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# Rights to Animal Genetic Resources – basic facts and debates

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Abstract
At the background of the inquiry into the creation of rights to animal genetic resources lie different strands of thinking and various lines of arguments. These are fueled by three major developments in the AnGR sector: 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 the interface of AnGRFA, international trade and property rights and gives an overview of the ongoing processes, the present debates and involved institutions. It concludes that in order to balance the increasing enclosure of innovation in AnGRFA, 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 smallhoers from the South. It is therefore proposed to set out from a "toolbox approach", the task being to find an ideal combination of tools to serve the defined end.

# Content

## 1. Introduction

Advances in technology in the last decades have brought about fundamental changes in the valuation and economic potential of livestock genetic resources. Innovative biogenetic engineering opened up new avenues for the creation of genetically modified animals for biomedical application and for agriculture (Nieman et al., 2008). New biotechnologies in combination with increased computing capacity allow rapid genetic advances. The landscape in animal breeding and animal production is changing too: the new technologies have simplified transfer and reproduction of genetic information and hence (international) trade in *animal genetic resources* (AnGR).

Developments in transport and communication have promoted the expansion of global markets for livestock products (FAO CGRFA, 2007a). In parallel, demand for animal proteins has grown, triggered by increased purchasing power and amplified by population growth, intensified urbanisation and changing lifestyles (Steinfeld and Chilonda, 2006). Expansion is most dynamic in developing countries with rapid economic growth.

As markets in animal products grow, selection for high productivity is favoured. Trade in reproductive material thus mainly encourages the spread of high yield breeds. These developments lead to *decreasing diversity* of animal genetic resources, and to concentration in industrial breeding.

There is consensus that the global the diversity of Animal Genetic Resources for Food and Agriculture[1] (AnGRFA) is eroding (Hiemstra et al. 2006; FAO), although the lack of population data means that the exact risk cannot be established (FAO CGRFA 2007a). There is also agreement that diversity of domestic animals and plants is valuable and needs to be maintained (FAO CGRFA 2007a).This loss of AnGRFA diversity compromises efforts to achieve food security, improve human nutritional status and enhance rural development. It limits future options for adaptation of livestock breeds to changed environments and for enhancing disease resistance (FAO CGRFA, 2007a and 2007b).

Regarding AnGRFA diversity, we clearly are 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 industrialization and high demands in biosecurity. In the present situation, a strong concentration of companies offering a genetically uniform product to the market is being witnessed. This is true for the poultry and swine markets, and increasingly also with the cattle market.

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1 The term AnGRFA as used here is used in the sense of the FAO-CGRFA State of the Worlds Animal Genetic Resources for Food and Agriculture; i.e. on higher animal species, excluding for instance fish, insects.

This development has occurred outside of patent protection and on the basis of traditional ownership right, hybridisation and trade secrecy.

A similar process has taken place in the area of Plant Genetic Resources for Food and Agriculture (PGRFA). There, genetic engineering 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 if, 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 background information in two areas: firstly on the differences between animal and plant breeding and related property rights in general; and in context with the impact of genetic engineering on AnGRFA. Secondly, to inquire into indigenous and traditional AnGR breeding practices and related systems of ownership and property rights.

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 basis to create incentives to provide for adequate investments in traditional breeds and to foster creativity to adapt them to specific environmental conditions and consumer preferences[3].

## 2. Factual background

In tackling the question of rights to AnGRFA, three different 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.

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2 See Temmerman M., 2011, and Biber-Klemm S., 2011.

3 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 on the 27 and 28 November 2008. The complete results are available in Biber-Klemm S. 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/nccr-trade.ch/wp3/Rights%20to%20Animal%20Genetic%20Resources.pdf

These aspects are tested against the background premises that: 1) for AnGRFA – as for genetic resources in general – there is a North–South divide regarding diversity of AnGRFA and access to technology; 2) there is a 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 to prevent harmful effects.

## 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 on-going 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 (Steinfeld and Chilonda 2006; FAO CGRFA 2007a). These lead to structural changes in trade and retailing (FAO CGRFA 2007a). 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 industrialization 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 cross-breeding with exotic animals (FAO CGRFA 2007a).

There is consensus that the global diversity in farm animals is under threat (Hiemstra et al. 2006), although the lack of population data means that the exact risk cannot be established (FAO CGRFA 2007a). There is also agreement that diversity of domestic animals and plants is valuable and needs to be maintained (FAO CGRFA 2007a). Allegedly, higher diversity exists in smallholder systems; in particular in smallholder and pastoral systems in the developing world, that depend on locally adapted breeds (FAO CGRFA 2009a and b; Hanotte et al. 2010; Hoffmann 2010). 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 An-

GRFA 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 utilization is an important strategy for An-GRFA (Hiemstra et al. 2010). 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 (Swanson 1995; OECD 1996; see also the sources in Biber-Klemm and Cottier 2006; though the theory has recently been challenged by Tisdell 2008). 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 CBDs 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 (Ivankovic 2008; CGRFA 2009c). In the context of the present discussion, the question of ownership of the resources that are to be covered by the ABS system or the entitlement to dispose of the resources is examined.

## 2.2.Comparison of plant and animal breeding and related property rights

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 foodstuff 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 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 (Mäki-Tanila, 2010).

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 conventional[4] 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 (Marguerat 2010; Köhler-Rollefson 2010). In farm animals, the genetic resources and their derivates 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 derivates 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 disloca-

[4] For this publication a distinction is proposed between: traditional/indigenous breeding in community breeding contexts without written documentation (Kassie 2010, Köhler-Roleffsson 2010, Tibbo 2010); conventional breeding: phenotypical selection criteria; including artificial insemination and embryo transfer technologies; modern breeding: quantitative genetics, analysis methods (marker assisted selection, single nucleotide polymorphism (Marguerat 2010).

tion 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 (Temmerman, 2011; Gura, 2010). Yet, AnGRFA, in spite of the increasing industrialisation of breeding and production processes, has remained largely outside the scope of patenting (Temmerman, 2011). 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.

Yet, 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 (FAO CGRFA 2007a, Hofmann 2010b*).* Gollin et al. (2009) confirm this fact. They analyse AnGR trade flows in live 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 Hoffmann (2010b) and Anderson and Centonze (2006) that there is little interest in uncharacterized local breeds by formal breeding.[5] 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. (2006 and Valle Zarate 2010), improved Tuli and Boran have found increasing interest as a source for genetic diversity with the potential to im-

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

prove 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[6].

## 2.3.On-going changes

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 revolutionize 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 (Flury 2010). 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. (2005) describe several agricultural uses[7] of transgenic animals, none of them bear genetic information from related livestock species. This corresponds to Mäki-Tanila's (2010) 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. (2008) describe for instance environmentally friendly pigs that have been developed to address the problem of manure-related pollution (phosophorus) by introducing a bacterial phytase gene; pigs with an introduced spinach desaturase genes, to reduce the amount of non-saturated fatty acids; and the introduction of human lactoferrin into cattle, in order to increase 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 preparation[8]. They are bound to increase once the complete genomic sequences of all farm animals become available. 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 (see above).

The breeding technologies such as artificial insemination, semen sexing technologies and embryo transfer enable a faster and increased multiplication of interesting traits (Flury 2010; Malafosse 2010).[9] In addition, they allow

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6 See also Ntombizahke Mpofu (2002).

7 There is transgenesis in livestock for biomedicine that is already in practical use such as gene pharming and xenotransplantation of cells/tissues. Cp. Niemann et al., 2005, and Jankowski in Biber-Klemm and Temmerman (forthcoming).

8 See in Nieman et al. (2008) the table on p. 286.

9 Seemingly, also cloning technologies are increasingly used (see International Herald Tribune, Friday, July 30, 2010: Test-tube calf seen as savior of vanishing lineage) and commercially offered. According to Flury (2010) the application of the technology for animal breeding is expected to be restricted, as breeding relies on variation and the costs are not economically

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 (Flury 2010). As a result, the genetically uniform high-yield breeds increasingly outcompete 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 to what extent 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.

## 3. Economic and market context

As observed above, there is at present little trade from extensively producing to more intensive production systems and the gene-flow is N-S rather than S-N.[10] 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. As an alternate line of argument it is submitted 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 international market, and/or are undervalued in a bigger markets. Rege and Gibson argue that the traditional resource rights - to plant and animal genetic resources – in general remain undervalued (Rege and Gibson 2003), 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

portable (p. 36) 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.

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

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 globalized the markets. Semen and embryos are traded worldwide. Global documentation systems include the standardization of recording[11]. 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 the lacking characterization 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 value (Hiemstra et al. 2010) 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 (2004). 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

11 See for instance www.icar.org (International Committee for Animal Recording) ; www.interbull.org. In recent years, the combined world exports of live animals for breeding (bovines and swine), plus the trade in bovine semen, has totaled US$ 500 million to US$ 1 billion annually (D. Gollin et al. 2009).

competition principle to all walks of economic and non-economic life as part of the economic globalisation process"(p. xx)[12].

These theories support the – intuitive – finding that solutions must be found to foster the competitiveness of the "South AnGR" on the world market[13]. 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.[14] Yet, government of DCs - forcibly or not - set other priorities and frequently do not have the capacities in technology, knowledge and finances to develop and implement respective policies and measures[15].

## 4. 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

12 See also The Group of Lisbon, Limits of Competition, 1995.

13 Compare on the necessity to foster "niche economy" C. Tisdell, I. Seidl (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.

14 Compare FAO, Global Plan of Action for Animal Genetic Resources (2007b)(GPA) *(see e.g. Part I 13; Part II 29).*

15 See also GPA, Strategic Priority Area 4.

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.

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 (2010). 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. (2010) conveys the argument that globalization and changes in business organisation may put livestock keepers and smallholders at a disadvantage and lead to inequitable outcomes.

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 (see also Mäki-Tanila 2010). The main application of biotechnology in AnGRFA at present is in the application of selection processes. Yet, as Temmerman (2010) submits, it is important to anticipate the effects patents can have once they enter the field of AnGRFA (Cf. also Then 2010, and Bilang, 2010). He points out that 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 is it 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 comes 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.

## 5. 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.

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 been embedded in the International Undertaking on PGRFA (1983, IU).[16] In order to promote acceptability of the IU, the conformity of plant breeders' rights with this principle was recognized. As a counterbalance, the so-called farmers' rights were introduced in the IU[17] and ultimately formalized in the International Treaty on Plant Genetic Resources for Food and Agriculture (IT PGRFA). In animal breeding so far no analogue 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. 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.

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

16 For details see Biber-Klemm S.,Cottier T., Cullet Ph. and D. S. Berglas (2006).

17 See Girsberger 1999.

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[18]. The process of adapting the International Undertaking on PGRFA to the ABS principles of the CBD resulted in the adoption of the ITPGRFA in 2001.

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[19]. Therefore, whether access and utilization of AnGRFA will be submitted to the ABS principles depends on the implementation on national level.

The debates on AnGR for food and agriculture have recently been given a frame by the FAO Commission on Genetic Resources for Food and Agriculture (CGRFA) and its inquiry 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 (FAO CGRFA 2007a). 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 (FAO 2007b).[20] 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[21].

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 Work[22] 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.

From the above follows that PGRFA are more intensely framed in a legal and institutional perspective. This includes the global infrastructural means

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18 Nariobi Final Act of the Conference for the Adoption of the Agreed Text of the Convention on Biological Diversity; Resolution III Paragraph 4.

19 The International Regime on Access and Benefit Sharing encompasses the CBD, the Bonn Guidelines and the Nagoya Protocol on Access and Benefit Sharing. Decision adopting the Nagoya Protocol, COP 10 Dec. X/1, para 7.

20 Information available at http://www.fao.org/nr/cgrfa/cgrfa-meetings/cgrfa-comm/twelfth-reg/en/ (last visited 7 December 2009).

21 Funding strategy available at http://www.fao.org/docrep/012/i1674e/i1674e00.pdf

22 Available at http://www.fao.org/nr/cgrfa/cgrfa-mypow/en/?no_cache=1.

that encompasses the CGIAR centres and collections, now integrated in the Multilateral System of Facilitated Access and Benefit Sharing of the IT-PGRFA. The process regarding AnGRFA was initiated at a much later stage but has some parallels regarding the institutional setting and processes (World State of AnGRFA; Action Plan).

# 6. State of debate

## 6.1.CGRFA

The Global Plan of Action is intended as a rolling plan containing provisions for the sustainable use, development and conservation of animal genetic resources at all levels. Elements 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.[20]

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 utilization 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.

## 6.2.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 specialized measures warranted by such special nature. The International Technical Expert Workshop[23] raised

[23] Held in Wageningen, the Netherlands, from 8-10 December 2010; Organized by the Centre for Genetic Resources, the Netherlands (CGN) of 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 Agri-

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 specialized 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 negotiating 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 AnGRFA conservation and use, and in addition, to develop voluntary instruments, such as guidelines for national governments for developing measures for the international exchange of AnGFRA; the harmonization 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 Protocols[24]. 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.

### 6.3.WIPO

Animal breeding in smallholder conditions in developing countries has a strong component of traditional knowledge[25]. 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. The IGC is at present undertaking text-based negotiations 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)[26]. This work also encompasses text on TK related to genetic resources.[27] Though much centred at the interface of TK with IPRs (patents?) further analysis needed in what aspects the TK element is of importance (for benefit sharing) in relation to AnGRFA.

culture of Switzerland. See the report of the International Technical Workshop by Hiemstra et al. (2011). The following paragraph primarily draws from this document.

24 For more information see LIFE Network and Lokhit Pashu-Palak Sansthan (2010).

25 See Köhler-Rollefson 2010; FAO 2010b.

26 See under http://www.wipo.int/tk/en/igc/.

27 Draft Objectives and Principles related to Intellectual Property and Genetic Resources prepared at IWG 3 (WIPO/GRTKF/IWG/3/17, MARCH 16, 2011).

### 6.4. Analysis

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. It is taken up to some extent in the question, whether and how importation of exotic genetic material that is not adapted to the ecological and economic conditions in the importing country, could be controlled.

## 7. 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 derivates. On this background, at the outset the question was asked, whether the creation of (intellectual property) rights to AnGRFA bears potential to incentivise their conservation and sustainable use.

Behind the question of the creation of rights to AnGRFA are two lines of argument that need to be distinguished. They can be roughly characterized as follows: 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 diversity of AnGRFA. This approach sets out from the rights question.

The second line of reasoning responds to the situation where 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. Here the task is 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 clear. Besides the possibility of common property in indigenous communities, the assignation of rights follows the same mechanisms in traditional and in conventional systems.

It is therefore proposed to put the emphasis also on 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. 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.

However, solutions must also be found in publicly funded conservation programmes since correcting the market (i.e. the demand for high-productivity products) may never succeed to a sufficient degree. The starting point for both conservation programmes and 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.

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 summarizing 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.

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 examined (breeder's exemption, farmer's privilege, compulsory licensing). In this context it should be borne in mind that conventional An-

GRFA breeding is similar to other low-tech innovation. It is therefore proposed to set out from a "toolbox approach", the task being to find an ideal combination of tools to serve the defined end.

In that sense a *sui-generis* protection system for AnGRs – based on the establishment of breeders' associations, associated with geographical indications or trademarks, and the protection of traditional knowledge and livestock keepers' or breeders' rights could be useful. In turn, given the prevalent flow of AnGR from North to South and the structure of the property rights, the applicability of the ABS system to AnGRFA seems to be limited.

Such initiatives may be backed by registration systems, either in the form of the European herdbooks that are supplemented by some adapted ABS principles, by a participatory documentation system that integrates indigenous knowledge for the stewardship of farm animal diversity; or by an official registration system, that allows the registration and documentation of new and improved breeds according to standard descriptors, and includes primary populations. A basic request is to mainstream awareness to enable effective participation of local and indigenous communities on the potential use of AnGR to strengthen the position of smallscale livestock keepers in combination with innovative approaches for community-based participatory breeding schemes.

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.

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