landbouworganisatie, en internationale workshops over ABS in Duitsland en India bezocht. Ook is er in Nederland een internationale conferentie georganiseerd om te onderzoeken wat de impact van intellectueel eigendomsrechten is op de mogelijkheden van publieke onderzoeksinstellingen om hun kennis en technologieën met partners in ontwikkelingslanden te delen. Dit alles heeft geresulteerd in vijf artikels die gepubliceerd dan wel ingediend zijn bij wetenschappelijke tijdschriften (*peer-reviewed journals*), plus een startdocument en verslag van de conferentie. Samen met de introductie en conclusie vormen zij het proefschrift dat voor u ligt.

De opkomst en ontwikkeling van benefit-sharing en de internationale landbouwsector

Hoofdstuk 2 geeft een historisch overzicht van de oorsprong en ontwikkeling van het concept *benefit-sharing* in internationale regelgeving. Het blijkt dat *benefit-sharing* oorspronkelijk geïntroduceerd is in international verdragen over de maan (1979) en de zee (1982), waarin het was gekoppeld aan de notie van het gemeenschappelijk erfgoed van de mensheid (*common heritage of humankind*) en verwees naar gelijke distributie, oftewel verdelende rechtvaardigheid. Er van uitgaande dat de grondstoffen in de bodem van de maan of de diepzee van geen enkel land of individu zijn, zouden de baten die daar uit voortvloeien met de gehele mensheid gedeeld moeten worden. Echter, met diens introductie in de CBD is *benefit-sharing* voornamelijk een instrument van compensatie geworden en verwijst het naar het idee van commutatieve rechtvaardigheid, oftewel ruilrechtvaardigheid. Uitgaande van het principe dat landen soevereine rechten hebben over hun eigen plant genetische bronnen, kunnen overheden de toegang tot die bronnen reguleren en onderhandelen over de bijbehorende *benefit-sharing* condities. In dit artikel komt naar voren dat dit model niet geschikt is voor de meeste plantensoorten, en zeker niet voor landbouwgewassen. Het model heeft zelfs schadelijke gevolgen gehad voor de landbouwsector in zoverre dat het de internationale uitwisseling van genetisch materiaal, waar die sector altijd van afhankelijk is geweest, heeft geblokkeerd.

Om beter aan te sluiten bij de noden van de landbouwsector heeft de VN Landbouworganisatie in 2001 een ‘multilateraal systeem van *access en benefit-sharing*’ geïntroduceerd in de *International Treaty on Plant Genetic Resources for Food and Agriculture* (verder ITPGR genoemd). In lijn met de algemene doelstellingen van de ITPGR, maar ook van de CBD, pleiten wij ervoor dat *benefit-sharing* niet alleen gerelateerd wordt aan het

principe van ruilrechtvaardigheid, maar aan een breder model dat ook gebaseerd is op het idee van verdelende rechtvaardigheid. Dit heeft gevolgen voor de toepassing van *benefit-sharing*. Door een onderscheid te maken tussen modellen die slechts gericht zijn op een verdeling van de uitkomsten van een onderzoekstraject (*downstream benefit-sharing*) en modellen waar al in een eerder stadium (bijv. aan de hand van de onderzoeksdoelen) overleg wordt gepleegd over de uitkomsten die uiteindelijk verdeeld zullen gaan worden (*upstream benefit-sharing*), laten wij zien dat *benefit-sharing* een instrument kan zijn dat bijdraagt aan voedselzekerheid en globale rechtvaardigheid.

Een diversiteit aan benaderingen tot benefit-sharing

Hoofdstuk 3 verschaft een overzicht van in totaal zeven fundamenteel verschillende benaderingen tot *benefit-sharing* met betrekking tot plant genetisch materiaal. De benaderingen beschrijven de verschillende opvattingen die bestaan over *benefit-sharing*, over de onderliggende principes, doelstellingen en de gewenste mechanismen om die doelstellingen te bereiken. De verschillende benaderingen zijn gebaseerd op de volgende percepties en motivaties:

- De Noord-Zuid ongelijkheid op het gebied van exploitatie van biodiversiteit.
- De noodzaak voor natuurbescherming en behoud van biodiversiteit.
- Biopiraterij en de disbalans in intellectueel eigendomsrechten.
- Een gedeeld belang in voedselzekerheid.
- Onevenwichtigheid tussen de bescherming van intellectueel eigendom en publieke belangen.
- Behoud van de culturele identiteit en cultuur van inheemse gemeenschappen.

- De bescherming van de belangen van de biotechnologie industrie.

Door de verschillende benaderingen in het tweede deel van dit artikel te vergelijken, worden de voornaamste struikelblokken in de huidige nationale en internationale onderhandelingen over ABS zichtbaar. De vergelijkende analyse laat zien dat de diversiteit aan motivaties leidt tot grote verschillen in de mechanismen van *benefit-sharing*, en de daarbij horende verwachtingen over het soort en de waarde van de baten die gedeeld moeten worden. Een bijkomend probleem is dat de verschillende benaderingen niet één op één overeenkomen met de standpunten van verschillende belangengroepen. Verschillende groepen steunen vaak een combinatie van twee of meer benaderingen. Doel van het artikel is, door de verschillende benaderingen te onderscheiden, het inzicht te vergroten in de verschillende opvattingen en doelstelling rond *benefit-sharing* en zo een bijdrage te leveren aan een beter geïnformeerd en gebalanceerd debat waarin beleidsmakers en andere partijen zich meer bewust zijn van de verschillende belangen die op het spel staan.

Wat is fair and equitable benefit-sharing?

Hoofdstuk 4 bouwt voort op de verschillende benaderingen tot *benefit-sharing* om te onderzoeken wat nu precies verstaan wordt onder ‘eerlijke’ en ‘gelijke’ verdeling van baten, en hoe een *fair and equitable benefit-sharing* mechanisme het best kan worden gerealiseerd. De verschillende benaderingen vormen de basis voor een filosofische reflectie en worden besproken in samenhang met de voornaamste rechtvaardigheidsprincipes in kwestie. Deze zijn het principe van commutatieve rechtvaardigheid en, onder het domein van distributieve rechtvaardigheid, de principes van recht, verdienste, behoefte en gelijkheid. Bovenop deze principes, die als leidraad kunnen dienen voor de verdeling van baten, worden ook de principes van procedurele en cognitieve rechtvaardigheid besproken

aangezien zij een belangrijke voorwaarde zijn voor het realiseren van *fair and equitable benefit-sharing*.

Een belangrijke conclusie die voortkomt uit deze reflectie is dat het bilaterale uitwisselingsmodel van ABS in de CBD aan een fundamentele verandering toe is. Momenteel is het praktisch onmogelijk voor landen en gemeenschappen om de bewegingen en uitwisselingen te controleren van het plant genetisch materiaal op hun grondgebied of de traditionele kennis aanwezig in hun cultuur, en dus om zich te verzekeren van een eerlijke ruil van dat materiaal met externe partijen. Als alternatief wordt een model voorgesteld waarin de *benefit-sharing* verplichtingen niet gekoppeld zijn aan de uitwisseling van materiaal, maar aan het gebruik daarvan. Een voordeel van dergelijk model is dat de verantwoordelijkheid voor *benefit-sharing* nadrukkelijk komt te liggen bij de partijen die het genetisch materiaal en/of traditionele kennis willen gebruiken. Zo'n model wordt ook ondersteund door het principe van gelijkheid, dat fundamenteel blijkt te zijn voor het hele idee van *benefit-sharing*, en wat inhoudt dat de sterkste schouders de zwaarste lasten moeten dragen en dus de grootste verantwoordelijkheid hebben om *fair and equitable benefit-sharing* te realiseren.

Beschermen of delen? Publiek onderzoek naar genetisch materiaal in het jaar van de aardappel

Hoofdstuk 5 analyseert het beleid en de omgeving van twee publieke onderzoeksinstellingen die werken met genetisch materiaal van de aardappel; het Internationale Aardappelcentrum (CIP) in Peru, en Wageningen Universiteit en Onderzoekscentrum (Wageningen UR) in

Nederland. De twee instellingen zijn gesitueerd in een totaal verschillende omgeving, maar beide worden meer en meer geconfronteerd met een web aan (inter)nationale regulaties, belangen en opvattingen die invloed hebben op het genetisch materiaal en de (traditionele) kennis waarmee ze werken. Terwijl het CIP, als lid van de Raadgevende Groep voor Internationaal Landbouwonderzoek (CGIAR), het doel heeft de verspreiding van aardappel genetisch materiaal te promoten ten behoeve van de voedselzekerheid, is het gesitueerd in een land dat zeer ambivalent is ten opzichte van het delen van dergelijk materiaal en waar de bezorgdheid voor biopiraterij wijd verspreid is. Wageningen UR, op haar beurt, heeft vooral ten doel de Nederlandse aardappelsector te ondersteunen, maar het dient er voor te zorgen dat de hierbij horende intellectueel eigendomsrechten en zogenaamde valorisatiestrategieën het onderzoek voor ontwikkelingslanden niet in de weg staan.

Beide instanties zijn continue bezig hun eigen belangen en die van de verschillende partijen waarmee ze werken af te wegen met het doel een balans te vinden tussen het delen en beschermen van hun kennis, technologie en genetisch materiaal. Echter, in de huidige context waar arme maar biodiversiteits-rijke landen en gemeenschappen, zowel als geïndustrialiseerde landen en biotechnologie bedrijven, vooral gefocust zijn op de bescherming van hun materiaal om daar de vruchten van te plukken en diefstal te voorkomen, zijn publieke onderzoeksinstellingen het aan hun stand verplicht om te durven delen. Daarvoor moeten ze nieuwe manieren van delen en beschermen ontwikkelen die aansluiten bij hun missie en het best de publieke belangen dient.

Intellectueel eigendomsrechten in publiek onderzoek herbeschouwt: Een symposium

Hoofdstuk 6 bevat het startdocument en verslag van de internationale conferentie “Intellectueel eigendomsrechten in publiek onderzoek herbeschouwt: Het delen van biotechnologie met ontwikkelingslanden”, georganiseerd aan de Wageningen UR in April 2008. Het startdocument beschrijft de toenemende rol van intellectueel eigendomsrechten in biotechnologie onderzoek en het moeizame proces dat publieke onderzoeksinstellingen ondervinden wanneer zij toegang tot beschermde technologieën proberen te krijgen ten behoeve van onderzoek voor ontwikkelingsdoeleinden. De problemen variëren van het analyseren van complexe patentdatasystemen tot het onderhandelen om betaalbare of kosteloze licenties te krijgen met partijen die daar zelf weinig baat bij hebben. Tegelijkertijd echter, worden publieke onderzoekers zelf ook steeds meer gestimuleerd om hun kennis en uitvindingen te beschermen. Een belangrijke vraag is daarom hoe publieke onderzoeksinstellingen ervoor kunnen (en moeten) zorgen dat hun intellectueel eigendomsbeleid innovatie in ontwikkelingslanden niet blokkeert.

Over deze kwesties is gediscussieerd tijdens de internationale conferentie die partijen van verschillende disciplines en achtergronden bijeenbracht, waaronder plantkunde, sociale wetenschappen, ontwikkelingsstudies, intellectueel eigendom organisaties, onderzoeksfinancieringsorganisaties, de zaadindustrie en publieke groepen. Het verslag beschrijft de verschillende discussies, presentaties en belangrijkste uitkomsten van de conferentie. Daarbij is ook gesproken over mogelijke strategieën die publieke onderzoeksinstellingen kunnen helpen hun bewegingsvrijheid met betrekking tot onderzoek voor ontwikkelingsdoeleinden te vergroten, zoals de zogenaamde patent-pools, humanitaire licenties en open-source biotechnologie.

Wetenschapsvalorisatie met welke waarden?

Hoofdstuk 7 omvat een artikel dat reflecteert op de huidige trend van valorisatie – het creëren van economische waarde – binnen de publieke onderzoekssector. Meer specifiek richt het zich op de vraag of de nadruk op economische indicatoren de optimale manier is voor de wetenschap om een bijdrage te leveren aan de maatschappij, of aan de wetenschapsontwikkeling zelf. Daarbij wordt teruggekeken op de Wageningse conferentie over dit onderwerp, maar nu met speciale aandacht voor het organisatorische proces en de moeilijkheden om verschillende partijen bijeen te brengen om complexe problemen en de daarbij mogelijke oplossingen te bespreken.

Bij de kwestie van valorisatie in het publieke onderzoek zijn veel verschillende opvattingen en tegenstrijdige belangen betrokken. Om tot werkbare oplossingen te komen op dit gebied is daarom een continue input van, en dialoog tussen, de verschillende belanghebbenden vereist. Dit blijkt niet altijd makkelijk realiseerbaar, bijvoorbeeld omdat belanghebbenden het al oneens kunnen zijn over de probleemdefinitie op zich: Wat een probleem is voor de ene groep kan iets triviaals of zelfs een voordeel zijn voor de ander, ook binnen één en dezelfde organisatie. Maar aangezien de huidige valorisatietrend de rol van het publieke onderzoek zelf beïnvloedt, zullen onderzoeksinstellingen en individuele onderzoekers de nodige tijd en moeite moeten investeren om te reflecteren op diens impact en (lange termijn) gevolgen.

Op weg naar rechtvaardigheid in benefit-sharing

Hoofdstuk 8 brengt de voornaamste uitkomsten van dit onderzoeksproject samen. Zonder alle conclusies van de voorgaande hoofdstukken in detail te herhalen, geeft het een overzicht door te reflecteren op de onderzoeksvragen uit Hoofdstuk 1 en de algemene conclusies die daaruit voortgekomen zijn. Gegeven de vele praktische (en ethische) knelpunten rond *benefit-sharing*, en de sterk uiteenlopende belangen en opvattingen over het delen en/of beschermen van plant genetisch materiaal, (traditionele) kennis en intellectueel eigendomsrechten, kunnen we voorspellen dat het debat rond *benefit-sharing* vooralsnog niet voorbij zal zijn. In dit proefschrift worden enkele fundamentele veranderingen in het huidige uitwisselingsmodel van de CBD voorgesteld om zo de huidige impasse in de internationale ABS onderhandelingen te doorbreken, en om te werken naar een eerlijke en gelijke uitkomst daarvan. Het moet duidelijk zijn dat *benefit-sharing* ook lasten (*burden-sharing)* met zich meebrengt, en dat voor een succesvolle implementatie van *fair and equitable benefit-sharing* een voortdurende betrokkenheid vereist is van alle partijen op internationaal, nationaal en lokaal niveau. Met deze betrokkenheid kan benefit-sharing een nieuwe ‘standaard van rechtvaardigheid’ worden voor hoe landen, bedrijven, publieke onderzoeksinstellingen, en inheemse gemeenschappen met elkaar omgaan.

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Biography

Bram De Jonge has studied Arts and Sciences Studies at Maastricht University (1998-2003) and holds another Masters degree in Values and the Environment from the Institute for Environment, Philosophy and Public Policy at Lancaster University, United Kingdom (2001-2002). His dissertation dealt with Merleau-Ponty's phenomenology and the role that personal experiences of nature play within the field of environmental philosophy. After volunteering at the environmental NGO Legambiente in Italy in 2004, he started his PhD project on 'The Ethics of Benefit-Sharing in the Field of Plant Genomics' in 2005. This project was funded by the Centre for Society and Genomics and carried out at the Applied Philosophy Group of Wageningen UR. Since September 2009, Bram De Jonge is working at the Group of Sustainable Development and Food Security of Wageningen UR on a project that investigates the role of Intellectual Property Rights in reaching the Millennium Development Goals, especially with respect to the transfer of agricultural technologies between The Netherlands and the African continent.

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Description	Institute / Department	Year	ECTS
Courses:			
Mansholt Introduction course	MG3S	2005	1
Scientific Writing	CENTA	2006	1.5
Presentation Skills	CENTA	2006	1.5
The Future Genomics Society	VLAG / MG3S	2005	4
Interfaces between Science and Society	NFWT	2005	2
The Genome Society: ELSA Genomics, the State of the Art and Beyond	CSG / ISHSS	2006	2.5
Genomics & Globalisation	CSG / ISHSS	2007	2.5
Organisation of Workshop 'Genomics & Development'	CSG / WUR	2006	1
Organisation of International Conference 'Reconsidering IP policies in public research'	CSG / WUR	2008	2
Fundamental Ethics Course	APP (WUR)	2005-9	4
Teaching:			
Genomics & Society	CESAGEN / CSG	2005	2
Food Ethics	APP (WUR)	2006	
Ethics of Science	APP (WUR)	2007	
Philosophy and ethics of biotechnology	APP (WUR)	2009	
Filosofie en de groene ruimte	WUR	2008	
Presentations at conferences and workshops:			
ICABR Conference, Ravello (IT)		2006	5
Innogen Conference, London (UK)		2007	
ABS Conference, Bremen (D)		2008	
ABS Conference, New Delhi (IN)		2008	
CSG Conference, Amsterdam		2008	
EGN Conference, Cardiff (UK)		2009	
Mansholt PhD-Day		2009	3
Workshop 'Genomics & Development'		2006	
Corsage Workshop		2007	
CSG Onderzoeksdagen		2005-9	
Workshop Plant Breeding & IP (UK)		2008	
Total (minimum 30 ECTS)			**32**

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