Scientific Advisory Board on Biodiversity and Genetic Resources

at the Federal Ministry of Food, Agriculture and Consumer Protection

Recommendations for the implementation of the Nagoya Protocol with respect to genetic resources in agriculture, forestry, fisheries and food industries

Position paper by the Scientific Advisory Board on Biodiversity and Genetic Resources at the Federal Ministry of Food, Agriculture and Consumer Protection

(Translation of German original paper)

April 2012

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04/2012

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Citation format of this paper

Frank Begemann, Matthias Herdegen, Leo Dempfle, Jan Engels, Peter H. Feindt, Bärbel Gerowitt, Ulrich Hamm, Alwin Janßen, Hermann Schulte-Coerne, Helmut Wedekind, Scientific Advisory Council on Biodiversity and Genetic Resources at the BMELV, 2012: Recommendations of the implementation of the Nagoya Protocol with respect to genetic resources in agriculture, forestry, fisheries and food industries. Position Paper by the Scientific Advisory Board on Biodiversity and Genetic Resources at the Federal Ministry of Food, Agriculture and Consumer Protection, 60 p. (Translation of German original paper)

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Content

Summary

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits (ABS) which was adopted in 2010 provides in general for a bilateral exchange of genetic resources and envisages that the country of origin of a resource and its user negotiate the conditions for access and benefit-sharing on a case-by-case basis. However, the Scientific Advisory Board (Scientific Advisory Board for Biodiversity and Genetic Resources at the Federal Ministry of Food, Agriculture and Consumer Protection) takes the view that this type of bilateral exchange is not suited to the use of genetic resources in agricultural research and breeding. There is some concern that the implementation of ABS measures as specified in the Nagoya Protocol will complicate and discourage the use of genetic resources in agriculture if the distinctive features of agricultural resources and their use are not also taken into consideration.

In the face of new challenges such as climate change and continuing population growth, there is an urgent need for cross-boundary research and breeding efforts in the food, agriculture, forestry and fisheries sectors. Fast, uncomplicated and legally reliable access to the genetic resources for food and agriculture is a basic prerequisite for the development of new crop varieties, livestock breeds and fish strains which are better adapted to quickly changing environmental, cultivation and production conditions and also result in high yields.

Unlike in other sectors, genetic resources for food and agriculture are closely associated with human use and are sometimes specifically adapted to local conditions, which sets them apart with respect to the ABS system. Genetic resources for food and agriculture do not match the basic assumptions on the use of genetic resources reflected in the Nagoya Protocol, namely: that untreated genetic resources are discovered in nature, are collected, scientifically described and put to use through additional technical measures; that each of these steps can be precisely attributed to individual actors; and that specifiable human intervention creates significant commercial and monetary value. These ideas originated in the field of pharmaceutical and cosmetic use of genetic resources but fail when it comes to genetic resources for food and agriculture and the specific exchange structures and innovation processes related to them.

The trade in agricultural resources is characterized, *inter alia*, by complex and mutual exchange relations between the countries involved. Hence it is often impossible to clearly distinguish between „provider countries“ and „user countries“. Furthermore, the diversity of breeds and species used results from human intervention in agricultural breeding and usage. In this sense, preserving the diversity of these resources is always linked to their sustainable use.

In the area of crop and livestock breeding it is generally impossible to draw a clear line between genetic resources as commodities and as products. The products themselves often serve as a genetic resource for further breeding or for research and development. It is often impossible to determine a single country of origin or to trace a product back to a single exchange of a specific resource. Agricultural products, plant varieties and animal breeds are often based on variegated resources from several countries of

origin and necessarily also on manifold exchange relations between multiple actors within the value-added chain. As a result, any significant breeding success is typically not derived from a single resource which can be attributed to a specific country of origin but is rather the effect of complex interactions among several stakeholders, multiple resources and often various countries of origin.

Elements of a future ABS system should include both the negotiation of conditions for access and benefit-sharing and the implementation of monitoring and tracking measures to follow up on the development of genetic resources. Given the large number of exchange events, bilateral negotiations for each resource including monitoring and tracking arrangements would cause significant transaction costs for the agricultural sector. As the required human and financial resources would easily exceed any expected financial or other benefit both provider and user countries would abstain from any exchange in genetic resources.

With its position paper, and given the fact that a bilateral system of ABS will create significant barriers to the transboundary exchange of genetic resources for food and agriculture, the Scientific Advisory Board wants to initiate a discussion and work process in order to develop rules governing the access to genetic resources for food and agriculture and fair and equitable benefit-sharing and which take account of the particular features of these resources and their usage.

For this purpose, the paper analyses the particularities of the agricultural sectors with respect to ABS, it highlights potential areas of conflict in the implementation of the Nagoya Protocol and formulates recommendations for ABS regimes in food and agriculture. The Scientific Advisory Board will continue to observe the negotiations on the implementation of the Nagoya Protocol and, if necessary, specify its recommendations by issuing additional statements.

The Scientific Advisory Board bases its deliberations on the following considerations:

1) The guiding principle for future regulations governing ABS should be to maintain or to provide **reliable and facilitated access** to genetic resources for food and agriculture for breeding, research and training purposes; to create legal security for all transaction partners; to minimise transaction costs per exchange and to generate a benefit which results in a maximum contribution to the preservation of genetic resources and does not need to be confined to monetary value.

2) With respect to agricultural resources, the Nagoya Protocol should be implemented **in a uniform manner across the EU**. An important objective for this large economic area is to facilitate the exchange of genetic resources within the EU. Moreover, efforts should be undertaken to also facilitate the exchange between EU and non-EU countries.

3) For agricultural genetic resources, it is generally recommended that **ABS procedures** should be **standardised and aggregated**, and that benefit-sharing should be decoupled from both individual providers of genetic resources and the individual genetic resource. We therefore suggest developing **multilateral mechanisms**. Such mechanisms may be intergovernmental or voluntary agreements between public institutions and the main private stakeholders that are directly affected. Compared to bilateral solutions, multilateral agreements have the advantage that additional **transaction costs are kept low**.

4) The development of ABS systems should differ according to types of use, also taking into account the differences in the respective innovation processes. While the bilateral approach might be appropriate for the pharmaceutical or cosmetic use of genetic resources as envisaged in the Nagoya Protocol, significant progress in breeding and research of genetic resources for food and agriculture, including their use **as renewables and for energy purposes**, is only possible if access to the many required genetic resources is as open and as easy to handle as possible.

5) When implementing the Nagoya Protocol, **interventions in private law** should be kept to an absolute **minimum**, i.e. the rules should be limited to genetic resources which are under public control. For sectors where the majority of genetic resources are privately owned, we recommend the establishment of *ex situ* collections of genetic resources in public domain, i.e. in public genebanks. Not only would they make an important contribution towards preserving the respective resources; by using standardised access and benefit-sharing rules, they could also be designed in a way that allows for free access for agricultural research and breeding while any benefit claims could be used to finance conservation activities.

6) Developing ABS rules for genetic resources for food and agriculture (GRFA) requires precise delimitation and definition. This will present some difficulties as not all current and potential uses are known. At the beginning of the negotiations of GRFA-specific ABS systems, the Scientific Advisory Board suggests, as a first step, compiling a **list of species/genera** for each sector for which specific uses in plant and animal breeding are already known and for which a system with facilitated access and benefit-sharing could be developed. These lists of species/genera could be extended in the future. It may also be possible to develop ABS systems where the type of use determines the relevant rules on access and benefit-sharing. However, the experience gained from the negotiations on the Multilateral System of the International Treaty on Plant Genetic Resources for Food and Agriculture highlights the fact that such an approach faces major problems of acceptance at global level.

7) The country of origin of a resource should be disclosed, if known, in patent applications that are based on genetic resources. Such a **requirement to disclose the country of origin** should be introduced into the respective international negotiations.

8) Microorganisms and **invertebrates** which are of relevance for the food and agriculture sectors could be included in the drafting of an overall regulation on ABS for GRFA. However, in this paper the Scientific Advisory Board only describes the particularities of this group of organisms with respect to ABS.

9) Even though the requirements and conditions of the different sectors differ in detail, the aspects they have in common, as identified in this paper, justify the conclusion that **rules** on access and benefit-sharing should be found at a higher level and **for all genetic resources for food and agriculture**. The Federal Ministry of Food, Agriculture and Consumer Protection should therefore support such overarching agreements during the upcoming negotiations on ABS, both at FAO level and at the level of the

Contracting Parties to the CBD. On the one hand, this is intended to facilitate access to the genetic resources for food and agriculture provided by Germany. On the other hand, these efforts should also aim at supporting German stakeholders in their attempt to gain uncomplicated access to genetic resources in other countries.

Background and objective of the position paper

At their 10th Conference held in Nagoya, Japan, in October 2010 (COP 10), the Contracting Parties to the Convention on Biological Diversity, CBD, adopted the Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS). This so-called Nagoya Protocol contains binding measures governing the access to genetic resources and the fair and equitable sharing of benefits. Both the CBD and the Protocol refer to all genetic resources, except for human genetic resources, and to the associated traditional knowledge. Hence, they also include the genetic resources for food and agriculture.

Whereas, until the entry into force of the CBD in 1993, genetic resources had been deemed the common heritage of mankind, the CBD confirms the sovereign right of states to the genetic resources in their territory. It has since been the responsibility of the states to adopt rules on the access to their genetic resources and on the fair and equitable sharing of the benefits arising from their use. The Nagoya Protocol is regarded as the legal instrument designed to implement the ABS provisions laid down in the CBD.

The provisions on access to genetic resources and benefit-sharing drawn up under the CBD are based on the general assumption that the benefits, usually of monetary nature, are generated by individual products and are attributable to individual genetic resources coming from a specific country of origin. It is assumed that, for each exchange of resources, the donor and recipient country of the genetic resource can be clearly identified. The Nagoya Protocol therefore, in principle, provides for a bilateral approach to the access to genetic resources and to benefit-sharing. The conditions for the exchange are to be bilaterally negotiated between the country of origin and the user of the genetic resource on a case-by-case basis.

However, the Scientific Advisory Board is convinced that these basic assumptions do generally apply neither to agricultural resources and their utilization nor to prevailing exchange practices and innovation processes in agriculture. We would never have reached today‘s level of development in agriculture without the basic principle of free access to genetic resources and with frequent global exchange always having been in place. We can therefore expect restrictions to be placed on agricultural breeding and research if the bilateral regulatory principle under the Nagoya Protocol is to be applied.

In the face of the continuing global population growth and the likely impact of climate change, the agricultural sectors must, now and in the future, remain in a position to deliver innovations whilst adapting agricultural production to changing conditions and optimising it. The Scientific Advisory Board therefore sees the need to intensify research and breeding efforts, on a global scale, for food, agriculture, forestry and fisheries. The basic prerequisite for this is uncomplicated access to genetic resources for research and breeding, which at the same time takes into account legitimate concerns of resource owners and of the countries of origin of genetic resources.

The recommendations of the Scientific Advisory Board concerning the access to and sharing of benefits arising from the utilization of genetic resources for food and agriculture are based on the following guiding concept:

- All reflections on putting the Nagoya Protocol into practice must serve the objectives of the Convention on Biological Diversity and thus focus on both the fair and equitable sharing of benefits and on the conservation and sustainable use of genetic resources.

- Genetic resources for food and agriculture (GRFA) are defined as all genetic resources that contribute to food security for the world's population (food and feed production). Here, due to their growing importance for meeting basic human needs, the Scientific Advisory Board also includes the area of renewable resources and energy production. Therefore, these uses are subsumed under the terms „for food and agriculture" even if they do not directly contribute to feeding people or animals, but only indirectly serve nutritional purposes via income-generating activities of farmers. These areas are also within the mandate of the FAO.

- The types of use that come under „research, breeding and training" play a special role in agriculture. This is especially true of breeding purposes that tap the potential of crops and production animals in agriculture, forestry and fisheries. In the case of crops this is already reflected in the regulations on plant variety protection under the UPOV Convention, according to which a protected variety is freely – without licence fees – available to third parties, i.e. to other breeders for utilization in their further breeding activities. This 'breeder's privilege' mirrors the importance of research and breeding for progress in breeding as a public and economic objective, to which Germany is also committed. The breeder's privilege is also an essential basis for the ABS regulations within the scope of the Multilateral System of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). German (and also French) patent law provides for the option of using patented material for breeding purposes. This also testifies to the importance of breeding as a general public interest. However, this rule has not (yet) been established throughout the European Union.

- We must therefore keep the rules which govern the access to GRFA for research, breeding and educational purposes as simple as possible. While the accessibility of genetic resources for training and teaching purposes is of importance, we will no longer specially highlight it in the remainder of this text but will instead subsume it under the term „research and breeding".

- ABS rules for GRFA should be as simple, unbureaucratic, pragmatic and inexpensive in their implementation as possible. The rules must aim to minimise the costs of transaction per exchange and at optimising benefit sharing.

- Additional rules under the Nagoya Protocol should interfere as little as possible with existing law, e.g. private law. The Scientific Advisory Board regards the establishment of collections of genetic resources in the public domain as a means for governments to achieve, through a minimum of state intervention, maximum impact with regard to securing GRFA and ensuring general access to them.

- At European level, we are striving to achieve a concerted approach regarding the development of ABS rules. The aim is, on the one hand, to achieve an uncomplicated exchange of genetic resources among European states and, on the other hand, to develop solutions that facilitate, for European users, access to genetic resources in third countries that are of interest in terms of breeding.

- Given that bilateral ABS rules for GRFA are, as a rule, not expedient, we should seize the op-portunities offered by multilateral ABS rules. Financial support for and implementation of global plans of action, development of infrastructures that establish free transnational access to GRFA in the public domain, and knowledge transfer and capacity-building measures all contribute to a long-lasting joint effort across countries to create as a cultural heritage varieties and breeds with a high yield potential.

The position paper aims to identify concerns about the implications of the Nagoya Protocol for genetic resources for food and agriculture and to highlight viable pathways for the implementation of the protocol with a view to GRFA.

1 The Nagoya Protocol

In various sections, the Nagoya Protocol mentions the special nature of genetic resources in food and agriculture and provides for taking that into account during its implementation. The following chapter presents important elements of the Nagoya Protocol and analyses in which parts it refers to genetic resources in food and agriculture.

1.1 The Nagoya Protocol as an instrument for the implementation of the third CBD objective

The Convention on Biological Diversity, CBD, 1992, pursues three essential objectives: Aside from the conservation of biological diversity and the sustainable use of its components, the third objective concerns the „fair and equitable sharing of the benefits arising from the utilization of genetic resources" (benefit-sharing). The Nagoya Protocol aims at implementing this third objective.

While, until the entry into force of the CBD (in 1993), biological resources were generally regarded as the common heritage of mankind, and thus freely accessible to everyone, the CBD reaffirms the sovereign rights of states over their biological resources according to the principles of international law. Hence, in its Article 15, the CBD invites the Contracting Parties to create rules and regulations that govern Access to genetic resources and fair and equitable benefit-sharing, ABS).

Very simply put, the main idea lies in creating justice between „North" (= developed countries) and „South" (= developing countries) and in interconnecting utilization and protection of biodiversity. In the future, cases of „biopiracy", i.e. the utilization of genetic resources without the financial participation (benefit) of the country of origin, which occurred especially in case of pharmaceutical use, must be prevented. Instead, developing countries shall participate in financial gains and other benefits such as new knowledge, which result from the utilization of genetic resources but which they are often unable to achieve due to insufficient development and marketing capacities.

In the framework of the implementation of the CBD it was decided in 2004 to negotiate an International Regime which contains binding rules to govern the access to genetic resources and fair and equitable benefit-sharing. After 7 years of negotiations the so-called **Nagoya Protocol** (NP) was adopted in October 2010 (Decision X/1). It is intended to provide increased legal certainty in the exchange of genetic resources.

The Nagoya Protocol applies to genetic resources pursuant to the CBD (i.e. „material of plant, animal, microbial or other origin containing functional units of heredity", with human genetic resources being excluded) as well as to traditional knowledge associated with genetic resources within the scope of the Convention (Art. 3 NP). It reaffirms the sovereign rights of states over their genetic resources (Preamble). „**Utilization of genetic resources**" means to "conduct research and development on the genetic and/or biochemical composition of genetic resources, including through the application of biotechnology" (Art. 2 NP). This definition includes agricultural breeding and selection.

The Nagoya Protocol is a legal instrument for the implementation of the ABS provisions stated in the

CBD (e.g. Art. 15 CBD). It commits the contracting parties to implement the following measures, *inter alia*:

1) Access to genetic resources and to associated traditional knowledge requires the country of origin's **Prior Informed Consent (PIC)** based on the full knowledge of facts. Both the access to genetic resources and the fair and equitable sharing of benefits must occur according to **Mutually Agreed Terms (MAT)**. For that purpose the Contracting Parties are obliged to establish relevant legal, administrative or political measures and to make them transparent (Art. 6 and 7 NP).

2) The Protocol reaffirms the **bilateral character** of access to genetic resources and of fair and equitable benefit-sharing, yet, for genetic resources that occur in transboundary situations or for those for which it is impossible to grant or obtain Prior Informed Consent (PIC), the Protocol provides that the Contracting Parties shall consider the modalities of a global multilateral benefit-sharing mechanism (Art. 10 NP).

3) Compliance: Each contracting party shall establish at least one national checkpoint. The origin of genetic resources used within its jurisdiction shall be disclosed at these checkpoints. In addition, an international certificate shall be introduced and contain a minimum of obligatory information (Art. 17 NP).

1.2 References in the Nagoya Protocol to genetic resources for food and agriculture

The text for the adoption of the Nagoya Protocol (Decision X/1, CBD Conference of the Parties) refers to genetic resources for food and agriculture in various sections.

It is pointed out, for instance, that the „International ABS Regime" consists of the following elements:

- the Convention on Biological Diversity (**CBD**) itself,
- the **Nagoya Protocol** and
- **complementary instruments** including the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and the Bonn Guidelines to ABS.[1]

In addition, it is acknowledged that the objectives of the International Treaty (ITPGRFA) are consistent with the CBD and that the Treaty serves the purposes of sustainable agriculture and of global food security. Also, Resolution 18/2009 of the FAO Conference is mentioned, in which the FAO expresses its willingness to cooperate with the CBD and its working groups in order to find ABS solutions in the field of biodiversity in agriculture.

[1] The Bonn Guidelines on ABS, adopted during the 6th Conference of the Parties to the CBD in Den Haag in March 2002, intend to support the Contracting Parties and relevant stakeholders in developing national policies, relevant legal and regulatory framework conditions and/or to negotiate bioprospection projects in accordance with the CBD principles. However, as the Bonn Guidelines are not legally binding they have, in practice, proved to be lacking where the fair and equitable sharing of benefits arising out of the utilization of genetic resources between countries of origin and resource users is concerned. Consequently, in the Plan of Implementation of the World Summit for Sustainable Development (WSSD) in Johannesburg in September 2002, it was agreed to negotiate „an international regime to promote and safeguard the fair and equitable sharing of benefits arising out of the utilization of genetic resources." The Nagoya Protocol reflects the successful conclusion, by 2010, of negotiations of such an international ABS Regime. GTZ/BMU (o.J): Factsheet Genetische Ressourcen. Zugang und gerechter Vorteilsausgleich (ABS), http://www.gtz.de/de/dokumente/de-biodiv-thema-genetische-ressourcen-2008.pdf, date of download 21/03/2012.

The Preamble of the Nagoya Protocol itself explicitly refers to the interdependency of states in terms of GRFA and to their special nature and importance for achieving food security. It is recognized that their distinctive features and problems require distinctive solutions. The fundamental role of the International Treaty on Plant Genetic Resources for Food and Agriculture) and of the Commission for GRFA with the Food and Agriculture Organization (FAO/CGRFA) is also recognized here.

When implemented, the Nagoya Protocol shall not affect any rights and obligations arising from any existing international agreement (such as the ITPGRFA), provided that the latter do not cause serious damage or threat to biological diversity (Art. 4.1 und 4.4).

Article 4 also states that further specialized agreements can be developed, provided they do not run counter to the objectives of the Nagoya Protocol (4.2) and that the Protocol and other international provisions consistent with the CBD should be mutually supportive.

Article 8 points out „special considerations“. Thus, Article 8a calls for the creation of conditions which promote and encourage basic research for the conservation and the sustainable use of biological diversity. Present or imminent emergencies which require expeditious access to genetic resources should be taken into account (Art. 8b). Article 8c points out the importance of GRFA and their special role for food security.

For genetic resources occurring in transboundary situations or for traditional knowledge and/or for genetic resources outside of national sovereignty, it is possible to create a global multilateral benefit-sharing mechanism (Art. 10). The modalities of such a multilateral system shall be discussed during the 2nd meeting (2012) of the Intergovernmental Committee (see Annex II Nagoya Protocol).

Article 19 invites the members of the Nagoya Protocol to elaborate concrete sectoral and cross-sectoral model contractual clauses for mutually agreed terms. In addition, Article 20 aims at the development of codes of conduct, guidelines and best practices and/or standards.

Generally speaking, and in comparison to the CBD, the Nagoya Protocol offers more options to draw up special rules and regulations for specific areas of use and sectors, including agricultural sectors. The Scientific Advisory Board considers, as the main connecting factors, Article 4.2 because it essentially allows the development of international agreements which do not run counter to the aims and objectives of the Nagoya Protocol, and Articles 19 and 20 in particular, as they invite the contracting parties to develop sectoral model contractual clauses and voluntary instruments.

2 The special nature of genetic resources for food and agriculture and their consequences for ABS rules

As stated in Chapter 1.2, the Nagoya Protocol already points out that the special nature of genetic resources for food and agriculture needs to be specifically considered when drawing up ABS rules. The following chapter will thus describe in some detail the distinctive features of these resources.

In the CBD, „genetic resources“ are defined as „material of plant, animal, microbial or other origin containing functional units of heredity“, with human genetic resources being excluded.

„Genetic resources for food and agriculture“ (GRFA) are a subset of these resources whose distinctive features were described as follows by the CBD Conference of the Parties (Decision V/5, Appendix):

- Agricultural biodiversity is essential to satisfy basic human needs for food and livelihood security;
- Agricultural biodiversity is managed by farmers; many components of agricultural biodiversity depend on this human influence; indigenous knowledge and culture are integral parts of the management of agricultural biodiversity.
- There is a great interdependence between countries for the GRFA.
- For crops and domestic animals diversity within the species play an essential role and diversity between species has been greatly expanded through agriculture.
- Because of the degree of human management of agricultural biodiversity, its conservation in production systems is inherently linked to sustainable use.
- Nonetheless, much biological diversity is now conserved *ex situ* in genebanks or breeders‘ materials.
- The interaction between the environment, genetic resources and management practices that occurs *in situ* within agro-ecosystems often contributes to maintaining a dynamic portfolio of agricultural biodiversity.

The importance of GRFA for human livelihood
Aside from food, other commodities are required to satisfy basic human needs. In 1966, the International Covenant on Economic, Social and Cultural Rights (ICESCR), ratified by 160 states, already listed food, water, clothing, shelter and energy as being part of the human right for an adequate living standard (Art. 11, par. 1).

The importance of renewable resources which do not serve food purposes directly but satisfy other basic human needs for survival and which, not least in rural areas, are used to generate additional income, shall increase in the future, while natural resources such as crude oil shall diminish.

This is also reflected in present FAO objectives and areas of responsibility. In addition to raising the world’s nutritional and living standards, they include the enhancement of production and the distribution of agricultural, forestry, and fishery products as well as the improvement of living conditions of rural populations and the participation in world economic growth. Accordingly, the FAO Commission on Genetic Resources for Food and Agriculture (CGRFA) has, in recent decades, expanded its mandate from plant genetic resources (PGR) to the genetic resources of all sectors, including the forestry and fisheries sectors. Germany has continuously followed suit in extending the CGRFA's emphasis in the national working programme to genetic resources.

Distinctive features of GRFA regarding ABS

Ever since people became sedentary, agricultural development has been based on the domestication and modification of crops and domestic animals. An unhindered exchange of genetic resources – even across continents – made it possible for agriculture to spread successfully to almost every region on earth.

Thus, the success of agricultural breeding can *per se* be seen as a common transnational effort beneficial to all of mankind. The creation of high-performance varieties and races that are fit to meet the challenges we face because of population growth and changing climate must therefore also be seen as a common interest shared by mankind (Begemann & Himmighofen 2008).

Agricultural breeding, in general, builds on previous breeding successes, i.e., already existing breeds or varieties are further developed through breeding. In terms of the access to genetic resources and benefit-sharing this means:

- For GRFA, „donors" and „recipients" of genetic resources are not always clearly identifiable, as one is often both, because products from GRFA are newly created genetic resources at the same time (e.g. when a new plant variety is developed).
- The North-South view as such, according to which the states of the „North" are the recipients and users of genetic resources while the developing countries of the „South" are countries of origin and providers of resources, does not apply to GRFA (see, for instance, animal genetic resources for food and agriculture, Ch. 4)
- The degree of modification through human influence does play a role: Products are not developed from a single but from an array of various genetic resources. Consequently, products can often not be traced back to individual genetic resources and/ or to individual, clearly identifiable countries of origin.
- Often, at the time of an exchange of genetic resources the purpose of use is not foreseeable.

A large part of GRFA can be conserved and made accessible *ex situ*. This is widespread practice. Already, the provision of GRFA in *ex situ* collections and of infrastructure relevant for the conservation of the resource in question represent a great benefit for mankind.

Conclusion:

Genetic resources for food and agriculture are characterized by the fact that instead of occurring ‚naturally' they are the result of breeding and include a variety of genetic resources. Breeding will also influence future uses of genetic resources of various origins. Specific problems shall result for the elaboration of ABS rules and regulations where attribution and transaction costs are concerned. In order for agricultural breeding and research to be successful in the future, ABS regulations for GRFA must be drawn up in ways which allow uncomplicated and expeditious access to genetic resources and which minimize transaction costs and guarantee the conservation and sustainable use of GRFA.

3 Special conflicting interests regarding the implementation of the Nagoya Protocol

In view of the conservation and sustainable use of genetic resources for food and agriculture the Scientific Advisory Board sees certain conflicting interests where the implementation of the Nagoya Protocol is concerned. These conflicts arise, for instance, where different legal arenas are involved or where the Nagoya Protocol remains unclear on certain issues. The following chapter points out important conflicting interests and highlights issues which remain to be clarified.

3.1 Private property versus ‚public domain'

The CBD recognizes the sovereign right of states over their genetic resources (Art. 15.1 CBD). This right may be exercised by those Contracting Parties who are the countries of origin of such resources, or by those states who have acquired these resources in accordance with the CBD (Art. 15.3 CBD). The CBD defines the term „country of origin" as „the country which owns such genetic resources under *in situ* conditions" (Art. 2 CBD).

Neither the CBD nor the Nagoya Protocol affect the issue of ownership. In principle, the right to own property manifested in the General Declaration of Human Rights of 1948 applies although, globally speaking, it is handled quite differently. In Europe, the guaranteed right to property is protected by Article 17 of the EU Charta of Fundamental Rights and by Article 1 of the 1st additional protocol of the European Convention on Human Rights (ECHR); in Germany it is protected by Article 14 of the German constitution. Hence, at first, only resources in the public domain fall within the scope of the CBD and/or the Nagoya Protocol. Beyond that, it is up to the CBD Contracting Parties to extend their influence, through national legislation and the national implementation of the CBD/the Nagoya Protocol, to privately owned genetic resources.

The practice of exchanging genetic resources extends to both private property and resources in the public domain. There are examples for both in the various agricultural sectors (see Ch. 4). If genetic resources are exchanged through a purchase contract, the transaction is subject to private law. If a Contracting Party, pursuant to the CBD, wishes to influence access to these genetic resources and eventual claims in connection with benefit-sharing, this needs to be done in line with the system of property ownership of the respective state. For Germany this would certainly not be a trivial step and would possibly require a modification of the German Constitution.

Given the fact that the implementation of the Nagoya Protocol should interfere as little as possible with existing private law (see Ch. 1), it is suggested that ABS regimes refer to genetic resources which are under public power of control and in the public domain. In this paper, the term public domain is used in the sense of Article 11.2 of the ITPGRFA. It refers to genetic resources that are freely accessible as a ‚common pool' and can be freely defined by the public authorities of countries involved and which are not subject to any further physical or intellectual property rights. Such pools, in the form of numerous genebanks, already exist in the sector of plant genetic resources (see also Ch. 4.1.3). In other sectors, such as animal genetic resources or in the forestry sector, such genebanks have been rare until today. Instead, a large part of the resources is in private property and thus exchanged by means of purchase contracts. It could be considered whether the aim of conserving relevant resources could be reached by providing the infrastructure and by creating additional genebanks as publicly accessible pools governed by respective ABS regimes (see Ch. 5, conclusion 5).

3.2 Private property rights and ABS

The Nagoya Protocol does generally not affect obligations arising from other international agreements, „except where the exercise of those rights and obligations would cause a serious damage or threat to biological diversity“ (Art. 4 par. 1 sentence 1). The reservation regarding serious damage or threats to biodiversity is without prejudice to the protection of intellectual property rights. Consequently, the obligations laid down in the TRIPS Agreement (Art. 27) for the protection of intellectual property rights, relating to patents in particular, and in the UPOV Agreement on the protection of plant varieties, continue to apply, without restrictions, for the Parties to the Nagoya Protocol as well.

Apart from that, the CBD, as the „Original Convention“, provides for the effective protection of intellectual property rights (Art. 16 par. 2). However, the CBD does point out here that patents and other rights relating to intellectual property could affect the implementation of the CBD. Thus, the Contracting Parties are asked to make sure that intellectual property rights support the aims of the CBD (Art. 16. par. 5).

One possible legal consequence pursuant to the Nagoya Protocol would be the exclusion of intellectual property rights to the utilization of genetic material which was obtained without the provider’s consent, i.e. „without the innovative consent“. Such a legal consequence is provided, for instance, in Decision No. 391 of the Andean Community, the regional set of rules of the Andean states on access to genetic resources. This runs counter to the TRIPS Agreement (Herdegen 2011). There is, however, a suggestion supported by the European Union, to include in both the TRIPS Agreement and in the WIPO negotiations, a provision concerning the proof of origin.

Although the Nagoya Protocol does not offer a legal basis for obligatory licences, the Contracting Parties can create a legal framework that would provide for an appropriate share of countries of origin in the use and benefit of intellectual property rights, for instance via licence fees (Art. 16).

Use of traditional knowledge

Finally the provisions regarding traditional knowledge in connection with genetic resources must be observed. Significant limitations in terms of patent protection do not arise. As technical instructions which only implement existing traditional knowledge is not considered distinct they are not patentable (see the decision of the European Patent Office in the neem tree case, EPA, T 0416/01 - 3.3.2, S. 16 ff.). Problems can arise, however, in legal systems where only prior knowledge fixed in writing stands in opposition to distinctness.

The protection of traditional knowledge sought by the Nagoya Protocol (Art. 13) becomes particularly relevant if and when, based and building on traditional knowledge, patent protection is requested for an invention. This may, finally, lead to an intertwinement of the protection of traditional knowledge with patent protection „piled“ on top of it.

Current negotiations on this complex of issues are taking place in the framework of the

Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore of the World Intellectual Property Organization (WIPO IGC).

The problem of patenting
Intellectual property rights to products which resulted from the use of genetic resources are an essential prerequisite for the generation of (financial) benefits, by marketing such products and then share benefits fairly and equitably with the country of origin of the genetic resource in the sense of the CBD/Nagoya Protocol. Such intellectual property rights may exist, for instance, as patents, plant variety protection or trademark rights.

The country of origin of the genetic resource which leads to the invention and, possibly, to the issuing of a patent, would have to have agreed on a prior contract with the party lodging a patent application, which would allow that party to share profits resulting from the patent. Without such an additional participation agreement benefits could not be claimed in a legally binding form.

ABS rules and plant variety rights
Compared to other sectors of GRFA, the plant variety protection law developed in the international UPOV Agreement represents a particularity. If a variety meets the DUS criteria of distinctness, uniformity, and stability, plant breeders may, according to *plant variety rights*, obtain protection for a plant variety which resulted from their own breeding efforts. Cultivation and use of farm-saved seed of this protected variety will then only be possible against payment of a licence fee. The variety, however, shall continue to be available, free of charge – no licence fee payable – to third parties for further research and breeding purposes, including other breeders for their further breeding efforts (breeding privilege).

In the sense of the ABS regime pursuant to the Nagoya Protocol, the benefit resulting from plant variety rights, along with its breeding privilege, is anchored in the International Treaty on Plant Genetic Resources for Food and Agriculture for approx. 60 globally important crops (see Ch. 4.1).

ABS rules and the term of „breed“ for livestock
On an international level there is no uniform, legally binding definition of the term „breed“ which would be similar to the term of „variety“ for crops. Neither is the term of „breed“ legally defined in Germany or in the European Union. For certain animal species (equidae, cattle, buffalo, pigs, sheep and goats) there are zoo-technical regulations at EU level, in particular for the approval of breeder’s associations and for the keeping of herdbooks. In these regulations, however, implemented in Germany through the Animal Breeding Act (Tierzuchtgesetz) in force, the term of „breed“ does indeed occur.

Only the breeder’s associations approved by federal state authorities may conduct an actual „breeding programme“. Determining a breeding population and assigning a race name to it are a part and prerequisite of such breeding programmes.

Individual animals of a breeding population are identified according to the criteria stated in the Animal Breeding Act and/ or in the breeding programme and their pedigree is documented. Pedigree is one of the essential criteria if an animal is to be assigned to a breeding programme or to be attributed to a certain breed. For animals whose ancestors (up to a generation to be determined, mostly up to the generation of its grandparents) also stem from the breeding population in question, a breeding association may issue a so-called „zoo-technical certificate“ which identifies the animals as purebred individuals of their breed.

The term of breed therefore does not serve the purposes of possible ABS regimes.

However, breeding animals, semen, ova and embryos or other cell cultures can serve as genetic resources of agricultural livestock, if and where they can be used to breed fertile animals. The import of such resources from third countries is subject to the provisions of the Animal Breeding Act based on EU zoo-technical legislation. This is to mainly guarantee fulfilment of criteria regarding breed purity and uniform principles in connection with herd-book-keeping. Rules governing financial benefit-sharing are not connected with that procedure.

Relevance of trademark protection
A special form of intellectual property rights is based on the Law on the protection of trademarks and other marks, the so-called Markengesetz (MarkenG) which is embedded in the respective EU-legislation. According to the MarkenG, geographical indications of origin, among others and aside from trademarks themselves, may be protected. This is of relevance for products resulting from crops or animal livestock, as protection can also be obtained indirectly for varieties and animal breeds if they are connected with a geographical indication of origin (Brösamle 2002). For such designations, the MarkenG provides for the registration as a collective trademark, namely for legally capable associations, i.e. associations of producers or manufacturers of respective products. The trademark owner thus obtains the exclusive right to the registered name which allows him/her to exclude unauthorized third parties from using it and to ask members to comply with the conditions of use, e.g. certain standards in terms of quality.

Products with a regional identity, e.g. from plant varieties or animal breeds with a regional identity, may obtain EU-wide trademark protection as „Protected Designation of Origin (PDO) or as „Protected Geographical Indication (PGI)“. The „*Schwäbisch-Hällische Qualitätsschweinefleisch* (PGI) or the „*Diepholzer Moorschnucke* (PDO)“ can be named as successful examples.

Basically then, trademark protection is rather an instrument for the protection of intellectual property rights to products that refer to a particular geographic origin within a country. It could thus help to increase transparency on possible rights related to the origin of genetic resources.

3.3 Commercial versus non-commercial utilization/research

Pursuant to the Nagoya Protocol „utilization of genetic resources“ means to conduct research and development on the genetic and/or biochemical composition of genetic resources, including through the application of biotechnology as defined in Article 2 of the CBD. The request often expressed during the ABS negotiations to differentiate between commercial and non-commercial utilization of genetic resources could not be considered. Article 8 (a) of the Nagoya Protocol does state that each Party shall create conditions to promote and encourage research which contributes to the conservation and sustainable use of biological diversity, particularly in developing countries, including through simplified measures on access for non-commercial research purposes. However, the Nagoya Protocol fails to specify what is meant by non-commercial research purposes.

The ITPGRFA solves this problem by mentioning cases in which research leads to the marketing of products resulting from genetic resources. The ITPGRFA differentiates between cases in which marketed products continue to be accessible to third parties, without limitations, for further research and breeding purposes and cases without that option. The differentiation is mainly made on the basis of intellectual property rights which protect such research and development results, i.e. for instance in case of exclusive rights in connection with patent law or less exclusive rights such as plant variety rights (see Ch. 3.2).

An equivalent provision in the Nagoya Protocol could allow the creation of simplified measures for access to the genetic resources provided that only such products shall result from them and be marketed that will continue to be accessible to third parties, without limitations, for further research and breeding and which are not subject to exclusive protective rights such as patents.

Yet, as it is often unknown at the beginning of any research activity, whether any or which products will be developed from respective genetic resources, Article 8 (a) might usefully be interpreted in terms of measures for access to genetic resources being as easy and uncomplicated as possible while the issue of marketing of products resulting from them is to be dealt with separately.

3.4 Multilateral versus bilateral approaches

In principle, the Nagoya Protocol implies bilateral systems to govern access to genetic resources and benefit-sharing but, if necessary, it also allows for multilateral solutions in specific cases (Art. 4.4, 8, 10 and 11 of the Nagoya Protocol).

Normally then, a user would negotiate an individual „Prior Informed Consent (PIC)“ and „Mutually Agreed Terms (MAT)“ with the country of origin for each genetic resource he/she wants to utilize („case-by-case-scenario“). This negotiating process requires a certain amount of resources in terms of personnel and time of both donors and recipients.

The Nagoya Protocol requires Contracting Parties to establish rules and procedures for negotiations on PIC and MAT „in a cost-effective manner and within a reasonable period of time“ (Art. 6 NP). Hence it makes sense for both sides to aggregate and standardise ABS processes. In addition, the FAO Commission on Genetic Resources for Food and Agriculture (CGRFA) suggests to „decouple“ benefit-sharing from the individual provider and from the individual user (FAO 2011a, p. 38).

Possible approaches can be presented as a continuum between two ideal types, namely the „case-by-case“ scenario and multilateral benefit-sharing system. Box 1 compares the main features of both approaches.

Box 1: General differences between a bilateral approach and standardised, aggregated ABS procedures (see also FAO 2011a)

"*case-by-case scenario*" (Bilateral Approach)	National Standardisation and Aggregation of ABS Procedures (Multilateral Approach)
The ABS regime is dependent on **individual** genetic **resources** and on individual **providers/users**.	The ABS regimes can be **decoupled from the individual resource** and/or the individual provider/user.
Each transfer is negotiated **separately** by Prior Informed Consent (PIC), Mutually Agreed Terms (MAT) and, where applicable, using a Material Transfer Agreements (MTA).	Aggregation: **One central coordination authority** regulates all publicly held GRFA, for instance.**Standardisation** of procedures, e.g. standardised MTA which principally already cover all eventualities.
Both donors and recipients must, **for each individual transfer**, find out who is responsible and which stakeholders need to be included in the process.	There is **one** central authority for all transfers.
Benefit-sharing must be **separately negotiated** and carried out. Organising benefit-sharing and monitoring procedures related to it generates costs payable by donors and recipients involved.	Benefit-sharing is **centrally organised**: The central authority is to be contacted by everyone involved and is responsible for the distribution of benefits and for monitoring. Recipients must regularly report on utilization.
Transaction costs (costs incurred for PIC, MAT, benefit-sharing, monitoring) per individual transfer are **high** and are payable by individual parties involved (donor and recipient).	**High costs** and work load **for the central coordination body** while transaction costs for recipients/users remain low.
Example plant /animal breeding: The ratio between transaction costs per individual transfer and benefits from the individual resource is imbalanced. **Smaller enterprises** are being **excluded**.	**Example plant /animal breeding**: The ratio between transaction costs per individual transfer and benefits from the individual resource is appropriate. **Smaller enterprises** can also **participate**.
Individual solutions are possible.	Standardised solutions allow for **less individuality**, unless saving clauses are provided which could, however, weaken the system.
Genetic resources which occur in **transboundary** situations or whose origin cannot be attributed to a specific state (e.g. breeds and varieties from material of different origins) cannot be regulated bilaterally.	A multilateral system also allows the **regulation** of resources from **origins occurring in transboundary situations**.

Between both extremes, various levels of standardisation and aggregation are imaginable and have in fact already been partly implemented in ABS regulations in force.

In order to allow the coexistence of bilateral and standardised multilateral approaches within the framework of the Nagoya Protocol, certain **criteria for their delimitation** must be defined, e. g:

- Definition of a **subset of genetic resource**s for a multilateral system (list approach),
- Definition of **types of use** to which certain exchange conditions apply (use approach),
- Determination of a **defined circle of users** with its own code of conduct and clearly defined conditions of exchange (institutions approach).

There are already some examples for such delimitations. The ITPGRFA Multilateral System (see Ch. 4.1.3), for instance, is limited to „Research, Breeding and Training for Food and Agriculture" as types of use (utilization approach) and limits the Multilateral System to a list of plant varieties defined in Annex I (list approach). The International Plant Exchange Network (IPEN) founded by botanic gardens (see Ch. 4.1.3) limits itself to the exchange of live plant material for non-commercial utilization (utilization approach) and is open to botanic gardens exclusively (institutions approach).

The appeal of a multilateral public domain system has become quite obvious in recent years. The significant increase of the number of transfers of genetic resources in recent years (from approx. 12.000 samples in 2007 to approx. 33.000 samples in 2011) by the Leibniz Institute of Plant Genetics and Crop Plant Research (IPK) in Gatersleben (see Appendix 1) suggests that this is not least due to increased public awareness of the ITPGRFA Multilateral System, the simple option of online ordering and the uniform conditions for supplying material by way of the standardised Material Transfer Agreement (sMTA) which have led to a significant reduction of transaction costs.

3.5 Application over time: „before" versus „after" the Nagoya Protocol

In none of its sections does the Nagoya Protocol specifically elaborate on *ex situ* stocks of genetic resources. Article 3 of the Nagoya Protocol states: „This Protocol shall apply to genetic resources within the scope of Article 15 of the Convention". But neither are *ex situ* collections explicitly mentioned in Article 15 of the CBD. Mention is only made of genetic resources which were accessed by Contracting Parties in whose countries these resources originated, or of resources which were acquired by one Party pursuant to the CBD (Art. 15.3).

Thus, genetic resources which were included in an *ex situ* collection prior to the entry into force of the CBD fall neither within the scope of the CBD nor within that of the Nagoya Protocol.

Access to *ex situ* collections which were not established in compliance with the CBD had already been an issue during negotiations of the CBD text at the UNEP Conference in Nairobi. In Resolution 3 of the Nairobi Final Act of 1992 it was agreed that the FAO should clarify the indeterminate status of *ex situ* collections having been established before the CBD entered into force. This has already been done for all plant genetic resources within the scope of the ITPGRFA. The status of all genetic resources in *ex situ* collections which do not fall under the ITPGRFA continues to be unclear.

For genetic resources which were included in *ex situ* collections after the entry into force of the CBD, but prior to the entry into force of the

Nagoya Protocol, there may be differences in already existing ABS contracts. In this context, the implementation of the CBD on national level is of great importance. If, on the basis of the CBD, ABS contracts were already negotiated they continue to apply after the Nagoya Protocol entered into force. If, however, an exchange took place outside of the CBD and/or without any ABS contract, the Nagoya Protocol does not offer any possibility to claim that respective contracts be signed retrospectively (Chege Kamau et al. 2010).

Thus, it can principally be assumed that the provisions of the Nagoya Protocol shall apply only to the time following its future entry into force, i.e. following its ratification by 50 states, unless other agreements shall be made to cover retrospective action.

3.6 Conclusion

The effectiveness of the Nagoya Protocol as to reaching its aims of facilitating access to genetic resources and of guaranteeing a fair and equitable sharing of benefits, is limited by a number of factors. On the one hand, the scope of the Nagoya Protocol is limited to genetic resources in public domain, unless states do actively infringe on existing property rights, and also to events occurring after its future entry into force. On the other hand, the interfaces with legislation on intellectual property rights need to be further developed, concerning, in particular, the consideration of traditional knowledge in the assessment of the distinctiveness of patents sought, the distribution of gains from patents issued, the legal constitution of matters relating to animal genetic resources and the use of trademarks for the internalisation of benefits from geographical designations of origin. Not least, a number of clarifications are required to secure access to genetic resources for research and breeding: While a distinction between commercial and non-commercial utilizations will hardly be practicable, the extension of the system governing access and benefit-sharing beyond the actual 60 plant varieties listed in the ITPGRFA Annex as well as the establishment of multilateral solutions instead of bilateral case-by-case approaches might be of essential importance.

4 Sectoral particularities of genetic resources for food and agriculture and regulatory needs regarding ABS

During the ABS negotiations within the context of the CBD, the focus first lay on the typical „biopiracy scenario“: a pharmaceutical enterprise from an industrial country (= North) collects plant material in a biodiversity rich developing country (= South) and develops a gainful pharmaceutical product for which it obtains exclusive intellectual property rights. As could be shown in Chapter 1, the Nagoya Protocol generally takes special considerations on genetic resources for food and agriculture into account. Yet, they still need to be elaborated.

Comprehensive impact assessments of the Nagoya Protocol regarding the agricultural sector have yet to be carried out. First attempts were made by the FAO Commission on Genetic Resources for Food and Agriculture (FAO 2011a).

The following chapter describes the particularities of utilization and exchange of genetic resources in the agricultural sectors and highlights which issues of these sectors should be considered when implementing the Nagoya Protocol.

4.1 Plant genetic resources for food and agriculture

4.1.1 Which are the resources and types of use in question?

Following the ITPGRFA plant genetic resources for food and agriculture (PGRFA) mean „any genetic material of plant origin which is of current or potential value for food and agriculture“. Utilized PGRFA include both crops and their wild relatives. Specimens of any kind of plant seeds, fruits, vegetative parts, even tissue cultures or isolated gene sequences are exchanged.

Various studies on the utilization of plant genetic resources (e.g. Holm-Müller et al. 2005, ten Kate & Laird 1999) differentiate, *inter alia*, between agriculture, including plant breeding, horticulture, including ornamental horticulture, and pharmaceutical utilization, including cosmetics. This paper emphasizes utilizations in agriculture and in horticulture.

4.1.2 Particularities of PGRFA in terms of an ABS regime

- Breeding of agricultural and horticultural crops in Germany (as in most of central Europe) has been widely decoupled from the agricultural process and is done in approx. 60 (mostly medium-size) **breeding companies**.

- **Intellectual property rights** play an important part in connection with the term ‚**variety**' in plant breeding. Plant variety rights, developed in the international UPOV-Agreement, represent a particularity (distinctive feature) compared to other sectors of GRFA. If a variety meets the DUS criteria of distinctness, uniformity and stability, plant breeders may have their new plant variety, which resulted from their own breeding efforts, protected under the **Sortenschutzgesetz** (Plant Variety Protection Law). Cultivation and use of farm-saved seed of such a protected variety will then only be possible against payment of a license fee. However, the variety shall continue to be accessible to third parties, including other breeders, for further research and breeding purposes, free of charge, i.e. no license fee shall be payable (breeding privilege).

- Depending on crop type and breeding method the genetic resources that are accessible for research and breeding purposes are held by private companies, **breeders' gene pool**s, or by public institutions, namely ***ex situ* collections** (e.g. genebanks, botanic gardens or other collections). The material from *ex situ* collections continuously flows into breeders' gene pools.

- Also, **crop wild relatives (CWR)** of cultivated crops are utilized in plant breeding in the sense of the gene pool concept (Harlan & de Wet 1971) and, due to technical developments, become increasingly interesting.

4.1.3 Existing ABS approaches for plant genetic resources

The International Treaty on Plant Genetic Resources for Food and Agriculture
The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) is a legally binding international agreement with 127 member states (as of end 2011). Although it includes all plant genetic resources for food and agriculture, its Multilateral System on ABS (Art. 10 – Art. 13 ITPGRFA) covers only **about 60 crop species** (and/or genera) **of global importance** listed in a special Annex I. Utilization of these approx. 60 crops is granted by Article 12.3 (a) only for the purpose of utilization and conservation in **research, breeding and training for food and agriculture,** provided that this purpose does not include chemical, pharmaceutical and/or other utilization in the non-food/ non-feed industries. The central idea behind this ITPGRFA provision is to facilitate access to the aforementioned crops for the purposes stated, and to keep utilization from being prevented by possibly time-consuming contractual negotiations between a provider and a recipient of plant genetic resources. Consequently, facilitated access and benefit-sharing are managed by a **standardised Material Transfer Agreement (sMTA)**. The sMTA was internationally negotiated and agreed upon by the Governing Body, i.e. by the ITPGRFA member states for that purpose. By means of this sMTA, any genetic material from the ITPGRFA's Multilateral System now becomes quickly accessible. Facilitated access, in and of itself, can already be considered an asset by all parties concerned.

Yet, facilitated access has only been regulated for the approx. 60 crops listed in the above mentioned Annex I, while, legally speaking, a clear attribution of individual species may in some cases be difficult, due to taxonomic features which might leave room for interpretation. Also, the issue of whether a single accession of a collection in a genebank is subject to public control requires clarification when resources are introduced into the Multilateral System.

For crops not listed in the above mentioned Annex I, the facilitated access system has not been globally agreed on. The system is also insufficient, as it covers neither the types of use in the renewable resources sector nor those in the sector of energy generation. To these areas, the above mentioned complex bilateral procedure continues to apply which complicates the use of such resources rather than facilitating it.

The International Plant Exchange Network (IPEN) of Botanic Gardens
The Network, founded in Europe on the basis of the CBD, intends to simplify the exchange of plant material for non-commercial use. It is open to botanic gardens exclusively who have signed the common code of conduct for the acquisition and the supply of plant material pursuant to the CBD. This Codex obliges members to introduce into the IPEN Network only plants which were acquired in accordance with the CBD. In addition, each specimen („accession“) introduced into the Network by the member gardens receives a code number. The so-called „IPEN Number“ includes information on the country of origin, the conditions, set out by the country of origin, for the supply and utilization of the material, and about the botanic garden which introduced the material into the IPEN. The code remains with the plant material during every transfer. If material is forwarded to non-IPEN members, the recipient must sign a standard Material Transfer Agreement (sMTA). For the purpose of commercial utilization, material is only supplied by the Network if the potential user can prove that he/she has applied for and obtained the Prior Informed Consent (PIC) of the country of origin of the resource and that Mutually Agreed Terms were agreed upon.

Presently, for the sector of research and breeding for agriculture, food and renewable resources, IPEN does not represent an option for simplified exchange as it excludes commercial use and is limited to botanic gardens.

4.1.4 Recent developments and suggestions for future ABS rules on PGRFA

The growing world population and climate change increase the need to develop new high-yielding varieties adapted to regional growing conditions both in the food and the feed sectors. But this also applies to crops which are used to produce renewable resources of both material (work and construction) and non-material nature (energy).

However, the approx. 60 crops listed in Annex I to the ITPGRFA are far from sufficient for these purposes. For sustainable agriculture and world food security a significantly larger number of species are of vital importance. The Mansfeld data base, based on „Mansfeld's Encyclopedia of Agricultural and Horticultural Crops“ (http://mansfeld.ipk-gatersleben.de) and operated by the IPK, includes information on 6100 cultivated species worldwide, excluding forestry and ornamental plants. Experts even assume that usages of approx. 7.000 crop species are known worldwide and have been described (Hammer 1998). These are crop species which are either cultivated globally or only regionally, so-called Neglected and Underutilized Crop Species (NUS). The latter represent considerable potential for food security at regional levels but have been neglected in terms of research and breeding, which often accounts for the fact that they cannot compete with main crops. An expansion and intensification of breeding, research and seed production efforts in that area are urgently needed in order to tap into these resources and potentials. Up to now NUS are not considered in the ITPGRFA's Annex I.

The International Agricultural Research Centres (IARCs) of the Consultative Group for International Agricultural Research (CGIAR) as well as other international institutions, according to Article 15 ITPGRFA, have already introduced access regulations identical to the sMTA with an additional footnote referring to collections of other crop species for food and agriculture not listed in Annex I of the ITPGRFA.

In Europe, identical access regimes, based on the sMTAs were introduced in connection with the development of the decentralised European genebank AEGIS (A European Genebank Integrated System) and contain an additional footnote also for the European AEGIS collections of other crop species which are not listed in Annex I of the ITPGRFA. AEGIS is presently supported by 26 European member states (as of June 2011).

Recommendations

The Scientific Advisory Board suggests to consider, in accordance with the Nagoya Protocol, the possibility of special regulations and multilateral approaches which allow facilitated access to plant genetic resources for research, breeding and training for food, agriculture and renewable resources.

The Scientific Advisory Board sees the following needs for action:

Recommendation 1: Extension of facilitated access to PGRFA for species not included in Annex I of the ITPGRFA

Option A: Expansion of Annex I of the ITPGRFA to include further crop species for food and agriculture

Advantages: The existing structures of the multilateral system (MLS) of the ITPGRFA and its agreed implementation procedure could be used for an extended number of species without causing additional costs. The advantages of a multilateral approach (see ch. 3.4) would benefit to a larger part of genetic resources for food and agriculture.

Disadvantages/Challenges: An international marathon of probably controversial negotiations might be necessary to extend the list of Annex I of the International Treaty.

Option B: Cooperation with the MLS of ITPGRFA but without extending Annex I

This option corresponds to the current practice of the International Agricultural Research Centres (IARCs) pursuant to Article 15 ITPGRFA and/or the European Genebank Integrated System AEGIS, and it includes the suggestion to expand this practice. Genetic material of Non-Annex I species is made accessible through identical regulations corresponding to the sMTA of the MLS of the ITPGRFA using an additional footnote.

This option does not represent an expansion of the Multilateral System per se but an additional application of its ABS regulations through the identical application of the sMTA.

Advantages: In this case, the MLS structures already in place may also be used generating additional financial burden.

Disadvantages/Challenges: Provided, one wanted to include all genetic resources for food and agriculture in such an approach, the problem of having to restrict utilization "for food and agriculture" will arise. How to deal with multiple uses in each case? Does the ornamental plant sector, for instance, belong in the sector of "agriculture"? In Germany, this sector falls under horticulture and is thus considered as part of agriculture in the larger sense. At the international level, however, this has not been unequivocally clarified. Therefore, in Germany , a special Material Transfer Agreement for ornamental plants (Zierpflanzen-MTA) is used in connection with the German genebank for ornamental plants (Deutsche Genbank Zierpflanzen). It facilitates access to the genetic resources of this genebank but excludes the development of products that cease to be accessible for research and breeding purposes, i.e. it excludes patenting. Voluntary payments go to the German government which can use them for a system to share financial benefits, also at in-ternational level.

Recommendation 2: Expansion of facilitated access for uses other than "food and feed", including renewable resources and energy production, but excluding pharmaceutical uses

Uses as renewable resources and for energy production do not fall within the scope of the Multilateral System of the ITPGRFA and its sMTA. Yet, even these types of use serve to satisfy basic human needs, namely the need for clothing, shelter, energy and the generation of income (see ch. 3). Thus, facilitated access for research, breeding and training should also be contemplated. However, the ITPGRFA Multilateral System could not be taken resource to as its Article 12.3 (a) ITPGRFA) explicitly excludes such an expansion of utilizations.

If the application of regimes such as the ITPGRFA' sMTA is aimed for, one could invite providers and users of PGRFA to introduce, on a voluntary basis, one or several agreements identical to the sMTAs which, over time, would assume the status of "model contractual clauses" in the sense of the Nagoya Protocol.

Advantages: Contractual regimes would not have to be renegotiated because they could largely be drawn from the existing sMTA. As the current ITPGRFA regulations are in compliance with the requirements of the CBD and the Nagoya Protocol, it can be assumed that the same regulations for further types of use would comply accordingly.

Disadvantages/Challenges: As such an agreement identical to the sMTA could only be introduced on a voluntary basis, predictions on the extent of its distribution and application are impossible. Furthermore, the text would have to be harmonised and agreed upon by the main providers and users of PGRFA, and it would be unclear which platform could be used for such negotiations and/or harmonisations.

4.2 Forest genetic resources

4.2.1 Which are the resources and types of use in question?

There is no internationally recognized definition of forest genetic resources. Their differentiation from plant genetic resources arose from the difference in types of use (forestry versus agriculture). In this paper, we focus on forest tree and shrub species. In modification of the definition of PGRFA and following the CBD, forest genetic resources (FGR) could be defined as genetic material (populations, individuals, plant parts, seeds, fruits, cell cultures or other propagating material) of tree and shrub species with actual or potential value for forestry. In the sense of the *Bundeswaldgesetz* (German Forest Law) and its Article 2, any green area stocked with forest plants is considered as forest.

4.2.2 Characteristics of forest use in Germany

In the forestry sector in Germany, the emphasis lies on the use of wood as raw material (lumber, wood-based material, cellulose and paper) and as energy source (biomass). To a certain extent the fruits of forest plants are also used for human consumption (such as berries, nuts, chestnuts, medlars) and as feed (such as acorns, chestnuts, beechnuts, and foliage). Thus, FGR satisfy a significant part of basic human needs in terms of food.

Forest genetic resources are of essential importance for the development potential of forest ecosystems. The genetic variation of individuals and populations allows for a variety of species and ecosystems and is the prerequisite for adaptation processes in case of environmental change and for the longterm stability and productivity of forests (Anonymus, Draft of the national report to the FAO, 2012).

The natural adaptation mechanisms of forest ecosystems in the face of rapid climate change are limited, as far as we know today. Even if adaptation measures can be initiated by means of forest management, their success depends on the fact that the speed and extent of climate change do not exceed certain threshold values. A significant and excessively rapid change of present climate conditions exceeds the performance potential of forest ecosystems extensively and irreversibly. Forest adaptation to future climate conditions requires the full utilization of the entire genetic potential of indigenous populations as well as the targeted extension of the genetic spectrum to climate-adapted imported origins. Both structural and genetic variety are the guarantors of the suitability and the adaptability of species and living communities in the forest ecosystem (Anonymus, Draft of the national Report to the FAO 2012).

Aside from the differences between populations, studies have also shown high genetic variation within forests. The Act on Forest Reproductive Material (Forstvermehrungsgutgesetz, FoVG), with its indication of areas of origin, takes this large spectrum of genetic variety within and between forest tree populations into account. The FoVG governs the production, placing on the market as well as import and export of forest propagating material. Forest propagating material in Germany is produced according to its natural differentiation and is produced and marketed according to areas of origin. Forestry businesses may thus purchase propagating material that corresponds and is adapted to their various locations and conditions in order to meet their longterm management objectives (Anonymus, Draft of the national report to the FAO 2012).

In forestry, contrary to arable farm land, the principle of sustainability and the guarantee of forest diversity are anchored in forest laws. Aside from the sustainable production of wood, forests' functions in terms of nature and climate protection as well as their social importance (for public leisure) are also taken into consideration. Forest laws oblige forest owners, *inter alia*, to

1. reforest, promptly, any open area which came about as a consequence of logging. A conversion of forest area to other types of use is subject to approval (sustainability in terms of acreage);
2. use only as much wood as will permanently grow back (sustainability in terms of mass);
3. consider a forest's functions in connection with nature protection and leisure/recreation, in addition to its productivity (sustainability in terms of functions).

4.2.3 Particularities of forest genetic resources in terms of an ABS regime

In forestry, natural regeneration (on abt. 70% of the acreage) is of great importance. Should this amount be insufficient or impossible to achieve and/or in case of a change of tree species, additional trees will be planted on about 30% of the acreage, in rare cases there will be direct sowing (so-called „artificial regeneration"). Regionally adapted propagating material, produced mostly in Germany, will be used for seeding, i.e. compared to one- or two-year-old cultivars; the **demand for seeds per unit area is low**. As a rule, it amounts to figures between 2,000 (Douglas fir) and 10,000 plants per hectare (oak and pine).

In addition, **generation intervals in forests are often quite long** (70-200 years). Even with short-rotation plantations outside of forests (in agri-forest systems) intervals are still quite long (at 3-20 years). Hence, great care is taken in connection with silvicultural measures if indigenous forests are to be genetically modified and/or if forest genetic resources are to be imported from outside, i.e. from foreign areas of origin.

Imports of forest reproductive material are rare and mostly occur with neighbouring states. Imports concerning the three most important tree species 2010/2011 amounted to 25.5 t of common oak, to 1.4 t of silver fir and to 1.2 t of beech; imports of other tree species amounted to less than one tonne of seeds. In 2010/2011, Germany imported seeds from non-European third countries, namely (4 kg) of the grand fir (Abies grandis Lindl.) and (4kg) of the Douglas fir (Pseudotsuga menziesii) from the USA. However, parts of these quantities from North American origins (20-30 kg) were imported via European neighbouring countries (BLE 2011).[2]

In the forestry sector, plant breeding plays only a minor role. In Germany, breeding programmes are not initiated by forest owners but are mainly carried out in federal state (Laender) or Federal government forestry research institutes. In addition to the tree species processed up to now, the current focus is on fast-growing tree species for biomass production and energetic and material usage.

In Germany, forest genetic resources **are mostly private property**. Over 47% of forest acreage are privately owned forests, 30% are under the sovereignty of the federal states (Laender), and 19% are owned by public corporations while 4% are owned by the German government. Forest genebanks in various federal states are operated under public responsibility. There are forest genebanks in other European and non-European countries as well.

Given the forest's function as a carbon sink, forest conservation and forest genetic resources (FGR) are of significant **international importance for world climate**, across and beyond state borders.

[2] With weight indications, significant differences between various tree species need to be considered: 1 kg of seeds yield only 100 oak plants but up to 100.000 plants of the Douglas fir; so 1 ton of oak tree seeds corre-sponds to about 1kg of Douglas fir seeds.

As access to forests, including to those privately owned, is rarely restricted, forests can freely be used for a variety of **public tasks and purposes** such as recreation, tourism, environmental education as well as manifold other ecological functions for public benefit.

4.2.4 Recent developments and suggestions for future ABS regimes for FGR

Due to an increased demand for renewable resources and energy sources, the demand for wood will also increase globally. On the other hand, climate change will cause other genotypes and/or species to become more important in forestry in order to continue sustainable forest management. In Germany, efforts have been going on for decades to identify origins of main tree species (common spruce, Scots pine, common beech, sessile oak, English oak, European silver fir) which are most suitable for the various producing regions. Up to now, however, the exchange of genetic material took place within the same climatic regions (e.g. within European neighbouring countries while exchanges with the northern hemisphere, i.e. with North America took place to a very limited extent only). Further climatic shifts and their influences on the requirements regarding tree species remain to be seen.

Recommendation 3: Ensuring facilitated exchange of forest genetic resources for the uses “food and feed”, including renewable resources and energy production, but excluding pharmaceutical uses

A facilitated exchange of forest genetic resources is a basic prerequisite for the adaptation of forests to climate change as well as for meeting the increasing demand for food, feed, renewable resources (timber, paper, etc.) and energy production. Research and breeding activities on forest plants have to be facilitated and further increased for the future. Therefore, it is essential:

- to not create bureaucratic hurdles;
- to keep the transaction costs on a low level;
- that possible additional costs for the exchange are made available; and
- to offer legal certainty.

Option A: Development of model contractual clauses for transboundary exchange of forest genetic resources

Given the fact that many exchanges of forest genetic resources take place on the basis of agreements under **private law**, drafting a **model clause** similar to the ITPGRFA’s standardised Material Transfer Agreement (sMTA) would make sense for the cross-border exchange of forest genetic resources (and forest reproductive material).

Advantages: A model clause could be drafted more easily than an intergovernmental treaty.

Disadvantages/Challenges: The model clause should be harmonized among and agreed upon the most important providers and users of forest genetic resources, while it would remain unclear who such important suppliers and users would be and which platform could be used for such negotiations.

Option B: Cooperation with the ITPGRFA's Multilateral System

This option suggests the creation of a Multilateral Benefit-sharing system for forest genetic resources, similar to the one of the ITPGRFA. This system should be open for research, breeding and training for food, forestry and renewable resources, but should exclude pharmaceutical uses. The scope of this MLS should be defined on the basis of a list of relevant species.

This option reflects the current practice of the European Genebank System AEGIS and includes the suggestion to extend this current practice to clearly defined species and uses of forest genetic resources. Genetic material from non-Annex-1-species is made accessible through regulations identical to those in the sMTA of the ITPGRFA's MLS, including an additional footnote to clarify how such material is to be handled. Additional types of use for renewable resources and energy production should be added.

This option does not represent an expansion of the Multilateral System per se, but an additional application of its ABS regulations by means of the footnoted sMTA which expands uses for renewable resources and energy production. Questions as to which institutions should be involved and how they could interact to establish such an agreement remain to be clarified.

Advantages: Contractual regimes would not have to be completely renegotiated because they could largely be drawn from the existing sMTA. As the current ITPGRFA regulations are in compliance with the requirements of the CBD and the Nagoya Protocol, it can be assumed that the same regulations for further types of use would comply accordingly.

Disadvantages/Challenges: Provided, all genetic resources for food and agriculture shall be regulated through the approach of cooperating with the MLS, the question will arise on how to differentiate uses "for food and agriculture" from forestry uses. If, in forest plant breeding, the focus should be on species, existing regulations on forest reproductive material are quite appropriate for the definition of the scope of such an agreement.

Since a new MTA, very similar to the current sMTA, could only be introduced on a voluntary basis it would be difficult to estimate to what extent it would be used. Also, the text of such an MTA should be harmonized among and agreed upon the most important providers and users of forest genetic resources, while it would remain unclear who such important providers and users would be and which platform could be used for such negotiations.

The creation of a **global network of national/regional genebanks** for FGR as a pool of genetic resources in the public domain could solve the problem of identifying the main FGR providers. Access to genetic material in the global genebank network would be facilitated. The genebank network could refer to genetic material in a defined list of tree and shrub species in the forestry sector. Basic research and forest tree breeding does not generate significant financial benefits. Instead, benefit-sharing would take place at the non-commercial level of research co-operation, i.e. by sharing research results and by making breeding products freely available for further breeding activities.

4.3 Animal genetic resources for food and agriculture

4.3.1 Which are the resources and types of use in question?

Animal genetic resources for food and agriculture (AnGRFA) include domestic as well as wild animals, where they are or can be useful in the food, agricultural, forest and fishery industries. Similar to FAO procedures at international level, this paper treats aquatic genetic resources in the fishery industry separately.

4.3.2 Characteristics of AnGRFA use

AnGRFA are of essential importance for securing world food supplies through the direct production of food (meat, eggs and dairy products) and for sustainable agriculture as far as the latter is based on closed nutrient cycles and depends on animal husbandry. Animal husbandry allows the utilization of non-arable land (such as grassland, macchia, moorland) in marginal areas for food production with ruminants.

Aside from their function in sustainable agriculture and their importance for global food security, AnGRFA are vital in terms of the satisfaction of other human needs in connection with clothing, energy supplies and labour. Also, they contribute substantially to the conservation of certain traditional landscapes which they even mark.

Globally speaking, a group of only about 30 domesticated animal species constitutes the part of AnGRFA that are relevant for food and agriculture (Annex 2). These species have a breeding history which dates back centuries or even millennia. Domestic animals have followed mankind in the course of their migrations across continents or borders. People traded domestic animals and bred a multitude of breeds which were adapted to prevailing conditions. Through breeding and accidental drift, animal breeds are subject to dynamic processes of change during which both continuous breeding progress and changing breeding objectives in view of changing economic conditions, e.g. consumer behaviour, or prices, can play their part. Also, changing conditions as to husbandry and production, and environmental and climatic conditions in general will have longterm effects.

Hence, transnational interdependencies in animal breeding persist. The frequency and extent of exchanges of AnGRFA on a global level today are only rudimentarily documented. Today, AnGRFA exchanges mainly take place between North and North, to a lesser extent between North and South. Recently, the exchange between South and South has increased while hardly any AnGRFA flow from South to North. Many breeds are not exchanged across borders but rather at local levels (FAO 2009b and Hiemstra et al. 2006). Yet, for the very limited number of breeds which, in the northern hemisphere, supply the bulk of animal products (milk, eggs, pork in particular) there is a relatively intense trade in breeding material.

4.3.3 Particularities of AnGRFA in terms of an ABS regime

Wild relatives or **ancestors** of the AnGRFA are **partially extinct** and/or do not play any role in breeding activities. Breeding of livestock for food and agriculture **is mainly limited to approx. 30 livestock species** (see Annex 2).

Harmonized EU zoo-technical legislation applies to 6 domestic animal species (equidae, cattle, buffalo, pig, sheep and goat). It provides the basic principles for the approval of breeding organisations, for stud book-keeping and thus for the monitoring of pedigree, for performance recording and genetic evaluation. Only in pig production cross-breeding programmes are allowed as an alternative to pedigree breeding. In this sector only, breeders may be state approved as breeding organisations. In commercial poultry breeding there are no zoo-technical regulations. The sector is dominated by a small number of breeding organisations who mostly operate globally.

EU zoo-technical legislation stands opposed to anchoring particular access rights or entitlements to benefits of a country of origin or of an „author" of a breed because an additional independent breeders' association may be founded for an existing breed even in another EU Member State and without third party consent. Animals from the herd-book of a newly founded organisation are entitled to non-discriminatory entry in any approved herd-book of the same breed. As a particularity, a breeders' association which keeps the stud book of origin of a certain breed of equidae is entitled to provide for certain breeding principles to be complied with by other breeders' associations. Yet this right does not represent any dependency of those other breeders' association i.e. in terms of supervision, management or charges.

The breeding material, in the form of animals kept, is mostly still **held privately** by individual breedrs. Breeding stocks of commercial poultry (laying hens, broilers, turkeys) are owned, almost without exception, by globally operating breeding organisations. A similar development appears in pig production.

Breeding of less reproductive large animals occurs largely on farms and **involves farmers**. In the poultry production sector in Germany and in many other developed countries, however, breeding has, to a very large extent, been decoupled from the mere multiplication of breeding animals and their production. This tendency also shows in the sector of pig production. In cattle farming in Germany there are no such approved breeding operations; yet, the insemination industry does have a strong influence on breeding programmes.

The exchange of AnGRFA mostly takes place **as trade** on a commercial basis.

Contrary to plant breeding, AnGRFA often are not distinguishable as genetically distinct varieties consistent over time. The attribution of breeding animals to a certain breed in the EU can be shown via entries in herd-books where the genetic origin and/or parentage of animals is documented. Yet, there is remarkable genetic diversity within individual breeds. Also, due to breeding progress, the appearance and the performance potential within breeds change over time. This entails basic **difficulties regarding permanent distinctness**, but **also permanently valid description of breeds**.

In farm animal breeding there are no **intellectual property rights** similar to the Plant Variety Protection Law. In Germany and France, the abovementioned difficulties regarding definition, description and distinction of breeds have led concerned parties to abandon the idea of introducing a special commercial property rights for animal breeds. Similar difficulties might be expected for the introduction of a comprehensive multilateral ABS system.

The **right to further growth**, including the genetic value of individual (breeding) animals, is covered by the **sales price** when animals or semen are traded.

To date, AnGRFA are hardly represented in genebanks and thus **hardly presented in the public domain. Genebanks** are established or in the process of being set up in individual countries. They conserve AnGRFA in the form of semen, embryos or other cell cultures and reproducible tissue. With farm animals, the reproduction genebank material is more elaborate than with crops, for instance. A German genebank for agricultural farm animals is in the process of being founded. The Animal Breeding Act (*Tierzuchtgesetz*) contains an authorization, by a regulation of the Federal Minister, to provide principles for the collection, storage and utilization of semen, ova, embryos and other genetic material of indigenous breeds for the purpose of longterm security and conservation of these breeds as part of genetic diversity (§10). This authorization has not been made use of up to now.

4.3.4 Recent developments and suggestions for future ABS regimes for AnGRFA

At least where the northern hemisphere is concerned, animal products are largely produced with animals from very few, but often highly specialised breeds. Other breeds, which account for the largest part of breed diversity, have only a small share in that production.

Increasing uniformity of production conditions in the northern hemisphere has led to the fact that the efficient use of modern techniques, such as artificial insemination and embryo transfer, have concentrated on relatively few breeds. Thus, their superiority in terms of breeding and commercial value has steadily increased and as other breeds have been constantly marginalized genetic variation between breeds has been narrowed. The extensive use of such techniques, aiming at shortterm success, may lead to a narrowing of genetic variation, especially with bovine animals, also within breeds that are spread across the world.

To date, patent use has been quite restricted but the number of patents for inventions in the farm animal sector rises. This entails fears that access to breeding material might be restricted. Aside from restrictions by patenting there is a very real risk, for many breeds, of access to sophisticated but highly efficient breeding techniques, such as genomic selection, being barred by financial and technical restrictions. In the medium term, this would exclude those breeds from breeding competition and from agricultural utilization.

Climate change will, at least outside of central Europe, cause a considerable need for the genetic modification of livestock and will possibly require increased global exchange of genetic resources.

Recommendation 4: Facilitated access to the approx. 30 most important AnGRFA species worldwide

Animal genetic resources for food and agriculture can rarely be related to a specific country of origin. Hence there is a typical “transboundary” situation that is referred to in Article 10 of the Nagoya Protocol, for which Parties “shall consider the need for and modalities of a global multilateral benefit-sharing mechanism”. Compared to its benefits, costs for the development of a legally binding instrument for AnGRFA are considered to be too high. Moreover, substantial difficulties are expected in making such an instrument operational for livestock breeding.

The suggestion, instead, is to create a voluntary global network of national AnGRFA genebanks as a gene pool in the public domain. Access to genetic material from this global genebank network could be granted by a standardised MTA, yet to be developed, and by “model contractual clauses”. The genebank network should refer to the approx. 30 domesticated animal species previously mentioned (see Annex 2).

Given the fact that, due to an almost inexistent south-north exchange of AnGRFA, benefit-sharing cannot be justified on the basis of access to genetic resources, an alternative ethical justification/obligation remains to assist developing countries in that area. One internationally debated suggestions is, then, to push the implementation of the “Global Plan of Action for Animal Genetic Resources” and to see that as a part of the benefit-sharing process: to provide funds from the Funding Strategy for Capacity Development Measures and to support the conservation and sustainable use of animal genetic resources in developing countries.

Advantages: A global network of national/regional genebanks could be established stepwise and on a voluntary basis as a common gene pool. This approach would not require intergovernmental treaties but could be realised through one or more cooperation agreements between institutions/genebanks themselves. The network could start with a certain number of genebanks and could be expanded as others would join at later stages. The Material Transfer Agreement (MTA) for the supply of material from the network could quite easily be drafted and agreed upon by the network partners. In case such an MTA is widely used and accepted it could develop into a global standard similar to the “model contractual clauses”.

Disadvantages/Challenges: It remains to be seen whether enough genebanks would be interested in establishing such a network and whether both the network and its MTA would have to be officially notified to the FAO/CGRFA and/or to the Nagoya Protocol to ensure its coherence with both.

4.4 Aquatic Genetic Resources for Food and Agriculture

4.4.1 Which are the resources and types of use in question?

Aquatic genetic resources comprise all waterdwelling genetic resources, namely finfish, cyclostomes, mussels, crustaceans, marine mammals, aquatic plants and all other aquatic organisms which populate oceans, coastal and inland waters or kept in aquaculture. There are two central types of use:

- capture fisheries (marine and in inland fisheries) and
- aquaculture (freshwater, brackish water and marine water).

4.4.2 Characteristics of AqGRFA use

Capturing fish, molluscs and crustaceans living in the wild as well as harvesting aquatic plants (mainly seaweeds) has always been a vital basis of human livelihood. Nowadays, capture fisheries and aquaculture directly employ over 180 million people, supporting the livelihood of 8 percent of the world's population. Each of the sectors contributes about 50% of the global supply of aquatic foods for human consumption (see Annex 3). There are more than 31,000 species of fish, 85,000 species of molluscs, 47,000 species of crustaceans and 13, 000 species of seaweed, more than 5000 of which are used in capture fisheries and about 400 in aquaculture (FAO 2011b). Aquatic genetic resources for food and agriculture (AqGRFA) are the basis for the productivity and sustainability of world aquaculture and capture fisheries in fresh and brackish waters as well as in the marine sector. AqGRFA constitute the foundation which is needed to overcome future challenges such as the adaptation to climate change.

While in capture fisheries wild populations are exploited, in aquaculture more or less domesticated genetic material is used.

Only at the beginning of the aquaculture boom in the 1990ies did state bodies participate significantly in the international and national exchanges of material and in the collection of wild material. Nowadays, large breeding companies increasingly supply material. Access – including cross-border access – to breeding material occurs through private trade. ABS issues in that context are practically inexistent (FAO, 2009).

In view of an ABS regime, AqGRFA are characterized by the particular fact that they largely occur in marine waters outside of the exclusive economic zone (EEZ) pursuant to Article 55 of the United Nations Convention on the Law of the Sea (UNCLOS). Hence, no nation has sovereign rights over them. Within the EEZ, the coastal state has the sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources. Fish stocks in the open sea (without sovereign rights of a coastal state) are exploited by several nations. Continuous access to and general benefit from these AqGRFA can only be assured by internationally determined catch quota (conservation of viable, sound and useable stocks of organisms relevant for the fishing industry).

4.4.3 Particularities of AqGRFA in terms of an ABS regime

Aquatic resources are characterized by a number of distinct features which are vital for the ABS regime:

- AqGRFA can **often not be clearly attributed to individual states**, because they migrate, in inland waters or in oceans, across borders or they occur in marine areas outside the EEZ.

- In parts of various river systems, lakes and marine regions, separated reproductive units **of wild AqGRFA populations have emerged with** distinct pheno- and genotypically attributes.

- Contrary to animal genetic resources, the **relatives of AqGRFA persist today** and are used with practically all farmed species, more or less regularly, for introduction in the breeding populations (FAO, 2009).

- Breeding lines of farmed AqGRFA species are called „**strains**“. They are comparable to „breeds“ of animal genetic resources, as they do not represent **units officially tested for genetic identity and/or homogeneity and distinctness**. Yet, as the domestication of farmed fish species used has not made much progress, the term of „breed“ is not suitable for fish.

- Contrary to the Plant Variety Protection Law, in pisciculture there are no similar **intellectual property rights** for fish strains.

- In Germany, there are locally adapted strains of various commercial fish species which are cared for and/or owned by **private fish producers**. AqGRFA are generally exchanged in the form of sperm, fertilized ova, larvae, live fry and juveniles.

- To date, AqGRFA rarely exist in the public domain. On international level, a number of states operate publicly owned genebanks for the conservation of wild populations (e.g. sperm of salmon species in Canada). In Germany, individual strains of carp and trout were identified as distinct. Presently, there is no AqGRFA genebank in Germany.

- In Germany, the **breeding history** of most AqGRFA in aquaculture (with the prominent exception of carp) is relatively **short**.

4.4.4 Recent developments and suggestions for future ABS regimes for AqGRFA

Many commercial species in marine and inland waters are considered to be highly endangered. In order to assure the continued use of open ocean species (without nations sovereign rights) international protection strategies must be developed and implemented.

Aquacultures constitute a growing economic sector of increasing importance for world food supplies. The approx. 50 most important AqGRFA species worldwide represent over 90 percent of the global production in aquaculture (see Annex 4) with fish making of 60,3 percent, molluscs 22,9 percent, crustaceans 8,3 percent and invertebrates 0,3 percent (see Annex 5).

Aquacultures need an international exchange of AqGRFA and numerous species also require the possibility of hybridization with wild material.

Recommendation 5: Facilitated access to the approx. 50 most important AqGRFA species

To conserve valuable native strains of aquaculture species and endangered populations of wild species we suggest to consider at first whether a national genebank of AqGRFA can be established in the public domain and how these strains can be conserved on farm.

Similar to AnGRFA, a global network of genebanks, initially for the 50 commercially most important species of AqGRFA, might be envisaged (see Annex 4) to which Germany could contribute relevant material. In the case of carp for instance, a commercially important species in Germany, there is an interest in conserving and exchanging existing strains. The global network could also provide access to genetic material by means of a standardised MTA yet to be developed. Access to the AqGRFA in question would thus become easier.

It is also suggested that the FAO/CGRFA develop a Global Plan of Action for Aquatic Genetic Resources which could be implemented as a potential way of benefit-sharing at multilateral level.

The costs, compared to the benefits for developing a legally binding international instrument for AqGRFA, are estimated to be too high.

Advantages: A global network of national/regional genebanks could be created stepwise on a voluntary basis. It would solve the problem related to the fact that AqGRFA migrate across national borders and can often not be attributed to one particular state. Such a network would not require an intergovernmental treaty but could, instead be established by an agreement and/or agreements between the institutions/genebanks themselves. The network could start off with a number of genebanks and others could gradually join later. The MTA for the provision of material from the network could simply be drafted and agreed upon by the network partners. In case such an MTA is widely used and accepted it could develop into a global standard similar to the "model contractual clauses".

Disadvantages/Challenges: It remains to be seen whether enough genebanks would be interested in establishing such a network and whether both the network and its MTA would have to be officially notified to the FAO/CGRFA and/or to the Nagoya Protocol to ensure its coherence with both.

4.5 Microorganisms and invertebrates in food and agriculture

4.5.1 Which are the resources and types of use in question?

Genetic resources of microorganisms in food and agriculture include fungi (e.g. mycorrhiae, edible mushrooms), yeasts, microalgae, protozoa, bacteria, archaebacteria, mycoplasmas and viruses that are useable in food and agriculture. Invertebrates include all invertebrate animals which are of importance in the agro-ecosystem and/or in connection with biological pest control (pollinators, beneficials, soil-dwelling organisms etc.). The emphasis lies on arthropods (including arachnida, crustaceans, centipedes and insects) but also includes nematodes (threadworms), annelids (bristle worms) and molluscs (such as snails).

In connection with the ABS regime the distinction from pathogens which play a role as human pathogens in human medicine/world health, is important.

4.5.2 Characteristics of microorganism and invertebrate utilization

Microorganisms and invertebrates – directly or indirectly – play an important role both for world food supplies and for the production of renewable resources. Microorganisms, for instance, are an important aid in food and feed production (e. g. in fermentation processes) or in the production of pesticides, fertilizers and other chemicals used in agriculture (industrial production processes, „white biotechnology“). Biomass is also energetically used to produce biogas by means of microorganisms.

A large variety of invertebrates and microorganisms (e.g. pollinators, soil-dwelling organisms) constitute a vital basis for functioning agro-ecosystems, for the health status of plants and consequently for their quality and crop yields. „Beneficials“ (invertebrate control agents), insects or arachnids in particular, are often used for biological control. Classic concepts of biological pest management introduce a beneficial organism specifically to control a harmful organism which was itself introduced. Both organisms can establish themselves. Other concepts are based on the introduction of large quantities of control agents especially produced for that purpose to curb proliferation. In these cases the beneficial organism does not generally establish itself. Biological pest management is a socially desirable form of plant protection even if it bears risks when organisms are released.

Microbiological control agents can also be of enormous use for agricultural production by limiting the amount of harmful organisms. In animal nutrition, the potential of microorganisms might allow an increase in efficiency which has not been extensively explored yet. On the other hand, there is a large number of pathogens which have negative/harmful effects on agricultural production and on human health. An exchange of these genetic resources at international level is needed in order to push the investigation of appropriate remedies. In respect of pathogens, Article 8b of the Nagoya Protocol provides that in emergency situations (possible risk to human, animal or plant health) the access to pathogens shall prevail over benefit-sharing.

While the number of potentially usable microorganisms and invertebrates is estimated to be very high, only a small fraction is currently used (FAO 2011a).

4.5.3 Particularities of microorganisms and invertebrates in terms of an ABS regime

Microorganisms and invertebrates also show a number of distinctive features which need to be considered when they are included in the ABS regime:

- Microorganisms used in food and agriculture occur **in very high numbers** both on the species and on the genetic level.

- **Knowledge about the occurrence and characteristics** of individual populations or strains of microorganisms and invertebrates is still **very limited**, due to their probably very high number.

- Microorganisms and invertebrates used in food and agriculture are **hardly modified by human intervention**. Generally, they are detected and made accessible by screening large quantities of naturally occurring organisms. Currently, synthetic production methods only play a minor role but will probably become increasingly important in the future (FAO 2009e).

- When microorganisms are conserved in *ex situ* collections the fact that they can „horizontally" exchange genetic information is a problem. Moreover, **mutations occur often** and, given the fact that microorganisms are easily contaminated with other organisms, modifications within cultures are likely. Permanent controls by experts are required to ensure the quality of the collections. Another technical issue to be solved concerns the availability and documentation of complex strain mixtures. Even the *ex situ* conservation of invertebrates is expensive.

- Due to their role and importance for preventive and precautionary measures (in case of human, animal or plant health hazards) **microorganisms are subject to special regulations, some of which have already been internationally agreed upon**, and which will affect possible requirements in the sense of the Nagoya Protocol. Specific regulatory procedures are also in force in connection with patents for living microorganisms. The Parties to the Budapest Treaty of 1977 have founded a Union for the international recognition of the deposit of microorganisms for the purposes of patent procedure. In order to characterize strains of microorganisms for the purposes of patent procedure, a strain sample is deposited at official international depository institutions (Niemann 2008).

- **Microorganisms in public domain**: Microorganisms used in food and agriculture are mainly located in Microbial Culture Collections (MCC) in the public domain. The most important collections are part of the World Federation of Culture Collections (WFCC). It includes more than 500 collections, and most of the important collections are based in OECD countries. Developing countries and countries in economic transition, such as Brazil and Thailand, have also collected a significant amount of material which they keep available in collections. At present, a total of over 1.4 million stock cultures are contained in the WFCC collections (FAO 2009e). In Germany, the German Collection of Microorganisms and Cell Cultures (*Deutsche Sammlung von Mikroorganismen und Zellkulturen*, DSMZ) is the largest collection of archaea, bacteria, yeasts, fungi, plant viruses as well as plant, animal and human cell cultures. The DSMZ is a research institution under national and federal authority and is part of the *Leibniz-Gemeinschaft* (Leibniz Association). Accessions of the DSMZ can be purchased. In general, the collection focuses on areas where the supply of samples can generate direct value (a price list is available online). The DSMZ is a recognized depository for patent procedures pursuant to the Budapest Treaty.

- **At international level, large quantities** of microorganisms **are exchanged across borders**. According to the FAO (FAO 2009e) the WFCC collections supply more than half a million strains annually, mostly among the OECD states. An analysis at the 10 most important collections of microorganisms from food and agriculture (5 OECD countries, 5 non-OECD countries) showed that 50% or **more than half** of the cultures had been included in the collections **before the CBD entered into force**.

4.5.4 Recent developments and suggestions for future ABS regimes for microorganisms and invertebrates

Targeted use of microorganisms in food and agriculture will get more important, for instance in the fields of industrial food production and bioenergy production. „White biotechnology“ is largely based on genetic resources of microorganisms and steadily develops new procedures and applications. It is considered as a future growth industry.

For microorganisms, the important collections have already started to initiate agreements of joint MTAs and standards, also in view of ABS. This includes the "Microorganisms Sustainable Use and Access Regulation International Code of Conduct" (**MOSAICC**) which was elaborated by 12 leading institutions in the field. This **voluntary code of conduct** which was already developed in 1999 was updated and published in June 2011. It differentiates between access to *in situ* MGRs and *ex situ* MGRs. For access to *in situ* material two model documents have been developed. Users may access *in situ* material by using a **model application form** to apply for **Prior Informed Consent (PIC)**, while providers may use a model PIC-document to grant access to *in situ* material. Furthermore, a model MTA was drafted that provides the important element of a differentiation between non-commercial and commercial usage.

As the catalogue of the *Deutsche Sammlung für Mikroorganismen und Zellkulturen* shows, irrespective of CBD access regulation, the supply of **DSMZ** material is subject to numerous restrictions pursuant to regulations and legislation in force such as the **Biostoff-Verordnung** (Ordinance on Biological Agents, based on EU directive 200/54/EC), the **Infektionsschutzgesetz** (Infection Act), the **Kriegswaffengesetz** (Weapons of War Act, based on EU Directives EC/7815/09 and EC428/2009) as well as the **Gentechnikgesetz** (Law on Genetic Engineering, see also EU Directive 2009/41/EC). Restrictions are also placed on **plant pathogenic** microorganisms (pursuant to 2000/29/EC, 2008/61/EC) and on organisms under the **Tierseuchengesetz** (Law on epizootic diseases). The DSMZ differentiates various categories regarding access restrictions. In connection with ABS the DSMZ has drafted a Material Transfer Agreement.

For the field of **biological control** with invertebrates the International Organisation of Biological and Integrated Control of Noxious Plants and Animals (IOBC) has pointed out that further ABS regimes would considerably restrict possible progress(Cock et al. 2009). Similar to many other breeding concepts, a procedure in biological control also has to go through numerous steps before it can be successfully applied. The FAO has set up case studies of procedures in order to illustrate how difficult they are to establish (FAO 2009f). Financial gains are limited. The IOBC has developed a concept for a possible exchange and utilization of biocontrol agents at international level which largely satisfies ABS requirements on the one hand and tries, on the other, to eliminate restrictions on the exploration and development of biological control procedures based on invertebrates, or at least to reduce such restrictions to a minimum (Cock et al. 2010).

> The Scientific Advisory Board has not yet formulated any specific recommendations because further information and exchanges with technical experts are required.

5 Conclusions and recommendations

Based on the extended considerations in this document, the Scientific Advisory Board on Biodiversity and Genetic Resources at the Federal Ministry for Food, Agriculture and Consumer Protection concludes:

(1) Facilitated access for breeding and research for food and agriculture

Due to the special nature of genetic resources for food and agriculture (GRFA) and in accordance with the Nagoya Protocol, it is recommended to develop regimes which allow facilitated access to genetic resources for research, breeding and training purposes in food and agriculture. Future ABS regimes should provide legal certainty for both suppliers and recipients of genetic resources, they should minimise transaction costs per exchange and they should generate a maximum benefit in terms of the conservation of genetic resources, that could also be non-monetary.

In areas where access to genetic resources has been easy up to now, this should be ensured in fu-ture. Where access has already become more difficult it should be facilitated. The process of changing access conditions, resulting from the imminent implementation of the Nagoya Protocol, should regularly be monitored.

(2) Harmonized regimes at EU level

With regard to genetic resources for food and agriculture, the implementation of the Nagoya Protocol should be harmonized at EU level in order to first achieve facilitated access of genetic resources within a common EU economic zone. In addition, the ABS regimes should aim at achieving simplified access to genetic resources of relevance for breeding purposes also between EU and non-EU member states.

(3) Standardisation of ABS processes and multilateral solutions

The Scientific Advisory Board recommends the standardisation and aggregation of ABS processes to minimise transaction costs for the exchange of genetic resources. Due to the need for multiple ex-changes within the value added chain and to other distinct features of genetic resources for food and agriculture, it seems appropriate to decouple benefit-sharing both from the individual supplier and from the individual genetic resource. Multilateral agreements are advantageous here, as long as they are based on the broadest possible consensus among stakeholders. Multilateral arrangements do not necessarily have to take the form of intergovernmental agreements but can also be agreed upon directly, on a voluntary basis, between concerned parties or institutions, i.e. legal persons. The more actors would make use of the same standard arrangements, i.e. model clauses and/or Material Transfer Agreements (MTA), the more the latter could develop into globally accepted standards.

Such model clauses would also be required for the cross-border exchange of forest genetic resources and, as recommended by the Scientific Advisory Board, for the global networks of national or regional genebanks of animal and aquatic genetic resources. For non-Annex I species of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), and the so-called Neglected and Underutilised Species (NUS) in particular, the existing ITPGRFA Standard Material Transfer Agreement, supplemented by a footnote, could be used as is already the case at the international institutions of the CGIAR (pursuant to Art. 15 ITPGRFA) and the European genebank network AEGIS.

While this approach could be debated and supported by a recommendation from an intergovernmental body such as the FAO Commission on Genetic Resources for Food and Agriculture (CGRFA) there would be no need for the CGRFA or the Member States to conclude any additional intergovernmental agreements. The standard contracts or sMTA of providers and users of genetic resources concerned could thus be established as “model clauses” under the Nagoya Protocol. The rules in such standard contracts and MTAs should then be consistent with the Nagoya Protocol and should be more detailed for specific regulatory areas (e.g. by lists of species or specific types of use). The CGRFA could formally offer them to the Nagoya Protocol for official notification.

(4) Distinction according to type of use

The development of ABS systems should differ according to types of use and should also consider the differences of their respective innovation processes. While the bilateral approach envisaged by the Nagoya Protocol is conceivable for the pharmaceutical and cosmetic use of genetic resources, breeding and research for food and agriculture, including their use as renewable resources and for energy purposes, would only be meaningful if the access to the diversity of genetic resources is easily manageable.

(5) Creation of collections of genetic resources in the public domain

Regarding the further implementation of the Nagoya Protocol at national and European levels, it should not be necessary to have additional interventions in private law, i.e. additional rules under the Nagoya Protocol should be limited to genetic resources that are under public sector control. This seems appropriate because interferences with private law can, on the one hand, be expected to meet with considerable resistance and would, on the other hand, definitely lead to avoidable delays in the implementation processes.

Yet, the establishment of collections of genetic resources in the public domain, especially in those sectors where the bulk of genetic resources is privately owned, could lead to quite pragmatic ways of developing standardised access and benefit-sharing regimes for precisely these publicly accessible genetic resources. This is recommended for animal and aquatic genetic resources for food and agriculture (AnGRFA and AqGRFA), through the establishment of global networks of national/regional genebanks. Genebanks of such networks could store a limited number of species of AnGRFA and AqGRFA (see Ch. 4.3 and Ch. 4.4) in order to subsequently make these resources available under standardised access and benefit-sharing regimes.

The process of establishing such networks could be facilitated by the establishment of genebanks in which the genetic resources are deposited on a voluntary basis, including by private owners who could be invited to deposit specimens of their genetic resources in those public genebanks. Given the fact that genetic resources neither go to waste nor vanish when used in research or breeding, this approach is perfectly conceivable also for private owners, since this approach would of course enable them to continue to work with their original resources themselves.

(6) Demarcation of GRFA for ABS regimes

It is difficult to draw a clear line between GRFA and the entirety of genetic resources. Therefore, as a first step for negotiations on GRFA-specific ABS systems, the Scientific Advisory Board suggests to compile lists of species/genera for each sector for which specific uses in plant and animal breeding are already known and for which a system of simplified access and benefit-sharing could be established. These lists of species/genera could be extended in the future.

The approx. 60 species listed in Annex I of the ITPGRFA are far from being sufficient in terms of meeting the challenges of safeguarding global food security and mitigating the impact of climate change. It is precisely the crops of regional importance, so-called Neglected and Underutilized Crop Species (NUS), which offer tremendous potential for use in research and breeding that should be intensified in the future. For that purpose, however, access to their genetic resources would have to be facilitated. A precise list of NUS to be considered in that respect will have to be determined.

In forest tree breeding, prioritisation by species could be done along the rules and regulations for forest reproductive material. For the EU, the list of species of the relevant regulations for forest reproductive material might constitute a starting point.

As to farm animals (AnGRFA), the FAO considers approx. 30 animal species to be globally important farm species for livestock production and includes them on the World Watch List, while approx. 50 species or groups of species of aquatic organisms are included which account for over 90% of global aquaculture production.

In case of microorganisms and invertebrates, lists might not be the approach of choice. Whether they are feasible or not could be discussed in the respective institutions and networks such as the Micro-Organisms Sustainable use and Access regulation International Code of Conduct (MOSAICC) and International Organisation for Biological Control of Noxious Animals and Plants (IOBC).

Possibly, ABS systems could be developed to consider types of use as the decisive factor. Experience from negotiations on the Multilateral System of the International Treaty on Plant Genetic Resources for Food and Agriculture have shown, however, that such an approach faces major problems in terms of acceptance at global level.

(7) Disclose the origin of a genetic resource for patenting

An application for patenting of an invention based on genetic resources should include the obligation to disclose (where known) the country of origin. If an origin is unknown, it should be binding to disclose other information or data on the provider of the genetic resource, by means of which the invention was possible. Such a requirement to disclose the country of origin should be introduced into the respective international negotiations.

(8) Include microorganisms and invertebrates

Microorganisms and invertebrates of relevance to the food and agriculture sectors could be included in the draft of an overall regulation on ABS for GRFA. In this paper, however, the Scientific Advisory Board describes only the specific features of these groups of organisms with respect to ABS (see Ch. 4.5). Beyond that, the Scientific Advisory Board believes that, at this stage, there is only an insufficient basis for presenting practical recommendations for possible access and benefit-sharing regimes.

(9) Regulatory scope for GRFA as a whole versus individual sectors' solutions

Uncomplicated access to genetic resources for food and agriculture is the main aim of ABS arrangements for GRFA. With this basic objective in mind, a uniform principle should be sought which could be applied to all sectors. However, as the current situation shows, the individual sectors address the subject of ABS regimes very differently. While the plant sector, through the adoption of the ITPGRFA, has already created a multilateral arrangement that is binding under international law, other sectors, such as the forestry and livestock sectors, are only at the beginning of the discussion process. On that basis, the Scientific Advisory Board has examined the individual sectors to determine to which extent specific uniform principles for ABS regimes can be applied.

On balance, the Scientific Advisory Board favours multilateral over bilateral approaches (see item 3). With regard to GRFA, these could be narrowed down to specific plant, animal or other species of organisms that are of particular relevance to food and agriculture, including forestry, fisheries and aquaculture. On the other hand it is suggested to focus efforts on adopting rules for genetic resources in the public domain. These could be worked out with reasonable efforts wherever such genetic resource collections are already in place in the public domain, notably in existing genebanks. Where such genetic resource collections in the public domain do not exist yet, they could be developed in stages, on a voluntary basis, by private actors or institutions (private legal entities) and established as global networks of genebanks.

The standard contracts or Material Transfer Agreements to be drawn up in each case as model clauses as defined by the Nagoya Protocol for the individual sectors of GRFA, i.e. for agricultural and horticultural crops, forest plants, farm animals, fish and other aquatic organisms, microorganisms and invertebrates, would differ according to prevailing conditions. Individual solutions could be developed by the respective sectoral and/or regional representatives of the respective stakeholder groups.

The FAO Commission on Genetic Resources for Food and Agriculture (CGRFA) could be considered as an international platform for the discussion and drafting of such model clauses in the sense of voluntary guidelines as the Commission has the mandate for GRFA and has already gained relevant experience with the formulation of the ITPGRFA.

Acknowledgement

The Board members would like to thank Ms. Marliese von den Driesch and Dr. Stefan Schröder of the Information and Coordination Centre for Biological Diversity for providing important suggestions and ideas and for their comprehensive support in drafting this opinion.

The authors' thanks are due to Ms. Dagmar Fritze (Leibniz Institute DSMZ - German Collection of Microorganisms and Cell Cultures), to Mr. Dan Leskien (Secretariat of the FAO Commission on Genetic Resources for Food and Agriculture) and to Ms. Marie Schloen (University of Bremen, Research Centre for European Environmental Law) for valuable discussions and hints.

List of abbreviations

ABS	Access and Benefit-sharing
AEGIS	A European Genebank Integrated System, a de-centralised European genebank
AnGRFA	Animal Genetic Resources for Food and Agriculture
AqGRFA	Aquatic Genetic Resources for Food and Agriculture
CBD	Convention on Biological Diversity
CGRFA	FAO-Commission on Genetic Resources for Food and Agriculture
COP	Conference of the Parties (here: Contracting Parties to the CBD)
CWR	Crop Wild Relatives
DSMZ	Leibniz Insitut DSMZ - Deutsche Sammlung von Mikroorganismen und Zellkulturen (Leibniz Institute DSMZ - German Collection of Microorganisms and Cell Cultures)
FAO	Food and Agriculture Organization of the United Nations
FGR	Forest Genetic Resources
FoVG	Forstvermehrungsgutgesetz (Act on Forest Reproductive Material)
GRFA	Genetic Resources for Food and
IARC	International Agricultural Research Centres
ICESCR	International Covenant on Economic, Social and Cultural Rights (1966)

WIPO IGC	WIPO Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore
IOBC	International Organisation for Biological and Integrated Control of Noxious Animals and Plants
IPEN	International Plant Exchange Network
IPK	Leibniz Institute for Plant Genetics and Crop Research, Gatersleben, Germany
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
MAT	Mutually Agreed Terms
MarkenG	Markengesetz (Trade Law)
MCC	Mikrobial Culture Collections
MLS	Multilateral System
MOP	Members of Protocol
MOSAICC	Microorganisms Sustainable use and Access regulation International Code of Conduct
MTA	Material Transfer Agreement
NP	Nagoya Protocol
NUS	Neglected and Underutilised Crop Species
OECD	Organisation for Economic Co-operation and Development
PDO	Protected Designation of Origin
PGI	Protected Geographical Indication
PRGFA	Plant Genetic Resources for Food and Agriculture
PIC	Prior Informed Consent
sMTA	standardized Material Transfer Agreement
TierZG	Tierzuchtgesetz (Animal Breeding Act)
TK	Traditional Knowledge
TRIPs	WTO-Agreement on Trade-Related Aspects of International Property Rights
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea

UPOV	International Union for the Protection of New Varieties of Plants
vTI	Johann Heinrich von Thünen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries
WFCC	World Federation of Culture Collections
WG-ABS	Ad Hoc Open-Ended Working Group on Access and Benefit-sharing
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

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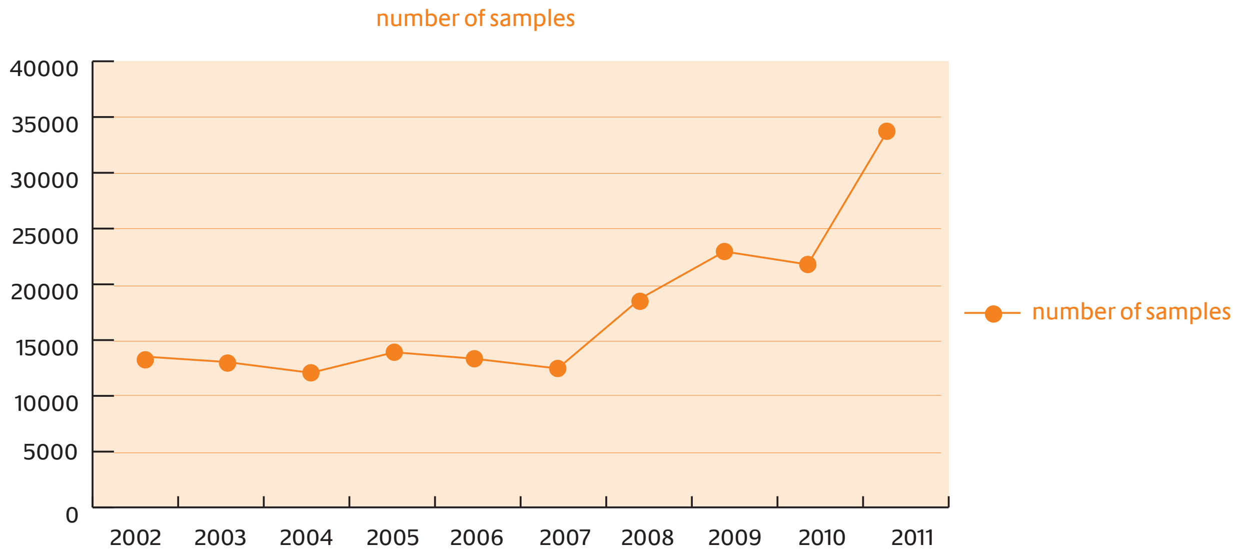
Annex 1: Total number of samples (accessions) supplied by the genebank of the Leibniz Institute for Plant Genetics and Crop Research (IPK Gatersleben) between 2002 and 2011



Annex 2: List of the globally most important domestic/ farm animal species (based on the FAO and DADIS World Watch List)

18 species of mammals	
Buffalo	*(Bubalus bubalis)*
Cattle	*(Bos indicus, Bos taurus, Bos frontalis = Mithan oder Gaur, Bos javanicus = Banteng))*
Yak	*(Bos mutus) oder (Bos grunniens)*
Dog	*(Canis lupus)*
Goat	*(Capra hircus)*
Guinea pig	*(Cavia porcellus)*
Sheep	*(Ovis aries)*
Pig	*(Sus scrofa)*
Ass	*(Equus asinus)*

Horse	*(Equus caballus)*
Bactrian Camel	*(Camelidae)*
Dromedary	*(Camelus dromedarius)*
Alpaca	*(Lama pacos)*
Guanaco	*(Lama guanicoe)*
Vicuna	*(Vicugna vicugna)*
Deer	*(Cervidae)*
Rabbit	*(Oryctolagus cuniculus)*

14 bird species	
Chicken	*(Gallus gallus)*
Duck	*(Anatidae)*
Turkey	*(Meleagris gallopavo)*
Goose	*(Anser)*
Muscovy Duck	*(Cairina moschata)*
Guinea Fowl	*(Numididae)*
Partridge	*(Perdix perdix)*
Pheasant	*(Phasianus colchicus)*
Quail	*(Coturnix coturnix)*
Pigeon	*(Columbidae)*
Cassowary	*(Casuarius)*
Emu	*(Dromaius)*
Nandu	*(Rhea americana)*
Ostrich	*(Struthio camelus)*

Annex 3: World capture fisheries and aquaculture production and consumption

	2008	2009 (estimate)	2010 (forecast))
Total production (Million tonnes)	**142,3**	**145,1**	**147,1**
Capture fisheries	89,7	90,0	89,8
Aquaculture	52,5	55,1	57,2
Total utilization	**142,3**	**145,1**	**147,1**
Food	115,1	117,8	119,5
Feed	20,2	20,1	20,1
Other uses	7,0	7,2	74
Aquaculture's contribution (%)			
To total production	**36,9**	**37,9**	**38,9**
To food fish	**45,6**	**46,8**	**47,9**
Per capita food fish consumption (kg/year)	17,1	17,2	17,3
From capture fisheries	9,3	9,2	9,0
From aquaculture	7,8	8,1	8,3

Quelle: FAO World Aquaculture 2010

Annex 4: World aquaculture production of fish, crustaceans, molluscs, etc. (without aquatic plants), by principal species items1 (top-50) in 2009

species item		Main Groups	Quantity (t)	Percentage (%)
Grass carp (=White amur)	*Ctenopharyngodon idellus*	FISH	4.159.919	7,5
Silver carp	*Hypophthalmichthys molitrix*	FISH	4.075.115	7,3
Cupped oysters nei[2]	*Crassostrea spp*	MOLLUSCA	3.528.516	6,3
Japanese carpet shell	*Ruditapes philippinarum*	MOLLUSCA	3.248.013	5,8
Common carp	*Cyprinus carpio*	FISH	3.216.203	5,8
Nile tilapia	*Oreochromis niloticus*	FISH	2.542.960	4,6
Bighead carp	*Hypophthalmichthys nobilis*	FISH	2.466.578	4,4

species item		Main Groups	Quantity (t)	Percentage (%)
Catla	*Catla catla*	FISH	2.418.821	4,3
Whiteleg shrimp	*Penaeus vannamei*	CRUSTACEA	2.327.534	4,2
Crucian carp	*Carassius carassius*	FISH	2.057.104	3,7
Atlantic salmon	*Salmo salar*	FISH	1.440.085	2,6
Scallops nei	*Pectinidae*	MOLLUSCA	1.277.181	2,3
Roho labeo	*Labeo rohita*	FISH	1.221.828	2,2
Pangas catfishes nei	*Pangasius spp*	FISH	1.193.023	2,1
Freshwater fishes nei	*Osteichthyes*	FISH	1.052.106	1,9
Marine molluscs nei	*Mollusca*	MOLLUSCA	927.114	1,7
Sea mussels nei	*Mytilidae*	MOLLUSCA	836.472	1,5
Giant tiger prawn	*Penaeus monodon*	CRUSTACEA	769.219	1,4
Cyprinids nei	*Cyprinidae*	FISH	762.474	1,4
Rainbow trout	*Oncorhynchus mykiss*	FISH	732.432	1,3
Milkfish	*Chanos chanos*	FISH	717.728	1,3
Constricted tagelus	*Sinonovacula constricta*	MOLLUSCA	683.806	1,2
Pacific cupped oyster	*Crassostrea gigas*	MOLLUSCA	648.574	1,2
Wuchang bream	*Megalobrama amblycephala*	FISH	625.789	1,1
Chinese mitten crab	*Eriocheir sinensis*	CRUSTACEA	574.247	1
Marine fishes nei	*Osteichthyes*	FISH	549.781	1
Red swamp crawfish	*Procambarus clarkii*	CRUSTACEA	526.091	0,9
Tilapias nei	*Oreochromis(=Tilapia) spp*	FISH	509.797	0,9
Mrigal carp	*Cirrhinus mrigala*	FISH	474.796	0,9
Channel catfish	*Ictalurus punctatus*	FISH	449.753	0,8
Blood cockle	*Anadara granosa*	MOLLUSCA	413.100	0,7
Black carp	*Mylopharyngodon piceus*	FISH	387.992	0,7
Snakehead	*Channa argus*	FISH	358.761	0,6
Torpedo-shaped catfishes nei	*Clarias spp*	FISH	341.974	0,6
Amur catfish	*Silurus asotus*	FISH	329.972	0,6
Green mussel	*Perna viridis*	MOLLUSCA	281.941	0,5

species item		Main Groups	Quantity (t)	Percentage (%)
Japanese eel	*Anguilla japonica*	FISH	262.769	0,5
Yesso scallop	*Patinopecten yessoensis*	MOLLUSCA	258.086	0,5
Asian swamp eel	*Monopterus albus*	FISH	237.084	0,4
Mandarin fish	*Siniperca chuatsi*	FISH	235.514	0,4
Soft-shell turtle	*Trionyx sinensis*	MOLLUSCA	235.044	0,4
Giant river prawn	*Macrobrachium rosenbergii*	CRUSTACEA	229.417	0,4
Flathead grey mullet	*Mugil cephalus*	FISH	221.978	0,4
Oriental river prawn	*Macrobrachium nipponense*	CRUSTACEA	209.401	0,4
Sea snails	*Rapana spp*	MOLLUSCA	203.795	0,4
Blue mussel	*Mytilus edulis*	MOLLUSCA	197.796	0,4
Aquatic invertebrates nei	*Invertebrata*	INVERTEBRATA	188.673	0,3
Pond loach	*Misgurnus anguillicaudatus*	FISH	177.012	0,3
Largemouth black bass	*Micropterus salmoides*	FISH	174.994	0,3
Coho(=Silver)salmon	*Oncorhynchus kisutch*	FISH	172.730	0,3
Other species			4.549.646	8,2
TOTAL			**55.680.738**	**100**

Source: FAO Aquaculture statistics

[1]Production data worldwide on aquaculture are broken down at either the species, genus, family or higher taxonomic levels into statistical categories called "**species items**"

[2]nei=not elsewhere included

Annex 5: World aquaculture production of fish, crustaceans, molluscs, amphibians/reptiles (without aquatic plants) in 2009

MAINGROUPS	Quantity (t)	Quantity by principal top-50 species (see Table 2)	Percentage by principle species (%)
FISH	36.117.881	33.567.072	60,3
CRUSTACEA	5.304.591	4.635.909	8,3
MOLLUSCA	13.548.078	12.739.438	22,9
INVERTEBRATA	378.808	188.673	0,3
AMPHIBIA/ REPTILIA	352.500	0	0
TOTAL	55.680.738	51.131.052	91, 8

Source: FAO Aquaculture statistics

Credits

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Department 421, Press Office