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Editorial

The current issue of elni Review (2/2011) covers a variety of topics on international environmental law, including standardisation of environmental NGOs, conservation law and two country specific contributions from Brazil regarding access to environmental information and biotechnological inventions.

Special focus in this issue is placed on two different topics: Firstly on intellectual property rights on genetic resources. The second subject is devoted to access to environmental information and access to justice within the framework of the Aarhus Convention.

First of all, *Christoph Then and Ruth Tippe* examine the impact of biopatents on animal and plant breeding in their article "Patents on melon, broccoli and ham?". After shedding light on current German and European patent legislation they discuss the consequences of patents on conventional breeding regarding genetic resources and food production.

The second article "Biopatents in Brazil" by *Edson Paula de Souza* provides insights into current legislation on biotechnological inventions in Brazil. He explores the impact of limitation on patent protection for R&D.

Susette Biber-Klemm and Michelangelo Temmerman then provide us with an overview of Rights to Animal Genetic Resources by comparing the different legal frameworks for plant and animal breeding/genetic resources on national and international levels.

The two subsequent articles address different aspects of the Aarhus Convention:

Sandra Aline Nascimento da Nóbrega gives an overview of access to environmental information in Brazil (access to environmental information is one of the three pillars of the Aarhus Convention). She compares the Aarhus Convention with Brazilian legislation and discusses which regulations have been implemented in Brazilian law.

In her contribution *Eva Julia Lohse* asks whether there is unrestricted access to justice for environmental NGOs. She examines the judgement of the European Court of Justice (Case C-115/09) on the non-conformity of the German Environment Appeals Act with Directive 2003/35 and the Aarhus Convention.

Ralf Lottes's article analyses what civic society can expect from the Commission's proposal for a legislative review of the European standardisation policy. He concentrates on the standardisation of NGOs through the review of the EU framework for standardisation regarding environmental NGO participation on a national level.

Hendrik Schoukens's contribution on temporary nature and conservation law examines the adaptability of European nature conservation law for temporary nature, focusing on the situation in Belgium.

Finally, we cover recent developments in environmental law with three different contributions concentrating on intellectual property rights in terms of genetic resources.

The article by *Lisa Minkmar* provides insights from a biopatent case: the "Teff-Patent" (EP 1646287).

Subsequently; *Claudia Fricke* reviews the current debate on the revision of Directive 98/44/EC on the legal protection of biotechnological inventions.

Lastly, *Graham Dufield* comments on the United Nations Special Rapporteur on the Right to Food and the interplay between traditional knowledge, intellectual property rights and the right to food.

Contributions for the next issue of the elni Review are very welcome. Please send contributions to the editors by mid-February 2012.

Claudia Fricke/Martin Führ
November 2011

Rule of Law for Nature

9-11th May 2012
in Oslo, Norway

The year 2012 marks a number of watershed points in international environmental affairs: The 40th anniversary of the adoption of the Stockholm Declaration, the 30th anniversary of the UN World Charter for Nature and the UN Convention on the Law of the Sea, the 25th anniversary of the Brundtland Report, and the 20th anniversary of both the Rio Declaration, Agenda 21, and the UNCED Conventions: the Framework Convention on Climate Change and the Convention on Biological Diversity.

This is an appropriate point in time for reflection on the legal status of nature, how environmental goods and services are valued and taken into account in decision-making, and the implications of the rule of law in this respect.

While the rule of law generally is used with regard to citizens' rights, this conference aims to explore the application of the rule of law to environmental protection, and its implications. How can the legal protection of the natural environment be strengthened? This also opens for reflections on the temporal and geographical extension of the rule of law.

The conference aims at analysing these basic issues of international and national environmental law and looking at new trends in this area of law.

For more information about participation, including registration forms, please visit:

<http://www.jus.uio.no/forskning/omrader/naturressurs/arrangementer/2012/05-09-rule-of-law>

Rights to Animal Genetic Resources – Basic facts and debates

Susette Biber-Klemm / Michelangelo Temmerman

1 Introduction

Different strands of thinking and various lines of arguments lie behind the enquiry into the creation of rights to animal genetic resources. These are fuelled by three major developments regarding livestock genetic resources: the increasing volume in trade in animal products, the scientific progress in animal breeding with the advances in genetic engineering, and the so-called erosion of animal genetic resources.

This paper discusses questions of conservation and the sustainable use of animal genetic resources for food and agriculture (AnGRFA) in context with international trade and property rights. It provides an overview of the ongoing processes, the current debates and involved institutions.

The question asked from a trade angle is whether and how incentives (market incentives) can be created to address the failures that lead to market concentration and uniformity of breeds. The hypothesis is that the questions of ownership and allocation of the rights to the genetic information are key and a basis for creating incentives to provide for adequate investments in traditional breeds and foster creativity to adapt them to specific environmental conditions and consumer preferences.¹

Regarding AnGRFA diversity, we are clearly confronted with a failure of the international trade system: on the one hand, the livestock revolution and the liberalisation of trade create opportunities for agrarian (developing) countries to participate in international markets. On the other hand, production efficiency promoting high yield uniform breeds and the demands of international markets (food safety, production and market chain integration, voluntary standards) lead to industrialisation and high demands in biosecurity. In the present situation, a strong concentration of companies offering a genetically uniform product to the market is observed.

In this paper these developments are considered against the background of the premises that:

1) for AnGRFA – as for genetic resources in general – there is a North–South divide in terms of AnGRFA diversity and access to technology; 2) there is the

probability of a future South–North inequity in the utilisation of genetic information; 3) genetic engineering – bringing AnGRFA under the regime of patents – may prompt enclosures that counteract the public interests in diversity and equity; and 4) ways and means must therefore be found to balance negative developments and prevent harmful effects.

A similar process has taken place in the last century in the area of Plant Genetic Resources for Food and Agriculture (PGRFA). In this area genetic engineering has brought genetic resources under the patent system and led to increasing enclosure of the genetic information by patents or – for plants – by the plant breeders' rights. The response has been the creation of farmers' rights and the system on Access and Benefit Sharing of the Convention on Biological Diversity (CBD). Similarly, in AnGRFA, there is a call for animal breeders' rights, and livestock keepers' rights.² In this context, it is important to assess whether, in what aspects and to what degree the approaches applied to PGRFA could be applied analogically to AnGRFA. To this end it is necessary to – in an interdisciplinary approach – take stock of the characteristics and mechanisms that define breeding, property rights and transfer of ownership in the two areas.

The objective of this paper therefore is to take stock of the relevant background information on 1) the differences between animal and plant breeding and related property rights in general; 2) the possible impact of genetic engineering on AnGRFA; and 3) on the specifics of trade/markets and intellectual property rights.

In tackling the question of rights to AnGRFA, three approaches need to be taken into consideration: 1) analysing the present situation regarding the triangle of AnGRFA diversity, rights to AnGRFA, and the present state of external elements that have an impact on AnGRFA diversity; 2) understanding the ongoing changes in R&D and in the marketing and flow of AnGRFA, and their significance for AnGRFA diversity; and 3) – given the potential of the development of genetic engineering and its impact on the property rights and the flow of AnGRFA – creating and discussing a scenario on future developments and changes.

¹ The following is based on the results of an international workshop on rights to animal genetic resources for food and agriculture held at the World Trade Institute, University of Bern in Switzerland, on the 27 and 28 November 2008. The complete results are available in S. Biber-Klemm and M. Temmerman, Rights to Animal Genetic Resources for Food and Agriculture, Notes from an interdisciplinary workshop, NCCR Trade Regulation Working Paper No 2010/05, available at: http://www.wti.org/fileadmin/user_upload/nccrtrade.ch/wp3/Rights%20to%20Animal%20Genetic%20Resources.pdf (last visited 18 September 2011).

² See M. Temmerman, Animal Breeders' Rights(?), NCCR Trade Regulation Working Paper No 24/2011, available at: <http://www.nccr-trade.org/publication/animal-breeders-rights/> (last visited 18 September 2011), and S. Biber-Klemm, Livestock Keepers' Rights, NCCR Trade Regulation Working Paper No 68/2011, available at: <http://www.nccr-trade.org/publication/livestock-keepers-rights/> (last visited 18 September 2011).

In dealing with the issues outlined above it is important to be aware of the multifaceted character of the subject matter “animal genetic resources” in view of innovation, trade and property rights. There is firstly the level of the “breed”, as expressed in a single animal, and as a result of incremental innovation processes in traditional breeding.³ The question here is what the impact of trade in animal products and derivatives (germplasm) on breed diversity is.

On the other hand there are the micro levels of biotechnology and genetics when innovative processes develop methods and products that are considered to be (process or product) technical innovations in the sense of the patent system.

For our context, we subsume ‘*innovation*’, whether incremental or in a technical sense of the patent system, under the term ‘*breeding*’. What is meant is the breeding of livestock, in the sense of the FAO’s State of the World’s Animal Genetic Resources; thus excluding for instance fish and other aquatic resources.⁴ In this context it is also important to flag that if we are talking about markets, we mean the marketing of the genetic resources, i.e. trade in germplasm or the transfer of animals for breeding purposes.⁵

2 Factual background

2.1 Present situation

The evolution in the livestock sector is characterised by three major developments: first, the increasing volume of trade in animal products; secondly the scientific progress in animal breeding and the advances in genetic engineering. These trends must thirdly be seen against the background of the ongoing erosion of animal genetic diversity.

As to the increasing volume of trade in animal products, expansion has been most dynamic in developing countries with rapid economic growth. In these countries, growth of the market in animal products is triggered by the increased purchasing power of the population, which leads to a greater consumption of meat, milk and eggs by a new middle class. The trend, termed the ‘*livestock revolution*’, is amplified by population growth, increasing urbanisation and changing lifestyles.⁶ These lead to structural changes in

trade and retailing.⁷ The globalisation of markets and the weakening of trade barriers allow growth of the livestock sector and changes in production mode. The demand for safe products, answering to the international zoosanitary and food safety standards as well as consumer demands led to the industrialisation of production in biosecure production entities. This is furthered by increasing competition and demands for standardised products by integrated market chains. These developments have an impact on livestock diversity: local breeds are being replaced by a narrow range of high-yielding breeds in specialised industrial systems. In traditional conditions, a similar development may take place as a consequence of inappropriate livestock development policies: Livestock diversity is also being diluted by indiscriminate crossbreeding with exotic animals.⁸

There is consensus that the global diversity in farm animals is under threat⁹, although the lack of population data means that the exact risk cannot be established.¹⁰ There is also agreement that diversity of domestic animals and plants is valuable and needs to be maintained. Allegedly, higher diversity exists in smallholder systems; in particular in smallholder and pastoral systems in the developing world, that depend on locally adapted breeds.¹¹ From a market and trade aspect, maintenance of diversity thus is closely related to its direct use value; i.e. the use and market value. From this follows that in the endeavours to maintain diversity of AnGRFA the smallholder and pastoralist systems in developing countries have a prominent role.

As conservation of AnGRFA, in comparison to PGRFA, is expensive and complex, conservation by

³ For the terminology compare FN 25.

⁴ Food and Agriculture Organisation of the United Nations, Commission on Genetic Resources for Food and Agriculture, The State of the World’s Animal Genetic Resources for Food and Agriculture 145-147 (FAO, Rome, 2007).

⁵ Albeit being aware that the markets of (other) animal products like meat, milk products, eggs have tremendous impacts on AnGR diversity (see e.g. Biber-Klemm et al. Effects of International Legal Regimes and Policy Measures aimed at the Protection of Human, Animal or Plant life or Health on Animal Genetic Diversity. NNCR International Trade Working Paper No 2010/09, in particular Annex III).

⁶ H. Steinfeld and P. Chilonida, Old Players, New Players, in Livestock Report 2006 3-14 (Food and Agriculture Organisation of the United Nations, Rome,

2006); and Food and Agriculture Organisation of the United Nations, Commission on Genetic Resources for Food and Agriculture, The State of the World’s Animal Genetic Resources for Food and Agriculture 53-54 (FAO, Rome, 2007).

⁷ Food and Agriculture Organisation of the United Nations, Commission on Genetic Resources for Food and Agriculture, The State of the World’s Animal Genetic Resources for Food and Agriculture 53-70 (FAO, Rome, 2007).

⁸ Ibid, 71-73.

⁹ S.J. Hiemstra, A.G. Drucker, M.W. Tvedt, N. Louwaars, J.K. Oldenbroek, K. Awgichew, S. Abegaz Kebede, P.N. Bhat and A. Da Silva Mariante, Exchange, Use and Conservation of Animal Genetic Resources, Policy and regulatory options, CGN Report 2006/06 (2006).

¹⁰ Food and Agriculture Organisation of the United Nations, Commission on Genetic Resources for Food and Agriculture, The State of the World’s Animal Genetic Resources for Food and Agriculture XXXV, 23, and 48 (FAO, Rome, 2007).

¹¹ Food and Agriculture Organisation of the United Nations, Commission on Genetic Resources for Food and Agriculture, The Roles of Small-scale Livestock Keepers in the Development, Use and Conservation of Livestock Resources, Doc CGRFA-12/09/Inf.12, FAO, Rome, 2009; Food and Agriculture Organisation of the United Nations, Livestock keepers – guardians of biodiversity, Animal Production and Health Paper No. 167, FAO, Rome, 2009; O. Hanotte, T. Dessie, and S. Kemp, Time to Tap Africa’s Livestock Genomes, 328 Science 1640/1, 25 June 2010; I. Hoffmann, Climate change and the characterization, breeding and conservation of animal genetic resources, 41 Animal Genetics 32–46 (2010).

utilisation is an important strategy for AnGRFA.¹² In this context, some authors argue that maintenance and sustainable use of the resources could be fostered by the creation of economic incentives. They propose the creation of property rights to the genetic resources and related traditional knowledge that would allow for the internalisation of their value in the market place.¹³

2.2 Ongoing changes and potential future developments

The breeding and reproduction environment has been significantly changed by the developments in the field of molecular genetics. The technology of marker assisted selection is continuously improving and is expected to revolutionise existing cattle breeding programmes. Breed improvement through genetic control may provide key entry points to increased productivity and/or to selecting for specific disease resistance.¹⁴ Such technologies, however, bring in patent rights and the shift in ownership these provoke. This is not a shift from public to private as is frequently the case, but rather from private (farmers) to private (inventors or patent holders). Yet, at present, the introgression of desirable traits by gene transfer from exotic local breeds to commercial breeds is not really successful. According to Flury, the techniques are still inefficient (besides the problems of public acceptance). Though Nieman et al.¹⁵ describe several agricultural uses¹⁶ of transgenic animals, none of them bear genetic information from related livestock species. This corresponds to Mäki-Tanila's¹⁷ observation that so far – in

contrast to the gene transfer in PGR – the introgression of desirable traits from local breeds to commercial breeds has failed.

Nieman et al. describe, for instance, environmentally friendly pigs that have been developed to address the problem of manure-related pollution (phosphorus) by introducing a bacterial phytase gene; pigs with an introduced spinach desaturase gene to reduce the amount of non-saturated fatty acids; and the introduction of human lactoferrin into cattle in order to increase the disease resistance of the mammary gland. They anticipate that within the next decade genetically modified animals will play a significant role in biomedicine. In the agricultural sector several applications are in preparation¹⁸. They are bound to increase once the complete genomic sequences of all farm animals become available. The transfer of desirable genetic traits is of course possible by conventional breeding methods, as Valle Zarate describes in her case studies on Boran and Tuli cattle breeds.¹⁹

The breeding technologies such as artificial insemination, semen sexing technologies and embryo transfer enable a faster and increased multiplication of interesting traits.²⁰ In addition, they allow for the intensification of the marketing of animal genetic resources on the global level – as frozen semen and embryos are transportable and health and quarantine restrictions are less stringent than for living animals.²¹ As a result, the genetically uniform high-yield breeds increasingly

¹² S.J. Hiemstra, B. Visser and K. Oldenbroek, Report of the International Technical Expert Workshop: Exploring the need for specific measures for Access and Benefit-Sharing of Animal Genetic resources for food and Agriculture (Wageningen, 8-10 December 2010, available at: http://documents.plant.wur.nl/cgn/seminars/Worshop20100812/Final_Report_of_the_International_Technical_Expert_Workshop.pdf (last visited 18 September 2011)).

¹³ T.M. Swanson, The appropriation of evolution's values: an institutional analysis of intellectual property regimes and biodiversity conservation, in: *Intellectual Property Rights and Biodiversity Conservation: An Interdisciplinary Analysis of the Values of Medicinal Plants* 141-175 (T.M. Swanson, ed., Cambridge University Press, Cambridge, 1995); and Organisation for Economic Co-operation and Development, *Saving Biological Diversity: Economic Incentives* (OECD, Paris, 1996).

See also the sources in S. Biber-Klemm and T. Cottier, *Rights to Plant Genetic Resources and Traditional Knowledge, Basic Issues and Perspectives* (eds.) (CABI Wallingford UK 2006); though the theory has recently been challenged by C. Tisdell, *Global Property Rights in Genetic Resources: Do They Involve Sound Economics? Will They Conserve Nature and Biodiversity?* The University of Queensland, Economics, Ecology and the Environment Working Paper No. 150 (2008).

¹⁴ Ch. Flury, *Biotechnology in animal breeding. Present stage and foreseeable developments*, in *Rights to Animal Genetic Resources, Notes from an Interdisciplinary Workshop* 33-38 (S. Biber-Klemm and M. Temmerman, NCCR Trade Regulation Working Paper No 2010/05, May 2010).

¹⁵ H. Niemann, W. Kues and J.W. Carnwath, *Transgenic farm animals: present and future*, 24(1) *Rev. Sci. Tech. Off. Int. Epiz.* 285-298 (2005).

¹⁶ There is transgenesis in livestock for biomedicine that is already in practical use such as gene pharming and xenotransplantation of cells/tissues. Cf. H. Niemann, W. Kues and J.W. Carnwath, *Ibid.*

¹⁷ A. Mäki-Tanila, *Differences between plant and animal genetic resources*, in *Rights to Animal Genetic Resources, Notes from an Interdisciplinary Work-*

shop 25-28 (S. Biber-Klemm and M. Temmerman, NCCR Trade Regulation Working Paper No 2010/05, May 2010).

¹⁸ H. Nieman, W. Kues, and J.W. Carnwath, *Transgene Farm Animals: Current Status and Perspectives for Agriculture and Biomedicine in Genetic Engineering in Livestock. New Applications and Interdisciplinary Perspectives* 286 (Engelhard, M., Hagen, K. and Boysen, M. (eds.), Berlin-Heidelberg, Springer, 2009); and Flury Ch., *Biotechnology in animal breeding - Present stage and foreseeable developments in Rights to Animal Genetic Resources*, in *Notes from an Interdisciplinary Workshop* 25-28 (S. Biber-Klemm and M. Temmerman, NCCR Trade Regulation Working Paper No 2010/05, May 2010); and Malafosse, *ibid.*, at 39-43.

¹⁹ Valle Zárata, K. Musavaya, & C. Schäfer, *Gene flow in animal genetic resources: a study on status, impact and trends* (available in the annex to Food and Agriculture Organisation of the United Nations, Commission on Genetic Resources for Food and Agriculture, *The State of the World's Animal Genetic Resources for Food and Agriculture* (FAO, Rome, 2007), available at: <ftp://ftp.fao.org/docrep/fao/010/a1250e/annexes/Thematic%20Studies/Geneflow/GeneflowStudy.pdf> (last visited 18 September 2011)).

²⁰ Seemingly, also cloning technologies are increasingly used ("Test-tube calf seen as savior of vanishing lineage", *International Herald Tribune*, July 30, 2010) and commercially offered. According to Flury, the application of the technology for animal breeding is expected to be restricted, as breeding relies on variation and the costs are not economically portable and seemingly of interest for elite animals only, for instance to maintain an ancient lineage of Spanish fighting bulls; to conserve elite breeds of racing camels or horses and the like (Flury Ch., *Biotechnology in animal breeding - Present stage and foreseeable developments in Rights to Animal Genetic Resources*, in *Notes from an Interdisciplinary Workshop* 25-28 (S. Biber-Klemm and M. Temmerman, NCCR Trade Regulation Working Paper No 2010/05, May 2010)).

²¹ Flury Ch., *Biotechnology in animal breeding - Present stage and foreseeable developments in Rights to Animal Genetic Resources*, in *Notes from an Interdisciplinary Workshop* 25-28 (S. Biber-Klemm and M. Temmerman, NCCR Trade Regulation Working Paper No 2010/05, May 2010).

out-compete local breeds. According to Valle Zarate and others, this increased global mobility will further enhance the gene flows. Projections for the 21st century suggest that there will be an increased impact of genetic material from a few globally acting enterprises on North–South and South–South transfers, and an increased North–North exchange of genetic material through networking in breeding programmes. Yet it can be inferred that new technologies to detect commercially interesting genes in local populations in the South may ease the mobility of valuable genetic material from South to North.

Taking into account such future developments, the question remains of the extent to which genetic engineering and, in particular the production of transgenic animals, would change the property rights landscape in AnGRFA too. Moreover, the increasingly international market for animals, animal products and derivatives becoming has a profound impact on AnGRFA diversity. It seems predictable that in both transgenic animals and those that are the outcome of conventional breeding, the focus will rather be put on increased productivity traits – genetic structures that are more developed in Northern countries. In parallel an impact on the question of rights, including IP rights, is highly probable.

Seen in this context, the arguments behind the call for the creation of property rights specific to AnGR can be summarised under the ideas of ‘*creation of incentives for conservation of AnGR diversity*’, and the overall call for equity and fairness in the way genetic resources are accessed and used in R&D. This argument goes hand in hand with the call to find a balance in the system of IPRs as applied to AnGR and AnGRFA.

Two options to this end are on the table: either to approach the matter via intellectual property rights or to integrate AnGRFA into the ABS system of the Convention on Biological Diversity (CBD)²². In both cases, the ideas are based on approaches in the case of plant breeding and of the plant genetic resources for food and agriculture (PGRFA). In order to assess these approaches and the prospects of learning from them it is important to compare the relevant characteristics of AnGRFA and PGRFA respectively.

2.3 Comparison of plant and animal breeding and related property rights

The arguments backing the call for the creation of property rights specific to AnGR can be summarised

under the ideas of ‘*creation of incentives for conservation of AnGR diversity*’, and the overall call for equity and fairness in the way genetic resources are accessed and used in R&D. This argument goes hand in hand with the call to find a balance in the system of IPRs as applied to AnGR and AnGRFA.

In this context, two approaches are being discussed: the first is to proceed according to the blueprint developed in plant breeding where plant breeders’ rights and the patenting of innovations were introduced step by step, and then answered by farmers’ rights aimed at reinforcing the position of farmers and rewarding creativity in plant breeding. Secondly, the CBD system ABS triggers another strand of debate. In contrast to PGRFA, the debate on the integration of AnGRFA into the ABS system is still in its initial stages.²³ In the context of the present discussion, the question of own-ership of the resources that are to be covered by the ABS system or the entitlement to dispose of the resources is examined.

In PGRFA, in the last century, the application of scientific breeding methods led to the formalisation and industrialisation of plant breeding. This process was accelerated by the application of methods of genetic engineering. It triggered greater investments in research and development (R&D) and brought the results of the innovation processes under the protection of IPRs: in contrast to AnGRFA, PGRFA were subject to a global extension of property rights in the second half of the twentieth century. The plant breeders’ rights (PBRs) were created to address the specific situation of plant breeding, and to balance the interests between access to and exchange of varieties and the return on the investments of the breeders.

Yet, in discussing a potential analogy between the creation of rights to PGRFA and to AnGRFA, it is important to be aware of the basic differences between the two. Farm animals, with the exception of pigs and chickens, produce few progeny. This leads to a higher market value of the individual animal. The flow of the genetic resources in the market differs accordingly and is based on bilateral exchanges of private property rights. Even if animals used for production exhibit the same genetic diversity as those used for selection, the “dual character” of PGRFA as both seeds containing hereditary information and as tradable goods or food-stuff seems less evident in AnGRFA. Here, the value of the genetic information is included in the market price of the animal. The main resource for genetic change in AnGRFA is genetic variation within the

²² M. Ivankovic, Analysis of Applicability of Access and Benefit Sharing Principles on Animal Genetic Resources (Centre for Genetic Resources Wageningen 2008); and Food and Agriculture Organisation of the United Nations, Commission on Genetic Resources for Food and Agriculture, Framework Study on Food Security and access and Benefit-Sharing for Genetic Resources for Food and Agriculture, Background Study Paper No 42 (2009).

²³ M. Ivankovic, Analysis of Applicability of Access and Benefit Sharing Principles on Animal Genetic Resources (Centre for Genetic Resources Wageningen 2008); and Food and Agriculture Organisation of the United Nations, Commission on Genetic Resources for Food and Agriculture, Framework Study on Food Security and access and Benefit-Sharing for Genetic Resources for Food and Agriculture, Background Study Paper No 42 (2009).

animal populations. Populations are dynamically changing; and in each generation, the genetic variation is increased by some 0.1%. Whereas plants depend on continuous introgression of new genetic information, this is not necessary in AnGRFA as there is spontaneous mutation and sufficient genetic diversity.²⁴

For these reasons, property rights in the genetic resources relate to individual animals that, as a rule, belong to a specific breed. Their exchange is as a rule regulated by private ownership – contracts under private law, or agreements under customary law. Regarding the genetic resources, the language in animal breeding is about the value and the characteristics of ‘breeds’. The question here is what exactly is meant by this term. It is indeed likely, especially with the eventual creation of a *sui generis* system, that the subject of such rights will be ‘breeds’. The terminology and the agreement on a given definition is therefore of primary importance. In both the North and the South, phenotypical characteristics and the perception and declaration as a breed play a role.

Breeding processes are similar in traditional and in conventional²⁵ breeding: selection is made according to desirable traits. The qualities of the parental lines are documented in a register (Europe), or memorized by the breeder.²⁶ In farm animals, the genetic resources and their derivatives as a rule are privately owned, whether they are registered in a herdbook or not. In traditional and conventional breeding systems, the value of the genetic information created by the breeder is included in the market price of the animal. The right to progeny is – as a rule – transferred with the transfer of the female animal. So the farmers own the animals and, in the case of females, also their

direct offspring, regardless of whether it has been produced by artificial insemination or natural mating. Prices of live animals and their derivatives like embryos or semen depend on the genetic value and/or market conditions. In traditional/indigenous systems, the property rights system might be more diverse, but follows the same basic principles.

Similarly to the developments in plant breeding, genetic diversity on AnGRFA markets varies from poor to almost non-existent (in swine and poultry). Poultry, cattle and pig markets show a progressive pattern of dislocation of public and private breeding. This leads to markets that are increasingly controlled by large corporations with the potential to limit or hamper competition, leading to genetically uniform livestock populations, selected uniquely according to performance. It is however interesting to note that the above-described effects on diversity of industrially bred animals at present is not due to monopolies through patents, but to trade secrets combined with the techniques of hybridisation.²⁷ Yet, AnGRFA, in spite of the increasing industrialisation of breeding and production processes, has remained largely outside the scope of patenting.²⁸ The question that thus arises is if, and to what extent, IP rights could be used to unblock this situation, by creating incentives to market genetically diverse products.

However, as mentioned above, and in contrast to the PGRFA, where diverse germplasm originating in the centres of diversity is essential for the breeding process, diverse AnGRFA germplasm originating from the South are not considered essential for breeding processes. Accordingly, the flows of the resources differ essentially. Whereas in PGRFA, important flows of resources take place from South to North, in AnGRFA the main flows take place in a North–North, North–South and South–South direction.²⁹ Gollin et al.³⁰ confirm this fact. They analyse AnGR trade flows in live

²⁴ A. Mäki-Tanila, Differences between plant and animal genetic resources, in Rights to Animal Genetic Resources, Notes from an Interdisciplinary Workshop 25-28 (S. Biber-Klemm and M. Temmerman, NCCR Trade Regulation Working Paper No 2010/05, May 2010, available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1652166 (last visited 18 September 2011)).

²⁵ For this publication a distinction is proposed between: *traditional/indigenous breeding* in community breeding contexts without written documentation (G.T. Kassie, A. Abdulai, C. Wollny, A. Drucker and W. Ayalew, Economic values of traits of indigenous cattle in local markets: implications for global genetic material transfer, in Rights to Animal Genetic Resources, Notes from an Interdisciplinary Workshop 20-24 (ibid); and I. Köhler-Rollefson, Livestock keepers' rights in Rights to Animal Genetic Resources, Notes from an Interdisciplinary Workshop 61-66 (ibid); *conventional breeding*: phenotypical selection criteria: including artificial insemination and embryo transfer technologies; and *modern breeding*: quantitative genetics, analysis methods (marker assisted selection, single nucleotide polymorphism) See: C. Marguerat-König, Traditional animal breeding and property rights, in Rights to Animal Genetic Resources, Notes from an Interdisciplinary Workshop 14-16 (S. Biber-Klemm and M. Temmerman, NCCR Trade Regulation Working Paper No 2010/05, May 2010).

²⁶ C. Marguerat-König, Traditional animal breeding and property rights, in Rights to Animal Genetic Resources, Notes from an Interdisciplinary Workshop 14-16 (S. Biber-Klemm and M. Temmerman, NCCR Trade Regulation Working Paper No 2010/05, May 2010); and I. Köhler-Rollefson, Livestock Keepers' Rights in Rights to Animal Genetic Resources, Notes from an Interdisciplinary Workshop 61-66 (ibid).

²⁷ M. Temmerman, Animal Breeders' Rights(?), NCCR Trade Regulation Working Paper No 24/2011, available at: <http://www.nccr-trade.org/publication/animal-breeders-rights/> (last visited: 18 September 2011); S. Gura, Trade in animal genetics - Competition and Concentration in Rights to Animal Genetic Resources, Notes from an Interdisciplinary Workshop 53-55 (S. Biber-Klemm and M. Temmerman, NCCR Trade Regulation Working Paper No 2010/05, May 2010).

²⁸ M. Temmerman, Animal Breeders' Rights(?), NCCR Trade Regulation Working Paper No 24/2011, available at: <http://www.nccr-trade.org/publication/animal-breeders-rights/> (last visited: 18 September 2011).

²⁹ I. Hoffmann, International flows of animal genetic resources – historical perspective, current status and future expectations (International technical expert workshop: exploring the need for specific measures for ABS of AnGR, Wageningen, 7-10 Dec. 2010, available at: <http://documents.plant.wur.nl/cgn/seminars/Worshop20100812/Hoffmann.pdf> (last visited 18 September 2011); and Food and Agriculture Organisation of the United Nations, Commission on Genetic Resources for Food and Agriculture, The State of the World's Animal Genetic Resources for Food and Agriculture 53-70 (FAO, Rome, 2007).

³⁰ D. Gollin, E. Van Dusen and H. Blackburn, Animal genetic resource trade flows: Economic assessment, 120 *Livestock Science* 248-255 (2009).

cattle and pigs for breeding and cattle semen from 1990 to 2005 based on data reported to the United Nations Statistics Division by 150 countries. They conclude that the data do not support the notion that Southern genetic resources are (at present) being used on a large scale in the North. The main trade flows are (in order of importance) North-North, North-South, South-South and South-North. They observe that world trade in AnGRFA is segmented into trade within high productivity systems and trade within low productivity systems. They note that there is very little trade across these two types of production systems, the largest flows taking place within high productivity systems that are both exporters and importers. This trade is multi-directional and apparently competitive. This coincides with the observation by Hoffmann³¹ and Anderson and Centonze³² that there is little interest in uncharacterised local breeds by formal breeding.³³ And, as Hoffmann points out, very few developing countries have commercially relevant breeding programmes (e.g. Brazil, South Africa, Kenya); and flows from South to North are rare. There is a clear difference to PGRFA where the flows of the resources from South to North are based on the network of (public) ex-situ collections and research centres under the CGIAR system of the Consultative Group on International Agricultural Research, that also do background work on collection and characterization of the resources.

There is some South-North trade though. According to a study by Valle Zarate et al.³⁴, improved Tuli and Boran have found increasing interest as a source for genetic diversity with the potential to improve production in subtropical and tropical regions. Boran have travelled from Ethiopia to Kenya (Improved Boran) and Zambia and then to Australia and South America and the USA (but there in competition to the Brahman); Tuli from Zimbabwe; South-African region, Australia and USA.³⁵

Transgenic animals would change the property rights landscape in AnGRFA too. Moreover, the increasingly

international market for animals, animal products and derivatives becoming has a profound impact on AnGRFA diversity. It seems predictable that in both transgenic animals and those that are the outcome of conventional breeding, the focus will rather be put on increased productivity traits – genetic structures that are more developed in Northern countries. In parallel an impact on the question of rights, including IP rights, is highly probable.

2.4 Analysis

Impacts of the market in AnGRFA products and derivatives are drivers of change. Trade liberalisation and globalisation leads to intensification and concentration of production. Advances in science (modern breeding methods) allow for acceleration and intensification, of breeding processes and easy transfer of GRs (germplasm embryos) globally. These processes are bound to continue. In this context, it is important to note that in comparison to PGRFA, there is less interdependence in AnGRFA. Flows are North-South, South-South, but – so far – hardly South-North. The impact of uncontrolled importation of high-production germplasm into low-intensity system is bound to contribute to the erosion of GRs. In comparison to PGRFA, ex-situ conservation of AnGRFA is costly. Therefore, in situ conservation through use is important.

In comparison to PGRFA, the property rights to the genetics of the individual animal are clearer. Also, AnGRFA – in spite of the increasing industrialisation of production – have largely remained outside the scope of IPRs. Yet, future innovation in biotechnology and genetic engineering are bound to focus on increased productivity. An impact on the right situation, including IPRs is highly probable. The resulting questions are, how in-situ conservation of valuable breed diversity can be furthered – also in making modern breeding technologies accessible and in balancing a possible negative impact of enclosure by IPRs.

3 The context of trade, markets and IPRs

3.1 Economics and markets

As observed above, there is at present little trade from extensive production to more intensive production systems and the gene-flow is N-S rather than S-N.³⁶ A general interpretation of this fact is that there exists no market for the specific genetic traits of the animals of the South – at least at present – and/or that in the important genetic traits are already available in the countries of the North. An alternate line of argument is that the breeds of the extensive smallholder production are marketed on local level and, due to the specifics of these market structures, either do not reach the inter-

³¹ I. Hoffmann, *Ibid* at footnote 24.

³² S. Anderson and R. Centonze, *Property Rights and the Management of Animal Genetic Resources*, CAPRI Working Paper 48 (2006).

³³ This corresponds to the observation in PGRFA, where industrial breeding is/private enterprises are not interested in working with uncharacterized landraces.

³⁴ A. Valle Zárate, K. Musavaya, & C. Schäfer, *Gene flow in animal genetic resources: a study on status, impact and trends* (available in the annex to Food and Agriculture Organisation of the United Nations, Commission on Genetic Resources for Food and Agriculture, *The State of the World's Animal Genetic Resources for Food and Agriculture* (FAO, Rome, 2007), available at: <ftp://ftp.fao.org/docrep/fao/010/a1250e/annexes/Thematic%20Studies/Geneflow/GeneflowStudy.pdf> (last visited 18 September 2011).

³⁵ See also N. Mpofu, *The multiplication of Africa's indigenous cattle breeds internationally: the story of the Tuli and Boran breeds, 2002*, available at: http://agtr.ilri.cgiar.org/agtrweb/index.php?option=com_content&view=article&id=77&Itemid=94 (last visited 18 September 2011).

³⁶ There are examples for South-South trade though (Indian Zebu to Brazil); and South-North exportation (improved Borana cattle). The point may be that there is much traditional and informal transfer by trade in animals.

national market, and/or are undervalued in bigger markets. Rege and Gibson argue that the traditional resource rights – to plant and animal genetic resources – in general remain undervalued³⁷, as value is not absolute but context-dependent. This corresponds to the thesis that in the case of diverse genetic information of the South, the marketing value of the genetics of an animal corresponds to the specifics of the given market situation. It is argued that the radius of the market is limited by the transportability of the genetic information; in traditional systems it is defined by the transportability of the animal and the (mental) information that the vendor has about its qualities. It is assumed that this leads to balanced markets in a local context. The introduction of the biotechnological methods to produce, conserve and transport germplasm has globalised the markets. Semen and embryos are traded worldwide. Global documentation systems include the standardisation of recording.³⁸ In turn, the value presently assigned to local breeds in the South follows local rather than global market mechanisms; their genetic material is undervalued. Several reasons can be identified for this market failure. Firstly, the specific (added) value of the products, given by their characteristics/ traits is known and made use of only/at most on the local level, due to a lack of characterisation and related accessible documentation and certification. Secondly, there is a disjunction in time. One possible scenario is that with changing environmental conditions, such as the effects of climate change, the value of diverse AnGRFA would increase enough to operate as an incentive for conservation. Yet, diversity is being lost at present. In this respect, the resources are to be considered as an option value³⁹ that is of interest not only on the local, but also on a global level, yet not being taken into account in the current market prices.

Thirdly, as has been shown, the market as it is played today, with its emphasis on productivity and competitive advantage, leads to industrialised production modes and homogenisation in many cases. Yet, an

emphasis on productivity is hard to avoid. From this follows that the conservation/ maintenance of the public good “diversity of animal genetic resources for food and agriculture” cannot be attained by market mechanisms alone, since correcting the market (i.e. the demand for high-productivity products) may never succeed to a sufficient degree.

These findings correspond to the economic “niche-theory” as proposed by Tisdell and Seidl.⁴⁰ Tisdell and Seidl examine the relationship between market niches and economic competition and explore the consequences of niches for economic efficiency, growth and diversity of commodities. They conclude that the availability of niches can potentially have a very positive impact on economic growth and development as well as on the diversity of commodities in situations of monopolistic competition. They argue that most niches are under threat; as a result of the “*neo-liberal restructuring of economies and political systems, of the deregulation of political activities and the retreat of governments and their administrations from previous political tasks to make place for private initiatives and markets, the tendency to centralise remaining political tasks, and the penetration of the efficiency and competition principle to all walks of economic and non-economic life as part of the economic globalisation process*”⁴¹.

These theories support the – intuitive – finding that solutions must be found to foster the competitiveness of the “*South AnGR*” on the world market⁴². According to our argument above, an essential basis would be the identification, registration and monitoring of selected breeds kept by smallholders, also in the countries of the South.⁴³ Yet, government of DCs - forcibly or not - set other priorities and frequently do not have the capacities in technology, knowledge and finances

³⁷ J.E.O. Rege and J.P. Gibson, Animal genetic resources and economic development: issues in relation to economic valuation, 45 *Ecological Economics* 319-330 (2003).

³⁸ See for instance International Committee for Animal Recording (www.icar.org (last visited 18 September 2011)) and especially the International Bull Evaluation Service, a permanent sub-committee of the International Committee for Animal Recording (www.interbull.org (last visited 18 September 2011)). In recent years, the combined world exports of live animals for breeding (bovines and swine), plus the trade in bovine semen, has totalled US\$ 500 million to US\$ 1 billion annually (D. Gollin, E. Van Dusen and H. Blackburn, *Animal genetic resource trade flows: Economic assessment*, 120 *Livestock Science* 248-255 (2009)).

³⁹ S.J. Hiemstra, B. Visser and K. Oldenbroek, Report of the International Technical Expert Workshop: *Exploring the need for specific measures for Access and Benefit-Sharing of Animal Genetic resources for food and Agriculture* (Wageningen, 8-10 December 2010, available at: http://documents.plant.wur.nl/cgm/seminars/Worshop20100812/Final_Report_of_the_International_Technical_Expert_Workshop.pdf (last visited 18 September 2011)).

⁴⁰ C. Tisdell and I. Seidl, Niches and economic competition: implications for economic efficiency, growth and diversity, 15 *Structural Change and Economic Dynamics* 119-13 (2004).

⁴¹ See also The Group of Lisbon, *Limits of Competition* 133 (Cambridge, MA: MIT Press 1995).

⁴² Compare on the necessity to foster “*niche economy*” (C. Tisdell and I. Seidl, *Niches and economic competition: implications for economic efficiency, growth and diversity*, 15 *Structural Change and Economic Dynamics* 119-13 (2004)). This is especially likely because in many markets, economic globalisation leads to a situation in which few producers occupy very large market shares, whereas comparatively many producers share the edges of the markets. Yet, the small producers at the edges often do not have the capital and capacities to carry out major investments and innovations, and simultaneously, the markets of the large producers are insufficiently protected to encourage large and uncertain investments (e.g. the pesticide sector). This constellation can also result in narrow lock-ins in technological development.

⁴³ Compare Food and Agriculture Organisation of the United Nations, Commission on Genetic Resources for Food and Agriculture, *Global Plan of Action for Animal Genetic Resources and the Interlaken Declaration* e.g. Part I 13; Part II 29 (adopted by the International Technical Conference on Animal Genetic Resources for Food and Agriculture, Interlaken, Switzerland, 3-7 September 2007).

to develop and implement respective policies and measures.⁴⁴

3.2 Intellectual property rights

As described, for a long time innovation in animal genetics occurred in an environment that was relatively free from intellectual property protection. Protection in AnGRFA has mainly been sought in secrecy, eventually combined with *hybridisation*. The strongest rights classically applied to the protection of innovation in PGRFA (patents and *sui generis* rights) are either not available (*sui generis*) or only made their appearance in the past decade (*patents*).

At the international level, the TRIPS Agreement leaves the choice over the patentability of animals open to domestic regulation. Unlike for plants, it does not prescribe a *sui generis* system for the protection of animal 'varieties'. Even in developed countries, classically open to the protection of biotechnology, many exclusions and limitations have been set to the patenting of genetic inventions concerning animals. Nevertheless the question arises whether the parallels in the evolution of animal and plant breeding can be taken further, to the creation of animal breeders and livestock-keepers rights, and ultimately up to the negotiation of an International Agreement on Animal Genetic Resources for Food and Agriculture.

Today patents are increasingly playing a role in accentuating the diffusion of the traditional v. biotechnology distinction. Whereas 'traditional' methods are not covered by IP rights of the patent type, biotechnology methods or methods with a number of 'non-traditional' steps often do fall under patent protection. Selection and herd improvement methods may for instance be based upon biotechnological steps, with 'conventional' yet improved breeds as an outcome. The one (or more) biotech step(s) may bring in patents and thus the control of the patent holder over the breed. Specific case law appears lacking, and analogical approaches from plant-related decisions have to be looked at carefully.⁴⁵

This of course highlights the rights question – i.e. the question whether the system of private property rights to AnGRFA, as described above, is appropriate to provide a basis for *fair market relations* for such transfers in expanded, globalized markets. For instance Kassie et al.⁴⁶ suggest that valuation efforts will send price signals for marketers facilitating local, regional and even global transfers of genetic resources. In turn, Hiemstra et al. conveys the argument that globalisation and changes in business organisation may put livestock keepers and smallholders at a disadvantage and lead to inequitable outcomes.⁴⁷

Together with these questions come the questions of impact on genetic diversity. The impact on diversity and the question of fair market relations and share are strongly interlinked. The strengthening of the market position of smallholders will also strengthen the diversity on the market and thus support conservation. Smallholders usually offer niche products outside the genetically uniform industrialised production. Strengthening their market position is as much an issue of private standard setting, possibly of subsidies, of using existing IP rights to bring the system closer to the law rather than the opposite (e.g. by means of collective trademarks and geographical indications), and of a simple market mechanism of supply and demand. These may be of equal importance to the question of (creating new) property rights.

The question of rights is also one of assessing the current and future impact of existing right systems and in particular of the patent system. Accordingly, the patenting of AnGRFA is at the centre of the debates. Unlike TMs and GIs, patents entered the field of AnGR only recently, with the advent of genetic engineering. Transgenic animals exist for medicinal purposes, but are scarce in AnGRFA.⁴⁸ The main application of biotechnology in AnGRFA at present is in the application of selection processes. Yet, as Temmerman suggests⁴⁹, it is important to anticipate the effects patents can have once they enter the field of An-

⁴⁴ Food and Agriculture Organisation of the United Nations, Commission on Genetic Resources for Food and Agriculture, Global Plan of Action for Animal Genetic Resources Strategic Priority Area 4 (adopted by the International Technical Conference on Animal Genetic Resources for Food and Agriculture, Interlaken, Switzerland, 3-7 September 2007). See also M. Temmerman, *Intellectual Property and Biodiversity: Rights to Animal Genetic Resources* (Alphen a/d Rijn, Wolters/Kluwer, forthcoming early 2012); and M. Blakeney, *Trends in Intellectual Property Rights and Genetic Resources for Food and Agriculture*, FAO CGRFA Background Paper 58.

⁴⁵ M. Temmerman, *Biodiversity and Intellectual Property: Rights to Animal Genetic Resources* (Alphen a/d Rijn, Wolters/Kluwer, forthcoming early 2012); M.W. Tvedt and M. Fickenhqgen, *Scope of Process Patents in Farm Animal Breeding*, 11 the *Journal of World Intellectual Property* 3-203 (2008); T. Sommer, *Patenting the Animal Kingdom? From Cross-Breeding to Genetic Make-Up and Biomedical Research*, 39 *International Review of Intellectual Property and Competition Law* 2-139 (2008); and M.F. Rothschild, G. Plastow and S. Newman, *Patenting in Animal Breeding and Genetics* (Oxon and New York, Cabi Publishing, 2003.):

⁴⁶ G.T. Kassie, A. Abdulai, C. Wollny, A. Drucker and W. Ayalew, *Economic values of traits of indigenous cattle in local markets: implications for global genetic material transfer*, in *Rights to Animal Genetic Resources*, Notes from an Interdisciplinary Workshop 20-24 (S. Biber-Klemm and M. Temmerman, NCCR trade regulation Working Paper No 2010/05 May 2010).

⁴⁷ S.J. Hiemstra, B. Visser and K. Oldenbroek, *Report of the International Technical Expert Workshop: Exploring the need for specific measures for Access and Benefit-Sharing of Animal Genetic resources for food and Agriculture* (Wageningen, 8-10 December 2010, available at: http://documents.plant.wur.nl/cgn/seminars/Worshop20100812/Final_Report_of_the_International_Technical_Expert_Workshop.pdf (last visited 18 September 2011)).

⁴⁸ A. Mäki-Tanila, *Differences between plant and animal genetic resources*, in *Rights to Animal Genetic Resources*, Notes from an Interdisciplinary Workshop 25-28 (S. Biber-Klemm and M. Temmerman, NCCR Trade Regulation Working Paper No 2010/05, May 2010).

⁴⁹ M. Temmerman, *Biodiversity and Intellectual Property: Rights to Animal Genetic Resources* (Alphen a/d Rijn, Wolters/Kluwer, forthcoming early 2012).

GRFA.⁵⁰ Patents are an instrument to encourage and finance the realisation of the prospects of biotechnology. In turn, patents affect the possibilities of gaining access to genetic material and thus to the animals as such. They may further influence the ownership structures and provoke a shift in control from farmers to the right holders in shifting the right to progeny from the owner of the animal to the patent holder.

At the centre of the debate is thus also the scope of the patents and particularly their extension on an X-number of subsequent generations, possibly obtained by natural reproduction. Whereas it is arguable that the right to produce always remains with patent holder, the impact of this rule may be stronger here than in other sectors. The AnGR system is traditionally based on an opposite ownership scheme. It will be necessary to tailor an appropriate balance between the need for a return on investment and the needs of this sector, and its smallholders in particular, and the questions of risk minimising instruments.

3.3 Analysis

From the above, two lines of arguments emerge: The first argument is to be seen from the perspective of increasing enclosure by patents on AnGRFA that have been subjected to biotechnological or semi-biotechnological processes. Here the objective would be to find ways to balance possible negative impacts on conventional breeding methods and on the diversity of AnGRFA. This approach sets out from the rights question.

The second line of reasoning responds to the situation in which the developments of the markets in animals and animal products lead to concentration and homogenisation of the gene pool. The goal here would be to find a balance for the failure of the market to maintain biodiversity. This approach represents a departure from the question of market mechanisms and trade in AnGRFA products.

There are of course interrelationships between the two approaches. Yet, in our view it is important to understand that the two scenarios play in different time-frames: whereas the impacts of the market-developments are ongoing, the increase in the utilisation of techniques of modern biotechnology in breeding (such as transfer of genes or cloning) are not yet market relevant in agriculture.

⁵⁰ Cf. also Ch. Then, Opposition against patent on pig breeding – the reasons, in Rights to Animal Genetic Resources, Notes from an Interdisciplinary Workshop 48-52 (S. Biber-Klemm and M. Temmerman, NCCR Trade Regulation Working Paper No 2010/05, May 2010).; and J. Bilanz, "Monsanto pig" and "Brassica" or the open question of what is an "essentially biological process" in Rights to Animal Genetic Resources, Notes from an Interdisciplinary Workshop 47 (S. Biber-Klemm and M. Temmerman, NCCR Trade Regulation Working Paper No 2010/05, May 2010).

4 Legal and institutional context

In the legal context, developments and debates take place in two main areas: the intellectual property rights, and in the system of access and benefit sharing of the Convention on Biological Diversity.

4.1 Intellectual property rights

In PGRFA the rights question has been approached on the global level half a century ago with the foundation of the UPOV and its convention on the plant breeders' rights (in 1961). This convention provided rights to protect the intellectual property rights in commercial varieties resulting from formal breeding processes. It granted some flexibility regarding farmers and research, the so-called farmers' and breeders' privileges. Concurrently with the technical development and the increasing industrialisation of the breeding process, the exceptions were narrowed down. The convention increasingly contradicted the practice that plant genetic resources should be freely accessible and made available without restriction to anyone. This principle had formerly been embedded in another (unbinding) international instrument: the International Undertaking on PGRFA (IU).⁵¹ In parallel to the development in the area of the plant breeders' rights, and in order to promote acceptability of the IU, the conformity of plant breeders' rights with the principle of free access was recognised. As a counterbalance, the so-called farmers' rights⁵² - were introduced in the IU⁵³ and ultimately formalised in the International Treaty on Plant Genetic Resources for Food and Agriculture (IT PGRFA (see below)). In animal breeding so far no analogue rights such as animal breeders' rights and livestock keepers' rights exist so far.

As regards patents, the TRIPS Agreement leaves the choice over the patentability of animals open to domestic regulation. Unlike for plants, it does not prescribe a sui generis system for the protection of animal 'varieties'. Even in developed countries, classically open to the protection of biotechnology, many exclusions and limitations have been set to the patenting of genetic inventions concerning animals. Never-

⁵¹ For details see S. Biber-Klemm, T. Cottier, Ph. Cullet. and D.S. Berglas, The Current Law of Plant Genetic Resources and Traditional Knowledge in Rights to Plant Genetic Resources and Traditional Knowledge 56-110 (S. Biber-Klemm and T. Cottier, eds., CABI Wallingford UK, 2006).

⁵² Working definition: Farmers' Rights consist of the customary rights of farmers to save, use, exchange and sell farm-saved seed and propagating material, their rights to be recognized, rewarded and supported for their contribution to the global pool of genetic resources as well as to the development of commercial varieties of plants, and to participate in decision making on issues related to crop genetic resources.. See at <http://www.farmersrights.org/about/index.html>.

⁵³ See M. Girsberger, Biodiversity and the Concept of Farmers' Rights in International Law (Peter Lang, Bern, 1999): for more details regarding the development of Farmers' Rights at the interface with the Plant Breeders' Rights S. Biber-Klemm, Livestock Keepers' Rights? NCCR Working Paper No. 2011/68, June 2011, available at <http://www.nccr-trade.org/publication/livestock-keepers-rights/>.

theless the question arises as to whether the parallels in the evolution of animal and plant breeding can be taken further, to the creation of animal breeders and livestock-keepers rights, and ultimately up to the negotiation of an International Agreement on Animal Genetic Resources for Food and Agriculture.

4.2 Access and benefit sharing

The CBD, and its system on access and benefit sharing *a priori* encompasses all genetic resources, be they of wild or domesticated origin. Although there is a definition of 'domesticated or cultivated species' in Art. 2, no further reference is made to the specifics of agricultural diversity. This means that in principle also the genetic resources for food and agriculture are under the sovereignty of the states that can then decide on the internal property rights and on the application of the access and benefit sharing system.

As to PGRFA, the parties adopting the CBD in 1992 referred this issue to the FAO.⁵⁴ The process of adapting the International Undertaking on PGRFA to the ABS principles of the CBD resulted in the adoption of the (binding) International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) in 2001.⁵⁵

The Nagoya Protocol in its preamble recognizes the special nature of agricultural biodiversity and its distinctive features and problems, and acknowledges the need for distinctive solutions. Accordingly, it explicitly opens the way for the development of other, specialized access and benefit-sharing agreements, under the reservation of their compatibility with the objectives of the Protocol (Art. 4 2. and 4) and acknowledges their potential role as *lex specialis*. As regards its implementation on the national level, the Protocol asks parties to specifically consider the importance of GRFA and their special role for food security (Art. 8 (c)).

The question whether a specific ABS regime for AnGRFA is needed is at present largely open (see below). This means that at present, AnGRFA fall under the ABS rules of the International Regime.⁵⁶ Therefore, whether access and utilisation of AnGRFA will be submitted to the ABS principles depends on the implementation on national level.

⁵⁴ Nairobi Final Act of the Conference for the Adoption of the Agreed Text of the Convention on Biological Diversity; May 1992, Resolution III, Paragraph 4.

⁵⁵ The ITPGRFA was negotiated by the FAO's Commission on Genetic Resources for Food and Agriculture (CGRFA). It contains the Multilateral System on Facilitated Access for a series of specifically defined PGR particularly relevant for food security, which provides for standardized access procedures and a common benefit-sharing pool.

⁵⁶ The International Regime on Access and Benefit Sharing encompasses the "Convention on Biological Diversity", the "Bonn Guidelines" and the "Nagoya Protocol on Access and Benefit Sharing" (Decision adopting the Nagoya Protocol, COP 10, Dec. X/1, para 7).

5 State of debate

5.1 CGRFA

The FAO Commission on Genetic Resources for Food and Agriculture is the permanent forum for governments in the framework of FAO to discuss and negotiate matters relevant to genetic resources for food and agriculture. It was established by the FAO conference in 1983 with a mandate to deal with issues regarding plant genetic resources. The 1995 FAO Conference broadened its mandate to cover all components of biodiversity of relevance to food and agriculture.⁵⁷ In 1997 the commission installs sectoral working groups on PGRFA and AnGRFA respectively.

The commission has laid the ground for the debates on AnGR for food and agriculture by its enquiry into the State of the World's Animal Genetic Resources for Food and Agriculture, the first comprehensive global assessment of livestock diversity and its management.⁵⁸ The State of the World's AnGRFA is the basis for the Global Action Plan for Animal Genetic Resources for Food and Agriculture, and the Interlaken Declaration on Animal Genetic Resources, adopted at the occasion of the International Technical Conference on AnGRFA in Interlaken in 2007.⁵⁹

The Action Plan contains two parts: the Strategic Priorities for Action for the promotion of effective management of AnGRFA; and the Agreement on Implementation and Financing.⁶⁰ The implementation of the Action Plan is integrated into the Multi-Year Programme of Work and the Strategic Plan 2010-2017 for the implementation of the Multi-year Programme of Work⁶¹ of the CGRFA. At its 12th regular session in 2009, the CGRFA adopted the Funding Strategy for the implementation of the Global Plan of Action, and requested FAO to implement it.

It is intended as a rolling plan containing provisions for the sustainable use, development and conservation of animal genetic resources at all levels. Elements

⁵⁷ <http://www.fao.org/nr/cgrfa/cgrfa-about/cgrfa-history/pt/>. Biodiversity for Food and Agriculture increasingly being understood in a broad sense, encompassing plant, animal, forest and aquatic genetic resources, invertebrates and micro-organisms; compare e.g. CGRFA -13/11/Inf.23.

⁵⁸ Food and Agriculture Organisation of the United Nations, Commission on Genetic Resources for Food and Agriculture, The State of the World's Animal Genetic Resources for Food and Agriculture 145-147 (FAO, Rome, 2007).

⁵⁹ Food and Agriculture Organisation of the United Nations, Commission on Genetic Resources for Food and Agriculture, Global Plan of Action for Animal Genetic Resources and the Interlaken Declaration, (adopted by the International Technical Conference on Animal Genetic Resources for Food and Agriculture, Interlaken, Switzerland, 3-7 September 2007, information available at <http://www.fao.org/nr/cgrfa/cgrfa-meetings/cgrfa-comm/twelfth-reg/en/> (last visited 18 September 2011)).

⁶⁰ Funding strategy available at <http://www.fao.org/docrep/012/i1674e/i1674e00.pdf> (last visited 18 September 2011).

⁶¹ Available at: http://www.fao.org/nr/cgrfa/cgrfa-mypow/en/?no_cache=1 (last visited 18 September 2011).

related to the question of rights to AnGRFA appear in the context of sharing the benefits arising from the use of AnGRFA (No 15); the recognition of the role of traditional knowledge, innovations and practices relevant to the conservation and sustainable use of AnGRFA; and the needs of pastoralists and farmers for non-discriminatory access to the genetic material, information, technologies, financial resources, research results, marketing systems, and natural resources.

In considering the reports of the Interlaken Technical Conference, the FAO Conference, at its Thirty-fourth Session, requested the Commission to address the important role of small-scale livestock keepers as custodians of most of the world's animal genetic resources for food and agriculture in the use, development and conservation of livestock resources. The multi-year programme of work has its priorities in the following areas of interest in our context; firstly the developments in the field of access and benefit sharing in relation to all components of genetic resources for food and agriculture; secondly, the role of intellectual property for the use and exchange of GRFA; thirdly the application and integration of biotechnologies in the conservation and utilisation of genetic resources; and – in the context of the review of the implementation of the Interlaken outcomes, the roles of small-scale livestock keepers as custodians of AnGR in the use, development and conservation of livestock resources.

In its 13th Regular Session, the CGRFA decided to establish an AdHoc Technical Working Group on ABS⁶², mandated – among other things – to identify relevant distinctive features of the different sectors of GRs requiring distinctive solutions; and to analyse possible modalities for addressing ABS for GRFA.⁶³

5.2 Wageningen workshop (ABS)

In the context of debates at the occasion of a special event on ABS preceding the 12th Regular Session of the CGRFA it was observed that it was not only important to claim the special nature of genetic resources for food and agriculture but also to develop and suggest specialised measures warranted by such special nature. As a follow-up, after the adoption of the Nagoya Protocol and in anticipation of the 13th Regular Session of the CGRFA, three Member States – the Netherlands, Norway and Switzerland – sponsored and organised an International Technical Expert Workshop. The Workshop⁶⁴ raised the question which

specific policies and measures might be developed for AnGRFA in the context with the International Regime on ABS. It evaluated specific characteristics and exchange patterns of AnGRFA and discussed, which type(s) of specialised international instrument(s) – such as for instance an International Treaty on AnGRFA – would be needed to support conservation and sustainable use of AnGRFA. The following were the main resulting points:

- 1) There are limited options for generating benefits from AnGRFA use through “classical benefit-sharing mechanisms” in a South-North context. It seemed doubtful that sufficient revenues could be acquired to have any substantial impact on conservation and to contribute substantially to the improvement of the livelihood of poor livestock keepers in developing countries.
- 2) The negotiation of a legally binding instrument for AnGRFA – in order to avoid possible negative effects of the implementation of the Nagoya Protocol for AnGR exchange, conservation and sustainable use – was not considered a first choice; the position was rather to use the Global Plan of Action for AnGRFA as framework to deal with the main issues of An-GRFA conservation and use, and in addition, to develop voluntary instruments, such as guidelines for national governments for developing measures for the international exchange of AnGRFA; the harmonisation of contracts and the development of model material transfer agreements; and – in order to address (also) Livestock Keepers Rights – to develop and implement Biocultural Community Protocols⁶⁵.
- 3) Participants emphasised the strong need for measures to facilitate more North-South collaboration towards capacity-building as a non-monetary form of benefit-sharing.⁶⁶

5.3 WIPO

The General Assembly (GA) of the World Intellectual Property Organisation (WIPO) in its 26th session in October 2000 established the Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (IGC).⁶⁷

Workshop by S.J. Hiemstra, B. Visser and K. Oldenbroek, Report of the International Technical Expert Workshop: Exploring the need for specific measures for Access and Benefit-Sharing of Animal Genetic resources for food and Agriculture (Wageningen, 8-10 December 2010, available at: http://documents.plant.wur.nl/cgn/seminars/Worshop20100812/Final_Report_of_the_International_Technical_Expert_Workshop.pdf (last visited 18 September 2011)).

The following paragraph primarily draws from this document.

⁶² For more information see LIFE Network: http://www.pastoralpeoples.org/docs/organising_around_breeds.pdf (last visited 18 September 2011).

⁶³ The report of the workshop was submitted to the 13th Regular Session of the CGRFA as Doc CGRFA-13/11/Circ.1.

⁶⁴ For more information on rationale and preparatory work see Doc. WO/GA/26/6.

⁶² CGRFA-13/11/Report.

⁶³ CGRFA-13/11/Report, Appendix D.1.

⁶⁴ Held in Wageningen, the Netherlands, from 8-10 December 2010; Organized by the Centre for Genetic Resources, the Netherlands (CGN) of the Wageningen University and Research Centre; sponsored by the Ministry of Economic Affairs, Agriculture and Innovation of the Netherlands, the Norwegian Ministry for Agriculture and Food, and the Federal Office for Agriculture of Switzerland. See the report of the International Technical

The IGC was to provide a forum to Member States to investigate and discuss issues related to IP issues arising in the context of ABS, protection of traditional knowledge (TK) associated or not to GRs and the protection of expressions of folklore.

The mandate of the IGC having continuously been renewed by the WIPO GA, the committee is now heading towards its 20th session in 2012.

The IGC is at present undertaking text-based negotiations in intersessional Working Groups, with the objective of reaching agreement on a text of an international legal instrument (or instruments) which will ensure the effective protection of traditional knowledge (TK)⁶⁸. This work also encompasses text on TK related to genetic resources.⁶⁹

Animal breeding in smallholder conditions in developing countries has a strong component of traditional knowledge. This TK may either be associated to the GR (the animal, the breed) such as a specific quality regarding climatic conditions; or it is incremental, such as knowledge about selection criteria. In this sense the work of the Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (IGC) might be of some relevance.

However, an analysis of the work of the IGC goes beyond the scope of this paper. A closer analysis of the role of TK in managing GR in smallholder systems, the resulting products (specific qualities of breeds) – and their potential interface with IPs might be of interest for assessing its relevance for TK related to AnGRFA.

5.4 Analysis

Awareness of the importance of AnGRFA diversity emerged with the enquiry of the FAO CGRFA in the State of the World's Animal Genetic Resources and the subsequent follow-up initiatives. This means that – in comparison to PGRFA – the debate was initiated at a much later stage, and AnGRFA are legally and institutionally less intensely framed. The process regarding AnGRFA was initiated at a much later stage but has some parallels in terms of the institutional setting and political processes (World State of AnGRFA; Action Plan).

This fact is based on various reasons: beside the different characteristics in reproduction and the related property rights, scientific progress led to industrialisation of plant breeding at a much earlier stage; also the Green Revolution was focused on PGRFA. In turn, the livestock revolution and the arguments of Climate

Change fostered awareness of the importance of livestock diversity.

PGRFA are more intensely framed in a legal and institutional perspective. This includes the global infrastructural means that encompasses the CGIAR centres and collections, now integrated in the Multilateral System of Facilitated Access and Benefit Sharing of the ITPGRFA.

In correspondence with the general tendency in the debates on conservation and sustainable use of biological diversity, the discussions on AnGRFA follow a North-South pattern. In the international processes, there is a strong focus on the situation of diversity in the south. The arguments are closely linked to issues of development, improvement of livelihoods, and food security in the South, the so-called smallholder farmers having a quite prominent role. Interestingly, the question of enhancing diverse production in industrially oriented systems (in the North), particularly in the areas where a broad concentration exists, is hardly discussed. In the context of the ongoing debates on international level, various processes and approaches might be relevant. As to the appropriate instruments and the level of regulation the field remains widely open, though. Here the issue is not only to find an optimal combination of instruments, but also to assess options regarding the level of governance.

6 Conclusions

The management of AnGRFA must be rethought with regard to the three major developments that are occurring: the introduction of biotechnology and the advent of bioengineering; the erosion of animal genetic resources; and the globalisation of the marketplace and the increase in trade in livestock products and derivatives.

This paper put these issues in the context of international trade. The basic question is whether and how within the trade system incentives can be created to address the failures that lead to market concentration and uniformity of breeds. To this end it was deemed important to – in a first step – take stock of the relevant factual elements and political debates.

From this exercise, two scenarios resulted: the “market failure” scenario; and the scenario of increasing enclosure of relevant information by patents. It is important to understand that the two scenarios play in different time frames. From this follows that an important task will be to identify the (future) trends and to assess, whether the law is ready to cope with the developments.

If we look at the ‘market-failure’ scenario with respect to creating incentives for the conservation of genetic resources, the questions arising are *at present* linked to the functioning of market mechanisms rather than to the questions of rights, as – *a priori* – the question of rights to the genetic information seems to be

⁶⁸ See under <http://www.wipo.int/tk/en/igc/> (last visited 18 September 2011). See also the IGC's mandate for the 2012-2013 biennium at http://www.wipo.int/export/sites/www/tk/en/documents/pdf/decision_assemblies_2011.pdf (last visited 5 November 2011).

⁶⁹ Draft Objectives and Principles related to Intellectual Property and Genetic Resources prepared at IWG 3 (WIPO/GRTKF/IWG/3/17, 2011).

clear. Besides the possibility of common property in indigenous communities, the assignation of rights follows the same mechanisms in traditional and in conventional systems. The question here is how the value of the diverse GRs can best be internalised.

The starting point for value-adding exercises for trade in AnGRFA derivatives may be the identification, registration and monitoring of selected breeds kept by smallholders, also in the countries of the South.⁷⁰

In addition, a creative use of IP rights to strengthen the market position of new players and to contribute to the creation of niche markets and their (often genetically diverse) products should be assessed. GIs and collective trademarks as well as patent type rights can be used to enable new players in the field to gain a better market position on concentration markets.

As to the second scenario '*modern biotechnology and genetic engineering*', so far there is little patenting of transgenic animals, but patents have started to come through in the form of process patents. Such a development is bound to increase. It will have to be investigated on the basis of a carefully elaborated scenario and the option to create sui generis IPRs, as well as flexibilities given in the design of (exclusive) IPRs like patents (scope, duration, rights to progeny). In finding responses to these anticipated developments in high-tech innovation, it is important to be aware of the possibility of counterproductive effects if exclusive rights are assigned to products and processes and, in particular, to research tools. The option would be to provide for easy exchange of the resources, to work with registration systems, and entitlement to royalties, but to avoid exclusion to use products and processes.

In summary it can be stated that in order to balance the increasing enclosure of innovation in AnGRFA, in particular the potential impact of patents on AnGRFA diversity, and market mechanisms that appear to go against the promotion of conservation and competition, an appropriate set of measures is needed to conserve, maintain and sustainably use diversity in AnGRFA and to promote equitable and fair market access for smallholders from the South.

It is therefore proposed for a '*toolbox approach*' to be taken, the task being on the one hand to find an ideal combination of tools to serve the defined end and on the other the optimal level of regulation.

The options discussed need to be carefully squared with available tools and complementary mechanisms – within or outside the realm of IPRs. There are not only exclusive rights, but a range of other instruments and mechanisms to be assessed, such as GIs, TMs, AOCs, rights to TK, or approaches under the aspect of compensatory liability or under contracts. At the interface with patents, the applicability of the flexibilities in the

patent system needs to be examined (breeder's exemption, farmer's privilege, compulsory licensing). In this context it should be borne in mind that conventional AnGRFA breeding is similar to other low-tech innovation. From such tools, a sustainable and coherent regulatory approach must be designed. It is necessary to carefully assess the options regarding the cost-benefit relationship in general, and in particular (open) exchange of the resources, the transaction costs and the enforceability of the rights. Importantly, it must be borne in mind that the global public good '*diversity of AnGRFA*' cannot be maintained by market mechanisms alone.

⁷⁰ See also Hiemstra et al. 2007, a.a.o FN 19 and Biber-Klemm, 2011 a.a.o FN 2.

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The Öko-Institut (Institut für angewandte Ökologie - Institute for Applied Ecology, a registered non-profit-association) was founded in 1977. Its founding was closely connected to the conflict over the building of the nuclear power plant in Wyhl (on the Rhine near the city of Freiburg, the seat of the Institute). The objective of the Institute was and is environmental research independent of government and industry, for the benefit of society. The results of our research are made available of the public.

The institute's mission is to analyse and evaluate current and future environmental problems, to point out risks, and to develop and implement problem-solving strategies and measures. In doing so, the Öko-Institut follows the guiding principle of sustainable development.

The institute's activities are organized in Divisions - Chemistry, Energy & Climate Protection, Genetic Engineering, Sustainable Products & Material Flows, Nuclear Engineering & Plant Safety, and Environmental Law.

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The Institute fulfils its assignments particularly by:

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The Society for Institutional Analysis was established in 1998. It is located at the University of Applied Sciences in Darmstadt and the University of Göttingen, both Germany.

The sofia research group aims to support regulatory choice at every level of public legislative bodies (EC, national or regional). It also analyses and improves the strategy of public and private organizations.

The sofia team is multidisciplinary: Lawyers and economists are collaborating with engineers as well as social and natural scientists. The theoretical basis is the interdisciplinary behaviour model of homo oeconomicus institutionalis, considering the formal (e.g. laws and contracts) and informal (e.g. rules of fairness) institutional context of individual behaviour.

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In many countries lawyers are working on aspects of environmental law, often as part of environmental initiatives and organisations or as legislators. However, they generally have limited contact with other lawyers abroad, in spite of the fact that such contact and communication is vital for the successful and effective implementation of environmental law.

Therefore, a group of lawyers from various countries decided to initiate the Environmental Law Network International (elni) in 1990 to promote international communication and cooperation worldwide. elni is a registered non-profit association under German Law.

elni coordinates a number of different activities in order to facilitate the communication and connections of those interested in environmental law around the world.

Coordinating Bureau

Three organisations currently share the organisational work of the network: Öko-Institut, IESAR at the University of Applied Sciences in Bingen and sofia, the Society for Institutional Analysis, located at the University of Darmstadt. The person of contact is Prof. Dr. Roller at IESAR, Bingen.

elni Review

The elni Review is a bi-annual, English language law review. It publishes articles on environmental law, focusing on European and international environmental law as well as recent developments in the EU Member States. elni encourages its members to submit articles to the elni Review in order to support and further the exchange and sharing of experiences with other members.

The first issue of the elni Review was published in 2001. It replaced the elni Newsletter, which was released in 1995 for the first time.

The elni Review is published by Öko-Institut (the Institute for Applied Ecology), IESAR (the Institute for Environmental Studies and Applied Research, hosted by the University of Applied Sciences in Bingen) and sofia (the Society for Institutional Analysis, located at the University of Darmstadt).

elni Conferences and Fora

elni conferences and fora are a core element of the network. They provide scientific input and the possibility for discussion on a relevant subject of environmental law and policy for international experts. The aim is to gather together scientists, policy makers and young researchers, providing them with the opportunity to exchange views and information as well as to develop new perspectives.

The aim of the elni fora initiative is to bring together, on a convivial basis and in a seminar-sized group, environmental lawyers living or working in the Brussels area, who are interested in sharing and discussing views on specific topics related to environmental law and policies.

Publications series

elni publishes a series of books entitled "Publications of the Environmental Law Network International". Each volume contains papers by various authors on a particular theme in environmental law and in some cases is based on the proceedings of the annual conference.

elni Website: elni.org

The elni website www.elni.org contains news about the network. The members have the opportunity to submit information on interesting events and recent studies on environmental law issues. An index of articles provides an overview of the elni Review publications. Past issues are downloadable online free of charge.

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