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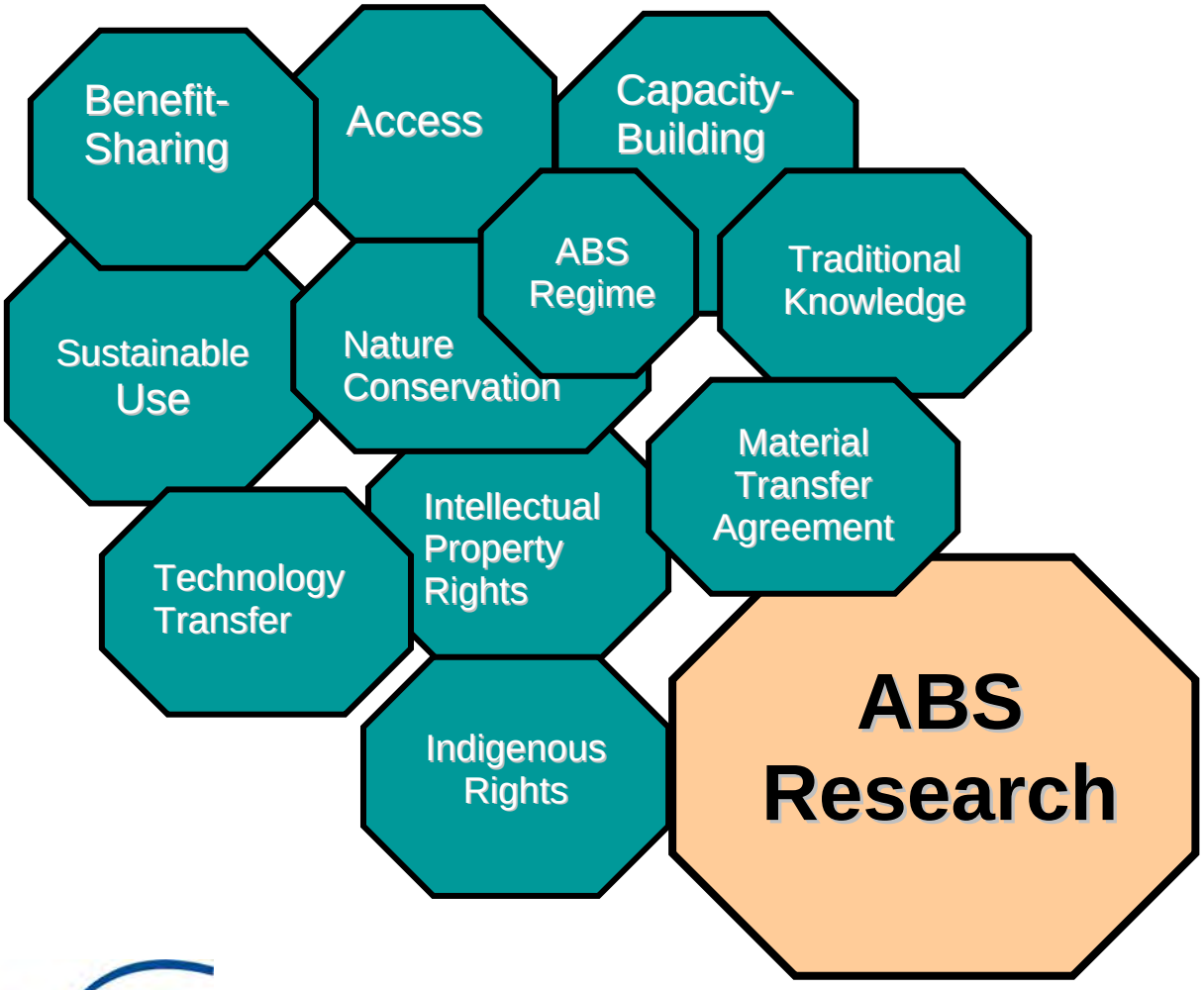
An economic analysis of new instruments for Access and Benefit-Sharing under the CBD – Standardisation options for ABS transaction

Final Report



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Abbreviations

ABS	Access and benefit-sharing
ABS WG	Ad Hoc open-ended Working Group on Access and benefit-sharing
ATCC	American Type Culture Collection
BCCM	Belgian Coordinated Collections of Microorganisms
BDP	Federal Association of German Plant Breeders
BfN	German Federal Agency for Nature Conservation
BLE	Bundesanstalt für Landwirtschaft und Ernährung
CBD	Convention on Biological Diversity
CIGAR	Consultative Group on International Agricultural Research
CHM	Clearing-house mechanism
CIOPORA	International community of breeders of asexually reproduced ornamental and fruit varieties.
COP 9	Ninth meeting of the Conference of the Parties
FAO	International Food and Agriculture Organisation
GB	Governing Body of the ITPGRFA
GR	Genetic Resources
IARCs	International Agricultural Research Centres
IPEN	International Plant Exchange Network
IPR	Intellectual property rights
IR	International regime on access and benefit-sharing
ISF	International Seed Federation
ITPGR(FA)	International Treaty on Plant Genetic Resources (for Food and Agriculture)
IU	International Undertaking
LOC	Letter of Collection
MAT	Mutually Agreed Terms
MGR	Microbial Genetic Resources
MLS	Multilateral System
MOSAICC	Micro-organisms Sustainable Use and Access Regulation International Code of Conduct
MOU	Memorandum of Understanding
MTA	Material Transfer Agreement

NFP	National Focal Point
NCI	National Cancer Institut (USA)
NIE	New institutional economics
NIH	US National Institute of Health
NITIT	New institutional theory of international transactions
PGR(FA)	Plant Genetic Resources (for Food and Agriculture)
PIC	Prior informed consent
PPR	Plant Protection Right
R&B	Research and Breeding
SC	Science commons
SCO	Source Country Organization
SLA	Simple Letter Agreement
sMTA	Standard material transfer agreement
TCE	Transaction Cost Economics
UBMTA	Uniform Biological Material Transfer Agreement
UNU	United Nations University
UPOV	International Union for the Protection of New Varieties of Plants
VfA	Verband forschender Arzneimittelhersteller (German Association of Reserach-based Pharmaceutial Companies)
WIPO	World Intellectual Property Organisation

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Summary

Access to genetic resources and the fair and equitable sharing of benefits arising of their utilisation (Access and Benefit-sharing, short: ABS) is a central issue in the Convention on Biological Diversity (CBD). ABS was intended as an instrument to create incentives for biodiversity-rich countries to conserve their resources. However, 15 years after the adoption of the convention, it is widely agreed that ABS is not working satisfyingly. Transaction costs and legal uncertainty are often referred to as severe implementation problems. Several standardisation options for transactions with genetic resources have been put on the table during the negotiations for an International ABS Regime (IR). To map their potential research on this topic was demanded.

In the at the beginning of 2007, the Institute for Food and Resource Economics at the University of Bonn started a research project on economic aspects of standardisation-based ABS instruments on behalf of the German Federal Agency of Nature Conservation. Model clauses for ABS contracts on the one hand and a fully standardized Multilateral ABS System (MLS) on the other hand were selected as focus. The project is now successfully completed. The results are presented in this report.

The project was guided by several, partly interrelated, research question:

(1) the empirical identification and theory-based analysis of problems occurring in the creation of bilateral ABS-agreements.

(2) the generation of a general assessment of the chances and limitations of both instruments supporting ABS.

(3) the development of a concept of similarity for transactions with genetic resources on the contract level, in order to discuss implementation aspects of “model clause instrument”, and

(4) the development of a resource-category system reflecting the heterogeneity of genetic resource with respect to utility components of ABS. Basing thereupon the benefits of a multilateral ABS approach can be compared to the bilateral ABS approach.

1 Problems in the accomplishment of ABS agreements can be categorised in information gaps or competence gaps on the user side, as well as on the provider side. Users are partly unaware of, or have insufficient knowledge about ABS. Some lack (access to) legal know-how (especially public institutions). Internal communication about ABS can be problematic, since the subject is a widely unrecognized. Many providers lack legal know-how (or access to it). The competences for ABS negotiations are often unclear for actors involved on the provider side and hence for users. Mistrust, which is partly due to a lack of scientific knowledge regarding utilization procedures, is a further impediment in negotiations.

2 Not all types of transaction costs could be tackled by both (the model clause and the multilateral system) instruments. Since the standardised multilateral ABS system includes more steps of the transaction process and implements a higher degree of standardisation it supposedly tackles more of the identified problems. On the other hand, designing, implementing and running such a system causes transactional costs on the political and administrative level. Moreover, it requires a significant degree of political compromising.

3 For the model clause instrument the contract or more general the governance form applied for transactions with genetic resources between users and providers is the subject matter of standardisation. Transaction Costs Economics and aspects of Strategic Management Theory were used to define similarity requirements of transactions in order to apply similar governance forms. The approach was to first identify relevant contractual elements and their design options in existing model agreements as well as in exploratory interviews and focus groups. As second step transactional characteristics supposedly determining the efficiency (hence the choice) of governance forms were defined. Thirdly, hypotheses about interrelations of case characteristics and the choice of contractual forms were formulated and tested with survey data. The findings can be used for recommendations regarding the level of standardisation that should be envisaged in a model clause instrument. Moreover, it indicates which contract elements should be included in an instrument and how stakeholders could be guided when selecting model clauses.

The results of the governance analysis verified that contracts and arrangements used to govern relations between users and entities in source countries vary in many respects. A contract standardisation instrument needs to reflect the heterogeneity. It needs to leave room, but guide users and providers in selecting model clauses and building a contract progressively, which suits the characteristics of their individual case. Such an instrument fills competence-gaps, and supports the creation of adapted, efficient governance forms for transactions with genetic resources.

The table below gives an overview of relevant governance elements and characteristics of transactions associated with the governance elements. An X marks that an empirically significant association between was found between a governance element and a transaction characteristic.

	Governance Variables				
Explanatory Variables (transaction characteristics)	Contract type	Contract Duration	Monetary Benefit Sharing (BS)*	Non-monetary BS *	Conflict Resolution *
Strategic Factors of Capacity Building *		**X**		**X**	**X**
Provider Contribution *			**X**	**X**	**X**
Asset Specificity			**X**	**X**	**X**
Primary Uncertainty of R&D with Genetic Resources *	**X**		**X**		**X**
Frequency of Economic Interaction	**X**			**X**	**X**
* Indicates that the variable actually covers several items under the same “heading”. Statistical significance of associations indicated in the table does not necessarily apply for each single item of variable.					

The main contribution of this study to the debate on ABS instruments is a concept of “similarity” with respect to efficient contractual forms. The results summarized in table X are a starting point for the development of model clauses. Moreover they can be used to develop guidelines, which may help stakeholders to characterize their individual case and accordingly select appropriate model clauses.

Tests for intra-sectoral homogeneity did not indicate that cases are more homogeneous regarding transaction characteristics or the choice of governance forms within a user sector than among sectors. Hence, the results rather contradict a sectoral approach for a model-clause instrument.

4 The contribution of this project to the debate on a standardised multilateral versus an individualised bilateral ABS approach is a resource-category system. Pros and cons of both systems are asserted with characteristics of genetic resources and the perspective of the stakeholder. To identify the relevant cost and benefit elements of ABS Transaction Cost Economics and Property Rights Theory were used. The findings on how heterogeneity of genetic resources influences the utility of ABS components, is the basis for deriving recommendations regarding the design of a multilateral ABS approach for resources within the scope of the CBD.

The results of a small survey with providers of genetic resources support our assumptions. Preferences for ABS-systems differ in accordance with the characteristics of the genetic resources, such as the present and potential future economic value according to the innovation potential, the domestic relevance of the resource for food security, and the distribution of the resource. The pattern is: the higher the (potential) commercial value and the lower the distribution of a genetic resource, the lower the offspring of a transaction cost reduction and access to improved varieties through a multilateral system in comparison to the benefit sharing expectations in a bilateral agreement.

To make an MLS more attractive for resources with higher commercial potential and/or very limited distribution, the heterogeneity has to be considered and reflected in the design of a benefit-sharing fund. The approach to monetary benefit sharing needs differentiation, for instance by designing a split fund, and technology transfer and transfer of know-how in the scientific field would need to be institutionalised within the benefit sharing system.

The resource category system developed in this study could be a starting point for developing a system to determine the providers' contribution, respectively the value of the resource and hence the benefit sharing claims. However, the survey indicates that in addition to resource characteristics country characteristics influence the provider's position towards a multilateral versus a bilateral ABS approach. Country characteristics are for example the "state of agricultural development" of a provider country, but also the "state" of other industries in which genetic resources are utilized, and the status of national ABS-institutions. These aspects require more research.

For a broader employment of the resource category system, for instance with other than plant genetic resources and/or other utilisation forms than Plant Breeding, further aspects of relevance to determine the utility of ABS components would need to be identified, and tested. The questionnaire in this project can be extended and used in a larger survey.

Part A: Stakeholder-Based Analysis of Problems Accomplishing ABS-Agreements

1 Introduction

1.1 Motivation of the Project

Access to and the utilisation of genetic resources and the fair and equitable sharing of benefits arising thereof (short: Access and Benefit-sharing or ABS) is a central issue in the Convention on Biological Diversity (CBD) (CBD 1992, Art. 1). ABS was intended as an instrument to overcome market failure for genetic resources. By member parties agreeing to mutually recognise the national sovereignty to regulate access and use, the enforcement of property rights for genetic resources shall be improved. Among other goals, this was aimed at an economic valorisation of genetic resources and by this creating incentive for biodiversity rich countries to conserve their biodiversity. In contrast, before the CBD was enacted biological diversity and hence genetic resources were understood as "common heritage of mankind", with free access to all and available without restrictions (FAO 1983, Art. 5).

It is widely agreed that over 15 years after the adoption of the convention, ABS is not working in a satisfactory way. Less ABS agreements are concluded than expected; as a result less benefit sharing is happening than was originally hoped. A concretisation of the ABS provisions to improve implementation is a major target in the further development of the convention. At the Johannesburg Summit, UN member countries officially adopted an International Regime on Access and Benefit-sharing (IR), to be implemented under the umbrella of the CBD. The timeframe for negotiations on the IR ends with the 10th Conference of the Parties to the CBD (COP 2010) in Japan.

In the consultations for an International Regime, legal uncertainty and transaction costs born by stakeholders of ABS agreements have been issued by government representatives, user representatives and "external" ABS experts (ABS WG (2001): 15; CARRIZOSA, 2004; GEHL SAMPATH (2005); OECD (2003): 26; RICHERZHAGEN (2007): 105). Incremental costs for acquiring genetic resources are viewed as an impediment to their demand, as users' (companies but also researchers from public institutions) time and financial resources are scare, hence costs or efforts for acquiring genetic resources matter (OECD (2003): 26). In particular, researchers from academic institutions and small companies presumably have very limited access to financial and human resources for lengthy and legally-demanding ABS procedures.

Moreover, genetic resources under the scope of ABS regulations compete with genetic resources available without ABS obligations, for instance resources that were put into gene banks or users` collections before the CBD came into effect or resources from countries without ABS regulations in place. Some users completely substitute natural product research and switch to other types of input for R&D (e.g. combinatorial chemistry). Finally there is also the option - though illegal - to take samples without concluding ABS agreements from In-Situ sources in countries with ABS regulations in place. Users might do this with or without the awareness of existing regulations (HOLM-MUELLER ET AL. (2005); KATE AND LAIRD (1999)). If genetic resources are substitutable as input and demand is cost sensitive, we must assume that transaction costs matter for the accomplishment of ABS agreements.

A promising option to reduce transaction costs and legal uncertainty is standardisation simplifying transaction processes and improving transparency, and also facilitating property rights and intellectual property rights enforcement. In a previous user survey standardisation has scored well among a range of suggested measures to improve ABS implementation (HOLM-MUELLER ET AL. (2005)). Work by VISSER ET AL. (2000) indicated that transactional costs born in transactions with genetic resources could be reduced significantly with standardisation instruments (VISSER (2000)).

During the consultations for an International Regime experts and country representatives made various suggestions for applying standardisation in the context of ABS. The range evolved from standard contracts comparable to the standard Material Transfer Agreement (sMTA) in the International Treaty for Plant Genetic Resources for Food and Agriculture's (ITPGRFA) system to sectoral menus of voluntary model clauses for ABS agreements (ABS WG (2006); ABS WG (2007a and 2007b); UNITED NATIONS UNIVERSITY (2003): 38; UGALDE (2007): 36). The model clause approach was adopted in the Annex of the Ninth meeting of the Conference of the Parties to the CBD (COP 9) as instrument for further investigation and potential inclusion in the IR (CBD (2008): pp.115). Also standards for access systems in provider countries were introduced in the debates (CBD (2007): 11).

Discussions about a Certificate of origin for transactions with genetic resources brought up questions of handling ABS for resources with more than one country of origin. This issue can not be resolved by contracting standards or models supporting bilateral agreements but supposedly calls for a multilateral solution.

1.2 Aim of the Project

In the beginning of 2007 the German Federal Agency for Nature Conservation (BfN) initiated a research project to analyse new instruments for an International Access and Benefit-Sharing Regime. The focus of the project is on instruments that are supportive for the accomplishment of ABS in a way that they reduce transaction costs and improve legal certainty for users and providers. Under consideration of previous research and the IR-negotiations, standardisation of ABS contracts was chosen as one mechanism for investigation and the Multilateral ABS System (MLS) of the ITPGRFA as a second. Both approaches are standardisation mechanisms, whereby the MLS enfolds all steps of ABS and therewith goes far beyond the contracting level, which a model clause instrument would be limited to.

The aim of the project is multiple: In a first step problems of accomplishing bilateral ABS agreements shall be identified and analysed. In this context transaction costs and legal uncertainty are to be issued. A sound discussion of actual problems is a prerequisite to evaluate the general chances and limitations of standardisation-based instruments to enhance the implementation of ABS. Tackling this problem-subject creates therewith a justification for research on design aspects of the instruments named above in the following steps.

According to theory standardisation is only suitable for circumstances where similar economic interaction is carried out repeatedly (KESTING AND SMOLINSKI (2006)). In the political debate a sectoral differentiation was suggested, as different ways of utilisation are supposedly affiliated with the sectors. However, what constitutes similarity with respect to the applicability of the two ABS instruments is not yet satisfactorily investigated and defined. The second aim of this research project is therefore to develop, with the help of economic theories, concepts to operationalise and test similarity of transactions with genetic resources. Based thereupon the third task can be carried out - the deduction of suggestions and recommendations for the implementation of standardisation-based instruments.

Findings derived from research within this project shall serve as basis for expert discussions about ABS instruments and future research. Moreover it shall feed into the current political debate on an International ABS Regime as background information.

1.3 Structure of the Report

The project had three main areas of research:

(1) users' problems for the accomplishment of bilateral ABS agreements and the evaluation in how far standardisation-based instruments tackle these problems

(2) a governance analysis of bilateral transactions with genetic resources on the contracting level, which is the basis for deducing the foundation and design recommendations for a model clause instrument, and

(3) the development of a framework of analysis to differentiate genetic resources with respect to the advantageousness of a multilateral ABS system versus a bilateral approach to ABS. From this research recommendations for adapting the multilateral approach for ABS under the CBD shall be derived.

This report is structured according to the three research topics. Part A, B, and C can be read and understood as individual studies. However, Part A serves as thematic introduction for the two following studies B and C. It includes an introduction to ABS under the CBD and an overview on the standardisation debate (Chapter 2). Chapter three provides key points of economic standardisation theory and its application to the two ABS instruments under consideration. Also in Part A, research methods applied in Part A and Part B are elaborated. This was done, because we used the same empirical surveys to generate data for the problem analysis and the governance analysis. Finally, Part A presents and discusses empirical results of the problem analysis with respect to standardisation instruments.

Part B deals with the second area of interest – a governance analysis of transactions with genetic resources on the contracting level. Part C presents the stakeholder' based comparative cost-benefit analysis of a multilateral versus bilateral ABS system from the. The second and the third part commence both with an introduction chapter elaborating more in depth the context, the goals and approach as well as the structure of the respective study. Both parts equally include a theory chapter in which the framework of analysis is developed. While the methods applied for the governance analysis in Part B are included in the Chapter on methods in Part A, Part C has two separate chapters on methods in accordance with the two steps of research applied in that study. All three Parts encompass evaluations of the empirical results and a discussion of the findings. Part B and Part C conclude with a critical assessment.

To conclude the report a final Part D comprehends the main findings and design-related recommendations for both instruments. Moreover, a few additional considerations for supporting ABS implementation that were derived during the course of this project are supplemented.

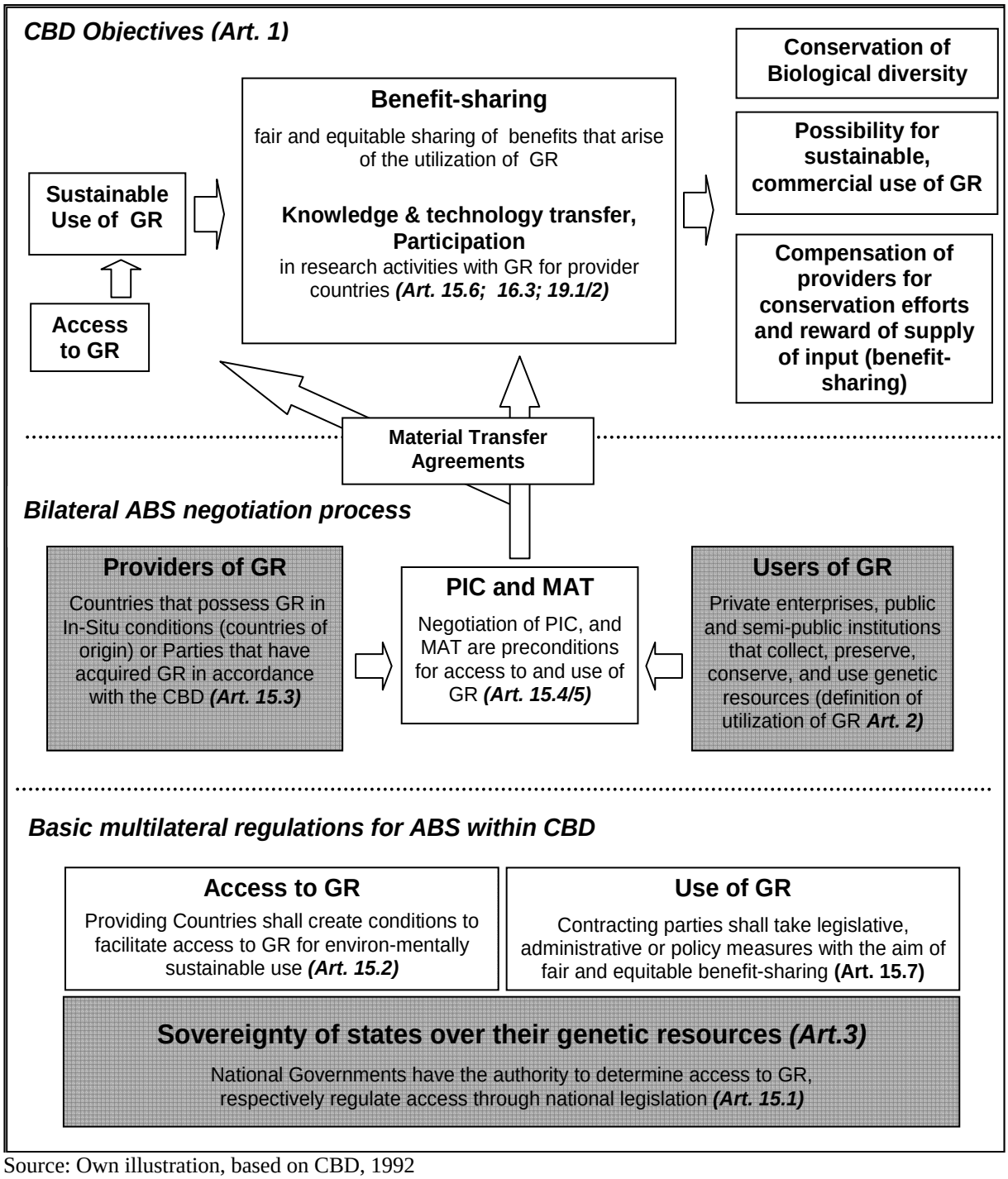
2 The Research Subject: Access and Benefit-sharing for Genetic Resources

2.1 ABS in the CBD – the Political Dimension

Access and Benefit-sharing was developed as multinational institutional framework to use the value of genetic resources in research and in the commercial sector as incentive for targeting the **objectives** of the Convention on Biological Diversity:

- Environment conservation => biodiversity conservation for ecological reasons, e.g. ecosystem functions;
- Distributive justice and development aspects => transfer of financial and technological resources, know how to developing countries, internalisation/compensation for positive global externalities of biodiversity existence/conservation; distribution of property rights for genetic material and traditional knowledge (YOUNG (2004a): 286);
- Trade and commercial-policy, intellectual property rights issues => access to genetic resources for (commercial) utilisation.

The convention builds **the institutional frame for ABS** with several pillars. Article three is the basis, as it affirms and secures the sovereignty of the countries over their genetic resources (CBD (1992): Art. 3). In contrast before the CBD was enacted biological diversity was understood as a heritage of mankind, with free access, and available without restrictions to everyone (FAO (1983): Art. 5). Moreover, article three states that the CBD member countries are responsible "to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction" (CBD (1992): Art. 3). Article 15 contains more "concrete" provisions related to Access and to Benefit-sharing (CBD (1992): Art. 15). Figure 1summarises the most important matters of the ABS articles and tries to illustrate the linkages between the regulations and the three in Art. 1 of the convention stated objectives.



Source: Own illustration, based on CBD, 1992

Figure 1: Access and Benefit-sharing provisions in the Convention on Biological Diversity

The **scope** of the ABS provisions is limited to the utilisation of genetic resources (as a part of the biological diversity) (CBD (1992): Art. 1 and Art. 15). Whereby, genetic resources are defined as "genetic material of actual or potential value" and genetic material covers "any material of plant, animal, microbial or other origin containing functional units of heredity" (CBD (1992): Art. 2). The utilisation of biological resources as raw material is originally not covered by the convention text on ABS. However, if resources previously procured as raw material for input in a production process are

later used for their genetic information, for example to produce offspring in ex-situ conditions, the utilisation would fall under the ABS scope (LATORRE (2005): pp. 38). TEN KATE AND LAIRD (1999) record that "it is widely accepted that the scope of Article 15 [of the CBD] is confined on the use of genetic resources for their genetic purpose" (KATE AND LAIRD (1999): pp. 17). However, national ABS regulations and bilateral contracts demonstrate how heterogeneous the interpretation of the convention text on scope is in reality.

The member countries of the convention are required to transfer decisions taken on the multinational level into a national ABS system. The CBD articles are legally binding international law, and by this binding for countries, but not directly for private entities such as companies, public or semi-private research institutions. However, by ratification the member countries commit themselves to implement the CBD provisions on national level and hence translate ABS into national laws, administrative regulations and policy measures (CBD Art. 15.7). As can easily be understood, the national systems are very different, as are the member countries and their main interests. So far, the convention leaves room for countries to define national ABS systems including the distribution of property rights over genetic resources and the authority to negotiate Prior Informed Consent (PIC), Mutually Agreed Terms (MAT) and benefit sharing.

Thirdly, as governments of biodiversity rich countries are providers of genetic resources they are involved on a third level of implementation of ABS: the contractual level. Governmental entities in provider counties can be involved in bilateral agreements with users.

We shall note that the convention text includes corner stones for ABS, but implications for actual exchange between users and providers of genetic resources are defined only very limitedly. So far the institutional framework is more strongly determined by the national ABS systems on provider countries. However, the CBD is an evolving convention and ABS is constantly under further development. Concretisation of the provisions is one major goal of the negotiations for an International ABS regime.

2.2 ABS Agreements – the Stakeholder Dimension

On the practical level providers and users of genetic resources are concerned with regulations and measures that implement regulations for the transfer of genetic resources. Both terms cover several different types of entities.

Users of genetic resources

Private companies and public or semi-public research institutions acquire genetic resources for basic research or for applied research to develop and market (intermediary) products. In the past 15 years a hand full of empirical studies have been conducted aiming at identifying sectors or groups of users and potential users to describe and analyse the demand side in the market for genetic resources (FRISON AND DEDEURWAERDERE (2006); HOLM-MÜLLER ET AL. (2005); KATE AND LAIRD (2000); LAIRD AND WYNBERG (2005)). Figure 2 compiles the main groups of users or areas of utilisation for genetic resources.

Healthcare	**Body care**
• Pharmaceutical industry • Botanical medicine	• Cosmetics, fragrances • Natural personal care products
Agriculture	**Biotechnology,** others
• Plant breeding (crops, ornamentals, fruit, vegetables, other econ. plants) • Spice and medicinal plants • Plant protection • Animal breeding	• Food • Energy • Environmental remediation • Material • etc.
Public research institutions and Ex-situ collections	
• Researchers at Universities and other institutions (pharmaceutical biology, chemistry, taxonomy, materials, etc.) • Botanical gardens, Zoos, Herbariums, Museums • Gene banks, microorganism collections	

Source: Own illustration, based on Holm-Müller et al., 2005, p. 18.

Figure 2: Users of genetic resources

Within this research, empirical surveys focus on public research institutions, companies utilising genetic resources for R&D in the fields of pharmacy, as well as Biotech companies and Plant Breeders (asexually reproduced fruit and horticulture as well as seeds).

Readers interested in previous empirical studies regarding the commercial value of and demand for genetic resources and/or the research and development process in certain sectors are referred to existing studies: KATE AND LAIRD (1999); LAIRD AND WYNBERG (2005); LAIRD ET AL. (2006)); GEHL SAMPATH (2005); HOLM-MÜLLER ET AL. (2005). Findings with relevance for this research are introduced in the respective theory chapters.

Providers of genetic resources

With respect to ABS provisions the CBD defines "provider" as a "country providing genetic resources", what encompasses "genetic resources collected from in-situ sources, including populations of wild and domesticated species, or taken from ex-situ sources, which may or may not have originated in that country" (CBD Art. 2). In practice a multitude of entities can be providers.

A specific genetic resource may have one country where it originates from, but many source countries, because genetic information spreads over time naturally or by humans. In reality intermediaries play an important role in the trade with genetic resources. They can roughly be divided in two groups: commercial intermediaries (broker companies) and non-commercial intermediaries (botanic gardens, public gene banks, etc...) (DROSS (2005): p. 126). The ABS provisions under the CBD are directed to entities supplying genetic resources in a particular transaction, may it be a governmental entity or an intermediary (CBD (1992): Art. 2).

We can distinguish providers with respect to their legal nature and their relation to genetic resources, for example how they got hold of the material. Also relevant is the country a providing entity is located in. Above we elaborated showed that member countries to the CBD are required to develop national systems to regulate access and to define benefit sharing requirements for genetic resources falling under their territory. The implementation through the countries varies significantly.

CARRIZOSA (2004) analysed national ABS systems and identified several institutional criteria in which national ABS systems vary: 1: The concept of ownership applied for genetic resources in the territory of the provider country. Two major ownership systems can be differentiated: private or communal ownership of natural resources versus state property. In the first case private or communal landowners do not need the State's approval to market biological, biochemical, or genetic resources. Regimes applying the latter approach require bioprospectors to obtain a permit from the State as well as to negotiate access with the individual or collective owner or holder of the land, respectively the ex-situ collection where the biological or genetic resource is found (2004: 14). 2: The scope of regimes including the types of resources, activities and actors varies among national ABS systems. 3: The design of access procedures is heterogeneous what influences the level of bureaucracy entities seeking access have to face. Bureaucracy is in this context understood as the organisation of functions and decision rights in provider countries comprising access permits, PIC, and MAT. Some provider countries designate one central agency while in other countries several entities on different organisational levels have to be considered. 4: In some countries ABS systems have different regulations for access request for commercial and for non-commercial purposes. 5: Regulations also vary with respect to specifications on benefit sharing, or and more generally compensation mechanisms, 6: as well as enforcement and monitoring mechanisms to be included in ABS agreements (ibid.17-19).

Transactions with genetic resources

In this study we understand the term "transaction" as the transfer of rights to access and to use genetic resources from a certain provider to a certain recipient (user). Subject matter of the transaction could be physical resources, but also transfer of rights to access such resources under in-situ conditions, as well as information related to genetic resources. In return the provider receives some kind of reward, for instance monetary benefits and/or non-monetary forms of benefits such as he transfer of know-how, technology or support to inventorisation and taxonomisation Biodiversity[1]. This exchange relation constitutes what in political terms is access to and sharing of benefits arising from the utilisation of genetic resources.

Table 1compiles steps considered necessary for users to conclude and conduct an ABS agreement in compliance with the recommendations in the Bonn Guidelines. The Bonn Guidelines (2002) provide points of reference regarding how some of the procedural steps ought to be realised by users and providers to comply with the ABS provisions in the CBD. The instructions, however, are quite theoretical, and user studies indicate that in practice the realisation is rather problematic.

Table 1: The Chain of conducting ABS according to the Bonn Guidelines of the CBD

Process stage	**Steps and measures**
1) Market search	- Identification of the potential providers or users, Identification of supply/request - Screening for reliability (providers/users)
2) Initiation and Negotiations	- Identification of contact points, stakeholders etc. - Evaluation of offer / request (assessment of resource/information quality, possible benefits) - Negotiation of contract
3) Contracting	- Drafting and signing of the contract (terminology, design)
4) contract enforcement	- Legal verification of the contract - Monitoring / verification of misconduction of the other contracting party - Dispute settlement , sanctioning / Remedies

Source: Authors', based on CBD Bonn Guidelines, 2002.

The literature indicates that in reality, transactions with genetic resources are heterogeneous. The steps listed in Table 1 are carried out differently and the transactional costs vary. Agreements seem to differ regarding the benefit sharing package and on the other hand providers' contributions can differ in many respects, for instance services related to genetic resources, rights granted for the utilisation, and the provision of information (GEHL SAMPATH (2005), LAIRD AND WYNBERG (2008)).

[1] The Bonn Guidelines list a range of monetary and non-monetary benefit-sharing measures (Bonn Guidelines, Appendix II Paragraph 1 and 2), and case study based literature shows that a variety of measures is applied in practice (see for example GEHL SAMPATH (2005); LAIRD AND WYNBERG (2008)).

Based on ABS literature, own findings from a user survey in 2005 (HOLM-MÜLLER ET AL., 2005) as well as statements by various actors in the political discussion we assume that high transaction costs are a considerable impediment to ABS transactions. Another issue is uncertainty regarding compliance of the contracting partner, and uncertainty that occurs in the case of incomplete information or unawareness about regulations regarding the own compliance provisions. There is a possibility to act against rules without purpose.

Imperfect information, asymmetric information, unbalanced market power of the contracting partners, imperfect property rights systems, and time lags between contract negotiations and obligations of both parties are indicated as factors underlying high transaction costs and uncertainty in ABS transactions (HOLM-MÜLLER ET AL.(2005): pp. 47; OECD (2003): pp. 15; RICHERZHAGEN (2007): pp. 108-128).

2.3 Standardisation in the debate of an International ABS Regime

Standardisation associated with ABS contracts has been mentioned in several forums during the last ten years. The CBD Panel of Experts on ABS recommended the consideration of sMTAs as a means to reduce transaction costs in developing mutually agreed terms already in the year 2001 (ABS WG (2001): 15), and the Bonn Guidelines have taken up this idea (Secretariat of the Convention on Biological Diversity (2002): 12). In the following negotiations and expert meetings the idea was taken up, for instance in the "Analysis of Gaps", compiled from outcomes of the third Ad Hoc Open-Ended Working Group on ABS meeting and following consultations of experts and concerned groups 2005. A couple of member countries criticised the lack of uniform standards for access procedures/regimes and benefit sharing provisions or respectively suggested these as useful measures (ABS WG (2006): 2 and pp. 11). Further suggestions can be found in a comprehensive report of the CBD secretary on the process and outcomes of the Gap-analysis provided as preparation for the fifth ABS Working Group meeting:

- The development of minimum standards at the international level to harmonise ABS legislation is suggested as a response to the lack of harmonisation of ABS measures which are considered to be a source of legal uncertainty for users.

- Standard Material Transfer Agreements are suggested as a solution to overcome the problem of unbalanced bargaining power resulting from asymmetries in information, knowledge, negotiation skills and capacity.

- Commercial users should participate in the development and implementation of "[…] standards for the entities that they deal with, and promoting best practices, which truly implement the Access and Benefit-sharing objectives of the Convention on Biological Diversity and their national manifestations" (ABS WG (2007b): 28).

- Model or standard agreements, for instance sMTAs could be considered for specific uses of genetic resources, bearing in mind that some organizations already developed and implemented codes of conducts or guidelines on ABS responding to the special needs of their sector.

- Standard Material Transfer Agreements for particular sectors could also be considered to address the concern of tracing or monitoring genetic resources over country borders to impede the misappropriation of genetic resources (ABS WG (2007b): 7, 11, 27, pp. 30).

In the framework of preparation for ABS WG five and six the EU submitted the proposal of "[…] sectoral work on standardising choices in Material Transfer Agreements […]" (ABS WG (2007a): 49). The following main rationales for this approach were named:

- the reduction of transaction costs as the general contract conditions are standardised,
- a higher legal certainty because standard options are already tested on their workability,
- balancing negotiation power and protection of the weaker party by limiting the choices and hence constrain the use of power in MTA negotiations,
- simplifying the information exchange through utilising electronic networks, what is possible by standardising information in transactions (Ad Hoc open-ended Working Group on ABS (2007a): pp. 49).

Several member countries stated an interest in this approach. The commission's expert group stated that further research on the applicability and feasibility of sMTAs has to be done, especially regarding the heterogeneity of the different sectors engaged in genetic resources transactions (AD HOC OPEN-ENDED WORKING GROUP ON ABS (2007a)).

Studies that were published during the course of the international regime negotiations debate take up the standardisation ideas for ABS only to a very limited extent. Legal experts stipulate that standardisation for the terms and concepts of ABS is vital requirement for harmonised legislation and transparent ABS transactions/procedures (YOUNG (2004a): 278; YOUNG (2007): 43), and therewith a key to reducing transaction costs. Barber et al. (2003) take up standardisation in the context of the certificate of origin discussion. They consider a standardised "gene flow documentation" to simplify the recognition of the existence of PIC, to increase legal certainty, to reduce transaction costs, to facilitate tracking of genetic resources, to increase the trade with genetic resources, and support more flexible ABS rules and procedures (United Nations University (2003): 38). UGALDE (2007) suggests documentation standards for genetic resource transfer and voluntary/mandatory standard benefit sharing obligations for non CBD/CBD genetic resources as elements of an international ABS regime (UGALDE (2007): 36). DROSS AND WOLFF (2005) recommend procedural standards for ABS to keep down the transaction costs for a certificate of legal provenance for genetic resources acquired from in-situ sources (DROSS (2005): pp.134).

3 Theory – Behavioural Uncertainty and Standardisation Theories

We learned that standardisation has been raised in the debate on an international regime as instrument to reduce transaction costs and increases legal certainty for transactions with genetic resources under the scope of the CBD. However, an in depth analysis of problems for the accomplishment of ABS agreements is lacking so far, and the mechanisms, chances and drawbacks of standardisation based instruments to tackle practical problems have been evaluated insufficiently. Economic theory provides with concepts to approach these issues.

In this chapter an introduction to theory concepts comprising behavioural factors and institutional uncertainty, which shall be used for an empirical analysis of implementation problems of ABS is given. Moreover, aspects of economic standardisation theories are elaborated, which shall be used to characterise the ABS instruments under consideration.

3.1 Human Behaviour in Economic Interaction

The concepts in New Institutional Economics including approaches dealing with transaction costs and governance solutions to minimise these are built on two main assumptions about human behaviour: bounded rationality (imperfect information) and individual utility maximisation, in other words opportunistic behaviour (PICOT, DIETL AND FRANCK (2002): 70; WILLIAMSON (1998): pp. 30).

The acquisition of information in a transaction process requires efforts and generates costs. Parties in a transaction remain partially uninformed if the costs of gathering information exceed the (expected) benefits incremental information creates. Following this argumentation, asymmetric information can be rational. The height of information costs depends to a great extend on information characteristics of the subject of transaction, in this study genetic resources, related information, rights and services. Bounded rationality is acknowledged in the ABS literature as characteristic for user-provider relations. Often neither the provider nor the recipient of genetic material can foresee at the contracting stage what the outcomes of the investigation with the resource - in other words, the benefits - will be (GEHL SAMPATH (2005): 65; CARRIZOSA (2004): 73).

Opportunism, which is also circumscribed as “behavioural uncertainty”, means that parties engaging in (economic) interaction face uncertainty induced by potential opportunistic behaviour of the other party. Each actor might try to make transactions work to their own advantage, particularly under the presence of asymmetric information. IN transactions with genetic resources asymmetric information can occur before contracting, e.g. when providers misrepresent the value of their supply, or when users are disingenuous with their intentions for the product, but also ex ante in monitoring relationships (GEHL SAMPATH (2005): 65; RICHERZHAGEN (2007): pp. 118).

The suspicion of opportunistic behaviour is sufficient to raise transaction costs, as parties will take actions to protect themselves (KERSTEN (2004): pp. 58). This is because it is difficult and costly to determine the trustworthiness of the transaction partner ex ante, particularly as the disposition to act opportunistically varies among economic agents (WANG (2002): pp. 161). However, the assumption of opportunism in Transaction Cost Economics (TCE) has evoked a lot of criticism from other disciplines, e.g. structural sociologists and behavioural researchers. They argue that embeddedness, trust and reputation can alleviate the hazard of opportunism (MEULEMAN ET AL. (2006): 4, referring to MAYER ET AL. 1995; ZAHEER AND VENKATRAMAN 1995; HILL 1990; PARKHE 1993).

3.2 The Institutional Environment of Transactions with Genetic Resources

Member countries to the CBD are requested to implement national ABS systems. Therewith the countries create the institutional environment for the initiation, the negotiation, and the enforcement of agreements for the transfer of genetic resources. Institutional Characteristics of the transaction environment are potential source of uncertainty (RICHMAN AND MACHER (2006): 42; SUTCLIFFE (1998): pp. 2) und determinants of transaction costs.

In chapter two we elaborated CARRIZOSAS' (2004) findings regarding the heterogeneity of institutional systems for ABS on the national level. Further authors concluded in their research that the institutional environment in provider countries significantly influences attractiveness for users and transaction costs in ABS projects. The bargaining and decision costs for ABS agreements are strongly impacted by institutional arrangements and governance systems including political stability, control of corruption, rule of law, and accountability in provider countries (RICHERZHAGEN (2007): pp. 111). The characteristics of market institutions (property rights and governance systems for genetic resources systems), under which a transaction with genetic resources is carried out, are determining factors for the choice of contractual solutions (GEHL SAMPATH (2005) pp. 76). Participants of a user study conducted 2005 in Germany stated, that high efforts associated with the identification of reliable and suitable contract partners on the providers' side. This was stated as one reason to drop engagements in ABS transactions (HOLM-MUELLER ET AL (2005)).

3.3 Standardisation

Roughly spoken, standardisation can be understood as a form of regulation, comparable to markets and organisations, including the creation and propagation of rules for economic interaction (BRUNSSON AND JACOBSSON (2002): 4-11). Standardisation can supplement and support other institutions, such as markets or hierarchies e.g. in companies. It can take various forms, such as product or production standards, a set of common definitions of terms relevant for a certain context, a contract standardisation, or a routine for decision making procedures and action taking. The purpose and the mode of operation depend on the subject of standardisation.

Standards for goods and services lessen the specificity of investments required for production and/or marketing (KLEINALTENKAMP (1993): 89). Moreover, they reduce uncertainty in transactions, because characteristics of the product or good are narrowed down or even clearly defined (BLIND (2004): 19). Market search is facilitated, and hence transaction costs for search and information are lowered (MÜHLENKAMP (1999): 34; RICHTER AND FURUBOTN (1996): 140; KLEINALTENKAMP (1993): 86).

Standardisation in form of routines for negotiations with similar subjects and contexts may increase the efficiency and economise scarce capacities. Lessons learned from former negotiations can help to avoid mistakes, and routines substitute deliberate planning, if solutions found in former problem-solving processes can be adopted (KESTING AND SMOLINSKI (2006): 12).

The predefinition of negotiation procedures and the limitation of possible outcomes can reduce the problem of asymmetric information and unbalanced negotiation power. Planning reliability can be increased this way, and negotiation time reduced. Legal certainty is improved, costs for control of contract enforcement on both sides lowered (SONDERFORSCHUNGSGRUPPE (SFG) INSTITUTIONENANALYSE FH DARMSTADT (2003): 19; KLEINALTENKAMP (1993): 97).

In spite of many positive features theory assigns to standardisation-based instruments, we learn that negative aspects or problems have been identified as well, such as:

- Developing and distributing standards causes costs.
- Not always the most appropriate standard prevails, but the standard fancied by the most powerful negotiation party.
- Standards can impede innovations and the ongoing of discussions and research on the matter of efficiency and feasibility of the implemented system (KESTING AND SMOLINSKI (2006): pp. 13; MÜHLENKAMP (1999): 23; SFG INSTITUTIONENANALYSE FH DARMSTADT (2003): 20).
- The implementation of standards leads to changes in the market situation and contention.

KESTING AND SMOLINSKI (2006) discuss criteria for the applicability of standards in form of negotiation routines. They defined two criteria for the efficient application of routines in the context of economic interaction: similarity of the problem and stability of the interaction context. The better these two criteria are fulfilled the better knowledge can be transferred from one problem on another (KESTING AND SMOLINSKI (2006): 4-16).

We transfer KESTING AND SMOLINSKIS' paradigm to our research subject. Accordingly, we interpret "problem similarity" as the similarity of the "subject matter of interaction" which comprises then the contribution by a provider in the respective transaction and the way of utilisation of the resources by the receiving party. "Context stability" is in KESTING AND SMOLINSKIS' (2006) model understood as the similarity of partners one actor faces in varying transaction. With respect to ABS this can be understood as the similarity of strategies, needs and requirements of different providers of genetic resources[2]. An additional aspect for consideration when defining "transaction context" is the transaction environment, which might vary significantly, if material is procured in bilateral transactions from different provider countries. Partly providers' negotiation-strategies in individual transactions and the national institutional settings could be linked, but not necessarily entirely.

Table 2 summarises the two dimensions of the elaborated concept. The solution including the institutional dimension, which KESTING AND SMOLINSKI did not explicitly include, is not displayed in the table but could be deduced in the same way.

Table 2: Applicability of standards/routines in economic interaction

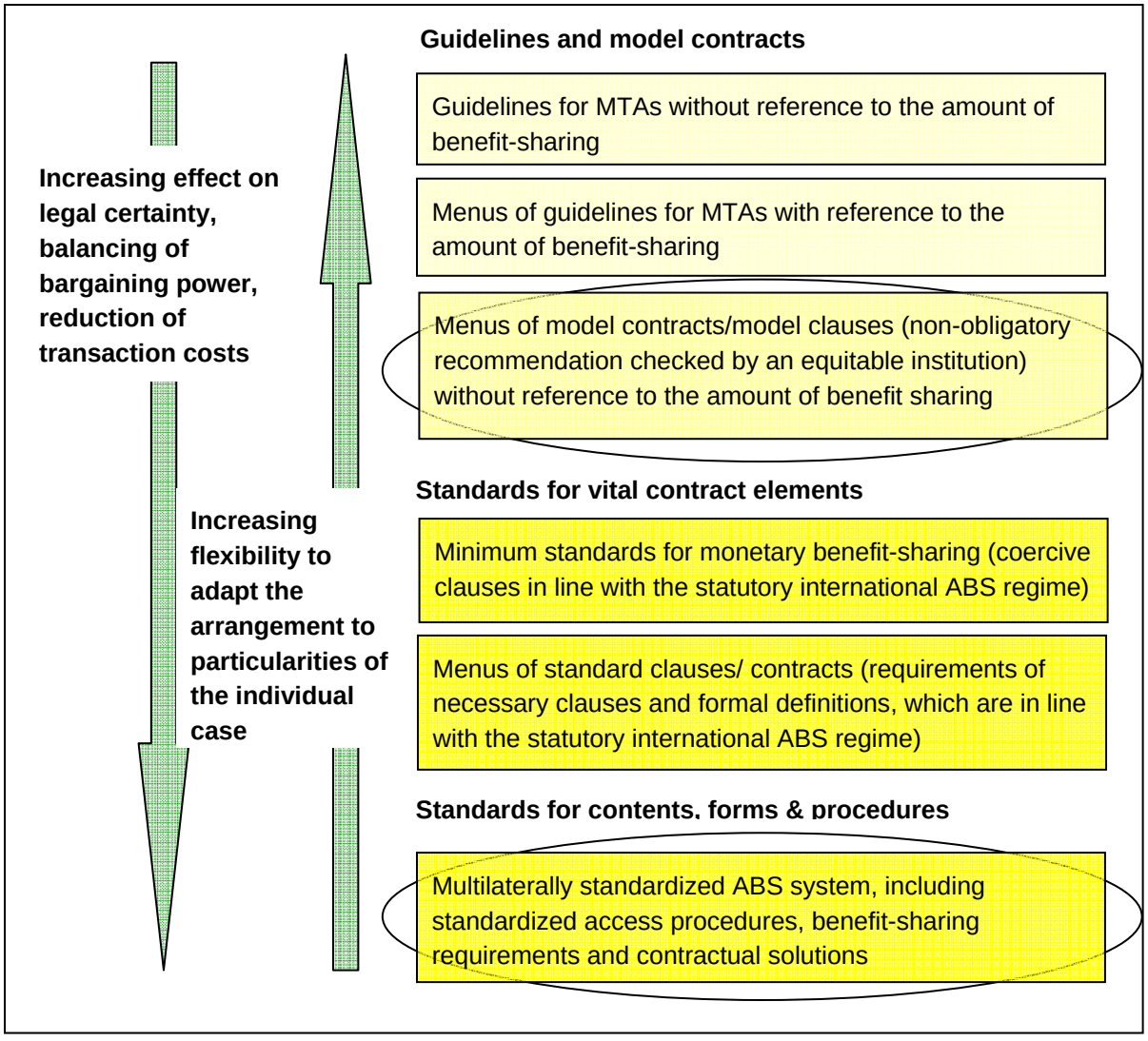
		Subject matter of economic interaction	
		Different / varying	Similar / standardised
Transaction context	Varying / different	No routine	Standards with respect to subject matter of interaction
	Stable / similar	Standards with respect to transaction context	Standards with respect to transaction context and subject matter of interaction

Source: Authors' based on KESTING AND SMOLINSKI (2006): 8 and 16 (with own modifications)

[2] Providers' strategies refers here mostly to the assessment of elements of ABS, for instance the importance of benefit-sharing measures, the assessment of the value of genetic resources etc.

3.4 Standardisation Instruments for Transactions with Genetic Resources

For ABS several standardisation approaches are theoretically possible. Figure 3 displays several options. Presumably, with a shift of the degree and the scope of standardisation the potential of an instrument to reduce transaction costs and legal certainty as well as to balance negotiation power changes, but also the flexibility for adaptation regarding the demands of transacting parties and in the last instance also the sovereignty of providers to define access requirements on a national level.



Source: Authors', based on KLEINALTENKAMP (1993): 85; VISSER ET AL. (2000): 8; NORTH (1992): 32; RICHTER AND FURUBOTN (1996): 292.

Figure 3: Standardisation of transactions with genetic resources under the scope of ABS provisions.

The focus in this study is on the two options encircled in Figure 3: (1) voluntary model clauses without reference to the amount of monetary benefit sharing and (2) a fully fledged standardised transaction system comparable to the MLS within the ITPGRFA.

Obviously these two instruments apply different degrees of harmonisation, and the scope of standardisation differs as well (Table 3). While the model clause approach stipulates voluntary application and a range of models rather than total harmonisation, the referred to multilateral system implements obligatory standards. The scope of the model clause approach is limited to the contracting phase of ABS projects. To a certain extend it might affect the negotiation phase as well[3]. The multilateral approach on the other hand comprises all phases of the transaction starting with market search and initiation phase (it standardises information of supply for genetic resources and access requirements including prices), it substitutes the negotiations (standards for Access and for Benefit-sharing), and provides a standard contract (or contract clauses) such that bilateral drafting is not applied. Moreover, it implements a standardised system for contract enforcement. Hence, the multilateral system approach concerns the provider countries' sovereignty of designing individual access regimes and it limits the users' scope for individual demand and price negotiations.

According to the scheme for classifying standardisation instruments we developed based on KESTING AND SMOLINKSI (see Table 2, chapter 3.3) we assign the model clause approach with the category "standards with respect to the subject matter interaction". The nature of the multilateral system approach is more comprehensive. It enfolds similarity of the subject matter of transaction as well as context stability including providers' strategies and the institutional environment.

As the two instruments differ in scope and degree of standardisation they feature different pros and cons: The model clauses approach supports stakeholders in the negotiation and contracting phase of transactions, hence tackles transactional costs born therein. The multilateral system approach eliminates variation in national access regimes and substitutes bilateral benefit sharing negotiations. Therewith it simplifies market search and transaction initiation. Moreover, benefit sharing standards circumvent problems in negotiations based on asymmetric information and unbalanced power. Hence, the fully standardised multilateral system eliminates most of the sources for "private" transaction costs meaning transactional costs born by users and providers that are parties to the transaction. Also, it has the potential to eliminate parts of the legal uncertainty. An efficient enforcement system is required for this, though.

The full standardisation approach tackles many problems that have been raised as impediments in the literature and in the debates, supposedly more than a model clause instrument would. However, theory emphasises that standards have potential drawbacks and the development and implementation causes transactional costs that have to be covered by the implementing and operating institutions. Moreover, the stronger harmonisation is envisaged and the more transactional steps shall be comprised, the more compromising in the implementation phase is required. Also, comprehensive and strict standards do not allow for flexible governance solutions adoptable for the individual case. In both regards the multilateral approach has significant drawbacks, respectively higher challenges compared to the model clause approach. As a fully standardised multilateral system is more comprehensive regarding the transactional steps and has higher demands for harmonisation in each step, it would require significantly higher transactional costs and more compromising ex ante for drafting, implementation and ex post for monitoring. Also the risk of implementing inefficient standards is higher. Inefficient obligatory standards in worst case obviate the initiation of a transaction and therewith accomplishment of ABS agreements.

To outweigh the pros and cons of both instruments better, an in depth analysis of stakeholders' problems for accomplishing ABS agreements is necessary. Moreover, the aspects of problem similarity and context stability require empirical analysis. These issues shall be tackled in a series of empirical studies within this project. The theory concepts elaborated before guide this work.

[3] Transaction phases in ABS projects are listed in Table 1

Table 3: Overview on characteristics of standardisation-based ABS Instruments

	Voluntary model clauses / contracts	Fully fledged standardised Access and Benefit-sharing system
Matter of subject to standardisation	Bilateral transaction with in-situ or ex-situ genetic resources	- Transactions with genetic resources held in international collections – multinational holdership and potentially plurilateral origin - Bilateral transactions with genetic resources falling under the scope of the multilateral system
Type of standard	Elements to be regulated in an ABS contract - Recommendations for contents of relevant contract elements differentiated for groups of similar transactions - No standards on amount of benefit sharing ⇨ Voluntary, low level of standardisation	Standards for: - Access procedures and access requirements - Benefit sharing triggers, type, amount, and distribution - Contracts of material transfer
Similarity requirements	Transaction characteristics and demand aspects	- Transaction characteristics - Demand aspects on users side - Value of genetic resources (several aspects) - Providers needs (assessment of the relevance of benefit sharing aspects)

Source: Authors'.

4 Methods and Empirical Approach of the Study

This report is composed of three parts with different content-focus, though linked through the overall research question. Part A deals mainly with implementation problems for ABS, Part B with governance analysis of bilateral ABS agreements, and Part C compares pros and cons of a bilateral versus multilateral ABS approach from the perspective of different stakeholder groups. In each part of the study a mix of methods is applied. Findings of Part A are relevant for both subsequent investigations (B and C). Methodologically, Part A and B are partly linked. Data respectively information used for the analysis on implementation problems and for governance analysis stem partly from the same surveys. To avoid repetition, we decided to give a comprehensive description of methods contributing to Part A and B at this point. Methods applied only in the context of research for either part A or part B, are described in the introduction to the respective analysis. As Part C is methodologically not linked with the two foregoing studies, it contains a separate chapter on methods.

4.1 Exploratory Surveys: Interviews and Group discussions

The first step of empirical research was qualitative and exploratory. We conducted a series of problem-oriented interviews with individual users, companies and researchers from public or semi-public research institutes. Additionally we conducted three group discussions with four to eight participants. Exploratory interviews and group discussions can be applied in the process of formulating hypothesis for new research questions with limited previous knowledge (SCHÖNHAGEN AND WAGNER (2007): 7). The advantage of focus groups as method is that the communication tool is close to reality, hence participants' statements can be assessed authentically (ibid. 9).

Additionally, representatives of industry associations were interviewed and we gathered information from side events during ABS Working Group (WG) 5 and 6 as well as COP 9.

4.1.1 Object of Investigation

Subject matter of the exploratory interviews and group discussions are users' experiences and practice with the initiation and accomplishment of projects including access to or the procurement of genetic resources and related rights, information and services. The two main aspects of interest were: 1: problems and potential sources of problems occurring in the process of initiation and accomplishment of agreements; and 2: governance forms including the design of certain contractual elements that are applied in ABS projects. Here it was relevant to receive a first impression on how far there exists a common practice within the particular research group. Additionally we asked participants to elaborate their assessment of standardisation for ABS agreements on the contractual level (based on the submissions of the European Union in preparation of the ABS Working Group Meeting at that time).

4.1.2 Sampling Details

The construction of samples for interviews as well as for group discussions was determined by several factors: the target groups we selected for the exploratory survey, contacts that we could establish, partly with assistance of intermediaries, the willingness to participate and, at least for the focus groups the ability to communicate in German.

As elaborated in chapter 2 genetic resources serve as an input for various uses and purposes in a multitude of fields. However, we had to narrow down the scope of our exploratory inquiry. Three important groups of users were selected as research groups, namely researchers from public or semi-public institutions (Group A), secondly pharmaceutical and industrial biotechnology companies (Group B) and thirdly plant breeding companies in the fields of agricultural crops (Groupe C1) and horticulture (Group C2). The target group "researchers from public or semi-public institutions" is of particular interest for this study: Stakeholders and representatives of this group call for simplified ABS-procedures for basic research, but so far no workable concept for distinguishing basic and applied research with respect to ABS implications exists. Pharmacy and Biotech were selected as research group, due to their economic relevance and because previous studies indicate that companies accomplish comprehensive ABS agreements with provider countries. Plant Breeders have a specific role in the debate on an international ABS regime, because they are partly concerned with the ABS system of the ITPGRFA and have therewith experiences with the standardised procedures of ABS for resources from the MLS. Several large plant breeding companies and sector associations request the extension of the scope of the sMTA.

To recruit participants for the exploratory interviews we established a contact network with intermediary institutions (industry associations[4] and the German Research Foundation) which helped to identify potential participants and provided us with contact details. E-mails with the announcement of the survey, a short description of the project and the request to agree with an interview were sent out, and addressees not responding were called and asked for the reason and invited a second time. More details about the survey are summarised in Table 4.

Table 4: Details of survey "exploratory interviews with users of genetic resources"

Target Group	Number of participants	Type of interview	Period
Researchers from public or semi-public research institutes (varying disciplines)	5	Telephone interviews + one email	April and May 2008
Pharmaceutical companies and Biotech companies	4	Face-to-face	January to March 2008
Plant breeding companies (crops, seed industry), and representative of German Plant Breeders Association (BDP)	5 + 1	Telephone interview + face-to-face with BDP' representative	December 208 and January 2009
Representative of International Community of Asexually Reproduced ornamental and fruit plant varieties (CIOPORA)	1	Face-to-face	May 2008

Source: Authors'.

[4]Bund Deutscher Pflanzenzüchter (BDP), Deutsche Industrievereiningung Biotechnologie (DIB), Verband forschender Arzneimittelhersteller (VfI)

4.1.3 Interview Instruments

To structure the interviews a **guideline with several open questions** was used meaning that experts were not presented with alternative answer possibilities but requested to elaborate their experiences and assessments on the respective topic. The questions base on theoretical and practical considerations, as well as findings and indications found in the topical literature and from stakeholder contributions in the framework of the political debate.

Each interviewee received an e-mail with the guiding questions beforehand. Interviews with representatives of pharmaceutical and biotech companies were conducted as face-to-face; with participants from the two other groups we applied telephone-interviews due to long distances. The duration of telephone interviews varied between 45 Minutes and 1½ hours; face-to-face interviews were longer varying from 1 ½ to 2 ½ hours. In both cases clarification of remaining questions was accomplished by e-mail.

Similar to the recruitment procedure applied for the interview-survey, we proceeded to invite users for the focus groups. In the pharmaceutical and Biotech group participants of both survey were partly identical. In the other two target groups new participants could be recruited. Details of the survey are listed in Table 5.

Table 5: Details of survey "focus groups"

Target Group	Number of participants	Location and Duration	Period
Researchers from public or semi-public research institutes (varying disciplines)	7	4 hours (with coffee break), Institute for Food and Resource Economics, University of Bonn, Bonn	7th of July 2008
Pharmaceutical companies and Biotech companies	4	3 1/2 hours (with coffee break), Gustav-Stresemann-Institute, Bonn	12th of Septembe r 2008
Breeding companies in the field of Asexually Reproduced ornamental and fruit plant varieties	4	1 ½ hours, International Trade Fair for Plants, Technology, Floristry and Sales Promotion, Essen	29th of January 2009

Source: Authors'.

The arrangement or design of the group discussions varied according to the participants' previous level of knowledge regarding ABS in general and practical experiences as well as time-restrictions. In both respects the conditions for the group discussions with researchers from public and semi-public institutions (Group A) and pharmaceutical as well as biotech companies (Group B) were very positive. The majority of participants had extensive experiences with the procurement of genetic resources and the negotiation of ABS agreements. Moreover, several were following and partly contributing to the political debate on ABS. The conditions for the group discussion with horticultural plant breeders (Group C1) were less optimal.

To guide the focus groups for target group A and B we informed the participants beforehand in an e-mail about the main discussion topics including contractual elements of ABS agreements we planned to discuss. For exemplification we enclosed an overview over core elements of existing model contracts. The meeting was opened with a short presentation about the research project and the topics and objectives for the discussion. During the course of the meeting one person of the organisation team took notes which allowed us to reconstruct the process of discussion and the statements made by the different participants afterwards. We decided against the option of recording, to guarantee an open atmosphere in which all participants could speak without restraint.

4.1.4 Evaluation of the Surveys

The interview protocols were distributed after the meeting and participants could correct for misunderstandings and fill remaining questions. Following the method of qualitative content analysis (see MAYRING 1995 referred to in LAMNEK 2005) we first resembled information and restructured the contributions documented in the protocols with the help of our guiding research questions. The results were analysed and discussed in an interpretative manner.

4.2 Standardised Online-survey

As continuation of the empirical research we conducted an international anonymous online-survey for users of genetic resources. Subject matters were users' experiences and assessments related to the procurement of genetic resources in general and the characterisation of a specific ABS project. The target group was limited to the private sector, but including many different fields of utilisation of genetic resources: pharmacy, biomedicine, biotechnology in other fields than pharmacy and plant breeding, plant breeding (seed and horticulture), biocontrol agents, cosmetics and care.

We used a standardised questionnaire with a total number of 51 questions. The vast majority is coded as closed questions meaning that the respondent is requested to select from a set of given answering options. Depending on the subject matter of the variables closed questions have dichotomous answering options (yes / no; option one or two), a nominal scale (selection out of more then two options but without logical ranking), or an ordinal scale (ranking, but not necessarily same distance between options). We chose this highly standardised approach to receive data which can be used for statistical analysis.

4.2.1 Structure of the Questionnaire

The questionnaire is composed of three thematic parts. Part 1 consists of questions dealing with the users' sector affiliation, the general approach to procurement of genetic resources as well as companies' experiences and strategies to keep transaction costs low. Moreover, we asked participants to assess the relevance of a set of institutional factors in provider countries and characteristics to differentiate supply/demand of genetic resources for the choice of a provider country. Part 1 of the questionnaire could be answered by all companies using genetic resources independently whether resources are procured from ex-situ or in-situ sources.

Questions in the second part of the survey were used to gain information about the practice of governance solutions for bilateral ABS agreements. Following the overall bottom-up approach in this research, source of information should be the users experience and practice in real transactions with

genetic resources. The focus of interest is on cases in which resources are obtained from their source country and negotiations with authorised entities have taken place. However, due to confidentiality reasons we have no access to contract documents of such cases. Therefore we used the following approach: based on governance theories (governance of transactions) and findings from previous empirical research (analysis of existing model and standard agreements as well as exploratory surveys) we identified the most important elements of contracts, overall governance forms, and factors supposedly determining which governance form is the most efficient. Thus we developed a number of hypotheses on the relations between governance solutions and transaction characteristics. The variables were operationalised such that they could be surveyed in a standardised, anonymous online questionnaire.

A filter between part one and two limited the sample to companies experienced in negotiations with authorised entities in countries where the genetic resources occur in-situ (even if intermediaries have been involved for support) (Q5). Guidelines (Table 6) explained how the respondent should identify an adequate project and use it as reference to answer questions in Part 2. The result is that each participating company characterised in detail one particular project including the governance solution with the help of a series of standard questions. The questions are formulated such that as much information as possible to distinguish cases is revealed, but aspects known to be sensible (e.g. height of monetary benefit sharing, the concrete source country) and hence possibly deterring participants were left out.

Table 6: The guidelines for the case specific part of the online survey

In this part of the survey, we request that you recall a specific case of procuring genetic resources. **Please select a case for which the following factors apply (as closely as possible):**
- The genetic resources were acquired directly from their country of origin, whereas officially authorised actors from the provider country were involved in the negotiations (even when intermediaries are or were involved for support)
- The provider country in not a European Union member state and not the USA
- The main features of the agreement have been legally defined at the time of the survey.
- The agreement has at this point not been revoked and there is also no foreseeable revoking of the agreement.
- It is chronologically the last case you can remember well and the last case for which you have the most possible knowledge.
Note: In following sections, the case that you have selected will be referred to as the project.

Source: Authors'.

In the third part of the questionnaire company data were requested including the size in number of employees, turnover etc. Also we surveyed indirect capabilities such as the level of experiences with complex projects, e.g. with partners from developing countries.

4.2.2 Reliability and Validity of the Questionnaire

The selection of questions respectively variables is based on economic governance theories and ABS-literature. The theoretical concepts of governance on the transaction level have been applied to transactions with genetic resources very limited so far; no standardised survey has been conducted in this field yet. Therefore we could not draw upon existing operationalisation concepts. Accordingly, the approach was to orientate on empirical studies that applied the theories in the context of other research subjects but with a standardised approach for data generation and statistical analysis. Moreover, we could use findings from our previous empirical research within this project and literature in the fields of ABS to adapt the concepts. Several researchers cross-checked the questionnaire and a pre-test with two company representatives was conducted. To create a common understanding of important terms such as genetic resources, provider countries, Ex-Situ, and intermediaries a set of definitions was given on the introductory side (the second side of the questionnaire, see Table 7), as well as some principle guidelines how to answer questions and how to deal with questions that can not be answered.

Table 7: Selected definitions included in the guidelines to the online survey

Genetic Resources: Encompasses in this survey the usage of genetic information of plants, animals, Microorganisms (all creatures except humans) - as starting point in developing active compounds for intermediary or end products - for identification (and modification) of genes for breeding purposes - as Elements of vaccines - for the development of inactive compounds in products - as instruments in the research and/or production process
Ex-Situ: the genetic resource is stored outside its natural habitat for preservation purposes or to make it available for research.
Provider country: In this survey, this is the simplified term for the country in which the genetic resource can be found in its natural habitat.
Intermediaries: Institutions (such as gene banks, botanical gardens, research institutes) as well as commercial enterprises that mediate between the authorities and local/indigenous groups in the provider country on one hand and the enterprises interested in access on the other.

Source: Authors'.

In an online-survey it is challenging to implement a system which respects the trade-off between on the one hand maximising the response rate for vital questions and minimising the drop-out-rate on the other hand. We chose to select a number of questions that were vital for the most important evaluations. Those were modified as compulsory questions: only if the respondent answers a question of this type he/she could proceed to the next "page" in the questionnaire. Other questions were configured in a way the participant could skip them. This approach has an effect on the data; sample size varies between questions. But instead of sorting out cases with "missing" values for certain questions we evaluated each question with the respective sample size. The reason is that data on this topic is very scarce and hence valuable.

4.2.3 Recruitment of Participants

The recruitment of survey participants was a challenge in many respects. The subject matter of the survey is very specific, and the population is known and even identifiable only to a limited extent. There exists no official or unofficial database listing all companies that use or have been using genetic resources. Not even stakeholder associations have full knowledge, which of their member companies belong to the target group. Secondly, the topic is highly political and many companies are sensitive providing data. Thirdly, even if a company uses genetic resources it is difficult to identify and reach the proper contact person.

We applied a mix of non-probability sampling methods. Existing literature about ABS and bioprospecting cases was screened for company names and contact persons; the same was applied to participation lists of ABS WG meetings. Moreover, we searched on the internet for scientific conferences in the field of natural products research and noted companies and contact persons if available. Also we searched in different sources for associations representing companies in our fields of interest. In total about 38 associations were contacted via e-mail and/or telephone. We informed them about the project and invited them to distribute our survey invitation to their member companies or to provide us with contact details of companies potentially belonging to the target group. About eleven associations actively supported the survey. The number of contacts per association varied strongly, as some selected only companies supposedly belonging to the target group, while others distributed the invitation to all member companies. Following a hint from an expert publishing in the fields of Intellectual Property Rights (IPRs) and genetic resources we also placed the survey invitation in different “linked-in groups”. A certain time after the initial invitation a reminder was sent. Companies for which a telephone numbers and contact person was available were called.

Because distribution channels were used for which the number of invitation recipients is unknown to us, an exact number of addresses cannot be reported. The number of addressees we have knowledge of is about 600. However, it has to be noted that in all probability not only companies actually using genetic resources (target group) received the invitation. Additionally in many cases not the proper contact person might have received the e-mail. Therefore it does not appear useful to calculate a response rate anyhow. The sampling details of the survey are summarised in Table 8.

Table 8: Technical details of the online survey

Tool	EFS survey, online survey in German and English http://www.globalpark.de/efs-uebersicht/efs-survey.html
Period	November and December 2009
Approximate number of addressees	About 600
Number of questionnaires evaluated for Part 1 of the survey	Up to 77
Number of questionnaires evaluated for Part 2 of the survey	Up to 41

Source: Authors’.

A number of incidents during the course of the survey are worth reporting. Several companies called us or wrote emails to give notice that they are not users of genetic resources. Although we conducted a pre-test, some company representatives contacted us and reported that they had problems with the definition of the term "utilisation of genetic resources". A number of addressees said the questionnaire was too long, others had difficulties to abstract their reference project such that they could answer the questions using the standard answering options.

4.2.4 Evaluation Methods

The survey data was evaluated with the statistics program SPSS. The methods include one-dimensional, descriptive evaluations such as frequency counts, cumulated frequencies and Median (appropriate measure for mean value for data with ordinal scales) as well as two-dimensional evaluations with different association measures such as Cramer's V and Kendall's Tau. Cramer's V is used to evaluate combinations in which at least one variable has a nominal scale. Kendall's Tau is applied for evaluations in which either both variables have ordinal scales or one is ordinal and the other dichotomous. Both measure the strength of association between two variables, whereby only the latter indicates also the direction of association (CLEFF (2008); BROSIUS (2007); BÜHL (2005): pp. 250). We conducted significance tests to check with which level probability value (probability of error) the results can be generalised to the population. We applied non-parametric test statistics, because data exploration showed that the vast majority of variables are not normally distributed, and above that maximally ordinal scaled. Cross tabulations were used to visualise associations.

The values for Cramer's-V and Kendall's Tau indicate the degree of association between answering patterns of variables. Non-parametric tests are applied to assess whether the values calculated for the sample data can be generalised to the underlying population (Null-Hypothesis) with an error probability under 5%; with other word whether the test results are significant at a 5%-level.

A deduction of cause-and consequence between the variables based on this sort of analysis, though, is not allowed. However, association of answering patterns is a first indication of cause-and consequence relations and therefore it adds information.

4.2.5 Basic Sample Characteristics

The survey evaluation is split in two parts in the report. The companies sector affiliation respectively the fields of utilisation for genetic resources is part of two-dimensional evaluations in the problem-related part A of the study as well as the governance-related part B. Therefore a description of the sample with respect to sector affiliation respectively utilisation fields of genetic resources is given here.

77 companies that used the link and took a look at the opening page of the survey identified themselves as users of genetic resources in the sense of the survey. For the question (Q2a): "In which fields does or did your company use genetic resources" six fields of utilisation were given as answering options; additionally participants could fill in other fields of utilisation. Table 9 displays the frequency counts; multiple entries were possible.

Table 9: Frequency counts for field of utilisation for genetic resources in the online survey (Q2a)

Frequency of sectors chosen by respondents	**77**
Pharmacy	14
Botanical Medicine	11
Personal Care and Cosmetics	6
Plant Breeding - Seed	27
Plant Breeding - Horticulture	21
Biotechnology, other fields than Pharmacy and Plant Breeding	15
Others	13
Total number of entries	**107**

Source: Author's.

The different fields of utilisation – often called user sectors – are represented with a varying number of companies in the survey. By far most survey respondents selected utilisation for plant breeding purposes. Biotechnology others than Pharmacy and Plant breeding follows on the second, and pharmacy on the third place.

As the relation between number of entries (107) and participating user companies (77) indicates, several companies use genetic resources in more than one field of activity.

Table 10 displays how often each combination of utilisation areas was selected by the same company. Multiple entries reflect the reality. However, they cause difficulties for the evaluation of the survey: in combined evaluations of sector affiliation with other variables of interest each case has to be assigned to one sector, respectively one utilisation group exclusively. Therefore we re-operationalised responses for Qa2[5]. How this was done is explained in the following.

Table 10: Cross tabulation: entries for field of utilisation of genetic resources in the online survey

	Botanical Medicine	Personal Care and Cosmetics	Plant Breeding - Seed	Plant Breeding - Horticulture	Biotechnology, other than Pharmacy / Plant Breeding
Pharmacy	8	3	1	0	4
Botanical Medicine		4	2	1	1
Personal Care & Cosmetics			1	0	0
Plant Breeding - Seed				9	1
Plant Breeding - Horticulture					2

Source: Author's.

[5] As the survey participants were requested to chose a particular project basing on their experiences for answering the questions in part two of the questionnaire, we asked them to specify the field(s) of utilisation for genetic resources aquired within the framework of the project (Q11). The operationalisation of responses in the survey evaluaion is analog to Q2a.

The highest frequency of overlap is between plant breeding in the fields of agricultural crops/seed and plant breeding in the fields of horticulture (nine companies) (Table 10). This caused the idea of subsuming both types of plant breeding, and hence all companies that selected plant breeding into one utilisation category. However, this would only make sense if we do not lose information to characterise and distinguish utilisation forms by aggregation. Therefore, we conducted nonparametric statistical tests[6] comparing the answering distribution of each variable of interest for companies that selected only horticulture respectively only seed. The test results varied meaning that we should not generally merge the two groups into one category, as we would lose information. Instead, we kept the two utilisation groups and added a third category for companies' active in both fields, as they could not be affiliated with either of the existing categories only. The further proceeding in evaluations combining sector affiliation with other variables of interest was based on the test results mentioned above. For variables where tests results indicated different answering distributions we used the three categories for plant breeding (only seed, only horticulture, both). In combinations with variables where answering-distribution do not significantly differ we used a merged category "all plant breeding".

Also a strong overlap is found between pharmaceutical R&D and botanical medicine; eight companies selected both fields of utilisation of genetic resources. Four companies selected biotechnology in other fields than pharmacy of plant breeding and at the same time they also made an entry for Pharmacy. Therefore we extended the category pharmacy to: pharmacy and more than one field of application including pharmacy.

Only six participants selected personal care and cosmetics, and four of them indicated that their companies use genetic resources also in the fields of botanical medicine. Hence we subsumed both fields in one new utilisation category: Botanical Medicine, Cosmetics and Personal Care.

From this it follows, that companies' sector affiliation respectively the field of utilisation for genetic resources is operationalised as either five or seven categories variable in further analysis depending on the handling of plant breeding. This holds for combined evaluations with general questions (Part 1 of the questionnaire) as well as for evaluations in combination with case specific variables (Part 2 of the questionnaire), and also company data (Part 3).

[6] Mann-Whitney U-test is a nonparametric test to evaluate whether two seemingly independent samples come from the same distribution (Bühl (2005): pp. 293). If the distributions do not significantly differ we can aggregate the utilisation forms in one utilisation category.

5 Survey Results – Implementation Problems for ABS-agreements

The research project has the aim to evaluate standardisation measures regarding their applicability and feasibility to support the implementation of ABS agreements particularly by reducing transaction costs. Accordingly the identification of implementation problems was the first task within the empirical surveys of the study. Focus of part A and B of the report is on users of genetic resources. As elaborated in the chapter on methods we conducted a series of user-surveys. Implementation problems were issued in the exploratory interviews, group discussions as well as in the standardised online-survey. Additionally we evaluated Websites of National Focal Points. The results of the surveys with respect to implementation problems are presented in this chapter. Findings from interviews and group discussions are presented combined under the heading “exploratory survey”.

5.1 Exploratory User Surveys – Implementation Problems ABS

To reveal potential sources and components of transaction costs and other problems users participating in the first survey were asked a series of questions. The guiding questions are based on a previous literature review and practical considerations.

The guiding questions:

(1) What kind of problems did you experiences in the process of negotiating and accomplishing agreements for the procurement of genetic resources?

(2) In what stages of the process did you experiences particular problems?

(3) What kinds of transaction costs did you experience (e.g. manpower requirements for negotiations, impediments of research triggered by long waiting times)?

(4) Is the transfer of material common in your field? How do you organise this?

(5) Acceptance of model clauses as instrument to facilitate ABS implementation.

The evaluation of the questions is presented separately for the three user groups we investigated. The findings are summarised subsequently.

5.1.1 Researchers from Public Institutions

Problem identification

Survey findings on overall problems reported by users from public research institutes are summarised in tables three and four. We divided them in problems affiliated with competencies and resources of the user and a second group of problems associated with institutional factors on the provider side.

"Provider-centred problems" are issues users felt were shortcomings related to the governance system, transparency of the regulatory system, legal capabilities or the general position taken by providers towards ABS (see Table 11).

Table 11: Provider-Centred Problems; Exploratory survey, Group: Researchers From Public Institutions

- Negotiation with Providers - Lack of competent contact person - Lack of expertise on provider side to assess access requests (often complex research approaches) - Unclear hierarchy of responsibility regarding ABS issues on provider side - Unclear regulations about other groups, e.g. indigenous people, that have to be consulted (PIC) - Providers lack knowledge of legal situation	- Benefit-sharing - Mistrust of users - Fear of exploitation - Exorbitant claims for benefit-sharing - National ABS Laws - Lack of transparency - Legal systems / procedural requirements vary among different provider countries - Intransparent distribution of benefits increases risk of corruption accusations for user

Source: Authors'.

User centred-issues relate to general lack of information. Moreover, there is a lack of informed contact partners e.g. in legal departments at research institutions. Related to this, researchers have problems to integrate ABS into the planning of research projects, and to practically execute the required steps in the provider country.

Of special interest, and we assume these are typical problems for this group, are issues centred on the integration of ABS principles in research planning (see shaded box in Table 12). This has much to do with the researchers' intermediary position. They are the party engaged in direct interaction with providers, but their institution (e.g. the university) and external financing bodies decide on research policies, the distribution of research grants and in fact often are the contracting authorities in ABS agreements. This means the researchers often are the ones initiating ABS agreements, but have a limited say in negotiations.

Users from the target group public research institutes suggested the implementation of a superordinate entity (e.g. at the CBD level, with representatives of providers and users) to check best practise initiatives like codes of conduct, guidelines, etc. for ABS regarding their consistency with general ABS provisions in the CBD. Such an entity could also provide Guidelines for Memorandums of Understanding (MOUs). MOUs seem to be a useful tool to communicate complex research projects to providers of genetic resources. From the researchers' perspective, the clear communication of what they intend to do with the genetic resources is extremely important. Misunderstandings and mistrust are perceived as sources of impediments in research projects or even the breakdown of cooperation between users and providers.

Table 12: User-Centred Problems in ABS; Research Group: Researchers from Public Institutions

General lack of information and awareness of researchers, responsible actors at research institutions and granting institutions regarding

- Concernment by ABS regulations
- Actual political and legal situation
- limited capacity to achieve & process information on ABS regulations (legal issues are not core competence of natural scientists)
- very limited legal competences regarding ABS of research institutions

Specific case related problems

- Identification of appropriate procedure
- Finding the authorised partner in provider country to negotiate ABS
- Identify other groups that have to get involved according to national ABS laws
- Adapted communication (language, complexity of research intention)
- Definition of fair benefit-sharing offer
- Adequate formulation of agreement in contract

Integration of ABS in research project planning

- Anticipation of research process regarding relevant issues for ABS contract
- Consideration of policies of research institution when defining the utilisation intention and other MTA elements (e.g. benefit-sharing and IPRs)
- Researchers' communication of ABS towards university, granting institutions and industry partners regarding integrating benefit-sharing in project planning
- Bridging finance for the initialisation and negotiation time before project beginning
- Back-up plan to safeguard the research project (risk that ABS negotiations fail)

Source: Authors'.

Material transfer to third parties:

Users from this survey group reported two main types of material transfer to third parties, differing in the utilisation intention of the subsequent user. The regulation of material transfers to subsequent users in ABS contracts is very important for researchers from public institutions because shared material and information among colleagues is a vital key for research progress. Moreover, individual researchers or research groups are often a link in a whole chain of research and development with genetic resources, for instance in cooperation projects with industry partners or with other public research institutions.

Acceptance of model clauses as instruments for the facilitation of ABS

Users from this group are usually not trained lawyers and they only have limited access to legal assistance. In so far capacities of natural scientists – the people actually conducting research and development with genetic resources - are not optimal used if they are required engaging in lengthy administrative procedures and contract negotiations. Users from this target group view each measure that can simplify such procedures as an enhancement. Participants from this group stated that they would very much appreciate a central contact for support in administrative and legal issues on ABS. Saving time, specifically reducing lead times for research activities is an important issue in the public research sector, as researchers and financing are often bound by certain projects with fixed time constraints. However, the discussion and interviews showed that this user group is particularly characterised by extremely heterogeneous ABS cases. This would need to be reflected in the development of model clauses.

5.1.2 Pharmacy and Industrial Biotechnology

Problem identification

A main reason for pharmaceutical companies ceasing engagement in natural product research in recent years have been new technologies allowing the substitution of genetic resources as input for R&D, for instance with combinatorial chemistry. Most survey participants in this group do not see transaction costs as a main impediment to engage in ABS agreements or to cease natural product research. In relation to other cost components of R&D with genetic resources, transaction costs for acquiring the resources are rather moderate.

At first glance these two statements may seem contradictory. The explanation is that most survey participants are active in natural product research since many years and by the time they have established individual strategies of efficient means of procurement. One strategy is to involve Intermediaries in source countries, may it be research institutions or broker companies, are involved in the chain. One of their major responsibilities is to deal with the national administrative access requirements or at least support the company in this. These arrangements might be for efficiency reasons; the intermediaries in source countries better understand the rules of the game in their own country (for instance the language, culture, business practices) and they might face a higher level of trust from the providing entity. Furthermore, the company seeks to distribute a part of the legal uncertainty and image risk inherent in intransparent ABS regimes by establishing in a private contract with the intermediary that the latter will retain resources and transfer them to the company only in accordance with national access legislation. Another strategy is to choose, if possible, a provider country that has unbureaucratic and transparent access requirements in place.

Users from the field of Pharmacy and Industrial Biotech participating in the exploratory interviews and group discussions assess their transaction costs as tolerable. But they stated that transaction costs could be significantly higher, particularly if national ABS regimes are supplemented by compliance measures in the frame of an international regime. Such measures might imply additional bureaucratic efforts which cannot be distributed to intermediaries in the existing arrangements.

A problem of a rather general nature stated by users in this survey group is that ABS is a strongly politicised issue and the expectations for benefit sharing are excessive from their perspective. This leads to a difficult atmosphere for ABS negotiations between users and providers. Related with this is the public perception of bioprospecting activities. Image risks resulting from engaging with providers of genetic resources are seen as a significant threat to companies conducting natural product research. Users see themselves as potential victims of biopirating accusations. The greatest risks are seen under circumstances in which concerned minorities, for instance a local groups or indigenous peoples in a provider country, do not feel or are assumed to be not well represented by the governmental entities who take decisions in ABS negotiations.

Based on these problems the participants of the group discussion saw a potential benefit from the standardisation or harmonization of ABS requirements in provider countries as a means to increase legal certainty for users and circumvent a race to the bottom of ABS standards.

Material transfer to third parties:

As mentioned in the previous section on utilisation intention, material transfers among different stakeholders in the chain of research, development and production of pharmaceuticals and industrial biotechnology products is common practice. Materials and related information are transferred among different entities in the commercial sector, but public research institutions like universities can also be involved in the framework of a research cooperation or contract research.

We can distinguish three main forms of material transfers reported by users of this survey group:

- Outsourcing of certain activities which are part of the R&D program, which means that intermediate products flow back into the chain of the outsourcing user;

- Sales of intermediate products based on genetic resources, whereby these products serve as input in the production process of a different company without further research on the product being conducted (for instance fine chemicals);

- Transfer of genetic resources and/or related information to other users who wish to conduct their own R&D with them, detached from R&D activities of the transferring company.

Users stated that an MTA between the provider and user should contain a clause with the terms of material transfers to third parties. This would determine the value of the resources transferred. The more freely the user can work with the resource, the higher the potential value for the user.

Liability regarding third-party activities was also an issue raised in the discussion. According to the participants, it is a common business practice and in line with international private law that the transferring party (the company which first received material from a provider) is not accountable for actions of subsequent recipients, as long as the transferring party acts in compliance with the contract with the initial provider.

Acceptance of model clauses as instruments for the facilitation of ABS

In this survey group model clauses for ABS contracts were viewed more controversially than in the group previously elaborated. The overall attitude was one of scepticism. The concept and the goals of the instrument, as introduced in the debate on an international ABS regime by the EU, are still unclear to survey participants (although these individuals try to stay current on the overall regime debate). Reluctance to support this measure also seems to stem from a rejection of additional restrictions and a fear of interference with competencies to negotiate bilateral contracts. Confidentiality and competitive aspects are further reasons. An argument raised by participants was that they doubted model clauses could appropriately reflect the heterogeneity of transactions with genetic resources (among others the needs of providers). However, after a lively discussion users tended to find the idea of supportive checklists and guidelines for contracts feasible.

Regarding potential model clauses on utilisation forms for pharmacy and industrial biotechnology, the discussion yielded that utilisation purposes for genetic resources within the field of pharmaceuticals and industrial biotechnology vary, but they can be subsumed to a limited number of categories. This might be a starting point to design model clauses on utilisation intentions/scopes allowed under a certain MTA.

5.2.3 Plant Breeding Companies (seeds)

Problem identification

With one exception our interview partners did not report severe problems or impediments in materials / genetic resource acquisitions. One breeding company reported the failure of an ABS project within which the provision of certain land species of a crop was demanded in exchange for an exchange of scientific staff and breeding cooperation. The project failed because the providing entity was insecure regarding the national access regulations and finally (two years after the request was posed by the company) decided not to grant access.

In other cases personal contacts and trust established during long-term relationships with entities in the provider countries helped to set up arrangements for material transfers and exchanges without bigger problems in terms of negotiations and administrative requirements. Another participant reported that they conducted regular collection expeditions in different target countries in cooperation with a German gene bank and a gene bank in the target country. Here, as described before, a private company cooperates with public entities in the source country to delegate the management of administrative access requirements.

A significant impediment to demand of raw material from Ex-Situ Collections is that such material is often described and evaluated only at a very low level. For most plant breeders the costs to carry out these pre-breeding steps are too expensive and they do not match the commercial expectations of including the material in the breeding programs.

Material transfer to third parties

In the seeds branch of breeding we find a material exchange in various constellations. Breeders from the private sector exchange "raw" genetic resources and breed material with other breeders from both the private and public sectors. This happens mainly via multistakeholder breeding programs under breeders associations (for instance the Gesellschaft für Pflanzenzüchtung, GPZ). The exchange of material and information is a key driver of progress in the sector, as the breeding process is lengthy, costly and often information is generated which is of general interest for the sector but not necessarily confidential. There seem to be strong links (at least in the European crop breeding sector) between the private and the public sectors. Many breeders call for an increase in evaluating material held in ex-situ collections, which would be publicly available information.

According to the statements of interview partners, material is usually transferred with standard or model MTAs which have been provided, for instance, by ex-situ collections in the past. Mutual trust has been mentioned as an important prerequisite for the exchange of material and information among breeders in Germany and also with breeders in source countries of genetic resources.

Acceptance of model clauses as instruments for the facilitation of ABS

The official representatives of the European seed industry ESA (European Seed Association) call for an extension of the scope of the ITPGRFA sMTA on all crops. The standard contract is supposed to be workable and could be applied for all ABS-relevant transactions of plant breeders with crops (ESA (2008): 4). However, in our interviews plant-breeding companies revealed diverging opinions regarding the applicability and feasibility of model contracts for all transactions with genetic resources. Based on their experiences in transactions with gene banks and botanical gardens, some users find this a practical means to keep administrative efforts/costs low, particularly as most small and medium-sized plant breeding companies in Germany have no individual legal department. On the other hand, users engaging in transactions directly with entities in provider countries more strongly stress the individuality of cases, for instance the specific needs of providers and the administrative systems and infrastructure in provider countries. Such agreements would depend more on mutual trust and understanding, what could hardly be reflected in standard contracts like the sMTA. Here model cases would allow for more flexibility.

Breeders in the field of ornamental horticulture (represented by International community of breeders of asexually reproduced ornamental and fruit varieties (CIOPORA)) did explicitly not favour the approach of applying the same ABS system as the seed industry does. They feel as a very distinct industry in terms of the distribution of the value chain, lower monetary benefits created, and less support / engagement of the public sector. The industry trends to be characterised by small or medium sized family driven enterprises, which usually do not have internal legal advisors or even departments who can deal with complex legal issues of ABS. Therefore, if they have to commit to negotiating ABS agreements, instruments that facilitate legal issues would likely be helpful.

5.2 Evaluation of ABS Focal Point-Websites

The member countries to the CBD are very heterogeneous. This applies for their capacities in implementing ABS measures, but also to political priorities and economic interests in genetic resources and ABS issues. Linking this with the fact that national ABS implementation relies on the convention's definitions which lack in clarity and common understanding of key terms for ABS (Young, 2004a), it is no wonder that national ABS regulations and systems vary immensely. Although the number of countries with ABS policies and legislation is increasing during the past years there remain many without, mainly user countries or countries lacking the required capacities (DEUTSCHE GESELLSCHAFT FÜR TECHNISCHE ZUSAMMENARBEIT (2006): 11; DROSS (2005): 21). In 2004 out of 188 member parties only 22% had concluded or developed laws and policies regulating ABS (CARRIZOSA (2004): 9).

Existing national legislation and resulting ABS provisions vary immensely in:

- Scope regarding the regulated subject (genetic resources, biological resources, derivatives etc...) and interpretations of the main CBD terms like "access", "users" and "provider";
- Policy and procedure of prior informed consent (varies in a range from "not needed at all", over "the competent authority just needs to be informed" up to "very restrictive complex procedure with many stakeholders involved");
- Benefit sharing obligations (what kinds of benefits are obligatory, and who is to benefit) (Dross, 2005, p. 43f, p 157f).

Many experts consider the high variation in interpretation and transformation of ABS on national level as one of the major problems in the ABS process. According to Young the "[…] most important underlying causes of failure of ABS processes to operate well, on an international basis relates to the lack of a regulatory level of clarity regarding the nature of ABS concepts, including key matters of coverage and legal authority" (2004b: 8). The insecure international regulatory system is seen as main reason for high complexity and strictness in national access regulations of provider countries. These countries can't rely on the international system and streamline their regulatory systems, as there is no international basis for dispute settlement in case of dissensions in ABS issues (ibid 2004b: 11). TEN KATE AND LAIRD (1999) summarise in their study the user's argumentation towards this issue as follows: „Access legislation introduced in some countries in order to ensure prior informed consent and benefit sharing is unclear, bureaucratic, time-consuming and costly to comply with." As result users tend to avoid those kinds of countries, as many of them in the mean time have build up own collections of genetic resources, or can obtain resources from ex-situ collections in their own countries, partially for free. Under these circumstances, the motivation to negotiate and agree on ABS contracts with source countries declines (ibid. 7; LAIRD AND WYNBERG (2005): pp. 7).

Besides the variation in national ABS laws and regulations we can also identify huge differences in supportive ABS measures, for instance information measures. The Bonn Guidelines recommend the implementation of national focal points (NFP) as information source for potential users, e.g. on application procedures, PIC, MAT, benefit sharing, and contacts of the competent national authorities, and other relevant stakeholders. These NFPs should be made public on the CBDs' official Clearing House Mechanism (CHM) website. We searched the CHM website for information on NFPs: the result is alarming, especially as user surveys showed that the internet is the most important information channel.

Still not all CBD members have implemented NFPs, not all of the implemented NFPs do have websites, and some of the NFPs websites can't even be accessed. Not all the internet sites, registered on the CBD CHM are in fact accessible (see Table 13).

Table 13: Internet presence of National Focal Points for ABS

Continent	No. of CBD members	No. of NFP websites	No. of NFP websites not accessible	Regional Focal Point websites *
Europe (including Russia)	51	27	6	EC Biodiversity CHM (EU + others)
Asia	54	11	3	
Africa	52	20	4	includes 16 countries
South and Middle America (incl. Mexico)	15	10	3	Andean Community (includes 4 countries)
Others (Caribbean, North America, Oceania)	18	8	1	
*the site of the European community and the Andean community (except Bolivia) is additional to the national websites. The African countries covered by the regional website do not have additional national websites.				

Source: own, status July 2007, http://biodiversity-chm.eea.europa.eu/portal_europe; http://www.comunidadandina.org/ingles/intellectual_property.htm; http://bch-cbd.naturalsciences.be

We also tried to elaborate the quality of the websites. As criteria we defined:

- the design of the site (is it clearly arranged so important information can be found easily without time consuming search procedures);
- the language in which it is available (especially important for foreign applicants);
- the kind of information offered (does the site provide useful facts about ABS, like legal regulations, information on PIC procedure, information about contacts to authorities, etc...).

The websites analysed turned out to be very heterogeneous regarding these criteria. From what we consider the users point of view, only few websites are really well arranged, and relevant information is simple to find. Many, especially biodiversity rich countries, only provide information in their official language. For example from all South- and Middle American countries only Costa – Rica has a national website that is available in English. The common website of the Andean Community is in English, too, but the sites of the particular countries are only available in Spanish. The information content of the websites regarding ABS relevant issues is all in all rather minor. On many websites it is difficult to get any information on national ABS regulations, the legislative framework or the competent authorities at all. Most sites content was more focused on information in protected areas. To get useful, concrete information about ABS the user of the website needs to search his way through many submenus, and in case information on legislation exists, it is often only available in the native language.

5.3 Online-survey with User companies – Implementation Problems ABS

In this paragraph a part of the survey results – those that contribute to the identification and interpretation of problems for the accomplishment of ABS agreements - shall be elaborated. Moreover participants' (users) assessment of a range of institutional factors in provider countries shall be presented. To remind the reader: the sample size varies among the questions and sometimes even among items of one question. This is because not all participants answered each question (item), but as the sample size is quit small we decided not to exclude data sets because of missing values for some items. We wanted to use as much data for the evaluation of the survey as possible.

The chapter is structured in six subchapters. The first elaborates experiences with and the perception of transaction costs of the survey sample as representatives for companies using genetic resources. In the second paragraph the survey results regarding the heterogeneity of users are presented and put into relation with transaction costs aspects. We proceed similarly in the following subchapter on characteristics of genetic resources utilisation. Subsequently the participants' experiences and approach regarding the public perception of bioprospecting activities will be elaborated. The second last part deals with the users' assessment of institutional framework aspects in provider countries: how relevant are certain ABS-related institutional measures and arrangements for the users' choice of a provider country to engage in ABS negotiations with? Finally we elaborate a question on users' strategies to minimise transaction costs.

5.3.1 Users' Perception of Transaction Costs and Image related Aspects of Bioprospection

We used four questions to survey information about the users' experiences and assessment of transaction costs and image related problems of bioprospecting activities.

One question evaluates the overall relevance of transaction costs related aspects for users to choose a source for procuring genetic resources. In the second part of the survey all questions refer to a specific case / project the user chose from his experiences according to a list of criteria. As one of the first questions we asked the respondents to indicate how long the initiation time of the project was. Long lead times are mentioned in the literature and in our exploratory survey as an impediment to accomplish ABS agreements. The third question in this context is a three items question. Users were asked to assess whether the negotiations for the chosen project have been long and tedious. Secondly they evaluated transaction costs in relation to other cost components, and thirdly in relation to the value of the genetic resources and related services they received from the provider. In the closing part of the survey we included a question on users' experiences with the public perception of bioprospecting activities, because in literature this has been mentioned as a restrain to demand for genetic resources from provider countries.

The results of the survey for these questions are presented in the following paragraphs. Apart from frequency tables we compiled cross tabulations with "problem related variables" on the one hand and sector affiliation and / or size of the company on the on the other hand to evaluate whether there are (significant) associations or differences.

In Q3 we asked about transaction costs related factors that in general might induce the companies' choice of a supply source. Table 14 displays the results.

Table 14: Frequency table: Transaction Cost aspects of Supply Sources for Genetic Resources (Q3)

Factors for the Selection of Supply Sources for Genetic Resources (If possible consider the activities of your company over the past 10 years.)										
	1= not important at al ... 7= very important									
How important are the following aspects?	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**all**	**median**	**Cumulated frequency cat 5-7 in %**
Short lead and start times	8	3	5	10	6	11	13	56	5	54%
No negotiations about the terms of trade with the provider	4	6	5	10	8	8	11	52	5	52%
Standardised processes for material acquisition	8	7	4	12	7	4	11	53	4	42%

Source: Authors'.

Item 1 "short lead and start times" and item 2 "no negotiations about the terms of trade" have both the median 5, what corresponds to "rather important" on the seven point scale. On average, respondents rated item 3 "standardised processes for material acquisition" less important. The median is 4, which is the exact intermediate category and therewith neither approving nor deprecating. However, for all items all possible answering categories were chosen by several respondents. This means users' assessment of the importance of each item varies over the whole range from "not important at all" to "very important".

We tested whether the importance of the three transaction costs related aspects of procurement from the users' point of view is correlated with the companies' sector affiliation. This was not the case.

The public perception of bioprospecting projects and hence image effects for companies involving in such activities have been mentioned in the literature as a problem and impediment for the demand of genetic resources from provider countries. Also image aspects have been mentioned as incentive to chose intermediaries as providers and circumvent negotiations with the official entity in charge. We elaborate this issue based on our cross sectional survey and asked the participants to report about their companies' experiences and perception of Image-related aspects of bioprospection (Q44). Table 15 displays the results.

Table 15: Company's assessment of the Public Perception of Bioprospection (Q44)

Assessment of public perception of bioprospection / acquisition of genetic resources from provider countries	1= not correct at all ..... 7 = completely correct									
	1	2	3	4	5	6	7	Cum. freq. cat. 5-7	Median	valid entries
1: In the past, our company has had negative experiences with the public perception of acquiring and using genetic resource.	8	11	4	5	3	1	2	18%	2	34
2: Damage to one's image is a potential risk in our industry when conducting bioprospection.	5	4	6	6	3	3	5	34%	4	32
3: We are active in corporate communications / We participate in the public/political discussion to clarify issues surrounding bioprospection.	3	6	4	5	3	6	6	45%	4	33

Source: Authors'.

On a one to seven scale we asked the participants to elaborate in how far different statements regarding image aspects apply for their companies. Only six out of 34 companies answering this question stated their company had made negative experiences with the public perception of acquiring and using genetic resource in the past. The mean value for this item is two - the second lowest category on the seven point scale. Less then half confirmed that damage to the company's image due to Bioprospection is seen as a potential risk within their industry. However, even if only a minority of the participants actually made negative experiences with the public perception of bioprospection, more than half participate in corporate communications and / or political discussions to clarify issues surrounding bioprospection.

The initiation time for a project is a transaction cost factor. The initiation causes real efforts e.g. time of employees. Moreover, capacities of a company which are put on hold for a "project with genetic resources in the pipeline" are not available for other projects. So, engaging in initiating a project induces "opportunity costs"[7]. The longer the timeframe of initiation, the more likely other good project opportunities turn up and the company changes plans. Therefore the timeframe of initiation is a relevant aspect in the context of transaction costs.

[7] Opportunity costs are costs of foregone income; they reflect the value of the second best solution, here the potential benefits of alternative projects.

For the chosen project we asked the survey participants to indicate how long the initiation of the agreement – from the initial contact to the first activity of the provider – took (Q18). The statements were aggregated to four categories. The results are displayed differentiated by sector affiliation of the companies in Table 16.

Table 16: Cross tabulation: Initiation Time and Sector Affiliation

	Initiation time for the project to commence				
Sector affiliation	**less than 6 months**	**6 up to 12 months**	**longer than 12 up to 24 months**	**longer than 24 months**	**all**
Pharmacy; Pharmacy and Botanical Medicine	1	2	1	0	4
Botanical medicine, Care and Cosmetics; Botanical Medicine and Care and Cosmetics	0	0	1	1	2
Plant Breeders (Seed, Horticulture, and both)	6	5	5	1	17
Biotech others than Pharmacy and Plant Breeding	1	2	0	0	3
Biocontrol agents	0	1	0	0	1
All	8	10	7	2	27

Source: Authors'.

Ten out of 27 respondents chose a timeframe between half a year and one year. Eight respondents stated they needed less than six months from first contact to first action of the provider, and seven chose category one year up to two years. Only two respondents reported an initiation time over two years.

Companies were required to choose as, reference for this survey part, a project which has reached the contracting phase (initiation is concluded) and which at this point has not been revoked and there is also no foreseeable revoking of the agreement. By using these criteria we created the prerequisites that the projects serving as information reference are successfully implemented – successful in so far as transaction costs did not prohibit them. This could be because transaction costs weren't that high or at least not in comparison to other cost components in the project, and / or because they were acceptable regarding the value of the transaction.

In question Q 40 we asked the companies whether in their reference project negotiations were tedious (proxy for transaction costs in the initiation phase). Secondly, they evaluate transaction costs covering initiating the agreement, ongoing communication with the provider, renegotiations, as well as monitoring measures in relation to the value of the transaction subject and in relation to other cost components of the project. The answers of users in our sample are displayed in Table 17.

Table 17: Frequency table: Respondents' assessment of Transaction Cost aspects in reference cases (Q40)

	1= not correct at all ..... 7 = completely correct									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**all**	**median**	**Cumulated freq. cat. 5-7**
1: Negotiations are / were tedious and difficult.	5	9	0	5	2	4	3	28	3	32%
2: The effort level is acceptable in comparison to the value of the resources and related services acquired in the framework	0	4	2	2	9	10	4	31	5	74%
3: The effort level is low in comparison to other cost components of the project.	1	7	4	4	7	5	3	31	4	48%
Transaction costs were here defined as: effort for the initiation of the agreement, ongoing communication with the provider, renegotiations, as well as monitoring measures in the project.										

Source: Authors'.

Half of the respondents rejected the proposition that "Negotiations are / were tedious and difficult" in the project they were referring to. Another 5 were neutral and 12 confirmed that they experienced tedious and difficult negotiations in this specific case.

Three quarter answered that the effort level was rather up to fully acceptable in comparison to the value of the resources and related services their company acquired in the framework of the project. The most depreciative category (1) was not chosen by a single respondent. One might think that only users that experienced uncomplicated negotiations state that transaction costs are acceptable in relation to the transaction value, but statistical tests did not support this assumption. Hence, the results do not indicate that acceptability of transaction costs is associated with the actual transactional efforts.

For the third item - "The effort level is low in comparison to other cost components of the project" – answers cover the whole range of the 7 point scale. Although the two most extreme values (1 and 7) have been chosen least often and the median is the neutral centre of the scale (4), most respondents made an affirmative or a depreciative statement. This means that our sample covers projects where transaction costs make a significant part of the total costs, but also projects where transaction costs are rather negligible.

We tested if there would be a correlation between the transaction costs items and the utilisation field for genetic resources in the project. This was not the case (see Table A2Table A 1: Internet links on Model MTAs and experiences reported by responsible institutions

Name & Link
SMTA of ITPGR http://www.planttreaty.org/smta_en.htm

Model contract for ABS of the Australian Government http://www.environment.gov.au/biodiversity/science/access/model-agreements/index.html
BIO Guidelines & BIO Model contract for Bioprospecting activities http://www.bio.org/ip/international/200507memo.asp
LOC & MOU (US National Cancer Institute; http://ttc.nci. nih.gov/forms/
SLA: http://www.nhlbi.nih.gov/tt/docs/sla_mta.pdf UBMTA: http://www.nhlbi.nih.gov/tt/docs/ubmta.pdf
Science commons http://mta.sciencecommons.org/
MOSAICC, Model MTA and Checklist: http://bccm.belspo.be/services/bccm_mta.php ((in the final phase of this project we got notice that the Organisation is working on an updated instrument)

Source: Authors'.

Table A2). We also investigated a range of combinations of transaction costs variables with user and utilisation characteristics utilisation. Both types of factors might be associated with the users' perception and assessment of transaction costs and other implementation impediments. In the following sections we introduce the variables that potentially contribute explaining variation in transaction cost perception and subsequently evaluate the results of association tests between transaction cost and explanatory variables.

5.3.2 Heterogeneity of User' Company's Capacities and Transaction Cost

As proxies for company size we used the number of employees (Q45), and the turnover in the year 2008 (Q46), as well as the average R&D budget in the years 2004 to 2008 (Q48). Answering categories were defined after conferring with an expert from the German Association of Research-based Pharmaceutical Companies (VFA).

Table 18 shows that the sample contains companies covering the whole scale of numbers of employees. However, the categories "less than 10" and "between 50 and 250" have been selected most often, while only one company selected the highest category with more than 10,000 employees.

Table 18: Crosstabulation: Number of employees differentiated by companies' fields of utilisation of genetic resources

N: 35	**Number of employees in the year 2008**						
Fields of utilisation selected by the respondents	< 10	10 - 50	> 50 - 250	> 250 - 500	> 500 - 1,000	> 1,000 - 10,000	Above 10,000
Pharmacy and more than one application field including Pharmacy	2	0	0	2	2	1	0
Botanical Medicine; Cosmetics and Personal Care	0	1	0	0	1	0	0
Plant Breeding (Seed & Horticulture)	4	4	8	1	2	0	0

Biotechnology, other fields than Pharmacy and Plant Breeding	2	1	0	0	0	2	1
Biocontrole Agents	0	0	0	0	1	0	0
All	8	6	8	3	6	3	1

Source: Author's.

Table 18 also displays the distribution of responses for number of employees differentiated by utilisation group. While responses for companies using genetic resources in the field of pharmacy span the smallest as well as the second highest category, plant breeders are concentrated on the lower categories.

Table 19 shows responses on company turnover for the year 2008 differentiated by utilisation group. Highest frequency counts occur for the three lower categories.

Table 19: Crosstabulation: Companies' Turnover in fields of Utilisation of Genetic Resources

N: 30	**Turnover in Million Euro (€) and US Dollar ($) Numbers refer to the year 2008**							
Fields of utilisation	**€**	< 2	2-10	> 10-50	> 50-250	> 250-1,000	> 1.000-5,000	> 5,000
	$	< 3	3-15	> 15-74	>74-370	< 370-1,500	> 1,500-7,400	> 7,400
Pharmacy and more than one application field including Pharmacy		2	0	1	2	0	0	0
Botanical Medicine; Cosmetics and Personal Care		0	0	0	1	0	0	0
Plant Breeding (Seed & Horticulture)		5	5	7	1	0	0	0
Biotechnology, other fields than Pharmacy and Plant Breeding		2	1	0	0	0	1	1
Biocontrole Agents		0	0	0	1	0	0	0
All		9	6	8	5	0	1	1

Source: Author's.

Only two companies, both affiliated with the group utilising genetic resources for biotechnology in other fields than pharmacy and plant breeding, selected the highest respectively the second highest turnover category.

About half of the respondents indicated that the average R&D budget for the years 2004 to 2008 was lower than 1million € (equal to 1.5 million $), and the accumulated frequency for the lowest two categories (up to 10 million €) is 80% (23 companies).

Table 20: Crosstabulation: R&D Budget differentiated by Companies' Fields of Utilisation of Genetic Resources

N: 29	R&D budget in Million Euro (€) or US Dollar ($) Numbers refer to the approximate average between 2004 and 2008							
Fields of utilisation	€	<1	1-10	>10-50	>50-100	>100-250	>250-500	>500
	$	<1.5	1.5-15	>15-74	>74-150	>150-370	>370-740	>740
Pharmacy and more than one application field including Pharmacy		2	1	1	0	0	0	1
Botanical Medicine; Cosmetics and Personal Care		0	1	0	0	0	0	0
Plant Breeding (Seed & Horticulture)		9	6	1	1	0	0	0
Biotechnology, other fields than Pharmacy and Plant Breeding		3	0	0	0	2	0	0
Biocontrole Agents		0	1	0	0	0	0	0
All		14	9	2	1	2	0	1

Source: Author's.

Variation in company size is existent in the sample, even if higher categories have been selected significantly less often for each of the proxies.

We assume that company size is relevant for the respondents' perception of transaction costs. Therefore we calculated the level of association between transaction cost variables and three proxies for direct capacities: the number of employees, the turnover, and the budget for research and development. The statistically significant results are displayed in Table 21.

Table 21: Measures of Association: Assessment of Transaction Costs with Companies' direct capacities

	Measure of Association Kendall' s Tau-b		
(variables are aggregated to five category scales)	**Value**	**Approx. significance**	**N**
Turnover * Negotiations are / were tedious and difficult.	0.31	0.035	27
R&D Budget (2004-2008) * The effort level is low in comparison to other cost components of the project.	-0.4	0.004	30

Source: Authors'.

Kendall' s Tau-b is positive and significant for the combination of company size proxy "turnover" and the respondents' assessment of tediousness and difficulty of the negotiation process. This means bigger companies did more often assess negotiations as difficult and tedious. However, this might very well relate to the type of relation/project, and not to the company sizes. Possibly, larger companies initiate more complex projects. The size of R&D budget is negatively associated with the participants' assessment of transaction costs in relation to other cost components in the reference project on a 0.4% significance level.

Additionally to direct measures of the company size we surveyed information about the company's so called "indirect capacities" (Q41). Indirect capacity means the level of experience a company has with conducting complex long-term projects, especially with partners in developing or newly industrialising countries. The results of these questions are displayed in Table 22.

Table 22: Frequency table: Companies' self-assessment of "Indirect Capacities" to Execute Complex Projects (Q41)

	1= not correct at all ... 7 = completely correct									Cumulated frequency category 5-7
	1	2	3	4	5	6	7	all	Median	
1: Our company has a high capacity to execute long-term, complex projects.	4	3	6	3	3	4	11	34	5	53%
2: Our company already has experience in the past of executing complex long-term projects.	2	6	5	3	2	5	11	34	5	53%
3: Our company is experienced in projects with partners from developing or newly industrializing countries.	5	7	5	4	3	5	4	33	3	36%

Source: Authors'.

About half of the respondents stated that their company has experience in executing long-term, complex projects. The same share of respondents evaluates their companies' indirect capacity as rather high or high. For both items the median corresponds to answering category 5 (rather correct). However, only 12 out of 33 respondents indicated they were experienced in projects with partners from developing or newly industrialising countries.

The items one and three of indirect capacities are significantly correlated with the companies' sector affiliation. The test results are displayed in Table A3Table A3. Table 23 shows the responses differentiated by sector affiliation. Participants from category pharmacy (and additional fields of utilisation) assess their companies' capacity to execute long-term, complex projects answered rather heterogeneous. Responses by plant breeders are heterogeneous on the overall assessment of indirect capacities, but homogeneous regarding experiences with project partners from developing or newly industrialising countries. Only a minority of respondents confirmed capacities in this field.

Table 23: Crosstabulation: Companies' self-assessment of Indirect Capacities differentiated by Sector

	1= not correct at all ..... 7 = completely correct								Cum. freq.
Our company...	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**all**	**cat. 5 - 7**
... has a high capacity to execute long-term, complex projects									
Pharmacy and more than one application field including Pharmacy	1	0	2	0	0	2	2	7	**57%**
Botanical Medicine; Cosmetics and Personal Care	0	0	0	2	0	0	0	2	**0%**
Plant Breeding (Seed & Horticulture)	3	3	3	0	3	1	5	18	**50%**
Biotechnology, other fields than Pharmacy and Plant Breeding	0	0	1	1	0	1	3	6	**67%**
Biocontrole Agents	0	0	0	0	0	0	1	1	**100%**
... is experienced in projects with partners from developing or newly industrialising countries									
Pharmacy and more than one application field including Pharmacy	0	0	2	1	1	2	1	7	**57%**
Botanical Medicine; Cosmetics and Personal Care	0	0	0	0	0	1	0	1	**100%**
Plant Breeding (Seed & Horticulture)	4	7	3	1	0	0	3	18	**17%**
Biotechnology, other fields than Pharmacy and Plant Breeding	1	0	0	2	2	1	0	6	**50%**
Biocontrole Agents	0	0	0	0	0	1	0	1	**100%**

Source: Authors'.

The evaluation of this question of our survey yields one important result: altogether we observe a huge heterogeneity among the respondents regarding the level of capacities to execute long-term and complex projects, not only between fields of utilisation, but also within what is often called a "user sector".

Strategic management theory states that indirect capacities of actors help to minimise transaction costs in complex projects. Therefore we predict that users with high level of experience should be able to accomplish an agreement with less initiation problems than users without this kind of experiences. We tested this hypothesis by testing for association between the transaction cost variable "Negotiations are / were tedious and difficult" and all three indirect capacity items: none of the results is statistically significant.

5.3.3 Uncertainty of Genetic Resources' Utilisation and Transaction Costs

Not only the company's characteristics but also the characteristics of the utilisation process for genetic resources might influence transaction costs and how users perceive them. If uncertainty is high, for example in terms of unpredictability of R&D output (technically and or economically) or technical change is fast and therefore additional investments might be necessary during the course of R&D, it is difficult to define fair sharing of economic rents ex ante. A high level of this type of uncertainty requires more flexible and adaptive compensation mechanisms in ABS agreements. However, this increases the risks of opportunistic behaviour from both partners, and hence mechanisms to circumvent opportunism will presumably be adopted. The nature of such agreements is more complex and transaction costs to reach, adapt, and enforce the agreement are likely to be high.

To elaborate primary uncertainty in relation with users' perception of transaction costs we included a range of questions (Q30) in the survey. Table 24 summarizes the responses.

Table 24: Frequency table: Companies' assessment of Primary Uncertainty (Q30)

	1= not correct at all ... 7 = completely correct							valid entries	cum. freq. cat. 5-7
	1	**2**	**3**	**4**	**5**	**6**	**7**		
1: The utilisation process for genetic resources is completely unpredictable at the beginning of the project.	1	5	5	10	5	6	7	**39**	**46%**
2: At the beginning of the utilisation process, we are not able to anticipate commercial output at all.	2	6	2	6	6	11	7	**40**	**60%**
3: The technology in our field of use changes quickly.	6	9	0	6	5	7	4	**37**	**43%**
4: The genetic resources from the project will be used for research and development of products for new / uncertain markets	4	1	3	6	9	8	6	**37**	**62%**

Source: Authors'.

The sample shows a heterogeneous overall picture about primary uncertainty for utilisation of genetic resources as we operationalised in the questionnaire. For each item responses are distributed over the full range of possible answering categories. 16 out of 39 respondents confirmed or rather confirmed that "the utilisation process for genetic resources is completely unpredictable at the beginning of the project." Item 3 operationalises technological change as an indicator for unpredictable investments that might become necessary during the utilisation process. About 40% of the companies stated that technological change in their field of application is fast. 60% of the respondents rather to fully agreed that "at the beginning of the utilisation process, we are not able to anticipate commercial output at all." (Item 2). 62% of the users in our sample use genetic resources from their reference project for research and development of products for new and / or uncertain markets.

The evaluation of responses shows that utilisation of genetic resources is not always carried out under highly uncertain circumstances. However, in our sample a significant part of projects is characterised by a high level of uncertainty – in terms of the outcome of R&D with genetic resources, technological change, and in terms of the target markets (demand). Accordingly, we consider primary uncertainty as a relevant factor for transactions costs and worthwhile further investigations.

We tested whether there is a significant correlation between primary uncertainty and transaction costs. The association of “market and demand uncertainty ”with “The effort level is low in comparison to other cost components of the project” is significant and has a Kendall’ s Tau of 0.4 (see Table A4Table A4). This indicates that respondents procuring genetic resources for research and development projects for new / uncertain markets assess transaction costs lower in comparison to other cost components of their R&D projects.

One reason for companies engaging in new and uncertain markets in comparison to other companies assess transaction costs lower in relation to other cost components might be that R&D costs in “new markets” tend to be very high.

The tests were statistically not significant for all other item combinations. Consequently, our overall hypothesis about a relation between uncertainty and transaction costs – at least the way we operationalised it – is not supported empirically.

We assumed that in different fields of application for genetic resources the level of primary uncertainty would differ. However, statistical tests did not support this assumption meaning the sample does not provide evidence that users from different sectors – different fields of utilisation perceive primary uncertainty significantly different (see Table A5). This again is an important result of the survey: Primary uncertainty is not a challenge only in a certain “user sector”. It can be present and hence affecting ABS-negotiations across application fields for genetic resources.

5.3.4 Heterogeneity of Provider Types

Another factor of interest with regard to transaction costs is the providing party or parties in an agreement about genetic resources and related services. As elaborated in the chapter on methods we required the survey participants to chose a project as reference in which "The genetic resources were acquired directly from their country of origin, whereas officially authorised actors from the provider country were involved in the negotiations (even if intermediaries are or were involved for support)." In the survey we operationalised the question "With which provider type did your company negotiate access and use for genetic resources and related services in order to reach an agreement for this project?" by offering the user a range of different types of entities to chose from (Q15). Multiple entries were possible. Table 25 displays the results.

Table 25: Frequency table: Provider Types in Reference Projects of the online survey (Q15)

Number of valid cases= 43; **Number of valid entries= 62**	**frequency**	**Percent of entries**	**Percent of valid cases (number of respondents)**
1: National or regional authority in the provider country, such as environmental agency or ministry	10	16%	23%
2: Local authority in the provider country	8	13%	19%
3: A local group / indigenous community in the provider country	4	7%	9%
4: National biodiversity institute or equivalent institution that is authorised by the government to manage resources and grant access	8	13%	19%
5: Research institutes in the provider country (such as universities)	25	40%	58%
6: Others	7	11%	16%

Source: Authors'.

The overall number of valid entries for all six items is 62, and exceeds the number of respondents (cases) by 19. Twelve out of 43 respondents made multiple entries indicating that more than one type of entity was involved in the project on the provider side. Only 15 users (35%) responded a national or regional authority in the provider country (such as environmental agency or ministry) and/or a local authority in the provider country were involved as providers (multiple entries not counted double, therefore the sum is not 18 as table would suggest). On the other hand 15 users indicated that from the provider side only a research institute in the provider country was involved. In total 25 (almost 60% of the respondents) users stated a research institute in the provider country was involved in the project. Taken both figures together we yield an important result: Research institutes in provider countries are key actors for implementing ABS.

We assume that the provider type or the number of providers involved in ABS negotiations have an influence on transaction costs, especially for contract negotiations. Interviews in our exploratory survey indicated that the involvement of administrative entities can impede negotiations, especially if competences are often not clearly attributed. Now we want to test whether there is a significant correlation between the provider type and the perception of transaction cost. We constructed two different tests:

1: Differentiation of the sample in cases (a) in which national regional or local governmental administration entities are/were involved as provider entities and (b)) projects in which no such entity was involved.

2: Differentiation of the sample in projects in which (A) the provider entity was only (!) a research institute and (b) projects with (additional) other provider entities.

The first test yielded significant results. Users indicating that national, regional, or local governmental administration entities were involved in negotiations chose significantly higher categories on the transaction costs-Item "Negotiations are / were tedious and difficult" (see Table 26, test statistics see Table A6). The hypothesis is therewith supported. The second test was not significant.

Table 26: Crosstabulation: Assessment of Transaction Costs differentiated by Involvement of national, regional and / or local Governmental Administration entities as Providers

National, regional and / or local governmental administration entity was involved…	Negotiations are / were tedious and difficult. 1= not correct at all ..... 7 = completely correct							
	1	2	3	4	5	6	7	all
Yes	0	3	0	2	2	4	0	**11**
No	5	6	0	3	0	0	3	**17**
all	**5**	**9**	**0**	**5**	**2**	**4**	**3**	**28**

Source: Authors'.

5.3.5 Institutional Factors in Source/Provider Countries

The exploratory survey revealed that many users experienced problems and high transaction costs when trying to accomplish an agreement in relation with the institutional framework in the provider country. We subsumed information from literature and from the exploratory survey to 14 institutional items covering many different aspects of institutional frameworks. Items one to four cover mostly aspects of the provider countries' ABS-related information management and measures to guide potential users in complying with ABS requirements. Items five to nine deal with the provider countries' organisation of ABS negotiations and the legal capacities. Items ten to twelve are related to the providers' scientific capacities respectively capacities in the context of biodiversity / genetic resources. Finally items 13 and 14 shall indicate the provider country's own incentives to attract users and successfully negotiate agreements.

We asked the users to evaluate how relevant each item is for the company to determine the selection of a provider country for genetic resources (Q6). The respondents could rate the items on a one (not important at all) to seven (very important) categories scale. The results are displayed in Table 27.

47 to 50 participants evaluated the questions. We calculated the median and a cumulated frequency of category 5 to 7 to revise and compare the results among the different items.

Except for item 14, all aspects reached a median of at least five (clearly on the affirmative side of the 7-point scale) and an affirmation level of more than 50%. We interpret these overall results as verification of findings from interviews with individual stakeholders in the framework of our exploratory survey: These institutional aspects matter for most user entities searching for a partner country to procure genetic resources and related services. The survey results can be used for an evaluation of national ABS institutions. Moreover, they can help to identify priorities when measures shall be taken to improve institutions with the aim of attracting users of genetic resources.

In the following, differences in the degree of relevance among the items shall be elaborated. Three items of the group “Information and support” reached over 70% affirmation by the survey respondents. These aspects are most likely important to keep transaction costs down during the initiation phase of a project. The respondents’ answers indicate that they are relevant. Two items of the second group “legal system and capacities” reached affirmation by more than 80% of the respondents. This are item 6 “a clear distribution of competences for actors involved in access negotiations” and item 9 “A reliable legal system”. Both items reflect the aspect of legal certainty for users. The items of category scientific and biodiversity-related capacities relate to information asymmetries and transaction costs in negotiations. We assume that in a situation where providers have a scientific understanding of the users’ utilisation plans and a concept to evaluate the economic potential of genetic resources information asymmetries are easier to overcome and transaction costs in negotiations can be reduced. Users’ assessments of these institutional aspects are also affirmative on average, but less considerable compared to foregoing aspects. The two items of the “self-incentives-category” reached the lowest rates of affirmation. Only 39% of the participants evaluated the “Self-interest of the government of the provider country to attract foreign companies for bioprospecting, etc.” as rather up to very important. However, 14 respondents rated this item as important or very important. 28 respondents stated that the existence of potential research partners is a relevant factor. Especially the heterogeneity of responses for the last two items underpin that users proceed differently when they procure genetic resources and hence they have very different requirements for provider countries.

Table 27: Companies' assessment of the Relevance of ABS-related Institutional Factors in Provider Countries (Q6)

How relevant are the following characteristics of institutional frameworks of provider countries for your company in determining the selection of a provider country for genetic resources?	1= not important at all … 7= very important							Cum. Freq. of Cat. 5 to 7	Median
	1	2	3	4	5	6	7		
1: Competent contact partners in the administration are designated and reachable	3	2	3	5	5	12	20	74%	6
2: Information about the national system for access and use of genetic resources (GRs) are available online	5	2	3	7	8	8	16	65%	5
3: Information (as defined above) is available in English	2	2	3	7	5	8	23	72%	6
4: When necessary, an official representative facilitates communication with local / indigenous groups	2	4	3	5	11	8	16	71%	5
5: National regulations for the access and use of GRs are in place	4	3	4	6	7	10	14	65%	6
6: Clear competencies of actors for access negotiations	2	3	1	3	3	11	25	81%	7
7: Legal competency of participants in access negotiations	3	3	3	4	8	10	17	73%	6
8: Centrally managed access procedure for GRs	5	4	1	12	5	9	11	53%	5
9: A reliable legal system	2	3	3	1	2	7	31	82%	7
10: Provider country can provide information about biodiversity	4	9	0	6	9	7	17	63%	5
11: Provider has a concept for resource evaluation	2	6	3	6	4	10	14	62%	6
12: Scientific competency of participants in negotiations	1	6	6	3	10	15	9	68%	5
13: Existence of potential local research partners	2	4	7	7	10	10	8	58%	5
14: Self-interest of the government of the provider country to attract foreign companies for bioprospecting, etc.	9	10	1	8	4	7	7	39%	4

Source: Authors'.

5.3.6 Users' Strategies to Minimise Transaction Costs

The literature suggests that intermediaries play an important role for transactions with genetic resources. Users involve them to keep transaction costs low and as a mechanism to ensure a certain level of quality for material. Another strategy to keep transaction costs low could be to rely on previously established relationships. A certain pre-existing level of mutual trust and understanding can smoothen negotiations for complex transactions / projects. Case studies indicate that users select local research partners in provider countries as a further strategy to circumvent transaction costs. The user company outsources the task of dealing with administrative requirements. This might reduce the absolute transaction costs for achieving required permissions from authorities. Firstly, the involvement of local research institutes might increases the authorities' incentives not to blockade projects and secondly local entities presumably have skills like language, cultural knowledge, and knowledge about official and unofficial institutions. Finally, in the debates about an international regime it is often argued that transaction costs for accomplishing ABS agreements are excessively high, when provider countries' ABS-related institutions are insufficient. Our exploratory surveys indicated the same. Therefore we assume that experienced users chose provider countries with solid institutional frameworks as a means to keep transaction costs low.

In the survey we asked those companies indicating having experiences with procuring genetic resources from provider countries, to report which of the before elaborated strategies they apply to keep transaction costs[8] at a minimum level (Q 9). Multiple entries were possible. Table 28 displays the frequencies and the shares of the different strategy-items with respect to the number of respondents and the number of valid entries.

Table 28: Frequency table: Companies' Strategies to Minimise Transaction Costs (Q9)

Company's strategies to minimise transaction costs resulting from the acquisition of genetic resources from provider countries.			
Number of respondents: 52; Number of valid entries: 92	**Frequency**	**%- of respondents**	**%- of valid entries**
We involve intermediaries.	14	37%	21%
We rely on previously established relationships.	31	60%	34%
We work with local research partners.	28	54%	30%
We select provider countries with solid institutional frameworks.	19	27%	15%

Source: Authors'.

[8] Here transaction costs were defined as the time invested by employees, costs for external expertise, and travel costs for initiation, communication, and monitoring measures and renegotiations.

Table 28 shows that 60% of the respondents – equivalent to 31 companies experienced with procurement of genetic resources from provider countries – rely on previously established relationships as means to keep transaction costs low. Almost as many companies stated that they work with local research partners. The two other items have been selected significantly less often.

In some ways this result is surprising. It does not reflect the impression we received from the literature. We assumed that the involvement of intermediaries would score higher in comparison with the other items. Especially provider countries can learn from this result. To attract users and to keep transaction costs low - and therewith prepare the ground for higher mutual benefits of ABS agreements – they should strengthen local research capacities and support initiation of contacts and exchange with user industry / groups and the building of understanding and mutual trust.

6 Discussion Problem Analysis (Part A)

Part A of the report gave an introduction to the background, the aims and the approach of the project. Also we gave a short overview on the research subject - ABS for genetic resources and stakeholders to ABS agreements and elaborated on the research methods applied in part A and B of the study.

The theoretical concepts developed in chapter three of Part A created the basis for an in depth analysis of stakeholders' problems in accomplishing ABS agreements. The findings of the respective empirical surveys were presented in chapter five. The theory chapter also introduced a concept for characterising the ABS instruments in the focus of this research (menus of model clauses for ABS contracts and a fully fledged multilateral ABS system) against the background of standardisation theory.

In this concluding chapter for Part A results of the problem-analysis shall be summarised and discussed with respect to the features of the two considered ABS instruments. Therewith we motivate following research on design and implementation aspects of the two approaches that is presented in Part B and Part C of this report.

6.1 Summary of Findings – Problems of Accomplishing Bilateral ABS Agreements

Within the framework of the exploratory user survey we aimed at identifying problems occurring in the initiation and accomplishment of ABS agreements. In the individual interviews and group discussions we aimed at exploring problems. The standardised online-survey was used to highlight heterogeneity of user companies with respect to presumably transaction cost relevant characteristics. Another main point of interest was the heterogeneity of users' transaction cost perception in projects with procurement of genetic resources from source countries. Moreover, we tested for association of company characteristics, utilisation uncertainty and the provider type with the transaction cost perception, to learn about potential factors for variation.

6.1.1 Identification of Problems – Summary Results Exploratory Survey

The problems user entities indicated in the exploratory survey were classified in three main categories:

- User-centric problems consist primarily of a lack of awareness, insufficient information, and legal incapacity. Depending on the decision-making structures within a user entity, more than one actor is involved in the process of contract negotiations. In that case communication problems among different stakeholders on the user side are also potential problems. Particularly at public research institutions, unawareness and uncertainty about the implications of how to handle ABS in administrative and legal departments can cause problems.

- Provider-centric problems included similar shortcomings on the provider side as elaborated on the user side. Further problems result from a low level of trust and partly exorbitant expectations regarding benefit sharing (according to some participants).

- The third problem category is linked to the imprecise provisions on ABS in the CBD and resulting heterogeneous implementation on the national level.

In chapter two different steps of ABS were elaborated and aligned with types of transaction costs (see Table 1). Partly the problems indicated in the survey can be translated into transaction costs.

Many users indicated transaction costs of search and initiation as well as communication costs occur - problems related to the process of finding contact partners and initiating a project. Negotiation costs, decision costs and agreement costs have also been reported by several users. They seem to be particularly high if either one or both parties lack experiences, and/or general legal capacities, but also if the understanding of what would be fair compensation for access to resources and related information diverges extremely, and when decision competencies on the providers' side is unclear.

Adjustment costs are costs to renegotiate and adjust the terms of trade during the project, for instance if circumstances change. Users from public research institutes and from Pharmacy reported that they procure genetic resources partly in long-term projects, where adjustments of the agreement are necessary. How to deal with renegotiations is difficult, particularly for entities with low legal capacities. A particular problem for renegotiations occurs if political and/or legal frameworks are likely to change in the meantime.

The exploratory survey did not reveal information about users' experiences with monitoring and enforcement costs.

Another type of problem is related to (potential) material transfer to third parties / subsequent users. Altogether we found strong linkages for the exchange of materials between the private and the public sectors. Researchers from public institutions also frequently exchange material and information with each other. Exchange with commercial entities is especially important as public researchers often depend on the private sector for project funding and vice-versa, meaning that companies outsource parts of their research programs to the public sector. In drug research and development, companies and public institutions collaborate even at the stage of acquiring genetic resources. In the plant breeding sector the linkages between private and public sector are also very strong, both in joint research projects where several companies and public institutions collaborate in basic research, as well as in bilateral collaborations between a plant breeding company and for instance a working group at a university institute. Menus of model clauses should contain clauses on material transfer and should reflect the strong interlinkages between the two sectors.

A tricky question involves liability regarding potential inappropriate actions of third parties. Particularly the users from pharmacy and industrial biotechnology expressed a strong resistance to a model in which the initial user is liable for subsequent recipients' actions. With whom subsequent users shall be required to negotiate MTAs is a core question of liability in ABS. The legal implications of the different options need to be discussed more extensively with experts from fields other than economics, e.g. lawyers.

6.1.2 Interlinking Problems and Case Characteristics – Summary results Online-Survey

The online-survey showed that user companies assess transaction cost-related aspects of supply as relevant for the selection of a source to procure genetic resources: "short lead and start times" and "no negotiations about the terms of trade" were on average assessed as "rather important". About a third of the companies stated that "Negotiations are / were tedious and difficult" in their reference project, and less than one third of the projects had an initiation time under six month. Several users responded that transactional costs make a significant part of the overall project costs in their reference case. However, the majority assessed the effort level as rather up to fully acceptable in relation to the value of the resources and related services their company acquired in the framework of the project.

Since we requested the participants of the online-survey to select as reference case a "successful" project[9], the results might be biased meaning they are likely shifted to the positive side. In the population of projects including ceased projects the level of problems and transactional costs is likely to be higher. Due to limited capacities in this project users from public institutions were not considered in the online-survey. Findings from the exploratory surveys indicated, however, that in this user group transactional costs probably matter significantly because of highly constrained legal and organisational capacities of the researchers.

The online survey demonstrated a huge heterogeneity among companies regarding characteristics supposedly influencing the transactional capacities. Companies differ in size and therewith direct capacities, such as access to in house lawyers or funds for external consultants. User entities, however, also possess different indirect capacities, such as experiences with complex long-term projects and projects with partners from developing or newly industrialising countries. The absolute minority of respondents is experienced with project partners in developing countries or countries in transition.

We can note that the base of operations varies among users. Some possess high direct and/or indirect capacities, others have very limited resources, and also primary uncertainty of the R&D process with genetic resources varies among users. However, the results of the online-survey do not support our assumption, that the characteristics of a user entity or the utilisation uncertainty significantly determine the users' perception of transaction costs. Only the combined evaluation of transaction cost perception with the provider type involved in the reference projects yielded interpretable, significant test results. Users indicating that national, regional, or local governmental administration entities were involved in negotiations chose significantly higher categories on the transaction costs-Item "Negotiations are / were tedious and difficult.

Based on literature and the exploratory survey we defined 14 aspects of institutional ABS systems in provider countries. Survey participants assessed the relevance of each item with respect to the choice of a potential partner country for procuring genetic resources. Except for item 14, all factors reached on average a median of at least five (clearly on the affirmative side of the 7-point scale) and an affirmation level of more than 50%. The institutional aspects identified beforehand matter for most user entities searching for a partner country to procure genetic resources and related services.

- Three items of the group "provider countries' ABS-related information management and measures to guide potential users in complying with ABS requirements (Information and support)" reached over 70% affirmation by the survey respondents. These aspects are most likely important to keep transaction costs down during the initiation phase of a project.

- Two items of the second group "provider countries' organisation of ABS negotiations and the legal capacities (legal system and capacities)" reached affirmation by more than 80% of the respondents. Both items reflect the aspect of legal certainty for users.

- Items of the category providers' scientific capacities respectively capacities in the context of biodiversity / genetic resources relate to information asymmetries and transaction costs in negotiations. We assume that in a situation where providers have a scientific understanding of the users' utilisation plans and a concept to evaluate the economic potential of genetic resources information asymmetries are easier to overcome and transaction costs in negotiations can be reduced. Users' assessments of these institutional aspects are also affirmative on average, but less considerable compared to foregoing aspects.

[9] The definition of successful was given in the guidelines to the questionnaire.

- The two items of the “provider country’s own incentives to attract users and successfully negotiate agreements (self-incentives)” reached the lowest rates of affirmation. About 40% of the participants evaluated the “Self-interest of the government of the provider country to attract foreign companies for bioprospecting, etc.” as “rather” up to very important. 28 respondents stated that the existence of potential research partners is a relevant factor.

- Especially the heterogeneity of responses for the last two items underpin that users proceed differently when they procure genetic resources and hence they have very different requirements for provider countries.

As strategy to minimise transaction costs the majority of participants relies on previously established relationships as means to keep transaction costs low. Almost as many companies stated that they work with local research partners. The two other items - involvement of intermediaries and selection of provider countries with solid institutional framework - have been selected significantly less often.

The evaluation of National Focal Points’ websites indicates that information strategies about genetic resources and ABS regulations in many countries are insufficient so far. Stakeholders in (potential) transactions with genetic resources can be users from abroad but also entities from within the provider country, for example as research partners of foreign user entities, as , intermediaries or depending on the national property rights system as providers.

6.2 Discussion of Findings with respect to Standardisation-based ABS Instruments

The empirical studies verified that (potential) transaction costs for initiating, negotiating, drafting, renegotiating and monitoring agreements for the procurement of genetic resources from source countries can be an impediment to accomplishing ABS. Problems do not only occur in the course of actual projects; the anticipation of excessive transaction costs can obviate the initiation. We conclude that measures that reduce transaction costs and enhance legal certainty support the accomplishment of ABS agreements.

Table 29 shows at which step in the ABS which problems occur, and whether the instruments under consideration tackle the problems (minus equals no; plus equals yes).

Table 29: Standardisation-based ABS instruments tackling practical problems

Problem	Model clause approach	Fully standardised Multilateral System
Market search – bounded rationality		
- Information about supply (existence of resources)	-	+
- Quality of supply	-	+
Initiation of the transaction / Contacting phase		
- Search for authorised entities in provider country / partners in provider country	-	+
- Information search for legal system in potential provider country	-	+
- Internal coordination for the user	+	+
Negotiations		
- Lack of Know how to make an offer (user) / assess a request (provider)	+	+
- Retardation on provider side due to unclear decision competencies	-	+
- Divergent benefit -sharing expectations	+	+
- Consideration of other groups?	-	+
Contract drafting		
- Lack of legal know-how	+	+
- Lack of experiences in the field of ABS	+	+
Renegotiations		
- Lack of legal know-how - Changing legal environment	+ -	+ +

Source: Authors'.

Market search and initiation costs for transactions with genetic resources from source countries can hardly be tackled with the model clauses approach, but it supports in the negotiation and contracting phase by providing menus of models-solutions. Therewith limited legal capacities and experiences can partly be compensated. Also, it might be helpful to reduce internal coordination problems in companies and also within research institutions. Appropriate clauses in the initial contract to guide renegotiations and contractual adjustments can lower transaction costs at later stages and also reduce uncertainty. Model clauses on this topic would therefore address the issue of adjustment costs.

The multilateral system approach eliminates variation in national access regimes and substitutes bilateral benefit sharing negotiations. Therewith it simplifies market search and transaction initiation. Moreover, benefit sharing standards circumvent problems in negotiations based on asymmetric information and unbalanced power. Hence, the fully standardised multilateral system eliminates most of the sources for “private” transaction costs meaning transactional costs born by users and providers that are parties to the transaction. Also, it has the potential to eliminate parts of the legal uncertainty. An efficient enforcement system is required for this, though.

The full standardisation approach tackles many problems that have been raised as, supposedly more than a model clause instrument would. However, theory emphasises that standards have potential drawbacks and the development and implementation causes transactional costs that have to be borne by the implementing and operating institutions. Moreover, the stronger harmonisation is envisaged and the more transactional steps shall be comprised, the more compromising is required. On the other hand comprehensive and strict standards do not allow for flexible governance solutions adoptable for the individual case. In both regards the multilateral approach has significant drawbacks, respectively higher challenges compared to the model clause approach. As a fully standardised multilateral system is more comprehensive regarding the transactional steps and has higher demands for harmonisation in each step, it would require significantly higher transactional costs and more compromising ex ante for drafting, implementation and ex post for monitoring. Also the risk of implementing inefficient standards is higher. Inefficient obligatory standards in worst case obviate the initiation of a transaction and therewith accomplishment of ABS agreements.

We learned that the application of a standard or routine in general requires similarity of economic interaction. What characterises similarity depends on the instrument. In the theory chapter of Part A to this report we defined roughly similarity criteria for the two instruments under consideration. In Part B and Part C will elaborate more in depth on the criteria and investigate in how far they are satisfied for ABS transactions, respectively how instruments would have to be designed and modified for being be adopted to reality.

Part B: Governance Analysis of Bilateral Transactions with Genetic Resources

1 Introduction Governance Analysis (Part B)

1.1 Context and Goals of the Governance Analysis Study

As elaborated in chapter two of Part A, standardisation of ABS contracts has been suggested as instrument for potential inclusion in an international ABS regime. Supposedly contract standards can lower transaction costs, reduce legal uncertainty and balance negotiation power. So far insufficient research has been conducted about governance on the contracting level for transactions with genetic resources. Little knowledge exists why in practice so many different types of agreements with varying contractual solutions exist. This has to be understood to decide on the foundation and hence the design of models for groups of transactions with genetic resources. In the ABS WG meetings a sectoral approach for developing model or standard contracts was suggested (ABS WG (2007a): 48). However, whether a sectoral differentiation of contractual models is efficient has not been empirically investigated yet.

Aim of this study is to develop a theory construct for (1) characterising and distinguishing empirical contractual solutions for transactions with genetic resources. Based thereupon we can discuss what types of standardisation on the contracting level could be feasible for inclusion in the International ABS Regime. Moreover, by studying empirical governance solutions we can define elements for inclusion in an instrument and respective design options.

With the help of exploratory research and governance theories (mostly Transaction Cost Economics and Strategic Management) we further (2) want to identify factors (explanatory variables) contributing to explain the variation of contractual solutions in practice. These factors or explanatory variables could be used as similarity criteria for (potential) cases, as they determine which contractual solution (which option of a contract element) suits best to govern the respective user-provider relation. According to this result “similarity” combinations of model clauses could be recommended.

Finally, with the help of the beforehand developed and tested theory constructs we want to revise the suggestion of a sectoral approach to a contract-standardisation for ABS transactions.

The findings derived from this study can feed into the debate on ABS instruments as background information. This research also contributes to the topical literature by conducting group discussions with users of genetic resources from the private and the public sector to reveal implementation problems and governance strategies. Moreover, results from the first cross-sectional, standardised online-survey for user companies focusing on governance theories and constructed to be evaluated with statistical tools shall be presented and discussed.

1.2 Approach of the Research

The focus in this study is on governance of bilaterally negotiated transactions with genetic resources. This research is the first to take up the issue of standardisation for ABS contracts from the economic theories' perspective in a comprehensive way. Therefore we start from a very limited ground of knowledge.

The methodological approach of the study is iterative and a triangulation of methods. A review of topical literature and existing model agreements and guidelines provides the basis for our empirical surveys: In the framework of (1) individual interviews and (2) focus groups we investigate in an exploratory way several aspects of transaction practice. Moreover, we receive information for the operationalisation of our governance-theory construct regarding the research subject. A standardised cross-sectional online survey is subsequently used to generate case-related data sets from user companies.

The approach is to break down transactions with genetic resources to the level of governance elements (contract types, compensation mechanisms, enforcement mechanisms, duration of contracts etc.) and discuss how these respond to the nature of demand for genetic resources and ways of utilisation. Each company participating in the online-survey characterises a self-chosen reference case with procurement of genetic resources from a source country. The focus is on demand and utilisation characteristics (defined in accordance with governance theory), and on the choice of governance options for several contractual elements (contract type, monetary and non-monetary benefit sharing, and conflict resolution mechanisms). A one-dimensional evaluation of sample data shall be used to check for heterogeneity of the characteristics of explanatory variables as well as governance variables. Subsequently association measures are calculated for interrelating explanatory variables with the choice of governance elements. Based thereupon we evaluate which transaction and demand characteristics likely contribute to the choice of one of the options for a governance element. The results are used to critically revise the sectoral approach, and to develop an alternative, more feasible system to distinguish ABS transactions with respect to efficient contractual solutions and accordingly model clauses.

1.3 Structure of the Part B of the Report

The study is structured as follows. Chapter two gives an overview on economic governance theories we used to develop the framework of analysis. Williamson's concept of governance forms for economic interaction is the main theory used, but aspects from strategic management theory are added. Theoretical literature is supplemented with findings from topical literature on ABS and bioprospection. Chapter three presents' results of the exploratory user survey with respect to governance related aspects of ABS cases. Findings from chapter two and three are brought together in a framework of questions, assumptions and hypotheses regarding heterogeneity of ABS cases and linkages of transaction characteristics (endogenous factors like the type of access / service accomplished by the provider; uncertainty of usage, level of specific investments, etc.) with governance elements (contract types, duration of contracts, compensation mechanisms, and conflict resolution/enforcement mechanisms). With this framework at hand we developed a standardised cross-sectional online-survey for user companies. Data from the survey is used to test the theory framework. The results of the survey are presented in chapter four of Part B of the report. Chapter five includes a summary of the most relevant results and an interpretation in the context of the study. Also, the applied methods and the overall approach are reflected and the contribution of the study critically assessed.

2 Theory and Literature Governance Analysis

In Part A of this report we elaborated that standards or routines should be applied only for "similar problems". What constitutes similarity, however, depends on the instrument and the level of harmonisation envisaged. A model clause instrument tackles ABS agreements on the contracting level – it would implement menus of voluntary standards for contracts. Hence, groups of cases for which similar contractual solutions are feasible need to be defined. But what characterises a contractual solution and how do we know whether it is efficient to govern a transaction?

The public debate about ABS instruments very much focussed on a differentiation by sector. There has never been any investigation, though, whether the sectorial concept is the best to capture differences in (potential) ABS agreements. Thus, we want to employ economic theory to find appropriate ways to characterise transactions with genetic resources with regard to efficient governance forms. This chapter provides a brief overview over governance theory – mainly TCE. The single subsections on transaction cost attributes and governance forms are supplemented by findings from existing literature on Access and Benefit-sharing, respectively, Bioprospection projects.

Transaction Cost Economics provides an analytical framework to interrelate transaction attributes and human behavioural factors with coordination (governance) forms for transactions against the background of transaction costs economising. PICOT ET AL. (2002) describe TCE as a measure to analyse the performance relationships between transactors, and the optimisation of these (PICOT ET AL. (2002): 79 and 85). SHELANSKI AND KLEIN (1995) see the aim of TCE as "explaining […] contracting arrangements observed in practice" by using efficiency arguments (SHELANSKI AND KLEIN (1995): 341). According to MASTEN (1993) "[…] transaction cost economics offers […] a set of normative rules for choosing among alternative governance arrangements" (MASTEN (1993): 119). The common assumption is that the characteristics of the transaction attributes determine which governance form minimises transaction costs. "Governance form" relates in this study to the type of arrangement or the organisational form to govern the exchange of genetic resources and related services in return for compensation (benefit sharing) between user and provider.

The literature on bioprospection and ABS shows that coordination forms and their contractual solutions vary among transactions with GRs (TEN KATE AND LAIRD (1999); GEHL SAMPATH (2005); INTERNATIONAL INSTITUTE FOR SUSTAINABLE DEVELOPMENT AND STATE SECRETARIAT FOR ECONOMIC AFFAIRS (2007)). But in what way exactly are they heterogeneous and why? Both questions are substantial for the discussion of standardisation measures for ABS on the contractual level. GEHL SAMPATH (2005) who analysed literature on bioprospectiong projects with different theories from New Institutional Economics states that the identification of "the factors that motivate parties to choose one contractual structure over another" is vital to understand ABS agreements (GEHL SAMPATH (2005): 65). This is also the starting hypothesis of our research.

2.1 Transaction Attributes – Explanatory Variables

Oliver Williamson is the founder of the transaction cost theory interrelating transaction characteristics and governance forms. He identified three major transaction attributes: asset specificity, frequency, and uncertainty (WILLIAMSON 2002; WILLIAMSON (1979): 239) as determinants for governance efficiency. Other researchers supplemented the theory with additional perspectives. MILGROM AND ROBERTS (1992) for example found (among others) complexity and duration to be relevant as well (referred to in ALTMAN UND JOHNSON (2004): 3).

SHAN (1990) mixes traditional TCE explanatory variables with aspects from strategic management theory (SHAN (1990)). These variables are the basis of our framework to investigate heterogeneity of transactions with genetic resources and related services.

The following sections elaborate relevant transaction attributes on the theory level supplemented by topical literature on ABS and Bioprospection. The book by GEHL SAMPATH (2005) is a main reference, because it is the most comprehensive study using governance theories to analyse Bioprospecting projects. However, SAMPATH limited her research to the fields of Pharmacy and Biotechnology and her analysis is based on existing case studies, not on surveys conducted with this specific focus. We also consulted the work by RICHERZHAGEN (2007) which focuses on the provider side, but includes discussions of some TCE topics as well. Additionally, aspects from other topical references are supplemented, but literature in this field is rare.

2.1.1 Asset Specificity (Relation Specific Investments)

WILLIAMSON defines asset specificity as: "[The] degree to which an asset can be redeployed to alternative uses and by alternative users without sacrifice of productive value" (1996a: 59; see also PICOT ET AL. (2002): pp. 70). Asset specificity can take a variety of forms, for instance specific physical or human assets, site specificity, dedicated assets, brand name capital, and temporal specificity (WILLIAMSON (1998): 36). High relationship-specific assets in combination with uncertainty (see above section) require governance structures to safeguard economic rents out of the utilisation of specific investments. The link is the following: Uncertainty induces incomplete contracts and hence renegotiations and specifications of the utilisation of investments and sharing of rents in the course of the transaction are necessary. The investor cannot exit the agreement without loss of his specific investments. Therefore his position in renegotiations is weakened. The other party might take advantage of this and act in an opportunistic manner (ALTMAN, KLEIN & JOHNSON (2007): 3) or because of uncertainty at least hold up processes and therewith cause loss of economic rents. To circumvent opportunism and loss of specific investments, under uncertain circumstances parties will employ appropriate governance structures (ibid.; DYER (1997): 536).

SAMPATH found that opportunistic behaviour, legal uncertainty and insufficient enforcement measures for contracts can cause problems related to asset specificity in the context of Bioprospecting agreements (2005: 65). Particularly temporal asset specificity is a critical factor in Bioprospecting R&D projects. At certain stages in pharmaceutical research reliable supply of raw material (quantity, quality and schedule) is crucial; the process is vulnerable for hold-ups. The investments made in the course of R&D are at risk. Similar problems can arise if intellectual property rights over traditional knowledge are issued at a late stage of R&D process (ibid: 95-98).

RICHERZHAGEN (2007) affirms that asset specificity can be present in transactions with genetic resources, for instance as site specificity of user companies investing in a specific area in the provider country or in the form of human specificity built up in the run of long-term relationships between companies and provider-countries. Richerzhagen did not include asset specificity in her framework of analysis, because she found it not important enough for her research focus, which was the definition of certain country specific success factors. This research, however, focuses on a considerably different level of ABS: the transaction level. Here asset specificity is likely to be of high relevance.

2.1.2 Primary Uncertainty

WILLIAMSON distinguishes two kinds of uncertainty. Primary uncertainty is related to the transaction, and behavioural uncertainty is uncertainty related to the exchange partner, for example due to strategic interaction (1985: pp. 57). The latter one was elaborated earlier in Part A, chapter three. Primary uncertainty can be understood as the degree to which adjustments of exchange terms during a transaction are necessary and how predictable these adjustments are ex ante (PICOT AND DIETL AND FRANCK (2002): 70). In how far this applies to a certain transaction depends on the characteristics of the transaction object and the intended use of the transaction object. Uncertainty needs to be examined in connection with asset specificity. "Absent asset specificity, [transaction cost economics] […] does not predict that uncertainty leads to more hierarchical forms of governance (RICHMAN AND MACHER (2006): 7)".

Literature indicates primary uncertainty as main attribute for transactions with and utilisation of genetic resources: The results of research and development with genetic resources can be uncertain (scientific uncertainty) as well as the economic rents resulting from utilisation (market, or demand uncertainty). Often, neither the provider nor the recipient of genetic material can foresee at the contracting stage what the outcomes of the investigation with the resource - in other words, the benefits - will be (GEHL SAMPATH (2005): 65; CARRIZOSA (2004): 73). The technological process of utilisation can also be uncertain in the sense that unforeseeable investments might become necessary (technological uncertainty).

2.1.3 Frequency of Economic Interaction

Different governance forms for transactions require different levels of effort for their initial implementation. The costs accruing for each additional transaction vary. A reduction in costs for the individual transaction might outweigh higher implementation efforts if a certain number of transactions is reached (PICOT ET AL. (2002): 71). Therefore, if transactions are frequent, parties respond by investing in governance structures (high initiation costs) that increase reliability and are cost effective per transaction (low costs of individual transaction). GEHL SAMPATH (2005) states this also to be the case for Bioprospecting activities (GEHL SAMPATH (2005): 69).

2.1.4 Strategic Management

Strategic management suggests "access to relevant complementary assets" as strategic determinant for the choice of governance forms. Shan suggests supplementing variables for organisational efficiency with those of strategic behaviour to obtain a complete understanding of cooperative relationships (SHAN (1990): 131).

In the fields of utilising genetic resources strategically, relevant complementary assets are for example access and/or exclusivity rights for certain information about resources which only the provider entity possesses. Exclusive access to resources, information or the right to use both in a specified way – even granted for a limited timeframe - might grant the user a competitive advantage. A further strategic aspect could be that users seek access to new markets in the provider country or in the region. Cooperation with local research institutes or companies can function as door opener. Cost reduction in input allocation and outsourcing of work intensive initial steps in the utilisation procedure can also be subsumed under strategically motivated determinants.

2.1.5 Indirect Capacities

Indirect capabilities or capacities are competences in interacting with, for example economic suppliers, and alliance partners (ARAUJO ET AL. (2003); LOASBY (1998)). They are explanatory variables from the "resource based view" (KASCH & DOWLING (2008): 1766) which belongs under the umbrella of strategic management. Capacities assumingly increase with experience in cooperating (KALE ET AL. 2002; SIMONIN 1997), because experience builds up routines which protect tacit knowledge, and reduces uncertainty in communication with the other company. The theory suggests that indirect capacities affect the relative costs of different governance forms for economic interaction. Empirical studies show that companies with experience in R&D alliances respectively cooperation have a higher probability of entering another alliance or cooperation (GULATI 1999: 413; KATILA AND MANG 2003).

Genetic resources are used in many different fields of application (see chapter two, Part A) and by companies with different levels of experience in executing-long term complex projects, particularly with partners in developing or newly industrialising countries. The level of indirect capacities presumably varies among user companies. As theory suggests this effects the relative costs of initiating complex projects, we want to include this aspect in our investigations.

2.2 Governance Forms for Transactions with Genetic Resources

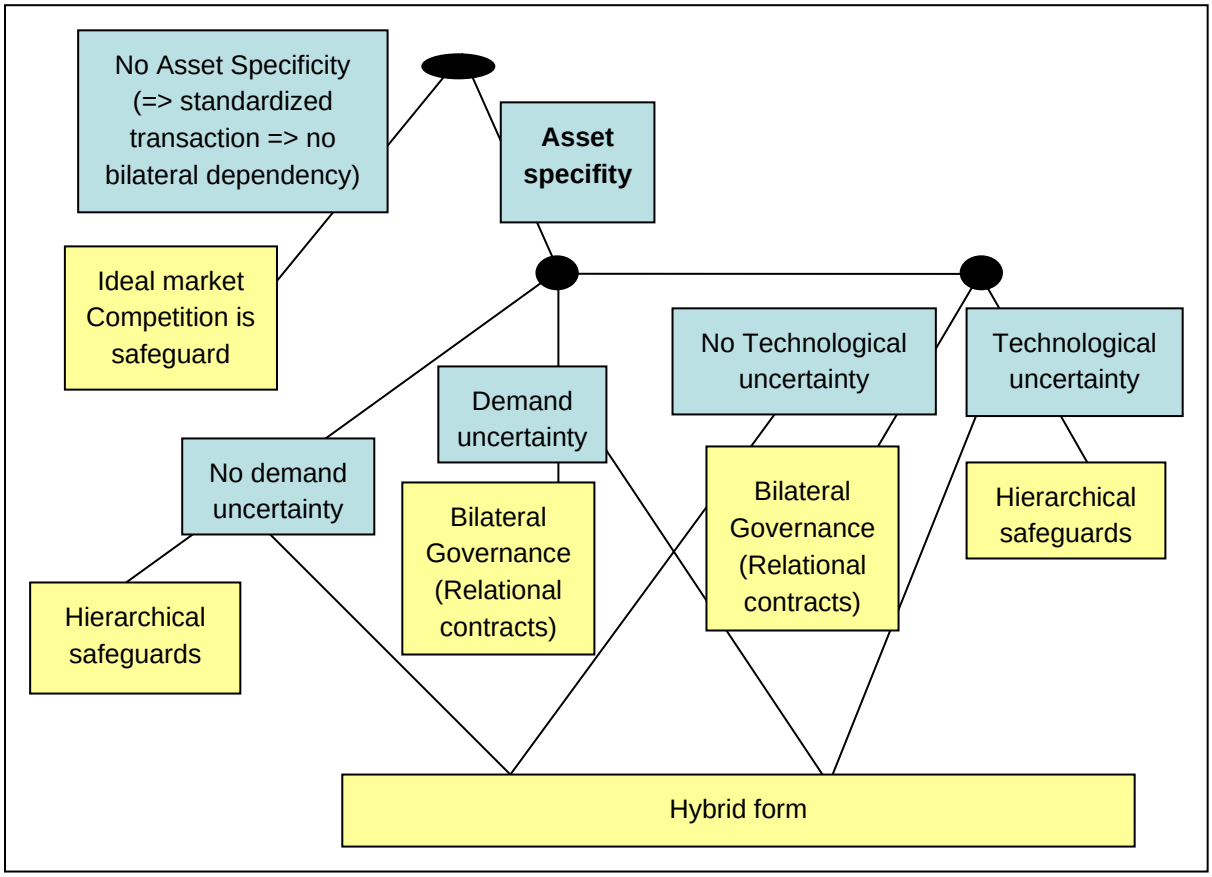
Theory and empirical studies distinguish governance forms in market governance (competition) versus hierarchical governance modes (partnership and co-operation). Accordingly, adapted contractual solutions or agreement types are distinguishable in classical, complete contracts versus incomplete relational contracts. Of course there are plenty intermediary and hybrid forms. In the case of transactions with genetic resources full integration is hardly possible as on the provider side governmentally commissioned entities are involved. However, hierarchical elements in agreements are possible, e.g. by investments of user entities in laboratories, infrastructure, or training for provider entities. Accordingly decision and enforcement mechanisms could include hierarchical measures.

Different contract types apply different mechanisms to govern transactions. The main functional units we can differentiate are 1: compensation mechanisms (flexibility and incentive intensity), 2: contract duration (long-term versus short-term), and 3: mechanisms of dispute settlement and enforcement (external through courts or internal through interest harmonisation, reputation, etc.).

The difference with respect to transaction costs lies in the in cost and competencies of a governance mode, respectively its governance elements. Williamson identified four characteristics of governance elements to operationalise costs and competencies (WILLIAMSON (1995 and 1998)): 1: Incentive intensity: markets provide incentives of competition; if the transaction partner performs insufficiently the other party can switch to a different provider. Hierarchy lacks this kind of incentives (WILLIAMSON, (1998): 37). However, in quasi-integrative governance forms interest harmonisation, e.g. through profit-sharing can be a strong performance incentive as well. 2: Administrative controls: at higher levels of integration more forms of administrative controls and sanctions are available. 3: Adaptation: adaptability to changes in demand or supply, where prices are good indicators, is higher at lower integration levels. If disturbances require adaptation in the overall process affecting several levels of a chain, coordinated response is better. Formal organisation (integration) of adaptation is more advantageous as the condition of bilateral dependency progressively builds up (WILLIAMSON (1991): 278-279). 4: Contract law: for market transactions the applicable contract law is external; dispute settlement and enforcement mechanisms are legalistic and rely on courts. In hierarchically organised transactions and internal dispute settlement measures are applied (WILLIAMSON (1998): 46).

The more relational a contract is the weaker is the legal commitment and the more important conventions and internal enforcement becomes.

Transaction cost economics invokes that transactions with different attributes (see foregoing subchapter) are governed in a transaction cost minimising way by governance forms with different costs and competencies (see Figure 4 and Figure 5).

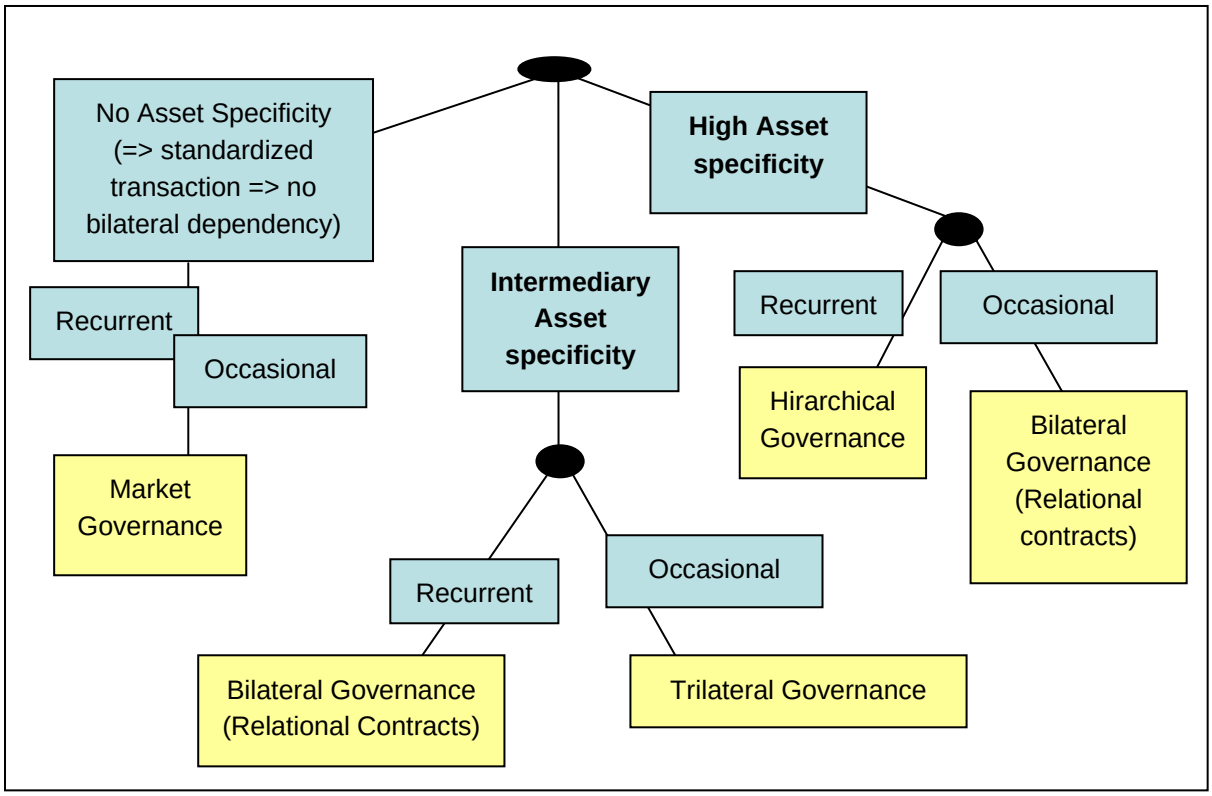


Source: Author's, based on WILLIAMSON (1995): pp. 246; WILLIAMSON (1998): pp. 38; RICHMAN AND MACHER (2006)).

Figure 4: Decision tree interrelating Asset Specificity and Uncertainty with Governance Modes

Figure 4 displays governance solutions depending on how the transaction attributes asset specificity and demand uncertainty as well as technological uncertainty are characterised. If asset specificity is high, safeguarding mechanisms have to be applied. Now it depends on the kind and the level of uncertainty whether this can be better achieved through bilateral governance structures (relationship/transaction specific governance structures with internal dispute resolution mechanisms), or by stronger hierarchically organised governance modes.

The influence of frequency on the advantageousness of governance forms is interrelated with Asset specificity. The combinations are displayed in Figure 5.



Source Author's: based on Williamson 1995 and 1998, pp. 38.

Figure 5: Decision tree interrelating Transaction Attributes - Asset Specificity and Frequency - with governance modes

Figure 5 shows that for transactions without asset specificity it does not matter whether the transaction is recurrent or occasional. In both cases market governance is more appropriate. If intermediary or high levels of asset specificity are at hand, frequency matters. Here we differentiate between trilateral (dispute resolution with third party assistance), bilateral (see above) and hierarchical governance forms.

Influence of strategic aspects on governance forms is manifold. If companies seek exclusive access to resources and or information, the supplier makes specific investments by granting these services to the user. If additionally the outcome of the utilisation is uncertain, governance structures have to include relational monitoring and enforcement mechanisms and participatory compensation mechanisms. If the user – motivated by cost factors - outsources preparation of material and other initial steps of the chain, it might be necessary to invest in provider entities. Accordingly internal enforcement mechanisms have to be adopted to govern the cooperation between user and supplier to reach supply requirements, e.g. quality standards. CARRIZOSA (2004) remarks that the integration of local counterparts and development projects with genetic resources is a common strategy to expedite the access process as local entities are familiar with local costumes and bureaucracy, and additionally it may bring legitimacy and transparency to the project (CARRIZOSA (2004): 17-19).

As elaborated in the foregoing section on transaction attributes, theory suggests that a high level of indirect capabilities increases the likelihood of a company to engage in complex governance structures. The transactional costs of implementing complex governance structures are relatively lower compared to companies lacking such capacities.

In the literature on ABS and Bioprospection we find a number of references to governance elements for transactions with genetic resources. We assigned them here to the respective items form the theory:

Incentives: MULHOLLAND UND WILMAN analyse ABS agreements as Principal Agent Problems. Royalties (outcome oriented compensation) are here interpreted as incentive based compensation mechanisms in response to primary uncertainty – the economic outcome of R&D with genetic resources cannot be anticipated fully, but the provider can contribute to success (2003: 420).

Administrative controls: DEDEURWEARDE observes that for bioprospecting transactions learning effects in relations between users and providers are a relevant governance element to (DEDEURWAERDERE 2005).

Adaptability: DEDEURWEARDE discusses different governance forms for bioprospection with respect to uncertainty. He states that relational constructs are more suitable under circumstances with high primary uncertainty. (Classical) Contracts on the other hand would not appropriately reflect the uncertainty inherent in the whole chain of R&D (2005: 8).

Contract law: In ABS literature trust building and reputation - a relational enforcement measure - is often referred to as important element in ABS projects (RICHERZHAGEN, 2007, p. 145). GEHL SAMPATH identified mutual dependency, and frequency as further relational governance mechanisms in ABS agreements to reduce transaction costs and prevent opportunistic behaviour, even if relation-specific investments are necessary (2005: pp. 95). DEDEURWAERDERE refers to the Inbio-Merck case in Costa Rica as example for a relational contract net, where reputation is a measure to circumvent opportunism (2005: 6, referring to STEINBERG (2001): 76-84).

2.3 Application of Governance Theory for Empirical Analysis in this Study

We chose the before elaborated economic governance theories as concept to operationalise the "similarity" requirement for the model clause instrument, as they explain empirical variation of contractual solutions with heterogeneity of the subject matter of transactions. The theory framework can therewith provide a starting point for characterising and distinguishing governance forms or contractual solutions for transactions with genetic resources including type of the agreement (phasing versus complete right from the start), duration of contracts, pricing mechanism including monetary and non-monetary benefit sharing, and conflict resolution and enforcement mechanisms. Moreover, it provides with factors supposedly determining the efficiency of governance solutions, and therewith an explanation for empirical variation of governance. These factors are transaction characteristics and strategic factors which operationalise in this research the standardisation-theory concept of the "subject matter of transaction".

Interrelating governance elements and explanatory variables provides a framework of hypotheses and assumptions for our empirical studies. The individual hypotheses or assumptions are elaborated in the evaluation chapters in conjunction with the survey results. Whether the concept of similarity based o governance theory is applicable for the subject matter of ABS agreements and therewith useful for the development of a model clause instrument - will be evaluated by means of empirical studies in the following chapters.

3 Results Exploratory User-Survey – Governance of Transactions with Genetic Resources

Theory provides a basis to develop a framework for analysing transactions with genetic resources regarding efficient governance forms and determining factors. However, the literature on this topic is scarce. This is why we surveyed existing model contracts for ABS agreements and conducted a series of exploratory empirical surveys with users of genetic resources. To get a better understanding of how the theory can be applied to the research subject and operationalised for hypothesis testing (see chapter 5) the exploratory surveys were a prerequisite. Moreover, they serve to identify additional relevant aspects. The findings of the exploratory surveys shall feed into a framework of analysis for a standardised cross sectional online survey.

This chapter is structured as follows: In the first part we evaluate existing model agreements and guidelines for ABS agreements as a starting point to identify contract elements stakeholder groups considered relevant. We compare the different solutions regarding contents and with respect to the level of standardisation envisaged by the instruments. The second part of the chapter presents findings from individual exploratory interviews and group discussions. The individual interviews were conducted first. The contents are of more general level and the discussions centered on individual experiences with ABS cases. The group discussions on the other hand were used to investigate whether there exist common praxis and a common understanding regarding certain contract elements within sectors, such as the terms of benefit sharing, IPRs, and others. In both surveys we asked the users whether they thought that standardisation on the contract level – particularly in form of model clauses for contracts in general could assist in the process of negotiating with providers.

3.1 Evaluation of existing Guidelines, Standard, and Model Agreements for ABS

The standardisation approach for contracts that govern transactions with genetic resources and related services has been applied by various stakeholder groups for several years, partly as reaction on the CBD provisions regarding ABS. The range of measures span the Bonn Guidelines, a set of non-binding and rather general guidelines for elements of Material Transfer Agreements (SECRETARIAT OF THE CONVENTION ON BIOLOGICAL DIVERSITY, 2002), to fully fledged standardised contracts like the sMTA of the International Treaty ABS regime (ITPGRFA, 2006). Besides these multilaterally developed measures further initiatives on different levels have evolved.

The identification and examination of such instruments is one step to learn how stakeholder representatives operationalise ABS cases in contractual form; which contractual elements are included and how they are designed. We checked and compared nine existing guidelines and model contracts:

- Bonn Guidelines
- ABS management tool
- sMTA of the ITPGRFA
- Model MTA of the Australian Government
- BIO Model MTA
- Letter of Collection (LOC) & Memorandum of Understanding (MOU) of US NCI
- Simple Letter Agreement (SLA) & Unified Biological Material Agreement (UBMTA) of the NIH
- Science commons model
- Micro-organisms Sustainable Use and Access Regulation International Code of Conduct (MOSAICC)

The results and the findings for our further research are presented in the following chapters. Table A 1 in Appendix IV provides with links to each instrument.

3.1.1 Guidelines for ABS Agreements

The *Bonn Guidelines* were developed by the Ad Hoc Open-ended Working Group on ABS and adopted in 2002 at the sixth Conference of the parties to the CBD. They shall give guidance to providers and users among others by providing recommendations for elements to be included in MTAs to cover transactions with genetic resources under the scope of the CBD. Moreover they give an overview of possible forms of monetary and non-monetary benefit sharing (SECRETARIAT OF THE CONVENTION ON BIOLOGICAL DIVERSITY (2002): 17-20) (see Table 30). The Swiss "*ABS management tool*", developed by ABS experts under the direction of the International Institute for Sustainable Development, is also a guideline for negotiating and implementing ABS projects. It is more detailed and gives more suggestions for different cases than the Bonne Guidelines. Both guidelines, however, suggest similar elements or aspects to be regulated in ABS agreements (see Table 30). Table 30 is not exhaustive; some more general elements are left out.

Some of the elements that are listed in Table 30 were discussed in the theory chapter as determining the type of contract or more broadly the governance form: the compensation or pricing mechanism, the termination or duration of the agreement and the dispute settlement mechanisms. Both guidelines mention these aspects as relevant to be contained in a contract, and they point out that ABS contracts should adapt to the individual case. The Management tool refers to a WIPO paper[10] in which five different contract types are mentioned for transaction with genetic resources, differentiated with respect to status of a transaction (initiation phase or implementation phase) and the type of interaction, respectively the relation between the user and the provider (merely material transfer versus research cooperation). Also specific contracts for handling tacit information are recommended:

1. Letters of Intent or Heads of Agreement: preliminary agreement on the overall framework of a proposed collaboration => creation of a solid basis of understanding.

2. Confidentiality or Non-disclosure Agreements: requiring the recipient of information to keep it confidential (e.g. information concerning the source of genetic resources, associated TK or know-how) => used to limit the purposes for which such information can be used.

3. Research Agreements or Research and Development Agreements: definition of R&D inputs (financing, material, intellectual contributions); specification of responsibilities in relation to the conduct of research and development => to govern cooperation in R&D projects.

4. Material Transfer Agreements (MTA): tool in commercial and academic research partnerships involving the transfer of biological materials => governs provision of identified physical material to a recipient; states recipients' agreement to restrict the uses according to prior understanding.

5. Licensing Agreements: contract to set out permitted uses of materials (e.g. genetic resources) or rights to information (e.g. TK or other intellectual property) that the provider is entitled to grant (INTERNATIONAL INSTITUTE FOR SUSTAINABLE DEVELOPMENT AND STATE SECRETARIAT FOR ECONOMIC AFFAIRS (2007): 20).

Neither of the guidelines goes beyond this by interrelating design options of contract elements with characteristics of cases, different user sectors, or provider types, though.

10 (WIPO), WIPO/GRTKF/IC/7/9 July 2004. "Genetic Resources: Draft Intellectual Property Guidelines for Access and Equitable Benefit-sharing," prepared by the WIPO Secretariat.

Table 30: Contract elements suggested by Bonn Guidelines and ABS Management Tool

ABS management tool	**Bonn Guidelines**
Definitions of terms (parties, material…)	Definitions of terms
Specification of transacting parties Framework (e.g., recitals or whereas clauses)	Legal status of provider and user General objectives of provider & user
Description of the providers contribution including definitions of material / extract: - Access to material and information - Specification of material & information - Exclusivity	Description of material covered by the agreement
	Handling of intellectual property rights, over the genetic resources received through the MTA
References to environment protection in conjunction with material sampling	Duty to minimise environmental impacts of collecting activities
Cover of costs for material sampling and transfer	
Other compensation (benefit sharing) (distinguished in short term, medium term and long term)	Terms and forms of benefit sharing
Allowed uses of transferred material and information	Permitted uses (under consideration of potential uses, products, derivatives)
	New Prior Informed Consent required in case of change of use
Handling of IPRs (Data, Publications, Patents etc…); distribution between source, collector and transferee	Settlements regarding IPRs
Settlements on material transfer & IPRs to third parties	Regulation of the transfer of genetic resources and/or accompanying information to third parties
Treatment of confidential information, Trade secrets	Treatment of confidential information
Termination (duration, terms of expiration)	Termination & duration of agreement
Enforcement of the contract - Governing law - Jurisdiction - Dispute resolution (Meeting of the parties, Courts, Mediation, Arbitration)	- Dispute settlement arrangements, - Choice of law

Source: Author' s, based on INTERNATIONAL INSTITUTE FOR SUSTAINABLE DEVELOPMENT AND STATE SECRETARIAT FOR ECONOMIC AFFAIRS (2007): 24-29, and SECRETARIAT OF THE CBD (Bonn Guidelines) (2002): 17-20.

3.1.2 Model Agreements for Transactions with Genetic Resources

In the following paragraph we present and discuss seven initiatives of standard or model contracts for transactions involving genetic resources. The instruments go beyond the Bonn Guidelines and the ABS Management Tool in terms of the applied standardisation level. Except for the sMTA, all presented approaches are rather model contracts and voluntary instead of obligatory standard contracts.

Table 31 displays the responsible institution and institutional level, the target group, and the stated intentions for the seven measures.

The instruments are designed by different types of institutions to fulfil needs of **different target groups**. However, the simplification of commitment with ABS requirements and the reduction of transaction costs are key **intentions** in all cases. Some instruments (1, 3, 4, 5, 6) are designed for specific user groups (Pharmacy, Biotech, academic research), developed particularly to increase **legal certainty** and reduce **transaction costs** for the users. Other instruments are developed by provider (2) or intermediary entities (7). The Australian model contracts are developed and established by the government of the provider country. The intention is to **implement the national biodiversity strategy**, but also to attract foreign research and to support national research by reducing transaction costs and increasing legal certainty. The MOSAICC model contract has inter alia the goal to contribute to the **implementation of ABS** from the Microorganism Collections (as intermediaries) side.

Table 32 subsumes further characteristics of the instruments, such as the object of transaction for which they are thought to be used, the type of transaction, and the praxis of benefit sharing suggested in the model.

Table 31: Main characteristics of existing Standardisation measures for ABS contracts

	Responsible Institution	Target group	Stated Intentions
1: sMTA in the ITPGRFA	Multilateral level Governing Body of the ITPGRFA	Commercial & non-commercial users, though restricted to research, breeding, training for food & agriculture	Simplifying access to and exchange of genetic resources for food and agriculture (supporting food security & quality), lowering transaction costs
2: Australian Model MTA	Australian Government, Department of the Environment, Water, Heritage and the Arts	Developed by government institution in its function as a provider of genetic resources. Guidance tool in ABS negotiations with commercial users.	Meeting CBD obligations for ABS; Minimising transaction costs; Encouraging R&D; Avoiding decision-making delays; Facilitating flexible access arrangements for lengthy or even unlimited periods
3: BIO Model MTA	US Biotech Industry Association BIO	Members of BIO, mainly Biotech-Companies for Bioprospecting activities	Educating & supporting Bioprospecting activities "[…] providing a useful "roadmap" for a BIO company […] in bioprospecting activities."
4: LOC and MOU of the US	US National Cancer Institute	Cancer fighting and prevention research, commercial and non-commercial utilisation	Providing a legal mechanism and fundamental framework for international cooperation; Balancing interests; Transcending national barriers, clearly defined common understanding of transactions
5: SLA & UBMTA of the US NIH	US National Institute of Health (governmental research Institute)	Restricted to academic research and domestic transactions with genetic resources	Standardising biological material transfer within the United States Minimising administrative impediments to academic research
6: Science commons	Researchers Initiative	Target group: not-for profit researchers from all scientific fields utilising genetic resources. For profit entities are affected indirectly when involved in genetic resource transactions with the target group.	Lowering transaction costs, simplifying negotiations for material transfers between institutions (academia & for-profit) Providing infrastructure for web-based transactions Avoiding impediments Improving accessibility and exchange of data, material, and metadata on genetic resource utilisation in research
7: MOSAICC MTA	Belgian Coordinated Collections of Microorganisms	Ex-situ collections for microbial genetic resources (intermediaries who obtain microbial genetic resources to extend their collections)	Facilitating access; Helping collections to make appropriate agreements; Increasing uniformity in MTA contents & defining a minimum set of information; Electronic handling of digitalised MTAs (fast, cost-effective, reliable management of MGRs

Sources: ITPGRFA (2006): 10-11; AUSTRALIAN GOVERNMENT, DEPARTMENT OF ENVIRONMENT AND HERITAGE (2005a and 2005b): both 3 and 26; AUSTRALIAN GOVERNMENT, DEPARTMENT OF ENVIRONMENT AND HERITAGE (2004): 9; BIO Model MTA: 1 and 8; NATIONAL CANCER INSTITUTE (1988b): 1; ROSENTHAl (1997): 4; NIH (1995a and 1995b); WILBANKS, J. AND J. BOYLE (2006); personal communication with PHILIP DESMETH (April 2008); BCCM (2000): II.2-II.4, 1.8

Table 32: Main characteristics of standardisation initiatives for ABS contracts continued

	Object of transaction	Kind of transaction	Understanding of Benefit sharing
sMTA of ITPGRFA	Plant genetic resources held in ex-situ collections	Spot market, limited complexity	Standardised; monetary benefit sharing is triggered only in cases where restrictive IPRs are applied to R&D outcome; flows into a multilateral fund, distribution through projects which are chosen according to multilaterally agreed priorities
Australian Model MTA	Biological resources including GRs, organisms and parts of organisms, populations, and any other biotic components […] with actual or potential use	Rather complex transactions; it is deemed most useful for procurement of in-situ resources	Threshold recommendations for monetary bs; distinguished by sector and gross revenue of the product concerned (0 to 5%). Recommendation to adjust amount and form of benefits depending on: Market conditions, Characteristics of the specific access agreement, Circumstances of contracting parties.
BIO Model MTA	Physical samples of "regulated genetic resources" (under CBD); in situ or ex situ; materials that contain functional units of heredity	Bioprospecting Agreements involving collecting activities and procurement from ex-situ collections	Benefits shall be defined depending on inter alia: Needs of the providers (including indigenous or local communities), The commercial value of the transferred physical samples, The intended use of the samples, The likelihood of using the samples to create a commercially viable product
LOC & MOU	Plants, micro-organisms, and marine macro-organisms	LOC: acquisition of GRs from region-specific collectors; MOU: research collaborations between with source country institutions	Contain clauses about appropriate compensation (e.g. royalties); Base for defining monetary bs: contribution of both parties, and relationship between the originally isolated product and the marketed drug
SLA & UBMTA	All kinds of biological materials	Intra-academic material and the transfer of information	As the transfer to commercial entities is prohibited, they do not contain any benefit sharing regulations
Science commons	All kinds of biological materials	Material & information, not for complex research collaborations	Does not contain benefit sharing suggestions
MOSAICC MTA	Microorganism genetic resources (MGRs)	Checklist for complex transactions; Model MTA is applicable to simple, more routine transactions	Payment of royalties should depend on the successful commercial utilisation; partly dedication to technical and scientific cooperation programs; Recommendation: negotiate preliminary agreement on monetary bs before starting R&D that could lead to commercialization

Sources: ibid.

As Table 32 shows the measures are partly designed for different **types of resources.** While the model contracts established by the Australian Government, the National Cancer Institutes, Science Commons, and the National Health Institutes are applicable for transactions with a whole range of materials under the term genetic resources, the sMTA and the MOSAICC Model-MTA are restricted to specific types of genetic resources. The sMTA was developed and multilaterally adopted only for transactions with specific PGRFA (Annex I resources). In the mean time several intermediary institutions use it also for non-Annex-I resources, but still only for PGRFA. The MOSAIC model MTA was developed for transactions only with microorganisms.

The types of transactions the different instruments are thought to be applied for vary in **complexity**. The sMTA of the ITPGRFA and the sMTA of the Australian Government are both comprehensive contracts, but the first one is a standard contract, while the second one is only a model contract which can be adjusted in the cause of an individual ABS project. This is, because it is thought to be most useful for transactions with in-situ material involving own sampling activities maybe in the frame of a complex cooperation project. It is explicitly meant to be used as a starting point and a guide in negotiating more case-adopted contracts. The ITPGR sMTA, in contrary, is mainly applied to spot market transactions, in which users and providers do not cooperate in further research and development. The resources are obtained from an ex-situ collection and the products and benefits are redistributed to that "anonymous" system. The NCI, provides different model contracts for different transaction types with respect to the intensity of cooperation between user and provider. The MOSAICC system recommends two different measures with regard to the complexity of the transactions: a model MTA for "simple" transactions and a checklist for customised transactions.

Benefit sharing is a core element in all models except those that are developed only for transactions within the academic environment. Monetary benefit sharing is concretised to numeric provisions only in the sMTA of the Treaty-System. However, the Australian model contract provides quantitative recommendations for monetary benefit sharing (AUSTRALIAN GOVERNMENT, DEPARTMENT OF ENVIRONMENT AND HERITAGE (2005a and 2005b): both p. 28). All other measures provide rather general recommendations for the assessment of forms and values of benefit sharing. These recommendations are mainly based on the economic value of the genetic resource in the R&D process of the user. The perspective of the Provider is reflected in terms like "circumstances of both parties shall be considered when benefit sharing is appointed".

Except for the ITPGRFA sMTA all systems differentiate requirements in ABS procedures for commercial and non-commercial utilisation of genetic resources. As a general rule the requirements are higher for commercial access purposes.

Not all instruments provide recommendations or standards regarding the **duration of contracts**. The BIO Model MTA suggests using a contract term of ten years (BIO Model-MTA, Article 7, p. 10). The wording in the standard contract of the ITPGRFA Multilateral system is that "This Agreement shall remain in force so long as the Treaty remains in force" (Article 9, Duration of Agreement, p. 7). We interpret this as a contract without termination. The Letter of Collection and the Memorandum of Understanding (both by US NCI) suggest an initial contract duration of five years and thereafter renewal based on mutual agreement (LOC, p. 5; MOC, p. 5). However, both documents contain an article on benefit sharing which notes that the duration of R&D in Pharmacy may require 10-15 years until eventually a drug can be marketed (LOC, Art. 9, p. 3; MOU, Art. 12, p. 4). The UBMTA contains several options to define the termination of the agreement "[…] (a) when the MATERIAL becomes generally available from third parties […], or (b) on completion of the RECIPIENT's current research with the MATERIAL, or (c) on thirty (30) days written notice by either party to the other, or

(d) on the date specified in an implementing letter […]". It does, however, not recommend a certain timeframe (UBMTA, Art. 13, p. 5). The Australian Model Agreement does not contain a standard on contract duration.

Dispute resolution is a further important contract element. However, most of the model agreements we investigated do not contain a clause in which dispute settlement procedures are stipulated (e.g. MOU, LOC, MOSAICC Model-MTA, UBMTA, SLA). The Australian Instrument contains a clause on dispute resolution which requires the contract partners to employ legal proceedings only as measure of last resort, if bilateral negotiations failed. The BIO Model-MTA contains placeholder paragraph for dispute settlement procedures and a commentary explaining that appropriate mechanisms depend on the Transferor(s) (provider), and, if the agreement is about to govern Bioprospecting activities international arbitration is recommended being included in the repertoire (BIO Model-MTA, Article 7.8, p. 10-11). The MOU contains no explicit clause on dispute resolution; however, the agreement includes several items that manifest close collaboration. The closing paragraph contains the wording "[…] this MOU will lay the basis for a mutually successful cooperation […]" (MOU, p. 5).

One hardly finds valid information about experiences regarding the efficiency and acceptance of the different model and standard contracts. Involved parties and experts assume that they do reduce transaction costs. In the case of the Treaty sMTA, experts recognise that the demand for genetic resources from collections of the MLS has re-stabilised after it decreased significantly before the sMTA was implemented. They assume that this is partly due to the simplified procedure of which the sMTA is a major part, but independent evaluations of experiences with the existing approaches in particular would be helpful for further assessment.[11]

Summary review of guidelines and Model agreements for transactions with genetic resources

The review of existing guidelines for ABS contracts and model contracts for transactions with genetic resources showed that contract standardization on a voluntary level is thought to be supportive in reducing transaction costs and to increase legal certainty by various entities representing stakeholders of transactions with genetic resources. Moreover, standard or model contracts are established as instruments to support the implementation of ABS and therewith the CBD principles.

However, different entities put the approach into praxis in different ways. The level of standardization - the concreteness of subject matter - varies for all main contract elements: benefit-sharing, duration of the contract, and dispute settlement resolutions. Presumably, one reason is that entities like the Governing Body of the ITPGRFA and the Australian Government are empowered to design and establish legally binding instruments in accordance with the multilateral treaties, while other entities (industry organisation) can only recommend their members to utilize model contracts. Hence, the BIO Model-MTA is considerably less concrete than the sMTA and the Australian Model-MTAs.

[11] Internet-Links see Table A1 (Annex IV).

Different types of model contracts are suggested for different types of transactions, here differentiated mostly by the type of contribution by providers and the different ways of utilisation of genetic resources. Both aspects are linked to the concept of complexity in the governance theory.

Generally we see that recommendations or standards for monetary benefit-sharing are mainly linked to the economic value of the resource in the utilisation process. Costs of conservation and opportunity costs of provision are hardly reflected in the models. Numeric standards for monetary benefit-sharing are only given in the sMTA of the ITPGRFA. The other fully fledged model contract of our sample (the Australian instrument) contains quantitative recommendations for monetary benefit sharing differentiated by fields of application and turnover with products based on the utilisation of genetic resources.

The difference of benefit-sharing provisions between the two instruments reflects the different scope. The SMTA is applicable to certain fields of utilisation, while the Australian model contract shall serve as basis for all utilisations with commercial intention.

The suggestions on duration of contracts vary among the reviewed instruments spanning a standard of five years including stipulation of renewal after renegotiations, ten years of duration (Bio Model MTA), up to the sMTA instrument, where contracts remain effective as long as the multilaterally agreed on sMTA is in force. Renegotiations and amendments of contracts are stipulated, particularly, if the type of relation is more complex meaning that the transaction constitutes rather research cooperation than a spot market, and / or that the R&D process is known to be long.

In the theory chapter we identified dispute resolution as further relevant contract element. Most of the reviewed models, however, do not contain a clause concretizing dispute settlement procedures. Where it is included internal dispute resolution mechanisms like negotiation, and third party assistance (international arbitration) are required, respectively recommended instead of legal proceedings. Instruments addressing more complex interaction include, though not explicitly designated as dispute resolution measures, internal / hierarchical mechanisms that address the issue. These are contained in clauses describing the contribution of both parties (involvement of providers in the research chain), as well as in clauses on information measures, and exchange of researchers.

3.2 Exploratory Interviews and Group Discussions – Focus on Governance Aspects

Parallel to the review of existing model agreements and guidelines for ABS contracts we conducted a series of exploratory individual interviews with users from different fields in public research, pharmacy and biotechnology, as well as plant breeding (seeds and horticulture). Subsequently, we organised three group discussions, one with users from academic research, one with Pharmacy and Biotech companies, and one discussion round Plant breeders in the fields of Horticulture.

In this chapter we elaborate the exploratory user surveys with respect to the focus of Part B of this study. The overall aim was to receive a better understanding of governance practice for interaction between users and providers involving transfer of genetic resources. Especially heterogeneity of governance among and within users affiliated with the same "sector" is relevant in the context of standardisation discussions.

The evaluation of the individual interviews and the group discussions is carried out combined, but differentiated by user groups (Public research institutes, Pharmaceutical and Biotech companies, as well as Plant Breeders). For this part of the empirical study we consider users as experts and the approach for data collection as exploratory. Interview transcripts and discussion protocols were evaluated in a qualitative-interpretive way with respect to the beforehand defined key questions: [12]

Guiding questions:

- Procurement strategies for genetic resources
- Utilisation of genetic resources and related information and provider services
- Praxis of Benefit sharing
- Handling of IPRs resulting from the utilisation of genetic resources and related information and provider services
- Exclusivity rights for users in connection with the procurement of genetic resources
- Types of agreements / governance forms employed for transactions with genetic resources
- Acceptance of model clauses as ABS instrument

Please note that not all aspects were elaborated to the same extend in all user groups. Interview and discussion participants had heterogeneous levels of experience with the procurement of genetic resources from in-situ sources, and prior knowledge about the political dimension of ABS and the implications for bilateral procurement of genetic resources varied.

[12] The methods are elaborated more detailed in Chapter four in Part A of the study

3.3.1 Procurement of Genetic Resources

Access to genetic resources can be sought from various sources. Presumably, different governance forms are employed for the transfer of a sample from a gene-bank to a plant breeder than for transactions with samples taken in the framework of Bioprospecting activities with ex ante undiscovered in-situ material. The first item we discussed with users in the exploratory surveys was the procurement ways they applied to access genetic resources.

Users from public research institutions

As we included researchers from various disciplines the procurement sources for genetic resources vary a lot. We found several joint projects between public research institutes and industry, particularly in research fields with a high degree of applicability (e.g. pharmaceutical biotechnology); universities and industry appear together as one user entity to procure genetic resources. Procurement of genetic resources from source countries or access to genetic resources in specific natural habitats plays an important role for researchers at public institutions. Therefore they are often confronted with how to deal with ABS regulations in provider source countries. Apart from that material exchange among researchers is common praxis and partly also acquisition from international ex-situ collections.

Pharmacy and Industrial Biotechnology

Users from both fields of utilisation procure material from international Ex-Situ collections, for example American Type Culture Collection (ATCC) or Belgian Coordinated Collections of Microorganisms (BCCM). Biotech companies reported that acquisition from and with the assistance of commercial intermediaries (small broker companies) are common praxis as well. In both sectors cooperation projects with local research institutions or smaller research based companies in provider countries also happen to be procurement strategies. It seems, however, that companies rather decide for one of the two strategies to access genetic resources from source countries, while material acquisition from ex-situ collections is always part of the strategy.

Plant breeding companies

Material for plant breeding purposes is procured in various ways: commercial plant varieties can be purchased on the market and used for further breeding under the “breeders’ exemption. Breeders might also exchange “material under development” using bilateral licensing agreements, and companies have their own collections of material from former breeding programs. “Raw” genetic material is acquired from gene banks or botanical gardens, as well as via expeditions and collecting activities. The latter options are rarer, though.

Materials that are acquired from gene banks or botanical gardens are usually (even before the sMTA of the ITPGRFA was in place) transferred under standard MTAs, without extensive efforts for administrative requirements. For transactions with material under development or raw material among breeders, informal conventions on licensing terms are applied (at least in some areas). Source countries of genetic material used to develop the commercial material are not involved in these transactions.

3.2.2 Utilisation of Genetic Resources

The subsequent topic on our interview and discussion guidelines was the utilisation of genetic resources. This aspect has more than one dimension, whereby two are of particular interest with respect to adapted governance for transactions with genetic resources:

- ⇨ The intention of utilisation: Is the intended outcome commercially valuable or not; can the user who seeks access foresee whether research with non-commercial intentions might yield commercially applicable results in the future?
- ⇨ The technical process of utilisation: How much economic uncertainty is inherent in the process from research, development to potential marketing of a product? Uncertainty is high, if R&D and marketing success are difficult to predict, respectively if investments during this process are difficult to predict. This might be the case, if R&D is extremely longsome, or if technological change is fast. A further potential factor is demand uncertainty, which occurs if products based on the utilisation of genetic resources are developed for new and/or uncertain markets.

We discussed both aspects with most participants and subsumed the information for each group.

Users from public research institutions

The applicability and the dedication of research to some kind of "economically useful" outcome are of increasing relevance in publicly funded research institutions, particularly if they want to receive external funding. One example is the directive of many universities for researchers to apply for patents whenever possible. This of course has implications for ABS negotiations between researchers and potential providers of genetic resources. Researchers are bound by their institutional grant regulations when defining their position on the issue of "utilisation intention". For a considerable part of research taking place at public institutions, utilisation permits limited to publications are not sufficient, even if the researcher himself has no commercial intention. We can distinguish three main utilisation types found in ABS agreements involving researchers from public institutions: 1. publications; 2. Patents and other IPRs; 3. Licensing/sale of IPRs or products commercialised by start up companies that are spin offs from public research institutes.

Pharmacy and Industrial Biotechnology

Users in this investigational group reported a range of utilisation purposes for genetic resources, though all of them are characterised by commercial interest. The difference lies in the process stage resources are inserted and whether they are used as model for the design of a product (active leads are used as patterns for synthesised molecules), as tool in a process (biocatalysts in an industrial production process), or in the production as active component of a drug (only to name some possibilities).

The chain of utilisation can roughly be divided into three stages:

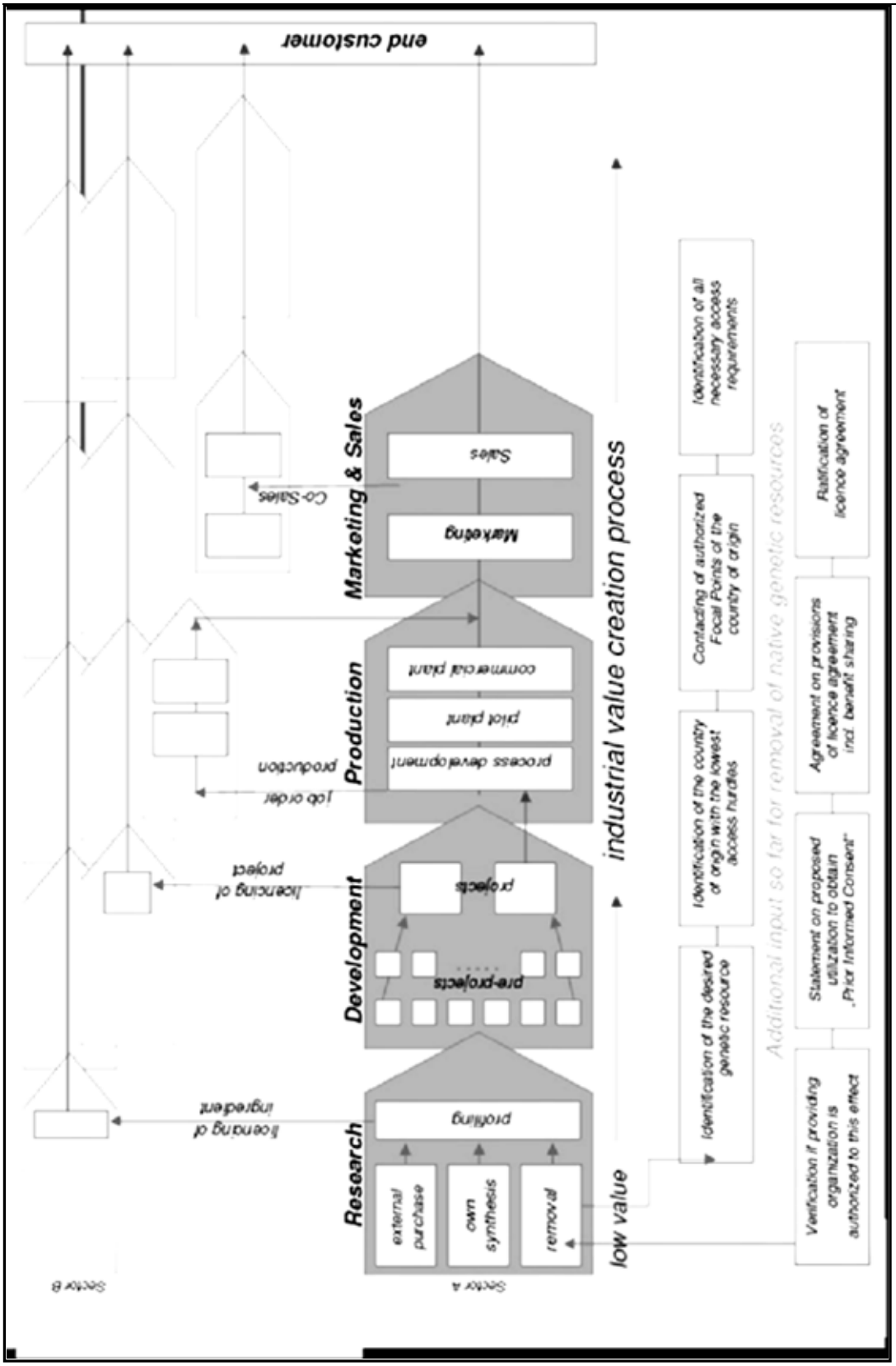
1st Stage: Efficiency Analysis

2nd Stage: Potential Evaluation

3rd Stage: Project Development (in Pharmacy: evaluating clinical trials)

The different steps are often not captured by one single company. A company might outsource certain activities or buy and/or sell certain intermediate products. Overview 4 shows the complexity of the value creation chain in this industry sector (Figure 6, see next page). Often several stakeholders contribute to research, development and production of a product in the chain and are therefore affected by an ABS agreement.

Therefore the willingness to invest in acquisition costs and options for benefit sharing vary. The closeness between the genetic resource (as input) and the product could be one factor determining uncertainty. However, as elaborated above the way of utilising genetic resources varies among the many different fields in industrial biotechnology and pharmacy. The activities within the chain lead to various intermediate products with different values.



Source: DEUTSCHE INDUSTRIEVEREINIGUNG BIOTECHNOLOGIE (2008).

Figure 6: The chain of utilising genetic resources in the biotechnology industry

Plant Breeding Companies

In this group the acquisition of genetic resources is dedicated to innovation in the plant breeding process. The intention is to develop marketable products, as the survey participants were employed by private companies. Genetic resources are mainly used for the search of and integration of tolerances against diseases in commercial varieties. The transfer of plant characteristics connected to a certain habitat, for example water, daylight, and temperature requirements, into commercial varieties is a further purpose for utilising wild material.

The technical procedure of breeding can be distinguished in classical breeding methods (e.g. selection breeding) and marker supported methods (application of biotechnology). This differentiation is important as it has implications on the duration and the costs of the research process and applicable IPRs. Classical breeding results (in a successful case) at the utmost in a new plant variety, which (in Europe) can only be protected with plant protection rights. This IPR includes the breeders' exemption, and therefore further use of improved material is possible for other breeders. In the latter case results of the utilisation can be protected with patents implying significant restrictions for further use of the utilisation product (HERRLINGER ET AL. (2003)). This is definitely an issue for consideration in ABS contracts.

Time frames for developing new varieties (the breeding process) with vegetative propagated ornamental plants vary between 3 to 10 years depending on the growth and reproduction cycle of the individual plant and on the degree of innovation strived after. Accordingly also the costs vary.

One crucial difference between the seed industry for agricultural crops and the horticulture strand of plant breeding is that in the latter cooperation between the private and the public sector is much more seldom. Public engagement in research for breeding of vegetative propagated ornamental plants is less intensive and developed than for agriculture and food plants (e.g. Consultative Group on International Agricultural Research (CIGAR), plant breeding at universities). The exception is fruit; here public involvement in breeding research is also high.

Stakeholders in the chain of breeding, propagating and marketing vegetative by reproduced horticulture plants is seldom a single company; most often several steps are carried out within typical provider countries, but not necessarily the country/countries where the genetic resources used in the process are originated in.

Summary on utilisation intention

The "utilisation intention" is the general factor to differentiate transactions with genetic resources. It determines whether parties of a transaction have to negotiate ex ante about potential economic rents resulting from the utilisation. The challenge is that commercial values might arise even if the recipient initially did not intend this, for example through subsequent users. The exploratory survey revealed that the border to assign utilisation intentions lies not between public research institutes and private companies. To develop more standardized model clauses, the chain of utilisation in different industry fields and science disciplines could be subdivided into distinguishable types of utilisation or intermediary products. The survey indicates that analogies can be found among sectors and disciplines. The overall perception of users was that the clear definition of utilisation rights in the ABS contract is vital to secure investments in research and development.

The second dimension of utilisation forms for genetic resources with relevance for governance elements is the method or the process of utilisation. Theory suggests that forms of primary uncertainty, market uncertainty, the timeframe of R&D, and also the level of specific investments are characteristics of utilisation determining the optimal design of compensation mechanisms, timeframes for contracts, and adapted dispute settlement measures. The exploratory survey indicated heterogeneity of transaction characteristics within and among the survey groups. These aspects have to be investigated in further empirical studies, in particular for cases with commercial utilisation intention.

3.2.3 Benefit sharing

Benefit sharing is the compensation, respectively the price mechanism in a contract for access to genetic resources, related information, and services. Theory suggests different types of pricing mechanisms depending on the characteristics of transactions. The Literature on Bioprospection and ABS indicates as well as our review of existing guidelines and model agreements that options for compensation mechanisms (here benefit sharing measures) are manifold. In the exploratory survey we discussed the users' understanding of benefit sharing, how it is applied in praxis, and the motivation for the choice of measures. Similarities and differences in praxis within and among user sectors were a focus of interest.

Users from public research institutions

Among the survey participants of this group we found a consensus of willingness to share benefits of research results based on the utilisation of genetic resources and related information. However, former user studies indicated that far from all researchers are aware of the CBD, and ABS (HOLM-MÜLLER ET. AL. 2005).

Different forms of benefit sharing (monetary, non-monetary) are applied in agreements users of this group engage in. Capacity building and technology transfers (the latter in larger, well-staffed and financially well-equipped projects) are buzzwords in projects with the involvement of public institutions. Often a participatory approach is even a requirement for external research funding. However, not all institutions and granting bodies necessarily connect this requirement with the ABS principle of the CBD.

If results-oriented payments are part of agreements, they are most likely linked to patent disposal or licensing. Some users reported that upfront payments are also performed, e.g. as a payment in return for sample provisions or in terms of infrastructure investments (e.g. a car that becomes the provider's property after a cooperation project ends).

Guidelines for monetary and non-monetary benefit sharing in research projects could be a useful tool for communication between researchers and their institutions for the financial planning of research projects and for negotiations between users and providers.

Pharmacy and Industrial Biotechnology

The group discussion showed a controversial understanding of the benefit sharing concept among the company representatives, although, all participants had experiences with transactions with genetic resources under the CBD scope. Confusion persists regarding which entities should be beneficiaries in agreements to comply with the ABS principle in the CBD. Should benefit sharing always include transfers dedicated to a determined governmental entity in the provider country, even if the transaction takes place without governmental participation? Also, the jurisdiction of ABS for certain transactions and not others was an unclear concept. Views of the survey participants and means of addressing these issues vary.

Users from industrial biotechnology reported that they acquire genetic resources mostly via "simple" buying transactions with commercial intermediaries (broker companies in provider countries). Ex-situ culture collections like BCCM and the ATCC[13] are further intermediary sources. In both cases benefit sharing payments for genetic resources takes the form of fees per acquisition/sample. The users did not explicitly label this as benefit sharing in the sense of the CBD, particularly not if the source is an Institution conducting ex-situ conservation and material provisions. In both procurement strategies (1. material is collected and transferred to the user by an intermediary company; 2. material is acquired from an ex-situ conservation institution) users usually do not have direct contact with governmental entities of the "source country" to negotiate ABS requirements.

Companies agreed that generally the terms of benefit sharing are individual from case to case and a matter of negotiation between the parties. Complex benefit sharing models are applied in projects with a higher level of collaboration in R&D between users and entities in provider countries. However, participants reported that the capacities of companies to conduct technology transfer or know-how transfer vary depending on the size and fields of activity. Also the specific needs of providers are considered: what is appropriate differs on a case-by-case basis (short and medium-term technology transfer and capacity building versus long-term, insecure success profit-sharing). Views regarding royalties as compensation mechanism differed among the interviewees; however, they are included in some ABS agreements.

[13]ATCC is a private, non-profit institution dedicated to the collection, preservation and distribution of authentic cultures of living microorganisms, viruses, DNA probes, plants, and human and animal cells. (http://www.lgcstandards-atcc.org/Home/tabid/477/Default.aspx).

As reference points for equitable benefit sharing, the participants of the group discussion indicated the overall effort required in the process of R&D for developing a commercial product, as well as the relationship between the genetic resources as input factors and the product (as a measure for the contribution of the resource). The characteristics of both criteria vary among utilisation cases in the survey group. Nevertheless, in the discussion users agreed that rough categories could be defined.

The overall tendency in the discussion was that pharmaceutical and biotech companies are willing share benefits. However, they criticised unsolved contradictions with common practice for economic transactions in their sectors. On the one hand ABS is discussed as a measure to define commercial values for genetic resources. Accordingly, the principles of business in international private law would, and payments should relate to the economic interaction between provider and recipient of a certain good or service. On the other hand the benefit sharing principle might oblige companies to share benefits with governmental entities although these do not actively contribute to the transaction (benefit sharing works like a tax).

Plant Breeding Companies

The overall view on benefit sharing in the agricultural plant-breeding sector communicated by associations and large companies is that the system of free access to and exchange of improved varieties and information is a major act of benefit sharing as such. However, plant breeders we interviewed in the frame of our exploratory survey reported various additional forms of bilateral benefit sharing: bilateral exchange of raw material or material under development, exchanges and training of scientific staff, financing of expeditions in which source country gene banks participated, cooperation in evaluating material, and collaboration in scientific publications.

The breeders state that usually the contribution of a single resource to the development of a new marketable variety is extremely small. However, this varies among plant types, as does the breeding effort required to develop a new variety. For model clauses it might be interesting to elaborate on defining groups of plants with similar characteristics regarding the closeness of the genetic resource and product. The same applies for costs and efforts for the entire breeding process.

The general feeling about benefit sharing among ornamental horticulture breeders was that they should not be subject to an additional regime or any benefit-obligations at all. The reasoning is that breeders by the nature of their business already conduct benefit sharing:

- By creating biodiversity (new varieties) and preserve existing biodiversity (varieties which are threatened with extinction);

- In the sense that improved varieties can be used by every other breeder for further breeding (UPOV), even if they are protected with plant protection rights;

- An essential part of the value chain of this industry is located in typical provider countries (societies benefit directly from the creation of jobs and income); and they are carried out by other stakeholders than the breeding company.

Breeding companies are likely to transfer additional monetary benefit sharing obligations for the initial recipients of genetic resources (the breeders) to subsequent stakeholders of the value chain (propagators, growers), because the margins at the breeders level are the smallest.

Summary on benefit-sharing

Benefit sharing - the compensation for provision of genetic resources and related information - is maybe the most controversial issue in the entire ABS debate. The overall consensus among participants was that "paying" for access to genetic resources is acceptable in general. However, for some users this meant a whole range of benefit-sharing measures, for others it meant paying a fixed fee to a certain intermediary. Discussions and interviews indicated that the differences mainly reflect heterogeneity among relationships between the user and the provider. Also relevant is the provider type: intermediaries (such as gene banks or broker companies) often require only standard fees. Several users would not label this kind of transaction as ABS agreement respectively the compensation as benefit-sharing. If provider country authorities and/or local research entities are involved, more complex solutions are applied.

Benefit-sharing as compensation, respectively pricing element in ABS contracts would require a whole range of model clauses to cover the variety of cases even within user groups appropriately. To develop such model clauses an analysis of the value chain and cost components in typical utilisation fields for genetic resources are necessary. On this basis more objective recommendations for monetary benefit sharing (or equally valuable non-monetary benefit-sharing measures) could be developed.

The overall recommendation for model clauses derived from the discussions is that they need to be flexible enough to reflect the users' options and the needs of the providers. A full standardization of monetary benefit sharing, particularly for complex transactions, is impossible and would not be feasible for both sides. However, model clauses providing suggestions for monetary benefit sharing and guidelines for choosing the appropriate option could be useful.

3.2.4 Intellectual Property Rights

The right to apply for Intellectual Property Rights based on the utilisation of genetic resources can be viewed as element of access and utilisation rights users "purchase" from providers. On the other hand IPRs can be used as benefit sharing component, when providers participate in joint IPRs or if benefit sharing is triggered by the commercialisation of IPRs.

Users from public research institutions

IPRs have an increasing relevance in the public research sector. They serve as tool for public research entities to generate commercial benefits from research with genetic resources. Therefore, depending on the concrete research field, IPRs can be a key issue in ABS contracts for this survey group.

Some researchers reported about projects in which joint patents are integral part of the ABS contract. The principle of joint ownership for IPRs with industry partners is common practice in other fields and transferable to projects involving the procurement of genetic resources from source countries. Joint patents between users and providers of genetic resources were discussed as means of monetary benefit sharing, particularly if the provider contributes to the research process beyond the mere provision of raw samples.

A stronger self-interest of provider entities to ease negotiations and administrative requirements is viewed as positive side effect of potential joint IPRs. It might also be a tool to demonstrate fair participation and reduce mistrust. On the other hand, joint patents are a challenge if it comes to commercialisation, e.g. licensing to subsequent users. All patent holders would have to agree on the terms of the transaction (both the price and with whom to conduct business). Guidelines for this case should be established in the initial contract between user and provider to avoid hold- up problems at later stages.

Legal requirements of joint patents were not discussed in this group.

Pharmacy and Industrial Biotechnology

The survey participants from this group are familiar with the principle of joint patents. However, in the context of ABS they see problems for applying this concept. The patent law requires that all patent holders actually contribute to the invention. It is understood that the mere provision of genetic material is not sufficient as contribution in this sense.

One participant described a case in which a joint patent would be applicable: If a provider contributes to the concept of the patent by providing the traditional knowledge about certain healing powers of a plant, and based on this knowledge the company extracts an active component from a plant and develops a drug. Benefit sharing could - in accordance with the provider countries national ABS regulations - include joint IPRs similar to allowance directives like the German Employee`s Invention Law (Arbeitnehmererfindungsgesetz).

Among survey participants of this group we did not identify a common practice regarding IPRs for genetic resources transferred under MTAs. The tendency seems that when resources are acquired via commercial intermediaries, more rights are transferred to the user (whether in accordance with the respective national law of the source country or not we can not say), while, if contracts are concluded with officially authorised public entities in source countries, more rights remain with the provider.

Plant Breeding Companies

Under European regulations, plant breeders can apply for plant protection rights (PPR) for a new variety. Such an IPR is applicable for traditional breeding techniques (selection breeding, crossing, cloning). PPRs are granted if a variety fulfils certain criteria (HERRLINGER ET AL. (2003): 246). The process of achieving such a right is lengthy and costly and a breeder will only engage in it if the new variety has sufficient commercial potential. Only selected plant breeding products on the market are protected by a PPR. Despite this, plant varieties under protection can be purchased and used for further breeding activities by any plant breeder without explicit consent of the holder of the PPR (Breeders Exemption in German law14 in accordance with the UPOV convention).

Since the 1980s biotechnology has been applied as new technique in plant breeding, one example being marker-assisted selection. Since the European Biopatenting Directive (1998), products from biotechnological plant breeding can be protected with Biopatents if they fulfil the patenting criteria (they are novel, non-obvious, and useful). Plants or parts of plants can be part of so-called Biopatents, if they are part of the invention, for instance a certain technique to locate, extract and transfer a gene of a certain plant (HERRLINGER ET AL. (2003): pp. 251). Biopatents provide a stronger, more exclusive protection right compared with PPRs.

[14] http://transpatent.com/gesetze/sortschg

Summary on IPRs

Intellectual Property Rights are a vital component of the outcomes generated by the utilisation of genetic resources. Even in the public research sector, IPRs play an increasingly important role because research institutions have to compete with each other in the acquisition of external grants. Moreover, selling and licensing of IPRs is a source of income generation.

All user groups reflected in the survey are in some way familiar with the concept of joint IPRs (patents), although experience of joint patents with providers of genetic resources is not widespread. Although this is viewed as a potential option for benefit sharing, particularly companies stressed the requirements for joint patents contained in the patent law. According to this, providers of genetic resources could only participate directly in a patent application if they contribute to the invention to be patented.

3.2.5 Exclusivity Rights for Access to and Utilisation of Genetic Resources

As elaborated in the theory chapter, exclusivity rights for certain inputs can be understood as strategy to achieve competitive advantages. In the case of genetic resources and related information we assume exclusivity rights can take various forms ranging from full exclusion of other potential users from access to the resource for a certain time frame to exclusivity limited for specific utilisation forms or research fields. The later form allows the provider to engage with several users for the same resource but for different utilisation forms. In the frame of interviews and group discussions we elaborated how commonly exclusivity rights are applied, in what form and how this relates to other elements of ABS agreements.

Users from public research institutions

The group discussion with researchers from public institutions found the group divided on this aspect. Most participants preferred a general open access approach for genetic resources, which would prohibit exclusivity rights. However, individual researchers argued for exclusivity rights, though limited to specific fields of research, as an instrument to secure research investments. This contractual aspect seems to be of relevance for researches at public institutions only in certain fields with a high level of applicability, e.g. in pharmaceutical biotechnology. If exclusive access increases planning certainty for researchers, it might trigger higher investments for the respective research project and therewith enhance the chance of commercial valuable benefits. Positive side effects for providers are possible.

Finally, participants in the group discussion found that MTA model clauses on exclusivity applicable to this group should be limited to certain forms of utilisation or research questions and with a limited timeframe. An option could be the expiration of the exclusivity right for access/utilisation granted by the provider, if the user does not manage to apply for a patent within the defined timeframe. If the user does not succeed within an agreed timeframe, the provider can reconsider engagement with other users or renegotiation and renewal of the arrangement with the first user.

Pharmacy and Industrial Biotechnology

In this research group, two forms of exclusivity are applied: exclusivity of access and exclusivity of a certain utilisation form. Companies apply both instruments to achieve competitive advantages in the sense of a head start to conduct certain research steps exclusively, for instance efficiency analyses.

Access exclusivity would increase incentives for users to invest in broad trials of the resource, which would increase the likelihood of commercial success. The users thought that the level of exclusivity that is finally agreed upon would be a matter of negotiation. Users' willingness to pay would depend on many criteria, including anticipation of success, uniqueness of the resources, and the level of information available on the resources. It would be comparably low for random samples.

Summary on Exclusivity

Exclusivity of access has been raised as matter of importance in all three user groups. The level to which it is approved differs by timeframe and scope. For instance, exclusivity can be divided into access for certain research questions or utilisation purposes or for full exclusive access to a resource. In general exclusivity is a tool to generate competitive time advantages in research. Which scope a provider and a user agree upon depends mainly on the user's willingness to pay and the price demanded by the provider. In general we would recommend a model in which exclusivity is limited to a certain timeframe and contains the option of renegotiation. This leaves the option for the provider and the user to decide after a certain time whether investments in prolonged exclusivity seem promising.

3.2.6 Duration of Contracts to Govern Transactions with Genetic Resources

Users from public research institutions

During the discussion it appeared that most researchers favour long timeframes for access and the right to utilise genetic resources publish results and apply for IPRs. This is, because timeframes for research are often very long; of course this varies among disciplines. Users see a risk in applying medium term contracts (e.g. three years) with the option of renegotiation and extension to contracts over utilisation rights for and access to genetic resources, particularly if the political climate regarding ABS issues is unstable in a provider country.

Pharmacy and Industrial Biotechnology

Company representatives that participated in the group discussion stressed that for transactions with genetic resources a concretisation of mutual obligations in contractual form is important for legal certainty of the user and the provider. However, some companies reported that before the first material transfer is carried out a fully fledged contract document including specifications on success-based monetary benefit sharing is drafted and signed. Amendments during the project are envisaged only to a limited extend. Other companies rather use the approach of phasing agreements. At each significant

step in the R&D process new contract documents are drafted or existing contracts might at least be extensively renegotiated and amended. Financial details would not be negotiated before the company has found a commercially promising lead in the samples provided under the initial MTA.

First considerations about potential reasons for the heterogeneity between similar fields of utilisation led to internal decision procedures in firms with different sizes and level of specialisation. Particularly in large companies, internal transaction costs might be minimised by applying phased decision procedures: low impact and costs projects can be decided on a low management level. Only when a higher level of probability for commercial potential is reached and costs increase, higher management level are engaged. In comparably smaller companies with flatter hierarchies and a higher degree of specialisation, engaged management levels might differ less.

3.2.7 Publications based on R&D with Genetic Resources

This is an issue that was discussed in depth only with users from the public research sector. Through publications, "new" information about genetic resources and related knowledge is transferred in to the public domain. Subsequent access to information is less controllable for the initial providers. In this sense publications are definitely a form of utilisation intention and they contain the risk of a loss of control. A mechanism to prevent or limit the risk of information acquisition by third parties without affirmation of the providers can be viewed as a prerequisite for facilitated access procedures for users only intending to publish in scientific publications. We had the impression that a substantial part of researchers are not aware of these interrelations and the resulting problems. The main findings from the discussion on this issue are:

- Model clauses on publications should classify kinds of information and related procedures for publication permits.

- The publication of information without explicit permission in an ABS contract should be regarded as a breach of contract.

- Researchers reported from experiences in other fields than ABS that publications resulting from research cooperation with industry partners are carried out under contractually formulated principles like reporting requirements, prior consultations and veto rights. These principles, adapted to the relationship between users and providers, might also be applicable in ABS agreements to reduce the risk of a loss of control.

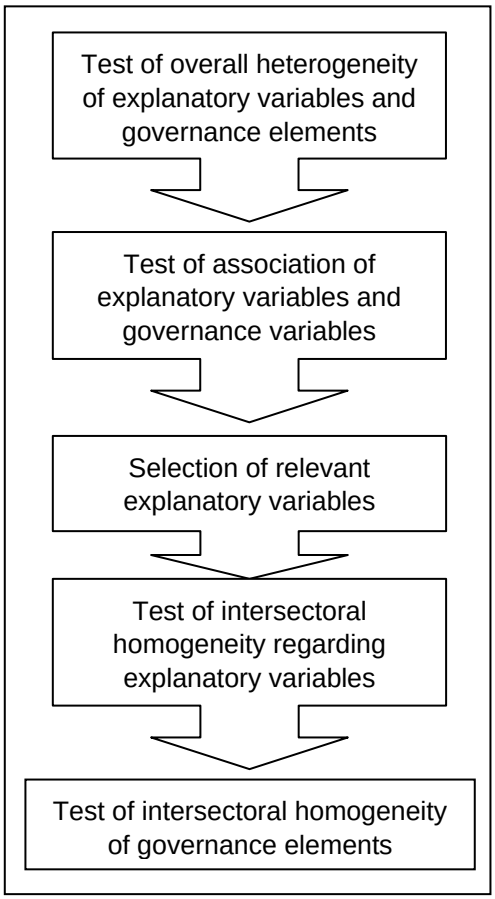
- Users should refer to the providers in publications.

In publications that subsequent users are requested to negotiate a new MTA (with the initial user or directly with the provider depending on the system chosen in the initial MTA).

4 Results Internet-survey – Transactions with Genetic Resources

Governance Analysis of transactions with genetic resources is a fairly new research field. Exploratory, qualitative studies were required to reach an initial level of understanding, among others as basis to operationalise theoretic concepts of governance theories with respect to the research subject. Existing studies about ABS agreements, respectively bioprospection, do not comprise statistical analysis. The third part of empirical research in the framework of this study attempts to apply statistical tools in this area. For this purpose we conducted a standardised, cross sectional online-survey with companies from different sectors. The basic sample description and explanation of the evaluation methods are given in Part A chapter four of this report. In the present chapter we evaluate the survey data with respect to governance-related research questions. Thereby we have two - possibly competing - approaches for the categorisation of ABS cases with respect to efficient governance forms: on the one hand a theory based differentiation on the basis of demand characteristics, strategic factors and transaction attributes; on the other hand the sectoral differentiation. Figure 7 visualises the procedure of the survey evaluation, and therewith the structure of this chapter.

Figure 7: Associations of explanatory variables with the field of utilisation for genetic resources in reference projects



Source: Authors'.

First the sample data was evaluated one-dimensional with respect to explanatory variables such as transaction attributes, strategic factors and demand characteristics and regarding governance elements. The aim is to verify heterogeneity of transactions with genetic resources. In the second step "successful" empirical cases are used to evaluate associations of (theoretically) explanatory variables with governance elements. The combinations we tested reflect assumptions about governance strategies derived from theory and exploratory research.

Accordingly, based on significant test results (empiricism – explanatory contribution) we select transaction attributes and demand characteristics for further analytical steps and discussions of instruments. Variables significantly associated with governance elements, should be used to characterise, respectively to differentiate cases for the development of model agreements/guidelines for drafting contracts.

In the second step we check whether cases are intra-sectoral homogeneous regarding the relevant explanatory variables (the variables we recommend to use for defining groups) and also regarding applied governance forms. The results are used to discuss in how far the sectoral approach/differentiation is appropriate and where it neglects heterogeneity and hence would lead to inefficient standardisation / models. Moreover, we can point out theory-consistent ways to define categories of cases for which common standardised contractual instruments could be applied.

4.1 Empirical Heterogeneity of Transactions with Genetic Resources

Basis of this research is the assumption that transactions with genetic resources are heterogeneous, and this heterogeneity contributes to the variety of governance forms which are applied in practice. The one-dimensional evaluation of our survey sample with respect to potential explanatory variables and governance variables shall verify the heterogeneity.

4.1.1 Characterisation of Transactions – Explanatory variables

Supposedly, ABS cases, respectively transactions with genetic resources theoretically falling under the scope of ABS are heterogeneous with respect to the subject matter of transaction (genetic resources, related information, services and rights, etc.), the characteristics of the utilisation process, and the characteristics of the user entity.

4.1.1.1 Differentiation of Demand for Genetic Resources

In chapter 5.3, in Part A of the report we elaborated several utilisation characteristics to interrelate them with transaction costs of ABS agreements. Here, additional aspects for the differentiation of demand and supply of genetic resources are supplemented.

Genetic resources are used in various fields and for various purposes. In fact, the term ABS covers economic interactions with a multitude of different subject matters. Previous studies and literature indicate that most often demand for genetic resources is combined with demand for additional services, information, rights, or even specific ways of access. Some users might demand access to undiscovered genetic resources as a potential source of innovative products might be very important, while for others traditional knowledge about effectiveness of natural resources is a major demand aspect, again others might prioritise exclusivity rights. To verify heterogeneity of demand we included in the questionnaire a battery of items characterising demand for genetic resources (Q4). The results are displayed in Table 33.

On a scale from 1 (not at all important) to 7 (very important) users were requested to assess the relevance of six items for the selection of supply sources for genetic resources. As we are aware that many companies procure genetic resources in several ways and for many purposes, we asked the respondents to consider if the items were relevant for at least some of their companies' projects.

Table 33: Frequency table: Differentiation of Demand in ABS agreements (Q4)

Please complete the following sentences and assess how important each aspect is for the selection of a supply source for genetic resources.									
For some projects in our company was or is...	**1= not important at all ... 7= very important**								**Cum. freq. cat. 5 to 7**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**all**	
1: ... access to undiscovered genetic resources (GRs) as a potential source of innovative products very important.	2	9	3	5	6	12	20	57	67%
2: ... access to properties of wild species of certain plants or animals very important.	6	4	4	5	5	13	19	56	66%
3: ... it very important to be able to study GRs in the context of their natural habitat.	12	10	9	6	8	6	7	58	36%
4: ... traditional knowledge about effectiveness of natural resources very important	17	7	5	6	3	10	10	58	40%
5: ... exclusive access or exclusive usage rights for genetic resources very important.	13	11	3	4	4	11	10	56	45%
6: ... it very important that the provider could deliver the GR(s) as raw material on a intermediate or long term basis in larger quantities.	21	4	2	4	9	6	8	54	43%

Source: Author's.

Table 33 shows that the majority of companies represented in the sample conducts projects for which access to undiscovered genetic resources (item 1) and to properties of wild species (2) are rather or very important. However, as we assumed, responses on more specific demand aspects (items three to 6) are dispersed. Some users assess them as highly relevant for certain projects, while others do not consider them at all.

ABS agreements govern transactions with heterogeneous goods and services. This becomes even clearer, when we look at the contribution of provider entities on a case level. As explained before, the questionnaire contained a "case specific" part. Participants were required to answer a series of questions under consideration of own experiences and practice in a specific project their company has been or is currently engaged in. Table 34 displays the 40 companies' answers to characterise services, and other types of contribution by provider entities within the project. The question is operationalised in eleven "contribution items" which the participants could select from (Q5). Multiple entries were

possible.

Table 34: frequency table: Providers contribution for the project with genetic resources (Q5)

Number of valid cases= 40, All entries= 105	frequency	Percent of valid cases	Percent of entries
Access to previously inventoried resources in national collections	18	45%	17%
Collection permission	15	38%	14%
Provider executes collection activities	11	28%	11%
Information (e.g. traditional knowledge) about usage possibilities	12	30%	11%
Preparation of the material	12	30%	11%
Evaluation of samples	13	33%	12%
Participation in advanced research	9	23%	9%
Exclusive access to genetic resources	6	15%	6%
Exclusive usage rights for certain information	5	13%	5%
Exclusive research rights in certain application areas	4	10%	4%
Other kinds of contribution	2	5%	2%

Source: Author's.

The total number of entries is 105. Accordingly several respondents made multiple entries. We counted the number of entries per respondent and figured the biggest group (45%) made three or more entries (see Table 35). Obviously, when users procure genetic resources directly from source countries, transactions are not limited to mere access permission or resource transfer. It is in fact a whole package of services that users tend to procure together with access to genetic resources. In about 45 % of the projects access to previously inventoried resources in national collections was granted, but only in four cases this was the sole contribution from the provider side. The only item for which answers are associated with sector affiliation is the "preparation of material". A significantly higher percentage of companies from Pharmacy, and Botanical Medicine, Cosmetics and care chose this item to describe their projects (see

Table A7).

The results testify that demand is heterogeneous and the providers' contribution in transactions with genetic resources differs considerably. Moreover, they demonstrate that providers contribute in many different ways in the chain of utilisation of genetic resources. Theory suggests that this is reflected in governance mechanisms.

Strategic aspects are part of our theoretical framework to explain governance choice, particularly the application of non-monetary benefit sharing measures. In the survey we operationalised strategic aspects by asking users about their motivation to engage in non-monetary benefit sharing measures. Table 35 presents responses on a range of questions regarding strategic motivation for non-monetary benefit sharing (Q36).

Table 35: Frequency table on synergy effects of non-monetary benefit sharing (Q36)

What synergy effects (can) result for your company from non-monetary benefit transfers in the project?	**1= Not correct at all ..... 7= Completely correct**								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**all**	**Cum. freq. cat. 5 - 7**
1: Providers will be better positioned to provide the desired activity, for example, quality / continuity of material supply.	0	2	3	4	0	7	3	**19**	**53%**
2: Local scientists will be able to conduct initial on-site evaluations of genetic resources, which will reduce costs for us in the long run.	0	1	3	5	3	4	3	**19**	**53%**
3: Capacity building ensures the conservation and the long-term availability of genetic resources.	1	1	3	3	1	5	4	**18**	**56%**
4: Capacity building is the prerequisite so that scientific cooperation is possible.	2	3	5	2	3	1	3	**19**	**37%**
5: Capacity building increases trust and facilitates communication with the providers.	1	0	0	3	3	4	7	**18**	**78%**
6: Capacity building is a fundamental requirement of the provider.	3	6	2	4	1	0	2	**18**	**17%**

Source: Authors'.

Only companies were required to answer the "synergy/strategy" questions that beforehand reported non-monetary benefit sharing measures being part of the compensation mechanism within the project. More than half of the users confirmed positive synergy effects of non-monetary benefit sharing as operationalised in item one, two, and three (see Table 35). Users have interests to safeguard supply in required quality, and amount, to ensure long term availability of resources. Also economising of costs for material evaluation is an incentive for many companies to conduct capacity building in provider countries. This testifies that strategic aspects are often a motivation for certain elements in ABS agreements. Strategic aspects shall therefore be included in further evaluations combined with governance elements.

4.1.1.2 Heterogeneity with respect to Transaction Attributes

In discussions about potential ABS instruments in the framework of an international regime it is stipulated that instruments should be adapted to "different ways of utilisation" in different users sectors or groups. However, a concept is missing for the operationalisation of "ways of utilisation". In this study we test a concept based on transaction costs economics and further theories. The one-dimensional survey-results presented in this subchapter give evidence for the heterogeneity of these variables in our sample.

Asset specificity

In transaction cost economics asset specificity is seen as one of the most relevant factors for the choice of efficient governance forms. Many empirical studies support this theory. However, Bioprospection and ABS agreements have been analysed with regard to asset specificity only very limitedly. Our survey has taken up this issue. Table 36 displays the answers differentiated by type of investment and location (Q22 and Q24).

Table 36: Frequency table companies specific investments for projects with genetic resources (Q22 and Q24)

Has your company invested or is your company investing for the use of genetic resources from this project in ...	**Yes**	**No**	**I do not know**	**Number of valid entries**	**yes in valid %**
- its home country/ies [a]					
... for buildings (Laboratories, Plants)	9	25	3	37	24%
... for laboratory equipment or other physical assets	19	20	2	41	46%
... for education / hiring of skilled employees	21	17	2	40	53%
Number of cases with "yes" entry for at least one item: 26					
- the provider country [b]					
... for laboratory equipment or other physical assets	11	29	1	41	27%
... for education / hiring of skilled employees	16	23	2	41	39%
Number of cases with "yes" entry for at least one item: 18					
[a] Home countries means business locations that were selected independently of the project or existed previously. [b] Provider country: simplified term for the country in which the genetic resource can be found in its natural habitat.					

Source: Authors'.

Out of 41 companies 28 (68%) confirmed that they invested for the utilisation of genetic resources

within their reference project. Thereof 26 made investments in buildings, laboratory equipment, other physical assets and /or employees in their home countries. 18 companies made investments in provider countries within the framework of the project. Only 13 participants stated that they did not invest in any of the listed ways specifically for the project.

An influence of investments on the advantageousness of governance forms, however, is only assumed, if investments are specific meaning the utilisation outside the initial transaction relation - here the utilisation of genetic resources from the project – would cause financial loss, hence the investments create the risk of opportunistic behaviour and potential hold-up situations. Therefore we asked the survey participants to evaluate in how far investments for the reference project can be reused in case the project is called off before completion without financial loss. Table 37 displays the answers differentiated by investment in the home country and investments in the provider country (Q23 and Q25).

Table 37: Degree of Asset Specificity for R&D-projects with Genetic Resources (Q23 and Q25)

1= only with high financial disadvantages ... 7= without financial disadvantages									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**All**	**Cum. freq. cat. 1-4**
Can your companies' investments in the home country be otherwise utilised if the project is called off before completion?	4	2	4	6	1	2	6	25	64%
Can your companies' investments in the provider country be otherwise utilised if the project is called off before completion?	5	3	1	0	2	0	5	16	56%
These questions were filtered, and only answered by participants that beforehand indicated their company invested/ invests in the framework of the project.									

Source: Authors'.

The scale of answering categories ranges from 1: investments can be used outside the project only with high financial disadvantages, up to 7: investments can be used outside the project without financial disadvantages. As we see, about 64% of the respondents chose categories 1 to 4 regarding investments in home countries, and 56% regarding investments in provider countries. We learn that for a considerable share of projects with procurement of genetic resources from source countries, specific investments are necessary. Therefore we will include asset specificity as variable in further evaluations.

Uncertainty

Survey questions on uncertainty related to the transaction object and its utilisation (primary uncertainty) have been evaluated in Part A of the study in Chapter 5.3.3 (Part A, see Table 24). The sample indicates that utilisation of genetic resources can be characterised by different forms and levels of primary uncertainty. The main result is that users' assessment of uncertainty is not associated significantly with their sector affiliation. Uncertainty is included as variable for combined evaluations with governance aspects.

Frequency

Theory suggests that the frequency of interaction between two entities matters for the cost efficiency of "competing" governance forms. If a user procures genetic resources (and related services) over a longer period of time repeatedly from the same providing entity it might pay off to invest in the development of a more complex but participative kind of relation.

Table 38: Repetition of Interaction between User Company and Provider differentiated by Companies' Sector affiliation (Q20)

Sector affiliation (aggregated) * Frequency of transaction			
	once	**repeatedly**	**all**
all	20 (49%)	21 (51%)	41
Pharmacy; Pharmacy and Botanical Medicine	2	4	6
Botanical medicine, Care and Cosmetics; Botanical Medicine and Care and Cosmetics	0	3	3
Plant Breeders (Seed, Horticulture, and both)	14	11	25
Biotech others than Pharmacy and Plant Breeding	3	2	5
Biocontrol agents	1	1	2
Measure of association	**Cramer-V**	**Approximate Significance**	
	0.32	0.379	

Source: Authors'.

Table 38 shows that approximately half of the projects described within the survey are characterised by frequently, over a longer period of time repeated transactions with genetic resources (Q20). Obviously projects with the procurement of genetic resources vary with respect to frequency, and as theory suggests it to be a relevant factor for the choice of governance, we will include frequency in subsequent combined evaluations.

Summary heterogeneity of transaction characteristics

The subject matter of transaction falling under the scope of ABS provisions is not a homogeneous or standardized good or service. On the general level survey participants confirmed that demand for genetic resources is differentiated. Specific demand aspects, such as the ability to study genetic resources in their natural habitat, access to traditional knowledge, exclusivity rights, and long term availability of a specific resource in large amounts, are evaluated very heterogeneously by survey participants. On the case-level the sample showed how heterogeneous projects with respect to the provider contribution are.

Strategic aspects or synergy effects of capacity building in provider countries can be viewed as specific demand characteristics. The survey shows that in many projects user companies benefit from capacity building measures in provider countries, for example by safeguarding supply in required quality, and quantity, and ensuring long term availability of resources. Also economizing of costs for material evaluation is an incentive for companies to conduct capacity building. For each item we surveyed, the distribution of responses covers the whole range of answering categories indicating the heterogeneity of cases with respect to the benefits user companies may realize from capacity building in the framework of ABS projects.

“Ways of utilisation” can be operationalised by using transaction costs economics and further theories dealing with governance on the contracting level. The first explanatory variable we surveyed was “asset specificity”, which is here understood as the specificity of investments made by user companies in the framework of a project to use genetic resources procured from a provider country.

The majority of companies in our sample confirmed that investments are made within the framework of their reference project (28 out of 41). Most frequently investments in laboratory equipment, other physical assets and /or employees in the companies’ home countries. 18 companies confirmed that investments made within their reference project could not or only with financial loss be used otherwise in case the project is called of before completion. Hence, our sample is heterogeneous regarding asset specificity, about half of the sample-projects our sample are characterized by high level of specific investments.

Uncertainty is the second transaction attribute we used to differentiate ABS projects. The survey shows that utilisation of genetic resources can be characterized by different forms and levels of primary uncertainty. For each uncertainty proxy we used responses are distributed over the full range of answering categories. Highest accumulated frequency of confirmation (60%) was reached for the general statement “at the beginning of the utilisation process, we are not able to anticipate commercial output at all”, and for market, respectively for demand uncertainty (62%). We learn that often utilisation of genetic resources procured from source countries is characterized by uncertainty; however, there is a huge variation among projects.

The sample is split half on the aspect of frequency: half the projects are characterized as frequently, over a longer period repeated transactions; the other cases are single or low number of interactions between user-company and provider entity or entities.

4.1.2 Empirical Governance Forms for Transactions with Genetic Resources

To characterise and distinguish governance forms for transactions we first ask respondents to affiliate their reference cases to certain types of relations and contracts. Subsequently, we took a closer look at elements of contracts, respectively of agreements for transactions with genetic resources: duration of contracts, benefit sharing mechanisms, and thirdly the measures for conflict resolution, respectively contract enforcement. Together they form the governance mode.

Types of agreements and contract duration

As elaborated in 3.1 (Part B) existing guidelines and model agreements developed by stakeholder entities' suggested contract types vary between phasing, tiered contract approaches and models of rather comprehensive contracts right from the start of a project. The survey sample is divided on this question. 17 users reported that for their project the approach of phasing contracts was applied, and the same number of companies chose the other option (see Table A8).

As timeframes for research and development on the basis of genetic resources tend to be long we expected contract duration to be long as well. Standards and recommendations in model agreements or guidelines vary between five years (with option for renewal, though) and ten years. In practice variation of contract duration is really large for transactions with procurement of genetic resources from provider countries.

Table 39: Frequency table: Timeframe of Contracts Governing Procurement of Genetic Resources from Source Countries (Q31)

For what timeframe were mutual requirements made contractually binding with the provider?	frequency	Percent of valid entries
Less than 1 year	9	23%
1 up to 3 years	13	33%
More than 3 up to 5 years	6	15%
More than 5 up to 7 years	4	10%
More than 7 up to 9 years	1	3%
More than 9 up to 11years	1	3%
More than 11 up to 13 years	1	3%
More than 13 years	4	10%
All	**39**	

Source: Authors'.

Responses within the survey (Q31) ranged from less than one year (9 entries) up to more than 13 years (4 entries). Table 39 displays the frequency of entries for each possible answering category.

Monetary benefit sharing

Benefit sharing is the compensation or price mechanism in agreements governing transactions with genetic resources. The literature and a review of model contracts as well as guidelines show a large variety of options for benefit sharing. Ranging from standard prices, over ex-ante negotiated up-from payments, to outcome-dependent payments (for example royalties). Theory suggests that price-mechanisms shall be adapted to several transaction characteristics to optimise incentives for suppliers, to distribute risks between contracting parties, and to prevent opportunistic behaviour. The particularity of ABS is that non-monetary compensation measures are explicitly recommended to supplement or maybe even to substitute monetary benefit sharing where appropriate. Case studies show that non-monetary benefit.-sharing is implemented in practice. Examples include measures to conserve Biodiversity, and sustainable use, but also general development support, and even measures specifically dedicated to enhance scientific and technological capacity of provider entities.

What types of monetary and non-monetary measures are recommendable for certain types of transactions is discussed only very limitedly in the literature, and model agreements as well as guidelines are vague on this aspect. The questionnaire of our cross sectional online-survey contains one question battery on monetary benefit sharing items (Q35) and one question battery with non-monetary benefit sharing measures (Q36). Users were requested to select items characterising best the compensation mechanism applied within their reference project. In a first evaluation step we aggregated the question batteries, and received an overview on the frequency of and the relation between monetary and non-monetary measures in the sample projects. These results are presented in Table 40.

In the majority of projects (26, 70%) some kind of monetary compensation is part of the benefit sharing arrangement. Most often only one measure of monetary compensation is applied. The sample contains eleven projects with a combination of monetary measures, though. In approximately half of the cases monetary measures are supplemented by non-monetary measures (see Table 40). However, ten respondents stated that no benefit sharing was conducted within the project, at least not in any of the ways we operationalised benefit sharing in the questionnaire.

Table 40: Benefit sharing in the Reference Projects described in the Online Survey (Q35 and Q36)

N: 38	**Frequency**	**Valid percentage**
Either monetary or non-monetary	11(9 only monetary ; 2 only non-monetary)	29%
Monetary and non-monetary	17	45%
No benefit sharing at all	10	26%
Number of Monetary benefit sharing measures		
One	15	39,5
Two	6	15,8
Three	3	7,9
Four	2	5,3
None	12	31,6%

Table 40 continued

	Frequency	Valid percentage
Number of non-monetary benefit sharing items		
One	19	25%
Two	6	8%
Three	3	4%
Four and more than four	9	60%
None	1	3%

Source: Authors'.

On a disaggregated level of responses we can see how heterogeneous and manifold monetary and non-monetary benefit sharing is applied in practice. We find all levels of flexibility in payments or compensation structures. The first item "weight-related or hourly-wage-related" payments are closest to market or standard prices among measures listed in Table 41. The other items are in order of numbering in Table 41 characterised through increasingly participative-risk-sharing, and flexible. Among all items "payments tied to the commercial output" was chosen most often. In ten projects this compensation mechanism finds application. However, frequency for the three foregoing items is almost the same. But we see that the two last items "output related payments that are negotiated during the course of the project", and contract clauses for ex-post renegotiations have been selected significantly less often.

Table 41: Frequency table: Monetary Benefit sharing stipulated in Contracts for Procuring Genetic Resources from Source Countries (Q35)

Which form of monetary compensation does the provider receive from your company within the framework of the project?	**yes**	**No**	**Affirmation in percent of valid entries [a]**
Weight-related, or hourly-wage compensation	8	30	21%
Negotiated advance payments (lump sum)	8	30	21%
Negotiated payments that are made after reaching certain steps in the usage process (milestone payments)	8	30	21%
Payments tied to commercial output (e.g. royalties)	10	28	26%
Output-related payments, that are negotiated over the course of the project, for example, when certain operational steps are reached	5	33	13%
The contract contains clauses for ex post negotiation of compensation in the case that the framework changes.	5	33	13%
[a] number of projects in which this measure is applied divided by the total number of valid cases (**N 38)**			

Source: Authors'.

Non-monetary benefit sharing

The Bonn Guidelines contain a long list of suggestions for non-monetary benefit sharing measures (Bonn Guidelines, Appendix II Paragraph 2). For the survey we defined eight types of measures (Q36). Table 42 displays the frequency with which the measures are or were applied within reference projects of the survey sample.

We elaborated in the foregoing chapter strategic aspects for users to engage in non-monetary benefit sharing. One result was that companies see synergies of non-monetary measures for safeguarding supply standards, and quantities, as well as cost economising through outsourcing of material preparation/evaluation to provider countries. We assume that especially know-how and technology transfer contribute to realise such synergies. This might explain, at least partly, why know-how transfer in the scientific field (14) and technology transfer (12) are two of the three most often selected items.

Joint IPRs are applied only in four out of 38 projects. We discussed practice of Joint ownership for IPRs based on the utilisation of genetic resources within the foregoing explorative survey. Theoretically joint ownership of IPRs has potentially positive mechanisms (incentives and risk sharing); in practice, however, applicability is limited. Patent laws imply restrictions regarding ownership what limits the availability as benefit sharing instrument. Hence, it is not really surprising that this measure is included only in few projects.

Table 42: Frequency table: Non-monetary Benefit sharing measures in Transactions with Genetic Resources from Source Countries (Q36)

Which form of non-monetary compensation does the provider receive from your company within the framework of the project?	yes	no	Affirmation in percent of valid entries [a]
Joint intellectual property rights to usage results	4	34	53%
Joint publication in scientific journals	13	25	11%
Support of inventory / taxonomy of Biodiversity	8	30	21%
Technology transfer	12	26	32%
Transfer of know-how in the scientific field	14	24	37%
Support of infrastructure measures	5	33	13%
Transfer of know-how in the field of sustainable use / cultivation of genetic resources	9	29	24%
Support of other measures to preserve biodiversity	7	31	18%

[a] number of projects in which this measure is applied divided by the total number of valid cases (N 38).

Source: Authors'.

Conflict resolution

Mechanisms to enforce services under the scope of an agreement and mechanisms to resolve conflicts are a further contractual element with several implementation options. External (court) and internal mechanisms are possible, as well as intermediary solutions like arbitration assisted by third parties. In the survey we asked companies to select from a list of four options those that are or were applied within their reference project (Q33). Several entries were possible, and an aggregation of entries shows that in over 40% of the cases more than one instrument is selected (see Table A9).

Only in seven out of 38 projects "Judicial authorities" are included in the dispute resolution mechanism. Item 3: Internal conflict resolution and the harmonisation of interests, on the other hand was selected for 45% of the cases, arbitration with third party assistance for one third of the projects. In about half of the projects mutual activities are described precisely in the contract. In contract theory this is viewed as prerequisite for the appliance of external, judicial dispute resolution. However, in our sample in only three out of seven cases with "judicial authority" as enforcement item, item one was selected as well.

Table 43: Frequency table: Conflict resolution and enforcement measures stipulated in contracts for procuring genetic resources from source countries (Q33)

Which conflict resolution mechanism was established for the project?	yes	no	Affirmation in percent of valid entries
Exact description of the mutual activities (for example, schedule, delivery quantities, prices, height of compensation payments) in the contract	18	20	47%
Judicial authority	7	31	18%
Arbitration with the assistance of an independent third party	12	26	32%
Internal conflict resolution mechanism, interest harmonisation	17	21	45%
N: 38			

Source: Authors'.

Concretisation of mutual activities was most often selected in combination with internal conflict resolution measures and interest harmonisation (see Table A10). Significant level of association was not detected, however. Except between item 1: "Exact description of mutual activities", and item 3: "Arbitration with third party assistance", no significant associations among the different instruments could be identified. In the referred case, the association is that these options are particularly seldom selected in combination. Most often either the one or the other is applied (see Table 43). While for all other combinations occurrence is more randomly (see Table A11).

Summary heterogeneity of governance elements

A basic description of contractual solutions can be given by the type of relation participants selected to characterize their reference case (purchase or scientific cooperation), a tiered or complete contract approach, and what timeframe was decided for the contract duration. The majority of projects (75%) in our sample were characterized as scientific cooperation, only one forth as "purchase of genetic resources". About the contracting approach the sample was exactly split in half for phasing contracts and comprehensive contracts right from the start. Contract duration varies between less than one year (much shorter than suggestions in the analysed model agreements and guidelines) up to more than 13 years. The sample is heterogeneous regarding all three beforehand elaborated governance variables.

The topical literature and existing guidelines name several options for monetary compensation for access to genetic resources and related services spanning fixed weight-related or hourly-wage-related payments, which can be viewed as analogues to market (standard) prices and highly flexible participative-risk-sharing payment compensation structures. All beforehand identified options are present in the sample, whereby payments tied to the commercial output was selected most often. Output related payments that are negotiated during the course of the project, and contract clauses for ex-post renegotiations are included very seldom. In the majority of our sample projects only one type of monetary benefit-sharing is applied.

Non-monetary benefit-sharing measures are included in about half of the sample projects. In accordance with results on strategic aspects as incentives for capacity building, know-how transfer in the scientific field and technology transfer are two of the three most often selected measures. Joint IPRs, though theoretically having a high potential for interest harmonization, are applied only in few projects, supposedly because applicability is limited in practice due to patent laws. We note that the sample is heterogeneous regarding monetary and non-monetary benefit-sharing.

Basing on governance theory we included three major types of conflict resolution/contract enforcement strategies in the survey: classical external measures, third party assisted arbitration, and internal mechanisms. In almost half of the projects a mix of instruments is applied, whereby judicial authorities were chosen least often. The exact description of mutual commitments/activities, however, is applied in about half of the projects, most often in combination with internal conflict resolution, and seldom in combination with arbitration.

We can note that contractual solutions for transactions with genetic resources between user companies and entities from source countries are heterogeneous. For all surveyed contractual elements the given design options were selected by several respondents. It can be deduced that in reality a high number contract types finds application.

4.2 Association of Transaction Characteristics with Governance Elements

In the present chapter assumptions about associations of explanatory variables with governance elements are tested. As potential explanatory variables we tested (1) types of services, rights and information contributed by provider entities, (2) strategic aspects, as well as transaction attributes such as (3) asset specificity, (4) Uncertainty, and (5) frequency of interaction. Uncertainty was differentiated in Demand/market uncertainty, technological uncertainty, overall uncertainty regarding commercial outcome of the project, and uncertainty regarding the development of R&D. However, only relevant results are presented here.

4.2.1 Contract Type and Contract Duration combined with Selected Explanatory Variables

As explained before, survey participants were required to classify the contractual arrangement adopted for the reference project either as comprehensive contract, which is negotiated and settled predominantly at the beginning of the project, or as tiered contract, which is developed and modified during the course of the project. Based on governance theory we assume that projects with a high level of uncertainty regarding the commercial outcome are rather governed by flexible, tiered contractual solutions. Firstly, the user requires flexibility to adapt the project (extend or cease R&D) depending on the development of commercial prospects. Secondly, the definition of an appropriate compensation scheme ex ante under commercially highly uncertainty circumstances causes high transaction costs. The number of scenarios for benefit sharing that would have to be included in the contract increases with high commercial uncertainty. In projects with high technological uncertainty it is supposedly feasible to apply fixed contracts to circumvent opportunistic behaviour. The risk of hold up situations could otherwise obviate that companies invest during the course of the project.

The survey results are partly contrary to our hypothesis. The majority of company representatives characterising the utilisation as uncertain - regarding commercial output and/or regarding technological change - report that comprehensive contracts right from the start were developed to govern the transactions (see Table 44).

Demand uncertainty requires adaptability of relations mostly in terms of amount and timing of raw material delivery, respectively material preparation. However, this only comes into effect if the actual production requires the genetic resources as raw material input in larger quantities. Hence, we filtered the sample cases and included in the evaluation only those cases in which genetic resources are (likely to be) required as raw material for the production. The association of demand uncertainty with choice of contract type was, however, not significant.

Table 44: Crosstabulation: Contract type combined with Primary Uncertainty

	1= not correct at all ..... 7 = completely correct								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**All**	**Cum. frequency cat. 5 to 7**
Contract type	**At the beginning of the utilisation process, we are not able to anticipate commercial output at all.**								
Comprehensive contracts right from the start of the project	0	3	2	0	0	7	5	17	71%
A tiered contract that is further developed, modified, or replaced during the course of the project	2	2	0	5	5	2	1	17	47%
Kendall's Tau: -0.4	**Significance level: 0.03**							**N: 34**	
	The technology in our field of use changes quickly.								
Comprehensive contract	2	2	0	1	4	5	3	17	71%
Tiered contract	2	6	0	3	1	2	1	15	27%
Kendall's Tau: -0.4	**Significance level: 0.004**							**N: 32**	

Source: Authors.

Projects with repeated transactions carried out over a longer period of time supposedly require mechanisms for adaptation to changing circumstances. The results of a combined evaluation of contract type and frequency of interaction match with this hypothesis. For single transactions most often comprehensive contracts are applied, while projects with repeated interaction over a longer period of time are mostly governed by tiered contracts (Table 45). Adaptability, which is likely to be required in long-term repeated economic interaction, is stipulated with the tiered contractual approach.

Table 45: Crosstabulation: Contract type combined with Repetition of Interaction between User and Provider

	Repetition of Interaction	
Contract type	Once	Repeated
Comprehensive contracts right from the start of the project	11	6
A tiered contract that is further developed, modified, or replaced during the course of the project	5	11
Cramer V: 0.34	**Significance level: 0.055**	**N: 33**

Source: Authors'

In Chapter 4.1.1.1 (see also Table 35) we elaborated that non-monetary benefit sharing measures can have positive synergy effects for user companies. However, we assume that such effects can rather be realised within long-term relationships. The results displayed in Table 46 affirm this assumption, as they indicate that long-term contracts are more often applied in projects in which companies capacity building has strong synergy effects in terms of enabling providers to provide the desired activity. Facilitation of communication and an increase in trust are also mostly applied in projects with long-term contracts.

Table 46: Crosstabulation: Respondents' Assessment of Strategic Factors' Relevance differentiated by Contract Duration in Reference projects

	1= not all important … 5= important						
	1	**2**	**3**	**4**	**5**	**all**	**Cum. frequency category 4 & 5**
Contract duration	**Providers will be better positioned to provide the desired activity (e.g. quality / continuity of material supply)**						
less than 1 year	0	0	1	0	0	1	0%
one year up to 5 years	0	5	1	3	0	9	33%
over 5 years up to 9 years	0	0	1	2	2	5	80%
over 9 years up 13 years	0	0	1	2	0	3	67%
over 13 years	0	0	0	0	1	1	100%
Kendall's Tau C: 0.4	**Approx. significance level: 0.000**						**N: 19**
	Capacity building increases trust and facilitates communication with the providers						
less than 1 year	0	0	1	0	0	1	0%
one year up to 5 years	1	0	2	4	1	8	63%
over 5 years up to 9 years	0	0	0	2	3	5	100%
over 9 years up 13 years	0	0	0	1	2	3	100%
over 13 years	0	0	0	0	1	1	100%
Kendall's Tau C: 0.5	**Approx. significance level: 0.000**						**N: 18**

Source: Authors'.

Ten participants confirmed that in their reference project capacity building contributes to safeguard supply quality and quantity. 70% of these projects are governed by contracts with duration longer than five years. In many projects capacity building has the positive effect of increasing trust and facilitating communication between user and provider entities. All companies referring to projects with longer

duration than five years clearly confirm this effect.

Summary results combination of explanatory variables with types of contracts and contract duration

The results partly support our assumptions regarding linkages between primary uncertainty and the choice of a contractual approach. The positive association of technological uncertainty with comprehensive contracts matches the hypothesis, while the positive association of commercial uncertainty with the comprehensive contracting approach is contrary to the presumption. Results on demand uncertainty are not significant. Contract type and frequency of interaction are positively associated – as presumed. For projects with repeated transactions that are carried out over a long period of time mostly tiered contracts are applied.

In a foregoing section we found that capacity building in provider countries, carried out in the framework of transactions with genetic resources often has positive effects for provider companies. We assume that synergy effects can best be realized in long-term relationships/projects. The survey results confirmed this assumption: we found a positive association of contract duration with confirmation of capacity buildings' synergy effects on the providers' ability to execute desired services, as well as positive effects on communication and trust building.

4.2.2 Monetary Benefit Sharing in combination with Selected Explanatory Variables

We operationalised monetary benefit sharing in the questionnaire with a multi-item battery from which the respondents could select for the reference project applicable measures. Multiple answers were possible and applied by several participants, which is why we cannot evaluate all options of monetary benefit sharing as categories of one scale of increasing adaptable and flexible pricing mechanism. Instead we evaluated the inclusion of each single monetary benefit sharing within a project in combination with transaction characteristics.

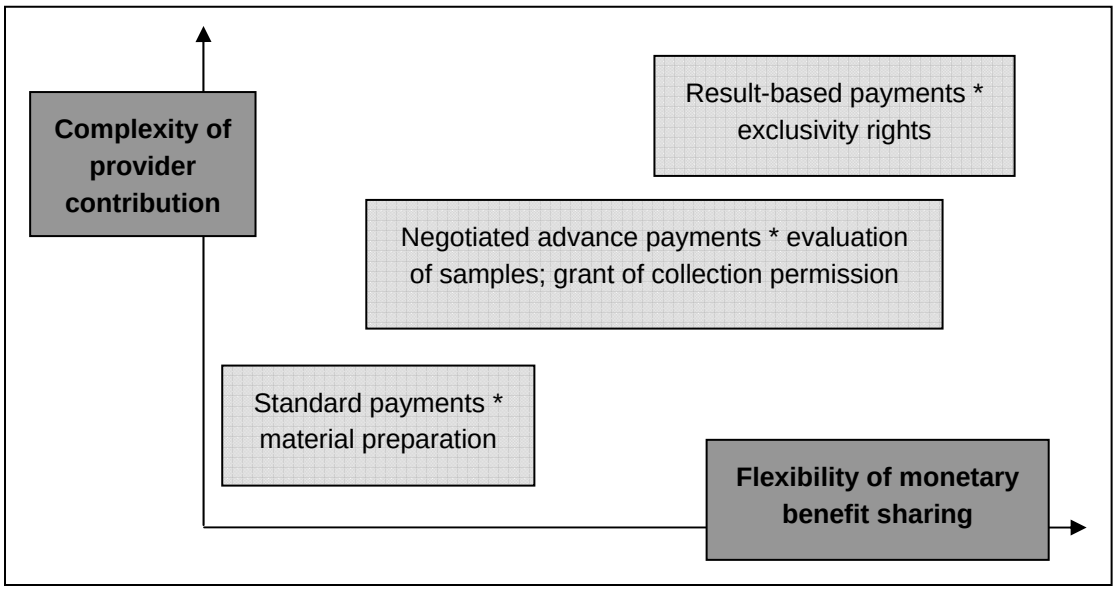
Monetary benefit sharing and provider contribution

Existing model agreements and guidelines suggest linking monetary-benefit sharing with the type of contribution by the provider. Sounding plausible, how to implement this principle is not self-explanatory. Based on theory we developed the hypothesis that easily measurable types of services should rather compensated with standardised and market oriented payments. While services with a more complex nature, which are not easily measurable and impacts are unpredictable ex-ante, are more efficiently governed with more flexible, output-related compensation measures. We tested combinations of all monetary-benefit sharing items with provider contribution-items, to evaluate how this is implemented in actual agreements.

The survey results support this approach by showing significant association of certain types of services granted by provider entities with certain monetary benefit sharing solutions (see Table A12). User companies pay weight-related or hourly-wage compensation as part of the benefit sharing arrangement in most projects in which provider entities accomplish preparation of material. Projects in which

provider solely grant access to previously inventoried resources and/or collection permissions rarely include payments tied to commercial output. Negotiated advance payments are applied more often in projects in which providers grant collection permissions. The same holds for evaluation of samples. We aggregated the three items dealing with exclusivity rights related to genetic resources (exclusive usage rights to certain information, exclusive access to genetic resources and exclusive research rights in certain application fields) and evaluated the new variable in combination with result-based monetary benefit sharing measures. The association of exclusivity rights with result-based payment measures is significant. Eight out of nine projects in which provider entities grant some kind of exclusivity rights, benefit sharing arrangement include negotiated payments that are made after reaching certain steps in the usage process (milestone payments) and/or payments tied to commercial output.

Figure 8 summarises the relation between complexity of provider contribution and adaptability of monetary benefit sharing deduced from the survey results.



Source: Authors'.

Figure 8: Association between Provider Contribution and Monetary Benefit sharing as indicated by the results of the Online Survey

Monetary benefit sharing and Asset Specificity

If companies make investments which they can utilise only with financial loss otherwise in case it is called off before completion, we characterise the investments as specific. Presumably, companies try to implement governance arrangements circumventing the cut off of a project before completion and therewith safeguarding specific investments. We expect that in projects with high asset specificity result-oriented monetary compensation forms are applied. Payments that are triggered only when certain steps in as utilisation process are reached, or which are tied to the commercial outcome provide incentives for providers to contribute to the success of the project, and not to hold up processes for strategic reasons.

In 17 out of 37 cases survey participants indicated that their company makes specific investments within the framework of the reference project (they chose category 1 to 4). Five out of the 17 projects with specific investments include milestone payments as benefit sharing measure. In seven projects companies commit to make payments tied to commercial output. Three participants report that output-related payments are negotiated over the course of the project. In all three combinations the majority of companies selecting the respective measure indicate also that specific investments in the frame of the reference project are made (Table 47).

Table 47: Crosstabulation: Monetary Benefit sharing Cases combined with Asset Specificity

In case the project is called off before completion, investments can be utilised otherwise… 1: … only with high financial disadvantages … 7 … without financial disadvantages									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8 (no investments)**
Negotiated payments that are made after reaching certain steps in the usage process (milestone payments)	**No**	6	3	3	0	0	1	7	9
	Yes	1	1	0	3	0	0	0	3
	All	7	4	3	3	0	1	7	12
Kendall's Tau C:	**Approximate significance level: not significant**								**N: 37**
Payments tied to commercial output (e.g. royalties)	**No**	4	2	2	2	0	0	6	11
	Yes	3	2	1	1	0	1	1	1
	All	7	4	3	3	0	1	7	12
Kendall's Tau C: -0.34	**Approximate significance level: 0.02**								**N: 37**
Output-related payments, that are negotiated over the course of the project, for example, when certain operational steps are reached	**No**	7	4	2	1	0	1	5	12
	Yes	0	0	1	2	0	0	2	0
	All	7	4	3	3	0	1	7	12
Kendall's Tau C: -0.04	**Approximate significance level: not significant**								**N: 37**

Source: Authors'.

Examined separately the foregoing results do not prove that the general hypothesis about the relationship between asset specificity and result-based monetary benefit sharing can be maintained. Therefore we composed a new variable indicating whether a participant selected at least one out of the three measures and evaluated it in combination with specific investments. Fourteen companies selected at least one of the three output-related monetary benefit sharing forms. Thereof nine refer to projects including specific investments. Association between the two variables is positive and significant (Table 48). The share of respondents selecting at least one of the output-related benefit sharing items is bigger among projects with higher levels of asset specificity. Our initial hypothesis is therewith supported.

Table 48: Crosstabulation: Aggregated variable for Output-related Monetary Benefit sharing in Reference Cases combined with Statements on Asset Specificity

In case the project is called off before completion, investments can be utilised otherwise… 1: … only with high financial disadvantages … 7 … without financial disadvantages									
		1	**2**	**3**	**4**	**5**	**6**	**7 …**	**8… No investments**
Some kind of flexible payments (Milestone payments and/or royalty payments and/or clauses that stipulate payments are negotiated during the course of the project.)	**No**	4	2	1	1	0	0	4	11
	Yes	3	2	2	2	0	1	3	1
	All	7	4	3	3	0	1	7	12
Kendall's Tau C: -0.4		**Approximate significance level: 0.03**							**N: 37**

Source: Authors'.

Monetary benefit sharing and uncertainty

The majority of users reporting about projects in which negotiated advance payments (lump sum payments) are appointed characterised the utilisation process as rather or totally unpredictable (63%). Responses for projects without this benefit sharing measure are more heterogeneous covering the whole answering scale (Table 49). Negotiated advance payments are rather applied in projects with a high overall uncertainty about the utilisation process. This might reflect the providers' requirements for income-certainty.

Table 49: Crosstabulation: Monetary benefit sharing in Reference Cases combined with Respondents' assessment of overall uncertainty in the R&D process

		1= not correct at all ..... 7 = completely correct							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**Cum. frequency categories 5-7**
	The utilisation process for genetic resources is completely unpredictable at the beginning of the project.								
Negotiated advance payments (lump sum)	**No**	1	5	5	7	3	4	4	38%
	Yes	0	0	0	3	1	2	2	63%
Kendall's Tau: 0.3		**Significance level: 0.04**					**N: 37**		

Source: Authors'.

Weight-related or hourly-wage compensation are not part of the benefit sharing package typically stipulated for transactions with genetic resources utilised to develop products for new and/or uncertain markets (see Table 50).

Table 50: Crosstabulation: Monetary benefit sharing in Reference Cases combined with Respondents' assessment of market/demand uncertainty

	1= not correct at all ..... 7 = completely correct								
		1	**2**	**3**	**4**	**5**	**6**	**7**	**Cum. frequency categories 5-7**
	The genetic resources will be used for research and development of products for new / uncertain markets								
Weight-related, or hourly-wage compensation	**No**	3	0	2	3	8	8	5	72%
	Yes	1	1	1	3	1	0	0	14%
Kendall's Tau: -0.4		**Significance level: 0.004**					**N: 36**		

Source: Authors'.

Significant results combination of explanatory variables with monetary benefit-sharing

Basing on governance theory we assumed a linkage between type of provider contribution and monetary compensation mechanisms. The survey results support such a linkage. Standard/market payments are positively associated with providers executing preparation of material. Effort for material preparation can easily be measured in hours of work and compensated with standard (market) prices. The sample indicates that negotiated advance payments (one level higher on flexibility scale) are typically applied in projects in which providers execute the evaluation of samples, and in projects in which providers grant collection permissions. Whereas, even more flexible compensation, such as payments tied to commercial output, is significantly less often applied for this type of provider' contribution. If exclusivity rights are at stake, negotiated payments that are made after reaching certain steps in the usage process (milestone payments) and/or payments tied to commercial output are significantly more often part of the benefit-sharing arrangement. Again, this matches the hypothesis. Exclusivity rights are a highly complex type of service, as they imply a strong constraint to the providers' property rights over the resources and possibly additional knowledge. The effort or opportunity costs for the provider are not easily measurable or definable ex ante with the help of market prices.

Governance theory suggests, investments made by the user company that can be utilized only with financial loss outside the reference project, induce a risk of opportunistic behaviour by the provider. We presumed that result oriented monetary-benefit-sharing measures could be applied as governance tool to circumvent such opportunistic behaviour. An aggregated variable of three output-related benefit-sharing measures yields significant association with asset specificity: the share of respondents selecting output-related benefit-sharing is bigger among projects with higher levels of asset specificity. Hence, we maintain our assumption that asset specificity is a relevant variable in this context.

The negative association of standard compensation (weight-related, and/or hourly-wage compensation) with demand and market uncertainty matches with our assumption about adaptability requirements in the context of this type of uncertainty.

Two out of the three transaction attributes variables are significantly associated with the selection of monetary compensation measures. Our assumption about a linkage of commercial uncertainty with flexible compensation mechanisms, however, is not supported by the survey results. Instead, we found a positive association of negotiated advance payments with overall uncertainty of R&D with genetic resources. One explanation is the high income risks for providers solely outcome-based compensation mechanisms incur under this type of uncertainty. A fixed basic compensation might be necessary to receive providers' participation in an agreement. The negative association of standard compensation (weight-related, and/or hourly-wage compensation) with demand and market uncertainty matches with our assumption about adaptability requirements in the context of this type of uncertainty.

4.2.3 Non-Monetary Benefit Sharing in Combination with selected Explanatory Variables

Under the term non-monetary benefit sharing the Bonn Guidelines list a range of measures and activities users of genetic resources are suggested to carry out within the framework of ABS projects (CBD Bonn Guidelines (2002): Appendix II, p. 19). The literature including case studies and overview studies on ABS implementation shows that in practice such measures find broad application. Our survey confirms this. We assume that user companies have two general incentives to carry out non-monetary benefit sharing within ABS projects. First, in accordance with the benefit sharing principle in the CBD, non-monetary benefit sharing is a tool to compensate providers of genetic resources for granting access, related services and rights and therewith share (partly ex ante) the benefits of utilisation. The second motivation is due to aspects found in governance theories. Companies strive to safeguard investments made within utilisation projects, and they chose governance instruments which are cost minimising. Results elaborated in chapter 5.3.2 point out that in many projects companies themselves realise positive effects from capacity building (non-monetary benefit sharing measures), for instance by safeguarding utilisation proceedings (material supply in desired quantity, quality, timing etc.), and reducing transaction costs.

The evaluations in this chapter aim at testing associations of certain non-monetary benefit sharing measures with strategic factors and other variables characterising projects with genetic resources.

Non-monetary benefit sharing and provider contribution

We assume that the choice of non-monetary benefit sharing measures is closely linked to the concrete service and/or rights contributed by the providing entities. Tests of associations between provider-contribution items on the one hand and non-monetary benefit sharing measures on the other hand yielded several significant results. Most of them support the general hypothesis.

Table 51 indicates, the majority of projects in which providers contribute in advanced research include the stipulation of joint publications in scientific journals. Companies support inventory and taxonomy of Biodiversity as part of the benefit sharing package more often in projects in which provider entities execute collection activities and/or prepare material.

Users commit to carry out technology transfer in most cases in which provider entities participate in advanced research. Technology transfer is also carried out in the majority of projects in which providers grant exclusive research rights in certain application areas, and/or exclusive usage rights for certain information related to the utilisation of genetic resources.. The combinations displayed in this table are examples in which benefit sharing measures are closely related to activities carried out by provider entities as service for the user; hence, association was expectedly.

Table 51: Crosstabulation: Various non-monetary Benefit sharing measures in combination with Provider Contribution

	Participation in advanced research *		No	Yes	All
Joint publication in scientific journals		No	22	3	25
		Yes	7	6	13
Cramer V: 0.4	Approximate significance level: 0.02				N: 38
	Provider executes collection activities		No	Yes	All
Support of inventory / taxonomy of Biodiversity		No	25	5	30
		Yes	2	6	8
Cramer V: 0.5	Approximate significance level: 0.001				N: 38
	Preparation of the material		No	Yes	All
Support of inventory / taxonomy of Biodiversity		No	24	6	27
		Yes	3	5	11
Cramer V: 0.4	Approximate significance level: 0.02				N: 38
	Participation in advanced research		No	Yes	All
Technology transfer		No	23	3	26
		Yes	6	6	12
Cramer V: 0.4	Approximate significance level: 0.01				N: 38
	Exclusive research rights in certain application areas		No	Yes	All
Technology transfer		No	25	1	26
		Yes	9	3	12
Cramer V: 0.3	Approximate significance level: 0.05				N: 38
	Exclusive usage rights for certain information		No	Yes	All
Technology transfer		No	25	1	26
		Yes	8	4	12
Cramer V: 0.4	Approximate significance level: 0.01				N: 38

Source: Authors'.

Transfer of know-how in the scientific field adds an integrative or cooperative approach to an exchange relation between users and providers. Table 52 shows that this non-monetary benefit sharing measure is applied in most projects in which providers participate in advanced research. The reason could be that it is a prerequisite for provider entities to be able to carry out activities user companies demand for, or know-how transfer takes place mutually within research cooperation. Transfer of know-how in the scientific field is also agreed on in most projects in which providers grant exclusive

usage rights for certain information. Transfer of know-how in the field of sustainable use / cultivation of genetic resources is part of benefit sharing arrangements in nine out of 38 projects. Particularly low is the share of projects in which users demand access to previously inventoried genetic resources.

Table 52: Crosstabulation: Know-How transfer in combination with Provider Contribution

	Participation in advanced research *		**No**	**Yes**	**All**
Transfer of know-how in the scientific field		**No**	21	3	24
		Yes	8	6	14
Cramer V: 0.3	Approximate significance level: 0.03				N: 38
	exclusive usage rights for certain information *		**No**	**Yes**	**All**
Transfer of know-how in the scientific field		**No**	23	1	24
		Yes	10	4	14
Cramer V: 0.4	Approximate significance level: 0.03				N: 38
	previously inventoried resources in a national collection *		**No**	**Yes**	**All**
Know-how in the field of sustainable use / cultivation of GRs		**No**	13	16	29
		Yes	8	1	9
Cramer V: 0.4	Approximate significance level: 0.02				N: 38

Source: Authors'.

Non-monetary benefit sharing and strategic aspects / synergy effects

As explained in the introduction to this subchapter, certain non-monetary benefit sharing measures are assumed to have strong synergy effects for user companies. Commitment to carry out such measures has therefore a strategic aspect. We tested this assumption by interrelating companies' assessments of synergy effects of capacity building within their reference project with the inclusion of certain non-monetary benefit sharing measures in the contractual arrangement of the respective project. The results show a significant association for several combinations.

Know-how transfer in the field of sustainable use and/or cultivation of genetic resources is positively associated with users' appreciation of safeguarding a long-term availability of genetic resources. The majority of respondents reporting that know-how transfer in the field of sustainable use and/or cultivation of genetic resources is carried out within their reference project confirmed that this kind of capacity building also aims at safeguarding the long-term availability of genetic resources. Companies referring to projects without this benefit-sharing aspect, evaluate this synergy aspect responded more heterogeneously and on an average less confirmatively on this synergy aspect (see

Table 53).

Table 53: Crosstabulation: Know-How transfer in the field of Sustainable Use / Cultivation of Genetic Resources in combination with Strategic Factor "long-term availability

		1= not correct at all ..... 7 = completely correct								
		1	**2**	**3**	**4**	**5**	**6**	**7**	**all**	**Cum. frequency cat. 5-7**
	Capacity building ensures the conservation and the long-term availability of genetic resources									
Transfer of know-how in the field of sustainable use / cultivation of GRs	**No**	1	1	2	3	1	2	0	10	30%
	Yes	0	0	1	0	0	3	4	8	88%
Kendall's Tau: 0.7		**Significance level: 0.000**						**N: 18**		

Source: Authors'.

Technology transfer is positively associated with the users' confirmation that capacity building enables providers to provide the desired activity, such as quality and/or continuity of material supply. Also, significantly more participants referring projects in which technology transfer is carried out confirmed the positive effect on trust and communication (Table 54).

Table 54: Crosstabulation: Technology Transfer in combination with Respondents' assessment of selected Strategic Factors

		1= not correct at all ..... 7 = completely correct								
		1	2	3	4	5	6	7	all	Cum. frequency cat. 5-7
	Providers will be better positioned to provide the desired activity, for example, quality / continuity of material supply.									
Technology transfer	**No**	0	2	2	2	0	2	0	8	25%
	Yes	0	0	1	2	0	5	3	11	73%
Kendall's Tau: 0.6		Significance level: 0.001								N: 19
	Capacity building increases trust & facilitates communication with providers									
Technology transfer	**No**	0	0	0	3	2	2	0	7	57%
	Yes	1	0	0	0	1	2	7	11	91%
Kendall's Tau: 0.7		Significance level: 0.001								N: 18

Source: Authors'.

Eleven out of 18 companies that indicated to engage in non-monetary benefit sharing measures in the framework of their reference projects selected "technology transfer" as part of this arrangement. The majority of these eleven respondents (8) confirmed that within their project capacity building has the positive synergy effect that providers are better enabled to provide the desired activity, such as quality and/or continuity of material supply. Except for one participant all companies committing to carry out technology transfer within the project confirmed that the increase of trust and a facilitation of communication are positive effects of capacity building.

Transfer of know-how in the scientific field is positively associated with several capacity building measures. Table 55 displays the cross tabulations and test results.

Table 55: Crosstabulation: Know-how transfer in the scientific field in combination with Strategic Factors

		1= not correct at all ..... 7 = completely correct								
		1	2	3	4	5	6	7	all	Cum. freq. cat. 5-7
Providers will be better positioned to provide the desired activity, for example, quality / continuity of material supply.										
Transfer of know-how in the scientific field	**No**	0	1	2	2	0	1	0	6	17%
	Yes	0	1	1	2	0	6	3	13	69%
Kendall's Tau: 0.5		Significance level: 0.01								N: 19
Capacity building is the prerequisite so that scientific cooperation is possible.										
Transfer of know-how in the scientific field	**No**	1	2	2	1	0	0	0	6	0%
	Yes	1	1	3	1	3	1	3	13	54%
Kendall's Tau: 0.5		Significance level: 0.007								N: 19
Capacity building ensures the conservation and the long-term availability of genetic resources.										
Transfer of know-how in the scientific field	**No**	1	1	2	1	1	0	0	6	17%
	Yes	0	0	1	2	0	5	4	12	75%
Kendall's Tau: 0.7		Significance level: 0.000								N: 18
Capacity building increases trust and facilitates communication with the providers.										
Transfer of know-how in the scientific field	**No**	1	0	0	3	1	1	0	6	33%
	Yes	0	0	0	0	2	3	7	12	100%
Kendall's Tau: 0.8		Significance level: 0.000								N: 18

Source: Authors'.

Nine out of ten companies stating that capacity building has the synergy effect of enabling provider entities to better provide the desired activity, transfer know-how in the scientific field within the framework of their reference projects. Similar associations are found for users' commitment to transfer of know-how in the scientific field with statements regarding capacity building as prerequisite for scientific cooperation and assessments of synergy effects on safeguarding long-term availability of genetic resources.

Within projects in which companies themselves profit from non-monetary benefit sharing measures such activities are agreed on much more often. All users confirming the positive effect of capacity building on trust and communication for interaction with providers of genetic resources within their reference project engage in know-how transfer in the scientific field.

The tests we apply for analysing two-dimensional relations cannot prove cause-consequence hypothesis. Hence, we can not reason based on the results that strategic factors are the cause for companies to engage in capacity building within ABS projects. However, independently on what was first: the intention to realise such effects or the unintended experience of profiting from synergy effects; the assessments made within the survey may indicate companies' future attitude in negotiations for similar projects.

Non-monetary benefit sharing and Asset Specificity

As explained earlier, investments with high quasi rents meaning that the next best utilisation outside the initial project or transaction create the risk of opportunistic behaviour. We assume that non-monetary benefit sharing measures can take functions as integrative governance elements increasing interest harmonisation and simplifying control. Therefore association between asset specificity and non-monetary benefit sharing was tested. Table 56 displays the significant test results. Several non-monetary benefit sharing measures are significantly associated with asset specificity. Particularly high is the relative difference of asset specificity between cases including or not including the respective non-monetary benefit sharing measures in the first four combinations (compare cumulated frequency category 4-1).

Table 56: Crosstabulation: Non-Monetary Benefit sharing in combination with Companies relation specific Investments (Asset Specificity)

Increasing level of Asset specificity In case the project is called off before completion, investments can be utilised otherwise… 7: without financial disadvantages … 1: only with high financial disadvantages										Cum. frequency cat. 4 - 1 => asset specificity is present
N: 37		**No invest.**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	
Joint ownership of IPRs to usage results	**No**	12	6	1	0	1	3	3	7	42%
	Yes	0	1	0	0	2	0	1	0	75%
Cramer V: 0.6		Approximate significance level: 0.04								
Technology transfer	**No**	12	4	1	0	0	2	2	5	35%
	Yes	0	3	0	0	3	1	2	2	73%
Cramer V: 0.6		Approximate significance level: 0.03								
Transfer of know-how in the scientific field	**No**	11	3	1	0	0	3	1	5	38%
	Yes	1	4	0	0	3	0	3	2	62%
Cramer V: 0.7		Approximate significance level: 0.01								
Support of infrastructure measures	**No**	0	1	1	0	1	0	2	0	44%
	Yes	12	6	0	0	2	3	2	7	60%
Cramer V: 0.7		Approximate significance level: 0.02								
Transfer of know-how for sustainable use / cultivation of GRs	**No**	11	5	0	0	1	3	2	7	45%
	Yes	1	2	1	0	2	0	2	0	50%
Cramer V: 0.6		Approximate significance level: 0.04								
Joint publication in scientific journals	**No**	11	3	1	0	0	2	1	7	40%
	Yes	1	4	0	0	3	1	3	0	58%
Cramer V: 0.7		Approximate significance level: 0.005								

Source: Authors'.

Non-monetary benefit sharing and frequency of interaction

As elaborated above, many non-monetary benefit sharing measures enfold positive synergy effects for user entities. Such measures are more often included in benefit sharing arrangements, for projects in which this is the case. Presumably, such positive effects can be realised rather in projects with repeated interaction over a longer period of time. Therefore we assume that several non-monetary benefit sharing measures are rather applied in projects with repeated interaction.

Table 57: Crosstabulation: Non-monetary Benefit sharing in combination with the Frequency of economic interaction between User and Provider

	Frequency of interaction	**Once**	**Repeated**
Support of inventory / taxonomy of Biodiversity	**No**	17	12
	Yes	0	8
Cramer V: 0.5	**Significance level: 0.003**		**N: 37**
Technology transfer	**No**	15	11
	Yes	2	9
Cramer V: 0.4	**Significance level: 0.03**		**N: 37**

Source: Authors'.

Table 57 displays the two measures for which we received significant association with the variable "frequency of interaction". Expectedly, support of inventory and/or taxonomy of biodiversity and technology transfer are significantly more often included in governance arrangements for projects involving frequently repeated interaction over a longer period of time (see Table 57). Both results confirm our hypothesis.

Significant results combination of explanatory variables with non monetary benefit-sharing

Background for tests of associations between strategic factors and provider contribution on the one hand with non-monetary benefit-sharing measures on the other hand were assumptions about synergy effects of capacity building in the framework of transaction-relations for genetic resources. Capacity building can be employed to pursuit strategic goals, such as safeguarding investments, overall reduction of transaction costs, and outsourcing of labour incentive working steps in the utilisation project. If companies actually can realize synergy effects, non-monetary benefit-sharing has the potential of efficient cost-benefit-relation, particularly in comparison to monetary compensation forms.

We used test results on associations of companies' assessments regarding synergy effects with commitment for concrete measures in reference projects as indicator for strategic incentives. Several combinations yield significant associations. Due to methodological limitations, this does not prove strategic considerations being determinants for companies' commitment to capacity building. However, the results verify that certain synergy effects most likely occur in projects with certain capacity building measures; and positive experiences of synergy effects presumably influence company's strategies to capacity building for future projects.

Our hypothesis about strategic considerations as (co-)incentive for capacity building in provider countries is also supported by results for combined evaluations of non-monetary benefit-sharing measures and provider contribution. Linking capacity building closely to an activity the provider executes on behalf of the user company supposedly has several advantages. The stipulation of joint publications in scientific journals in projects in which provider entities participate in advanced research creates interest harmonization. Moreover, this type of benefit-sharing causes low additional costs for the user company. A second example is the positive association of supporting inventory and taxonomy of Biodiversity with providers' execution of collection activities and/or preparation of material. Again the capacity building measure and provider service on user-demand are closely linked. We assume high the synergy effects for the company. The same applies for the combination of technology transfer and the transfer of know-how in the scientific field with providers' participation in advanced research. Even the negative association of know-how transfer in the field of sustainable use/cultivation of genetic resources with the limitation of provider contribution to access to previously inventoried genetic resources supports the overall hypothesis.

Specific investments create the risk of opportunistic behaviour. We assume that non-monetary benefit-sharing measures can take functions as integrative governance elements by increasing interest harmonization and simplifying control. The survey results support this hypothesis: non-monetary benefit-sharing measures with highly integrative effects, such as joint IPRs, technology transfer, and transfer of know-how in the scientific field are strongly positive associated with asset specificity. Frequency of interaction is positively associated with the benefit-sharing measures "support of inventory and/or taxonomy of biodiversity" and with "technology transfer". Both types of capacity building are significantly more often part of the exchange agreement with repeated interaction.

4.2.4 Conflict Resolution in Combination with selected Explanatory Variables

Theory suggests that especially in transactions with high specific investments conflict resolution and contract enforcement plays an important role. However, which type of governance measure (external or internal) is appropriate depends on a range of factors, among others different kinds of uncertainty and frequency. Moreover, we assume that the type of relation implicated through the provider contribution, and synergy effects companies can realise through capacity building are associated with the choice of conflict resolution respectively enforcement mechanisms.

Conflict resolution and Specific investments

We tested a series of operationalisation for asset specificity in combination with choice of conflict resolution measures, but only two results are significant. In 14 projects for which respondents indicated asset specificity being present (response category 1 to 4) only four projects stipulates judicial authority as conflict resolution mechanism (Table 58).

Table 58: Crosstabulation: Stipulation of Judicial Authority as Conflict resolution mechanism in combination with Asset Specificity

In case the project is called off before completion, investments can be utilised otherwise… **1: … only with high financial disadvantages … 7 … without financial disadvantages**										
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8: No investments**	**Cum. frequency categories 1 – 3 (asset specificity is present)**
Judicial authority	**No**	6	4	3	0	0	1	6	10	43%
	Yes	1	0	0	3	0	0	1	2	14%
	All	7	4	3	3	0	1	7	12	
Cramer V: 0.6		Approximate significance level: 0.02								N: 37

Source: Authors'.

The second combination is arbitration with the assistance of third parties with companies' investments in provider countries. This measures is significantly more often stipulated in ABS-projects in which user companies invest within the partner country providing genetic resources (see Table A13). However, in the latter case not all investments are necessarily highly specific.

Conflict resolution and uncertainty

As explained in the theory chapter, the effects of uncertainty on the choice of governance forms are linked to the occurrence of specific investments. Therefore we included in the following statistical evaluations only projects in which according to survey participants' specific investments take place (answering categories 1 to 4).

Theory suggests that utilisation projects characterised by specificity of investments and high demand uncertainty should be governed by bilateral, relational arrangements that facilitate adaptation of supply amounts. The results of association tests with our sample data are not significant on this question. Technological uncertainty yields several significant associations with conflict resolution mechanisms, though (Table 59, Table 60, and Table 61). We understand technological uncertainty as factor requiring R&D with genetic resources being adaptive to potential changes in accordance with technological development. As such it might imply adaptability of supply as well. The demands might change in terms of quantity, quality, and the level of processing etc. of material, but also regarding rights associated with material. Supposedly adaptation and potential conflicts arising under such circumstances require internal conflict resolution mechanisms and interest harmonisation measures to limit the risk of opportunistic behaviour.

Demand uncertainty was operationalised in our survey as the utilisation of genetic resources for research and development for products for new and/or uncertain markets. One out of four conflict resolution measures is significantly associated with demand uncertainty. The negative value for Kendall's Tau (Table 59) indicates that for higher levels of demand uncertainty relatively less often internal conflict resolution and harmonisation of interests was selected.

Table 59: Crosstabulation: Stipulation of Internal Conflict Resolution and Interest Harmonisation as Conflict resolution mechanism in Reference cases in combination demand/market uncertainty

		1= not correct at all ..... 7 = completely correct							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**all**
		The genetic resources from the project will be used for research and development of products for new / uncertain markets							
Internal conflict resolution mechanism, harmonisation of interests	**No**	0	0	1	1	1	4	2	9
	Yes	2	0	1	0	4	1	0	8
Kendall's Tau c: -0.6		Significance level: 0.008						N: 17	

Source: Authors'.

As elaborated above, technological uncertainty requires adaptable R&D process. If specific investments in connection with the utilisation of genetic resources take place, the adaptability requirement spans procurement of genetic resources as part of the chain. This argumentation following, we assume that projects with high technological uncertainty adopt hierarchical conflict resolution mechanisms and measures of interest harmonisation. The survey results, though, are contrary to this hypothesis.

Table 60: Crosstabulation: Conflict resolution mechanisms in in combination with Technological Uncertainty

		1= not correct at all .... 7 = completely correct							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**all**
The technology in our field of use changes quickly									
Internal conflict resolution, harmonisation of interests	**No**	0	1	0	2	2	2	1	**8**
	Yes	2	4	0	1	0	1	0	**8**
Kendall's Tau c: -0.7		Significance level: 0.000						N: 16	
Arbitration with the assistance of an independent third party	**No**	2	4	0	1	0	2	0	**9**
	Yes	0	1	0	2	2	1	1	**7**
Kendall's Tau c: 0.5		Significance level: 0.03						N: 16	
Judicial authority	**No**	2	4	0	3	2	1	0	**12**
	Yes	0	1	0	0	0	2	1	**4**
Kendall's Tau: 0.5		Significance level: 0.07						N: 16	

Source: Authors'.

In projects including specific investments by user companies, internal conflict resolution is significantly negative associated with technological uncertainty (Table 60). Only one out of six participants characterising the reference project with technological uncertainty selected internal conflict resolution. Arbitration with third party assistance, on the other hand is positively associated with technological uncertainty. Half of the projects include judicial authority as element of conflict resolution.

13 respondents confirmed that at the beginning of the utilisation process they can not anticipate commercial output of the project. Thereof only five indicated that internal conflict resolution and measures of interest harmonisation are stipulated within the contract (Table 61).

Table 61: Crosstabulation: Internal Conflict resolution and Interest Harmonisation in combination with Uncertainty of Commercial Output of Utilisation

		1= not correct at all ..... 7 = completely correct							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**all**
At the beginning of the utilisation process, we are not able to anticipate commercial output at all.									
Internal conflict resolution, harmonisation of interests	**No**	0	1	0	0	1	4	3	9
	Yes	1	2	0	3	2	1	2	8
Kendall's Tau c: -0.8		Significance level: 0.000						N: 17	

Source: Authors'.

Conflict resolution and frequency of interaction

For the same token as in the foregoing paragraph, only projects in which user companies make specific investments are included in combined evaluations of conflict resolution measures with frequency of interaction.

If economic interaction takes place repeatedly over a longer period of time between the same actors, investments for the development and implementation of more complex governance forms including hierarchical elements can be outweighed by reduced transactional cost for each subsequent interaction. In theory, and empirically verified in other areas than transactions with genetic resources, this principle enfolds conflict resolution and enforcement mechanisms as well.

Table 62: Crosstabulation: Internal conflict resolution and Interest harmonisation in combination with Frequency of interaction in the Reference project

		Repetition of the interaction		
		Once	Repeatedly	All
Internal conflict resolution, harmonisation of interests	No	5	4	9
	Yes	1	6	7
	All	7	10	16
Phi: 0.4	Significance level: 0.09			16

Source: Authors'.

As Table 62 shows, not all, but the most projects characterised by specific investments and repeated interaction stipulates internal conflict resolution mechanisms (six out of ten). Moreover, except for one case internal conflict resolution and interest harmonisation is only selected for projects with repeated interaction. Hence, the results support our hypothesis.

Conflict resolution and provider contribution

The more concrete mutual contribution in a transaction can be formulated and stipulated ex ante in a contractual form the higher chances of classical external conflict resolution. If, however, exchange is highly complex and judicial authorities are not able to assess whether parties fulfil their commitments, external conflict resolution is problematic, or at least very cost intensive. In such cases theory suggests relational or internal conflict resolution respectively, governance solutions safeguarding interest harmonisation.

Foregoing evaluations of the survey data indicated that projects with genetic resources are heterogeneous regarding the contribution of providers. In some cases users only access material from national ex-situ collections services are rather standard and in other cases they are highly specific and more complex. We evaluated combinations of conflict resolution measures and types of provider contribution and found several significant associations (Table 63). The classical external mechanism is the stipulation of a judicial authority in the contract. This governance element is applied significantly more often in projects including access to previously inventoried genetic resources, and in cases in which provider entities execute collection activities.

Table 63: Crosstabulation: Stipulation of Judicial Authorities as Conflict Resolution Mechanism in combination with the Provider Contribution

N: 38	Access to previously inventoried resources in a national collection					Provider executes collection activities			
		No	Yes	All			No	Yes	All
Judicial authority	No	20	11	31	Judicial authority	No	25	6	31
	Yes	1	6	7		Yes	2	5	7
	All	21	17	38		All	27	11	38
Cramer V: 0.4	Approx. significance level: 0.02				Cramer V: 0.4	Approx. significance level: 0.006			

Source: Authors'.

Both types of provider contribution can be defined ex ante rather well, e.g. by defining the number of samples, the weight of material supply or working hours.

Most projects in which provider entities participate in advanced research arbitration with the assistance of third parties is stipulated as conflict resolution mechanism (see Table 64).

Table 64: Arbitration with third party assistance in combination with providers` participation of advanced research

		Participation in advanced research		
		No	Yes	All
Arbitration with the assistance of an independent third party	No	23	3	26
	Yes	6	6	12
	All	29	9	38
Cramer V: 0.4	Approximate significance level: 0.01			N: 38

Source: Authors'.

Both results are in accordance with the theory based hypothesis elaborated above.

Conflict resolution and strategic factors/synergy effects of capacity building

Presumably, the exact accomplishment of capacity building measures have to be adapted during the course of a project, and if, due to synergy effects, companies are interested to sustain relationships in situations where conflicts arise, internal resolution and interest harmonisation play important roles. Hence, we assume that projects in which capacity building through non-monetary benefit sharing has positive synergy effects for user companies internal conflict resolution mechanisms and interest harmonisation are stipulated to support efficient governance. The sample for combined evaluations on this topic is limited to projects in which non-monetary benefit sharing measures are agreed on.

The overall result reflects the theory based predictions: the majority of companies confirming to profit from synergy effects of capacity building apply internal conflict resolution mechanisms (Table 65). More than half of the respondents that confirmed capacity building supports providers to better provide the desired activity, selected internal conflict resolution mechanisms and measures of interest harmonisation as part conflict resolution strategy in their reference project. All companies agreeing that capacity building increases trust and facilitates communication within their reference project apply internal conflict resolution and harmonisation measures. Six out of seven companies report that capacity building is the prerequisite that scientific cooperation is possible, selected internal conflict resolution mechanism and interest harmonisation. Six out of 10 respondents indicating that "Capacity building ensures the conservation and the long-term availability of genetic resources" reported that internal conflict resolution mechanism, and harmonisation of interests is part of the conflict resolution strategy within the reference project.

Table 65: Crosstabulation: Stipulation of Internal Conflict Resolution and Interest Harmonisation in combination with Strategic Factors

	1= Not correct at all ..... 7= Completely correct							
		1	**2**	**3**	**4**	**5**	**6**	**7**
	Providers will be better positioned to provide the desired activity (e.g. quality/continuity of supply)							
Internal conflict resolution	**No**	0	2	2	3	0	4	0
	Yes	0	0	1	1	0	3	3
Kendall's Tau: 0.5		Significance level: 0.007					N: 19	
	… increases trust and facilitates communication							
Internal conflict resolution	**No**	1	0	0	3	2	3	1
	Yes	0	0	0	0	1	1	6
Kendall's Tau: 0.7		Significance level: 0.000					N: 18	
	… prerequisite so that scientific cooperation is possible							
Internal conflict resolution	**No**	2	2	4	2	0	1	0
	Yes	0	1	1	0	3	0	3
Kendall's Tau: 0.6		Significance level: 0.002					N: 19	
	… ensures the conservation and the long-term availability of genetic resources.							
Internal conflict resolution	**No**	1	1	2	2	1	2	1
	Yes	0	0	1	1	0	3	3
Kendall's Tau: 0.5		Significance level: 0.02					N: 18	

Source: Authors'.

Summary results on conflict resolution

The tests conducted for association between conflict resolution and provider contribution support the assumptions derived from governance theories partly. The stipulation of judicial authority (as external mechanism) is significantly more often applied in projects including access to previously inventoried genetic resources, and cases in which provider entities execute collection activities. Both types of services can easily be defined ex ante in a contract. Projects, in which provider entities contribute to advanced research with genetic resources, most often include arbitration with third party assistance as conflict resolution element. This result too is in accordance with our hypothesis. Participation in advanced research is likely to be part of a more complex relation between user and provider. Moreover, fulfilment of the agreement is likely difficult to assess by judicial authorities.

We learned that projects in which companies realize positive synergy effects from capacity building in provider countries most often stipulate internal conflict resolution and interest harmonisation in conflict resolution proceedings. Again, we put this down to a mutual interest of sustaining relations in a cooperative way. Positive association of internal conflict resolution is strongest with the synergy effect trust building and communication facilitation.

Asset specificity and contract enforcement are significantly associated: judicial authorities are stipulated seldom in projects characterized by specific investments of user companies. Supposedly, the reason is a high complexity of interactions in projects including specific investments. Previously elaborated positive associations of asset specificity with non-monetary benefit-sharing measures support this explanation. Judicial authorities would unlikely be an efficient tool for resolving disputes in highly complex exchange relations including capacity building.

The survey results also support the theory based assumption that in relations with high specific investments the choice of conflict resolution measures is associated with uncertainty and with frequency. We find negative associations of demand uncertainty, technological uncertainty, and overall commercial uncertainty with internal, hierarchical conflict resolution mechanisms and interest harmonization. However, while the first result (negative association with demand uncertainty) was predicted, the latter two are contrary to the theory based predictions. Since we cannot really explain this phenomenon, interrelations of primary uncertainty with conflict resolution mechanisms in the field of transactions with genetic resources certainly require more qualitative, exploratory research.

In accordance with our hypothesis, the majority of projects characterized by specific investments and repeated interaction stipulate internal conflict resolution mechanisms.

4.3 Intra-sectoral Homogeneity of Transactions with Genetic Resources

Part of the research question is a revision of the sectoral approach to contract standardisation for ABS agreements. We proceed as follows. The aim is to test whether sector affiliation, which is on the case level the affiliation with one of the categories (fields) of utilisation for genetic resources, can be used as proxy for the explanatory variables of actual interest (the relevant case characteristics identified in the foregoing chapter). We assess this with the help of association measures and significance tests. Each relevant variable is tested in combination with sector affiliation. If the result is significant we deduce that intersectoral homogeneity is strong meaning that similarity is higher among cases affiliated with one sector/field of utilisation compared to overall similarity among cases affiliated with different sectors/fields of utilisation. Hence, the sector categorisation can be used as proxy for the actual variable. If intersectoral homogeneity is strong for all explanatory variables associated with the respective governance element, a sectoral assignment for designing a model clause is likely efficient. If, however, this is not the case, we deduce intersectoral heterogeneity. Hence, the orientation at sectors would not be helpful for the design of model clauses on the respective governance element. To double check our criticism of the sector approach to case differentiation, we evaluated intersectoral homogeneity for the choice of governance strategies by testing the significance of associations among governance elements on the one with sector affiliation on the other side.

All explanatory variables (and their items) that were found to be significantly associated with governance elements shall be subject of investigation for intrasectoral homogeneity. They are summarised in Table A 15 in the Appendix.

4.3.1 Homogeneity of User Sectors regarding Transaction Characteristics

Table 66 summarises all explanatory variables selected (based on the beforehand elaborated survey results) for differentiation of transactions with respect to efficient governance forms based on significant association with at least one governance element.

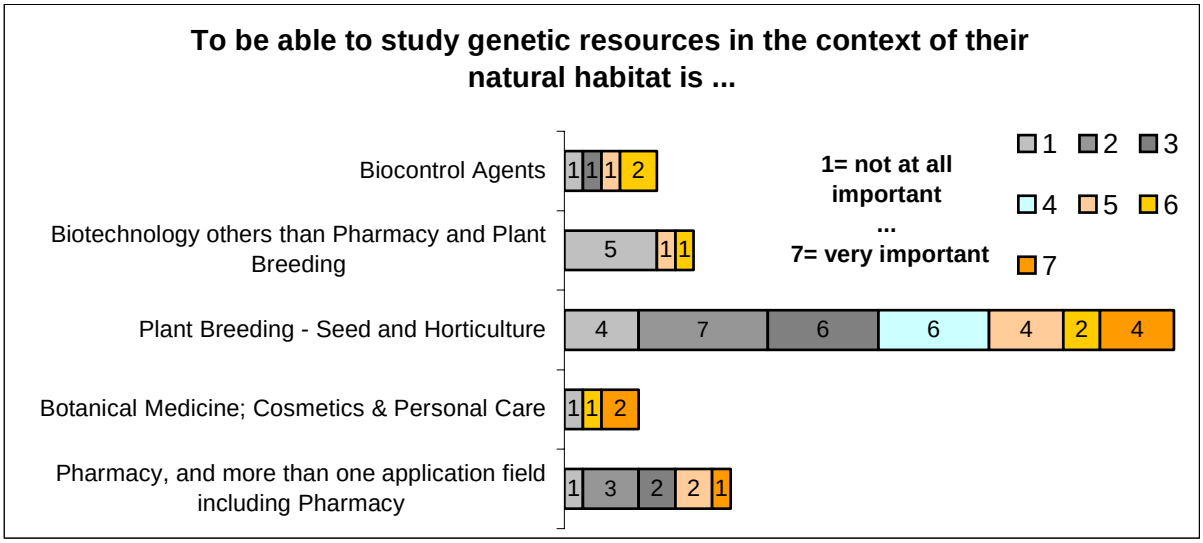
Table 66: Factors supported by the Survey Results as Relevant Explanatory Variables

<table>
<tr>
<td rowspan="2">Provider contribution:
- Only access to previously inventoried GRs
- Collection permission
- Collection activities
- Preparation of material
- Evaluation of material
- Contribution to advanced research
- Exclusivity rights</td>
<td>Asset Specificity</td>
</tr>
<tr>
<td rowspan="2">Uncertainty
- Uncertainty resulting from technological change
- Demand uncertainty
- Unpredictability of commercial output at the beginning of the utilisation process</td>
</tr>
<tr>
<td>Strategic factors
- Providers will be better positioned to provide the desired activity
- Capacity building increases trust and facilitates communication
- Cap. building safeguards long-term availability of GRs
- Cap. building is the prerequisite for scientific cooperation</td>
<td>Frequency of economic interaction</td>
</tr>
</table>

Source: Authors'.

In this section we present results of association tests for the selected explanatory variables with the field of utilisation in the reference project (sector affiliation).

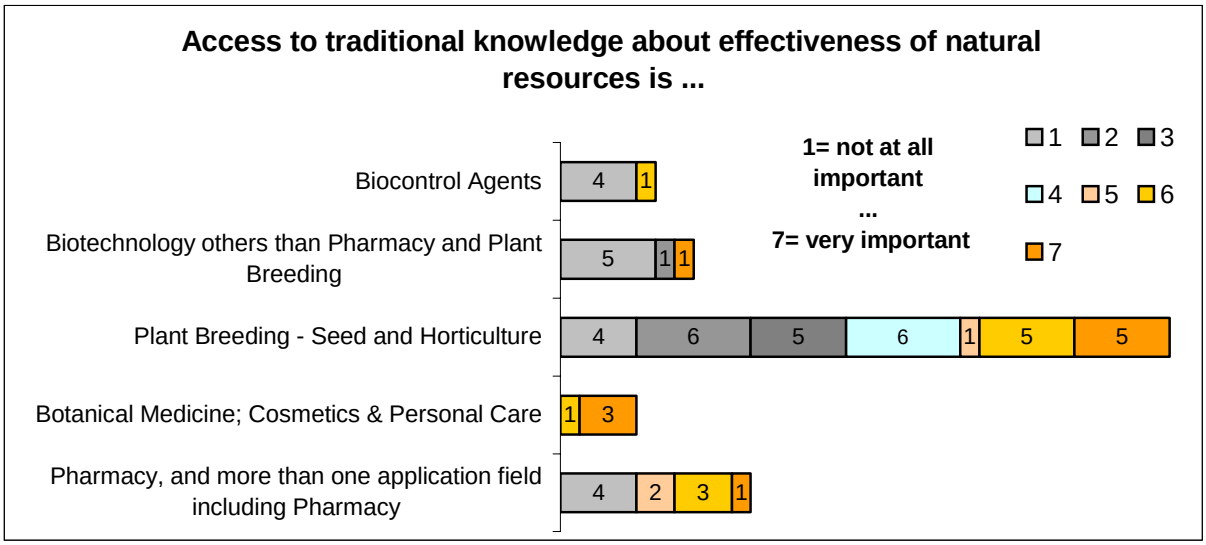
Tests with provider contribution as explanatory variables are not significant, except for one item: "preparation of material". This type of service is significantly more often applied in projects with utilisation of genetic resources in the fields of pharmacy, and botanical medicine, cosmetics and care. In general, though, we find that sector affiliation is not a good proxy for the type of provider contribution in transactions with genetic resources. However, we asked the respondents to assess in general a list of supply characteristics of genetic resources. Across sectors access to "undiscovered genetic resources as potential source of innovative products" and access to properties of wild species of certain plants or animals" is required (see Table A14). Assessments of more specific demand aspects, such as access to traditional knowledge and others are significantly associated with sector affiliation. However, the level of association is rather low (see also Table A14) indicating that heterogeneity among sectors exists but not very strong. Figure 9 to Figure 12 display the distribution of answers differentiated by sector.



Source: Authors'.

Figure 9: Relevance of "Possibility to study genetic resources in their natural habitat" differentiated by sector affiliation

As Figure 9 shows, users from Botanical Medicine, Cosmetics and Care as well as the field of Biocontrol Agents assess the ability to study genetic resources in the context of their natural habitat (in situ) as rather important for the choice of a source to procure genetic resources. In contrary, only about a third of the participants affiliated to Biotech, Pharmacy, and Plant Breeding evaluated this aspect as rather important.

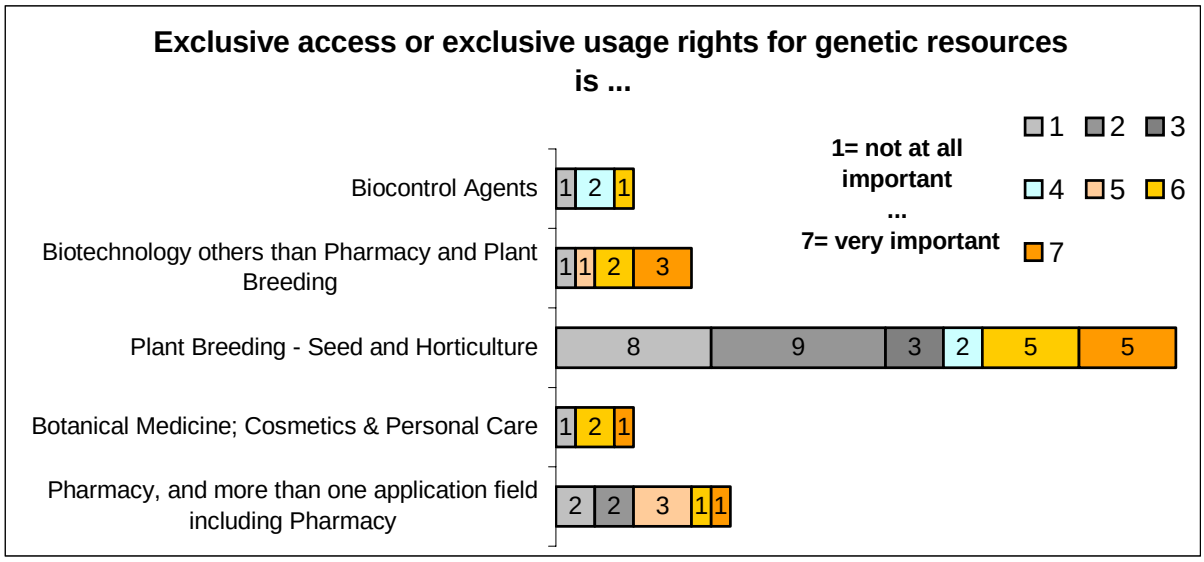


Source: Authors'.

Figure 10: Relevance of "access to traditional knowledge" differentiated by sector affiliation

Survey participants affiliated with botanical medicines, cosmetics and care rated "access to traditional knowledge about application possibilities of genetic resources as important" (Figure 10). Also, over half of the pharmaceutical companies and eleven out of 32 plant breeders seek access to traditional knowledge for at least some projects. Clear disaffirmation, however, was given by users from Biotech (other than pharmacy and plant breeding) and Biocontrol Agents.

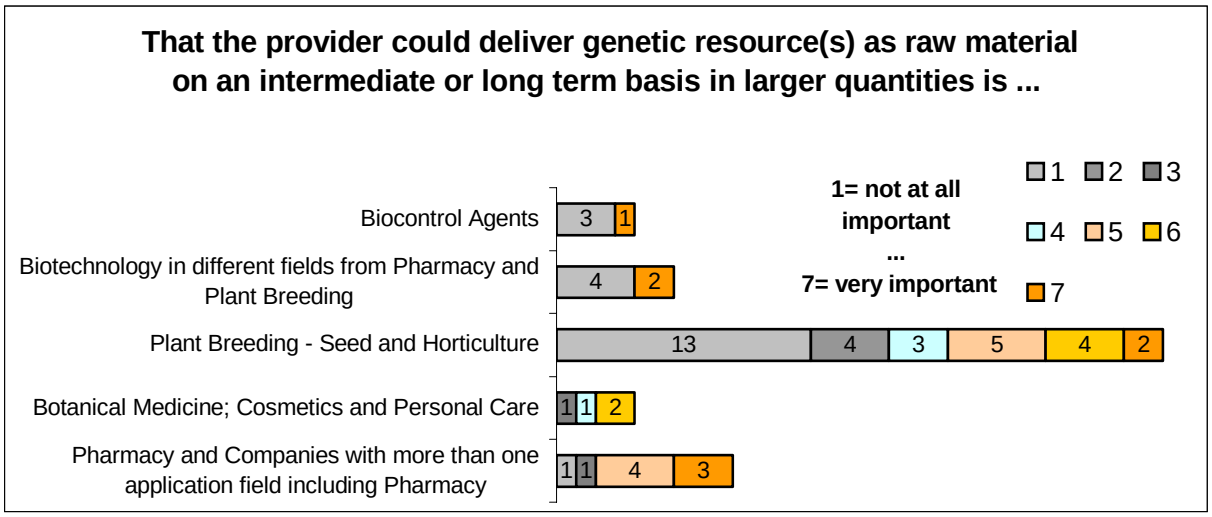
Exclusivity of access or usage rights for genetic resources was discussed in the foregoing chapters as instruments to safeguard investments and as strategic instrument to achieve competitive advantages. The evaluation of this aspect differs significantly with respect to sector affiliation. Among users from Biotech, Botanical Medicine, Cosmetics and Care we see a clear trend to rate exclusivity as important, while in other sector groups answers were more dispersed (Figure 11).



Source: Authors'.

Figure 11: Relevance of "exclusive usage rights for genetic resources" differentiated by sector affiliation

Highest affirmation for the item ”It is important that the provider could deliver (the) genetic resource(s) as raw material in larger quantities” was reached among participants utilising genetic resources for pharmaceutical purposes. Seven out of nine companies from this field stated that at least for some projects they search providers able to fulfil this requirement. After all 11 plant breeders stated that this aspect matters for the choice of supply sources in some projects as well.



Source: Authors’.

Figure 12: Relevance of “providers ability to deliver genetic resources as raw material on an intermediate or long-term basis in larger quantities” differentiated by sector affiliation

We learned that certain aspects of demand for genetic resources are significantly associated with sector affiliation. On the case-level (reference projects from the sample), though, an association of subject matter of transaction (type of provider contribution) with the field of utilisation is not significant. We conclude that sector affiliation, respectively the field of utilisation of genetic resources in a concrete project is not a good proxy for the subject matter of transaction regarding (potential) ABS agreements.

Several items were included in the survey to evaluate companies’ strategic motivation for capacity building in provider countries. Most of them turned out to be relevant, moreover, significantly associated with the stipulation of conflict resolution mechanisms, as well as with several non-monetary benefit sharing items. None of the strategic factors is significantly associated with the field of utilisation, though. Accordingly, sector affiliation can not be used as proxy for strategic factors, respectively the user companies’ prospects of realising synergy effects from capacity building in provider countries in the framework of ABS projects.

The explanatory variable asset specificity is significantly associated with several items from governance elements (1) output-related monetary benefit sharing, (2) non-monetary benefit sharing measures, and also with (3) conflict resolution mechanisms. For the design of models clauses for all three governance elements, a differentiation of cases with respect to specificity of investments should be considered. Asset specificity, however, is one of the two variables showing significant association with the field of utilisation for genetic resources.

As Table 67 shows, the majority of projects in the field of pharmacy (including also cases in which genetic resources are used for pharmacy and botanical medicine) are characterised by high asset specificity, while in contrary most projects in the field of plant breeding do not require specific

investments from user companies. The same holds for projects in which genetic resources are used for botanical medicine, personal care and cosmetics, but not for R&D in the field of pharmacy (Table 67).

Table 67: Crosstabulation: Asset Specificity in Reference cases combined with Field(s) of Utilisation of Genetic Resources in the projects

	In case the project is called off before completion, investments can be utilised otherwise… 1= only with high financial disadvantages ... 7= without financial disadvantages							**no investments**
	1	**2**	**3**	**4**	**5**	**6**	**7**	
Pharmacy; Pharmacy and Botanical Medicine	4	0	0	1	0	0	1	0
Botanical medicine, Care and Cosmetics; Botanical Medicine and Care and Cosmetics	0	0	0	1	1	0	1	0
Plant Breeders (Seed, Horticulture, and both)	2	4	2	0	0	1	4	12
Biotech others than Pharmacy and Plant Breeding	1	0	0	1	0	0	1	2
Biocontrol agents	0	0	2	0	0	0	0	0
all	**7**	**4**	**4**	**3**	**1**	**1**	**7**	**14**
Measure of association	**Cramer-V: 0.6**		**Approximate Significance: 0.001**					

Source: Authors'.

Based on this result, we might deduce that "field of utilisation/sector affiliation" could be used as proxy for asset specificity. We will discuss this question more in depth at a later point.

Association tests did not yield significant results for the combination of sector affiliation and primary uncertainty. We learn that uncertainty is a challenge in R&D with genetic resources across sectors. Hence, sector affiliation should not be used as proxy for uncertainty – at least to differentiate transactions with genetic resources. The same applies for frequency. Across utilisation fields we found cases with single interactions, as well as projects with frequently repeated interaction.

Summary on intrasectoral homogeneity

Although we found significant association of sector affiliation with one provider contribution item, and with asset specificity, the overall result is that a differentiation according to user sectors is not feasible for the design of model clauses or agreements for ABS agreements. In the introduction to this chapter, we explained our approach for assessing the sectoral approach: all explanatory variables significantly associated with the respective governance element should be significantly associated with sector affiliation as well.

Table 68 gives an overview over association tests for explanatory variables and sector affiliation, and Table 69 summarizes the results of the foregoing chapter – association of explanatory variables with governance elements.

Table 68: Associations of Explanatory Variables with Governance Elements

	Governance variables				
Explanatory variables	Contract type	Contract duration	Monetary benefit-sharing	Non-monetary benefit-sharing	Conflict resolution
Strategic factors of capacity building	**X**			**X**	**X**
Provider contribution			**X**	**X**	**X**
Asset specificity			**X**	**X**	**X**
Primary uncertainty of R&D with genetic resources	**X**		**X**		**X**
Frequency of economic interaction		**X**		**X**	**X**

Source: Authors'.

Table 69: Associations of Explanatory Variables with the Field of Utilisation for Genetic Resources in reference projects

	Significant association with sector affiliation	
Explanatory variables	**yes**	**no**
Provider contribution in actual projects	Only one item	
Strategic factors of capacity building		X
Asset specificity	X	
Primary uncertainty of R&D with genetic resources		X
Frequency of economic interaction		X

Source: Authors'.

The combined evaluation of Table 68 and Table 69 shows that for neither of the governance elements all relevant variables are simultaneously associated with the sector affiliation variable. Hence, the decision rule we developed for evaluating the sectoral approach with respect to designing models is not satisfied.

4.3.2 Intra-sectoral Homogeneity of Governance for Transactions with Genetic Resources

To double-check the findings from section 4.5.1 we evaluated the level of association between governance elements[15] and field of utilisation (sector affiliation). Table 70 summarises the results (test statistics see Table A16).

Table 70: Summary of Results Association Tests of Governance Elements with Sector Affiliation / Field of Utilisation

Governance elements	Association with field of utilisation	
	yes	no
Type of relation between user and provider		X
Type of contract		X
Contract duration		X
Monetary benefit sharing		X
Non-monetary benefit sharing		X
Conflict resolution mechanisms		
exact description of mutual activities	X	
others		X

Source: Authors'.

One governance-item - the exact description of mutual activities in the framework of the relation - is significantly associated with the variable "field of utilisation". Crosstabulation Table 71 displays the responses differentiated by sector.

[15] We checked only with governance elements that are significantly associated with at least one of the explanatory variables. Governance elements for which this does not apply are not further considered, therefore, our theory based concept of analysis does not contribute to explain them.

Table 71: Crosstabulation: Dispute Resolution combined with User Companies' sector affiliation

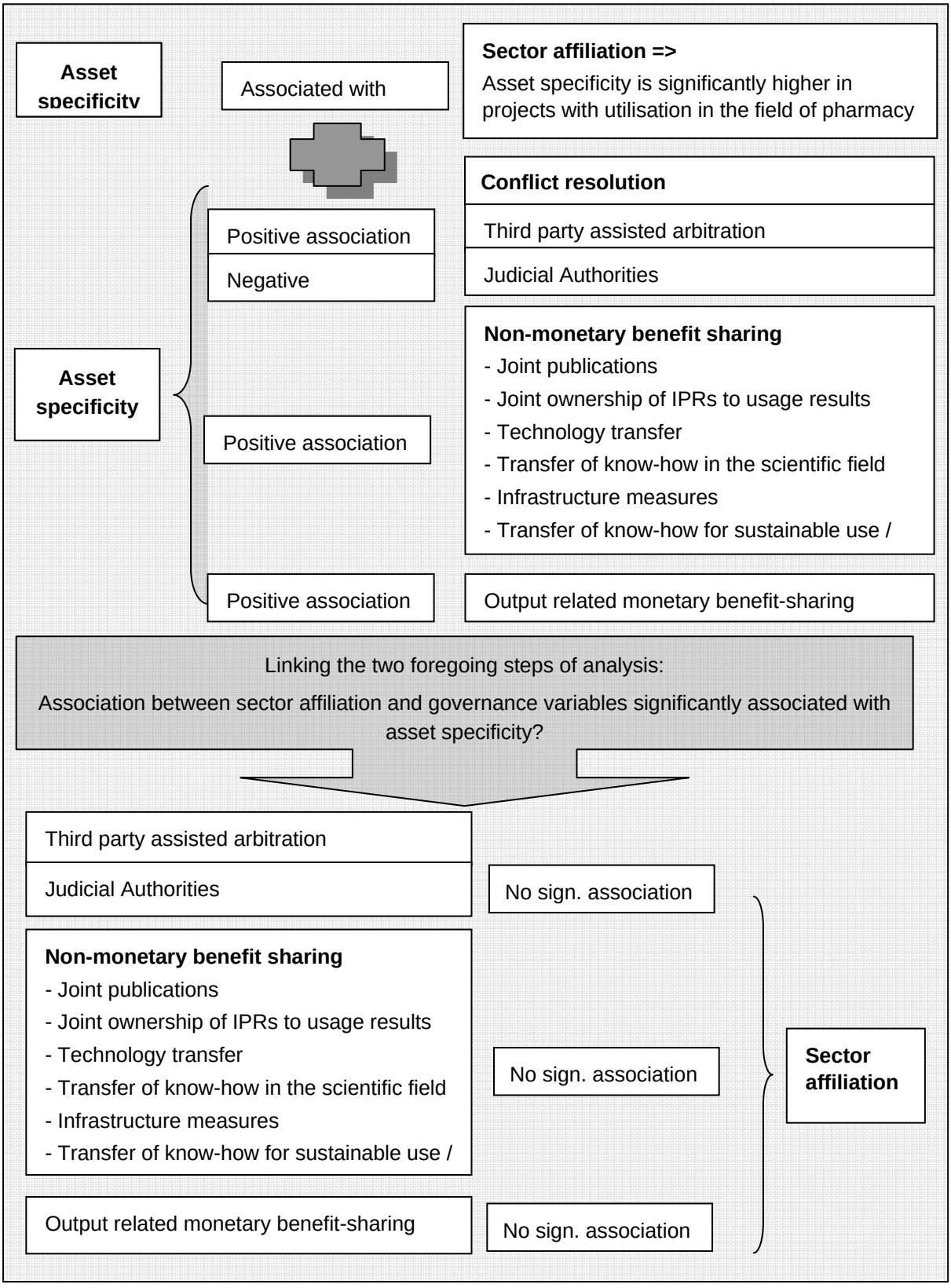
Sector affiliation (aggregated) * Exact description of the mutual activities (for example, schedule, delivery quantities, prices, height of compensation payments) in the contract				
	no	**yes**	**Yes in percent of entries**	**all**
Pharmacy; Pharmacy and Botanical Medicine	1	5	83%	6
Botanical medicine; Personal Care & Cosmetics; Botanical Medicine and Personal Care & Cosmetics	1	1	50%	2
Seed	2	8	80%	10
Horticulture	7	3	30%	10
Seed & Horticulture	3	1	25%	4
Biotech others than Pharmacy and Plant Breeding	5	0	0%	5
Biocontrol agents	1	0	0%	1
all	20	18	47%	38
Measure of association	**Cramer-V: 0.62**		**Approximate Significance: 0.02**	

Source: Authors.'

In general, though, the results support our findings elaborated in the foregoing chapter. Sector affiliation was not found to be a good proxy for any of the explanatory variables – except for asset specificity. Test results on association between governance variables and field of utilisation support the assumption that a sector-wise classification of ABS cases is rather arbitrary when it comes to governance solutions.

Now that the results on association between governance variables and sector affiliation are presented, we want to follow through the question of sector affiliation as proxy for asset specificity.

Figure 13: displays the approach. Asset specificity is significantly associated with sector affiliation (1. step). The explanatory variable is also associated significantly with several governance elements (2. step). However, except for "output related monetary benefit sharing" none of these governance variables is at the same time associated with the sector affiliation-variable (3. step). This speaks against a substitution of "asset specificity" with sector affiliation as characteristic to distinguish cases with regard to model clauses.



Source: Authors'.

Figure 13: Overview Argumentation Line to Revise the Sectoral approach to a Model Clause Instrument

5 Summary and Discussion Results Governance Analysis (Part B)

Context of this study is the debate about standards or model clauses for contracts to govern ABS agreements. The idea is to reduce transaction costs and increase legal certainty for parties to such agreements. Submissions of member parties (e.g. the EU) suggest a sectoral approach referring to different “ways of utilisation” for standardisation instruments. However, a concretisation what constitutes or differentiates sectors and ways of utilisation, and hence (potential) ABS cases, is lacking. In this study we used governance theories and exploratory research to identify characteristics of cases which are relevant for efficient governance design – hence can be used to differentiate cases with regard to model clauses. Based on these results an assessment of the sectoral approach is intended.

The present chapter provides a summary of the most important results derived from our analysis of transactions with genetic resources. Subsequently, the findings shall be interpreted against the background of the research questions. A reflection on the methodological approach and a critical assessment of the study conclude the chapter.

5.1 Summary of Findings

The approach of this study is iterative and a triangulation of methods. In the first step we reviewed existing literature on governance aspects of transactions with genetic resources. Subsequently individual exploratory interviews with user entities from the private and the public sector and a content analysis of existing model contracts and guidelines for ABS agreements were conducted. In focus groups the interim findings were discussed and supplemented. In a standardised cross sectional online survey with users of genetic resources from the private sector, we tested a theory based analytical framework that was developed on the basis of the foregoing work.

5.1.1 Main results Review of existing Model Agreements and Guidelines

Aim of this research step was to identify contract elements for ABS agreements stakeholder groups consider relevant, to compare designs among models, and to investigate how governance elements are linked with characteristics of the transactions in the model agreements and guidelines.

All entities that developed and implemented guidelines for ABS contracts and/or model contracts stress the aim of simplifying commitment with ABS requirements, and to reduce transaction costs for stakeholders. Additionally, provider entities use the models as tool to foster ABS implementation, non-commercial intermediaries apply standardisation to facilitate exchange in compliance with the CBD and user entities stress the aspect of legal certainty.

Governance elements that are included in all instruments are clauses or suggestions on monetary benefit sharing, in many cases supplemented with notes on non-monetary benefit sharing. The exceptions are models developed only for transactions within the academic environment. Most models contain suggestions or standards for the duration of the contract. Dispute resolution procedures are stipulated in few instruments, mostly internal dispute resolution such as negotiation and/or third party assistance (international arbitration) instead of legal proceedings.

Some models differentiate or recommend differentiating the design of governance elements in relation to characteristics of the transaction. We found references to the complexity of transactions expressed

in access to ex-situ versus in-situ resources, and the intensity of cooperation between user and provider. Monetary benefit sharing is suggested to be adapted with respect to the economic value of genetic resources in the utilisation process, and the closeness of genetic resources to the product. The suggestions on duration of contracts vary spanning a standard of five years including stipulation of renewal after renegotiations, ten years, up to the sMTA which remains effective as long as the multilaterally agreed on sMTA is in force. For complex relations and for projects with very long-term R&D renegotiations and amendments of contracts are stipulated.

5.1.2 Main Results Exploratory Empirical Research (Interviews and Focus Groups)

The exploratory survey includes users from the private (pharmacy, biotech, plant breeding) and from the public research sector. First we conducted individual interviews. The contents were of more general nature and the discussions centred on individual experiences with ABS cases. The group discussions were used to investigate whether a common praxis and a common understanding regarding certain contract elements within user-sectors exists.

In all three user groups **access to genetic resources** is sought from various sources. Procurement of genetic resources from source countries or access to genetic resources in specific natural habitats plays an important role for researchers from public or semi-public institutions. Hence, such institutions are often confronted with ABS regulations in source countries. Also, material exchange among researchers is common praxis, as well as acquisition from international ex-situ collections. Users from pharmacy and industrial biotechnology procure material from international ex-situ collections. Biotech companies reported that additionally acquisition of material from source countries from and with the assistance of commercial intermediaries is common praxis. In both sectors, though, cooperation projects with local research institutions or smaller research based companies in provider countries are procurement strategies as well. Plant breeders purchase commercial plant varieties on the market, exchange “material under development” under licensing agreements, and acquire “raw” genetic material from gene banks or botanical gardens. According to statements in the exploratory survey, own collection activities organised and conducted by breeding companies are applied, though, less common in comparison to other strategies.

The exploratory research indicated that **“utilisation intention”** has two dimensions, (1) the commercial versus the non-commercial intention and (2) the method or the process of research and development. Both aspects presumably determine at which stage parties should negotiate sharing of potential economic rents resulting from the utilisation. We learned that the differentiation of commercial and non-commercial utilisation intentions cannot be reduced to public research institutes versus private companies. Regarding methods and process of utilisation we found analogies among sectors and disciplines.

Users agreed that “paying” for access to genetic resources - **benefit sharing** - is acceptable in general. However, the type of compensation varies inter- and intrasectoral. Even the same user entity grants different benefit sharing packages in different projects. Seemingly, benefit sharing varies in accordance with the type of relation between user and provider (the type of contribution by provider entities, and the type of provider entity) as well as with the capacities of the user entity..

Especially in the pharmacy and biotech sector, but also in the public research sector, **Intellectual Property Rights** play an important role. User groups included in the survey are in some way familiar with the concept of joint IPRs, however, experiences with the concept in the framework of ABS projects is very limited. Practically, patent laws restrict the applicability of the concept in this field. ,

Exclusivity of access is relevant in all three user groups. It is a tool to generate time-advantages in research, development and market launch of products. Exclusivity can be differentiated by timeframe and scope.

Regarding **type of contracts** and the **duration of contracts** we find various strategies. Users pointed out the risk of applying medium term contracts with options for renegotiation and extension, particularly if the political climate regarding ABS is unstable in a provider country. However, we found companies that prefer phasing agreements. At each significant step in the R&D process new contract documents are drafted or existing contracts might at least be extensively renegotiated and amended. A potential explanation might be the internal decision procedure. Large, more hierarchical firms apply phasing contracts with the aim to keep transaction costs low at early stages of a project, when commercial output is very uncertain. Only when a project reaches a commercially promising phase higher hierarchical levels get involved, and monetary compensation measures can be decided. In utilisation fields with long-term R&D processes, long term contracts are often applied.

Acceptance of the standardisation approach was good among researchers from public institutions. These users have little legal capacities available, and each instrument that facilitates access and reduces transaction costs enables researchers better to efficiently use their expertise. A similar impression was given by small- and medium size plant breeding companies. Again, legal capacities are scarce for these users. However, several plant breeders pointed out that the heterogeneity of projects especially with acquisition of in-situ material from source countries would need to be reflected in an instrument. The argument of heterogeneity was also the central point of concern in the group of pharmaceutical and biotech companies. Users from this research group did hardly see the benefits of standardisation for projects with provider entities in source countries. However, the approach of voluntary guidelines for the negotiation and design of contracts was assessed as possibly useful.

5.1.3 Main results Standardised Online-survey

Subsequent to the exploratory surveys we conducted a standardised cross sectional survey with users from the private sector. The data was used for a characterisation of transactions with genetic resources on a more detailed level than it can be found in the literature. However, the main goal was to interrelate external factors, such as transaction characteristics and user/demand characteristics with governance elements. By the same token we critically revised the sectoral approach that was fostered in the political debate of ABS instruments in the last couple of years. Results of both aspects of analyses shall feed into recommendations for a categorisation of transactions with genetic resources for the development of model clauses.

A major finding of the research is that transactions with genetic resources between user companies and entities in source countries are heterogeneous in all aspects that were included in the survey. This applies to external factors (explanatory variables) as well as the choice of governance solutions.

Results of a combined evaluation of external (explanatory) variables with governance elements partly support our assumptions developed based on governance theory and exploratory research. Therewith we receive a theory-based and empirically tested framework of characteristics for the distinction of transactions with genetic resources with regard to efficient governance forms. This framework shall be used to discuss model clauses later on. Table 72 displays a comprehensive overview on associated explanatory and governance variables. However, variables marked with * in Table 72 are operationalised as item-batteries with multi-response in the questionnaire. Statistical significance of associations indicated in the table does not necessarily apply for each single item of variable.

Table 72: Summary of Associations of Explanatory Variables with Governance Elements

	Governance variables				
Explanatory variables	Contract type	Contract duration	Monetary benefit sharing *	Non-monetary benefit sharing *	Conflict resolution *
Strategic factors of capacity building *		**X**		**X**	**X**
Provider contribution *			**X**	**X**	**X**
Asset specificity			**X**	**X**	**X**
Primary uncertainty of R&D with genetic resources *	**X**		**X**		**X**
Frequency of economic interaction	**X**			**X**	**X**
* Indicates that the variable is a multi-item variable.					

Source: Authors'.

From the results summarised in Table 72 we can deduce which categories of explanatory variables should be considered for choosing a model clause for the respective governance element. For drafting clauses on the governance element monetary benefit-sharing the following factors (variables) should be considered: (1) strategic factors of capacity building, (2) the type of contribution executed by the provider entity, (3) whether the user entity makes specific investments for utilising genetic recourses that shall be transferred in the course of the project, and finally (4) the frequency of interaction between user and provider entity. In the same way the other entries in Table 72 can be interpreted.

Table A 17 in Appendix IV provides an overview of the significant results on the item level. Moreover, by showing the direction of the association it indicates which option of a governance element is suggested (based on the survey results) for a certain transaction characteristic.

Subsequently, we tested the "relevant explanatory variables"[16] for intersectoral homogeneity. The decision rule for assessing the sectoral approach in the context of model clauses is: all explanatory variables significantly associated with the respective governance element should be significantly associated with the variable sector affiliation (respectively field of utilisation) as well. Only asset specificity and one provider item are significantly associated with sector affiliation. Therewith the test results in general rather speak against a differentiation of cases by sector affiliation. To double check, we tested for association between governance variables and sector affiliation: the results support the findings elaborated above.

[16] Relevant explanatory variables are variables which are significantly associated with at least one of the governance elements.

5.2 Interpretation of the Results in the Context of the Study

Several forms of standardisation are possible on the contracting level. However, there is a general trade-off between scope and concreteness of harmonisation implemented with an instrument and therewith the simplification it can induce on the one hand and the degree of freedom for transactors to adapt the contract to the particularities of the individual case and therewith to adopt the best governance solution. A high level of standardisation targets the reduction of transaction costs and an improvement of legal certainty; however, if it reflects neither the significant heterogeneity of demand for and utilisation of neither genetic resources nor the particular needs of providers. Hence a high level of contractual standardisation supposedly impedes transactions with genetic resources, and consequently ABS.

The surveys conducted in the framework of this study show that in reality for the procurement of genetic resources from source countries various, individualised governance solutions are applied. This enfolds several contract elements identified as relevant, such as the contract type, contract duration, monetary and non-monetary benefit sharing, as well as conflict resolution mechanisms. The theoretical concept we developed to explain variation was mostly supported by the empirical results. In case a standardisation based instrument shall be developed, we recommend voluntary menus of model clauses for each governance element. Neither standard agreements nor overall model agreements can appropriately reflect the heterogeneity among cases, provide with efficient governance solutions, and therewith effectively support the implementation of ABS.

The study provides concrete starting points for the development of a model clause instrument. The results indicate[17] that governance theories, especially transaction cost economics and strategic management, contribute to explain variation of governance solutions among transactions with genetic resources. Most of the explanatory variables derived from the theories are significantly associated with one or more governance element. The identified associations between explanatory variables, such as provider contribution items, asset specificity, primary uncertainty, frequency and others, with characteristics of governance elements can be used to develop menus of model clauses and guidelines for stakeholders how to select the appropriate model clauses.

The idea of a sectoral approach was to take into consideration heterogeneity of utilisation among users, and therewith safeguard the development of appropriate models. However, we found that intersectoral homogeneity for transactions with genetic resources is weak. Cases affiliated with the same sector are not significantly more homogeneous compared to cases affiliated with different sectors. This holds for the explanatory variables and also for the selection of governance elements. Associations of sector affiliation with the characteristics of transactions with genetic resources (explanatory variables), respectively with governance variables are mostly not significant. We interpret this result as indication that a sectoral approach for the development of standards or models for contracts, respectively contract elements for ABS agreements is not feasible. If model clauses would be developed sector wise one would likely end up with menus of clauses for each sector, whereby several clauses would be identical among sectors. The same applies for characterisation of cases for the selection of the appropriate model clause. Hence, we do not see the advantage of a sectoral approach.

[17] Due to methodological limitations we can not say that the results “prove“ cause and consequence-relations between explanatory variables and governance solutions.

5.3 Reflection on the Methodological Approach

We applied an iterative research process with a triangulation of methods and a strong focus on empiricism. Exploratory research played an important role therein. Altogether we assess the methodological approach as valid to answer the research questions. Reliability and objectivity of the survey results are more difficult to assess, though. First, governance analysis of transactions with genetic resources is a fairly new research field, which is why the operationalisation of theoretical concepts in the literature is very limited and hardly tested so far. Apart from that, we could not counter check our results with similar studies. Secondly, this research has a strong empirical focus, while the subject matter is politically critical, and governance of transactions with genetic resources raises sensitive questions, which users are partly reluctant to answer. Hence the recruitment of survey participants was significantly challenging. Specific methodological limitations for each research step are discussed in the following section.

Model agreements and guidelines were analysed with the method of qualitative content analysis. A shortcoming of this research step, though, not induced by the method, is the low level of information about stakeholders' experiences with the instruments. It was not possible to assess whether in practice the instruments successfully implement the stated objectives. However, the review gave a good overview of and introduction to contractual elements and design options, and the applied method was appropriate.

The exploratory interviews and focus groups were conducted to discuss user practice and reveal governance options and heterogeneity among and within sectors. Moreover, first hand information should feed into the operationalisation of theoretical concepts for the subsequent online-survey. Due to survey participants' heterogeneous levels of experience - with respect to the concept and practical implications of ABS, as well the involvement in actual transactions with genetic resources - and external settings, exploitable data varied among interviews. The same holds for the group discussions. This surely is a limitation of the survey, not profound though, as the exploratory character was chosen deliberately in this research step. Particularly the dynamic aspect of group discussions created a chance to reveal new aspects and to discuss heterogeneity within user sectors.

In the subsequent standardised, cross-sectional online-survey we claimed to generate detailed and comparable data about transactions with genetic resources that would allow going one step beyond pure qualitative-descriptive governance analysis. However, practical constraints such as the limitation of manpower, information about the population, accessibility and willingness, or ability of companies to participate made it impossible to reach equal sizes of sub samples (cases representing user sectors or governance solutions). Altogether the sample size and the types of variables did restrain the methodological options for the evaluation of the survey data. The possibility of measurement errors has to be accepted when methods are applied for the first time in a research field. However, we reviewed empirical studies that tested the theories in other fields, and used the findings for our concept of operationalisation.

A particular challenge was the affiliation of respondents, respectively their companies and reference cases with sectors or fields of utilisation[18]. This is a consequence of companies' multidisciplinarity. Several participants indicated that genetic resources are used in several fields, even resources acquired in the framework of one transaction. This limits on the one hand the reliability of results based on which we criticised the sectoral approach. A more precise affiliation of cases with sectors/fields of utilisation - which is not possible - of course reduces the explanatory power of association tests of sector affiliation with explanatory variables. On the other hand, multidisciplinarity of utilisation within one company and even within one project as such implies the unfeasibility of a sectoral approach.

[18] For more in depth explanation see chapter 4, Part A.

We did not include the providers' perspective in our empirical surveys. This of course is a limitation of perspectives.. However, it is state of the art in empirical studies of governance decisions with focus on transaction cost aspects, to take the perspective of the entity demanding a good, service or intermediate (here the user) and to survey data only from this party to the transactions. Moreover, most of the variables correspond to the characteristics of demand and the utilisation of genetic resources, which can most appropriately be assessed by the user entity.

5.4 Conclusions of the Governance Analysis

The goal of the study was to improve the understanding of transactions with genetic resources and use this to elaborate on options for model clauses for ABS agreements. We realised these goals by applying several empirical surveys, and developing a framework of analysis for transactions with genetic resources based on economic governance theories.

In many respects this study goes beyond the existing literature. Focus group and standardised, cross-sectional online-survey are methods that have not been applied in this research field before. The focus groups allowed us to reveal new aspects, particularly regarding heterogeneity of practice within sectors and even within companies. The standardised company survey generated data that describe on very detailed level with a strong focus on governance aspects projects for the procurement of genetic resources from source countries. The questions are operationalised such that we can use statistical tools to analyse the data. We evaluated associations between characteristics of transactions and governance elements of the contracts that govern the transaction. This type of analysis goes beyond the qualitative description of case studies as we find in the literature. Our research provides the basis, both in terms of data and in terms of the theory construct, for causal analysis with statistical tools.

Together, governance theory, the review of existing model agreements and guidelines for ABS and the exploratory survey indicate which elements are relevant in ABS agreements and which designs they can take. Especially the online-survey generated findings on how to interrelate governance solutions with transaction characteristics.

The study responds to the call for research on practice of transactions with and ways of utilisation of genetic resources. The main contribution to the debate on ABS instruments is the provision of in depth information about characteristics of demand, utilisation forms and governance of transactions potentially falling under the scope of ABS. We developed a concept to operationalise "ways of utilisation" and characterise cases accordingly. Based thereupon, the study provides concrete starting points for the development of model clauses and guidelines for the characterisation of cases and selection of model clauses from menus. Theory based recommendations for the selection of model clauses in accordance with the characteristics of cases clearly go beyond existing models and guidelines.

The general idea of a differentiated instrument that reflects variation of the utilisation of genetic resources is strongly supported by the results of this study. However, the differentiation of cases is not along line with sector affiliation of companies and utilisation projects. Hence, it should not be called a sectoral approach, at least not, when it is about standardisation on the contracting level.

Part C: Stakeholder-based comparative Analysis of a Multilaterally Standardised versus a Bilateral ABS approach

1 Introduction to Part C

1.1 Background of the Study

Most ABS instruments under discussion neglect the fact that genetic resources often have more than one source country. With the application of a bilateral approach to ABS agreements additional potential providers are excluded. Moreover, many - particularly biodiversity rich countries - have very limited institutional capacities, such that they have not yet, and probably will not in the future implement institutions to successfully govern ABS for genetic resources in bilateral transactions.

This raises the question, if other instruments than those targeting the support of bilateral negotiations and bilateral contract enforcement should be considered. Parallel to the International Regime negotiations a system to regulate transactions with Plant Genetic Resources for Food and Agriculture (PGRFA) under the ITPGRFA evolved. A multilateral system (MLS) has been established in which important plant genetic resources (PGRs) of member states are pooled. The system includes detailed guidelines for facilitated access and benefit sharing in a Standard Material Transfer Agreement (sMTA). The sMTA replaces the individual negotiation of a contract between the provider and user. Financial resources generated in case monetary benefit sharing obligations are triggered shall be paid into a multilateral „Trust Fund“.

The potential advantages of the ITPGRFAs' highly standardised ABS system primarily entail the reduction of transaction costs through the use of the SMTAs (MOORE and TYMOWSKI (2005): 10). Moreover, the system recognises the fact of multi-source countries for genetic resources and limited institutional capacities of member states to the Treaty. Therewith the instrument supposedly tackles several implementation problems for transactions with genetic resources under the scope of the CBD that were identified in user surveys in Part A of this report.

The regulations of the MLS are valid for a selected list of crops - the so-called Annex I. In order to simplify access to further resources that typically fall under the jurisdiction of the CBD, plant breeders in particular advocate for an expansion of Annex I (BDP (2008): 10). Since the system is not a static entity, it allows leeway for a potential expansion of Annex I, as long as this is concluded by the member states. Moreover, a similar system including a Trust Fund and standardised access, contracting, benefit sharing and monitoring instruments should be considered also for governing genetic resources under the scope of the CBD.

1.2 Aim of the Study

The description of the ITPGRFAs' multilateral ABS system and the analysis of the major stakeholders' Pros and Cons towards an extension, respectively an application of the system to other genetic resources is a first research step for evaluating the applicability and design options of a comparable instrument in the context of ABS under the CBD. Moreover, this study should make a contribution to the discussion surrounding a potential expansion of Annex I within the ITPGRFAs the multilateral system.

The research focus in this study is on a comparative cost-benefit analysis of the bilateral and the multilateral approach to ABS. This includes the identification of intrinsic system factors that are relevant to interest groups in the course of weighing an expansion of Annex I, respectively applying a similar system in the framework of the CBD. A classification system for Plant Genetic Resources shall

be developed that serves as the basis for the evaluation of the resource regarding its inclusion in Annex I. The tool can be adapted and further developed in order to apply it for discussing other types of genetic resources and/or other fields of utilisation. Also, it can guide a general discussion about governing genetic resources under a bilateral versus a multilateral ABS system.

The resource category system operationalises for this part of the study the aspect of context stability (the transaction partners' strategies), which was defined as precondition for the application of a fully fledged standardised transaction system in Part A of this report (see chapter three – Theory)

Expanding on the economic analysis and classification, recommendations for adjusting the composition of a multilateral system should be deduced, in order that an Annex I expansion could reach a consensus for the resource classes identified. The findings can be transferred to a general discussion of the instrument in the framework of an international ABS regime under the CBD.

1.3 Approach and Structure of the Study

This part of the report is divided into four sections. First, the approach to the topic is outlined, including the political and institutional frameworks of both systems of the ABS. This includes the use of specialised literature including research works that document the negotiations for the establishment of Annex I. This allows for the identification of the critical arguments of interest groups and provides leads for the compilation of a resource categorisation system. As a further step in describing the object of study, the discussion surrounding the Annex I expansion is outlined. This also includes current arguments by interest groups.

In the second step of the research process, the explorative examination for the expansion of Annex I is the focal point. First the affected and participating interest groups are determined. The examination concentrates on the position of the resource provider and the resource user. The economic analysis of the system selection follows: utilising New Institutional Economics, hypotheses are sought to explain the level of utility of both systems of access and benefit sharing from the point of view of the user and provider. The central theories applied are the Property Rights Theory and the Transaction Costs Theory. The establishment of a construct for the classification of resources comprises the core of the explorative analysis. The previously developed theoretical hypotheses will be used to substantiate the system selection for certain resource categories.

The third section of the research process serves to examine the resource categorisation, including its hypotheses, based on a small survey. In this empirical section, solely the perspective of the resource provider is examined. This focus has been established for two reasons: 1. We assume that the composition of net utility for the provider in this context is multifaceted (more controversial) and is more dependent on the characteristics of the resources. For this reason, it can occur that there are often contradictions by the provider countries in the actual negotiations. 2. The providers' positions are rarely addressed in existing studies. The main focal points, also in the entire research project, are on the user side in parts A and B.3: Understanding the provider perspective is vital to suggest instruments for an ABS system or even the overall paradigm, as without the provider' countries affirmation no instrument in the framework of the CBD will be established, and no extension of the MLS under the ITPGRFA will be approved.

In the last section, the results of the survey are discussed, and suggestions for an adjustment of the system for the incorporation of further resources in Annex I are developed. The findings can be transferred and used in a broader discussion of ABS-instruments in the CBD

2 Genetic Resources in the ITPGRFA

2. 1 Origin, Goals and Mechanisms of the ITPGRFA

The threat to the diversity of agricultural crops was first recorded at the beginning of the second half of the 20th century. The topic was first focused on as a global issue during the tenth conference of the Food and Agriculture Organization (FAO) of the UN in 1959 (cf BEGEMANN AND HEMMINGHOFEN (2008): 60-61). Several symposia followed, addressing the topics of exploration, preservation, and the sustainable use of plant genetic resources (PGR) under the auspices of the FAO. In 1983, the International Undertaking on Plant Genetic Resources (IU) of the FAO was enacted in the organisation's 22nd session. Plant genetic resources were recognised in the IU as "common heritage of humanity". Through international cooperation, although not legally binding, it should have been assured that PGR be researched, preserved, evaluated and kept available for plant breeding and scientific purposes (cf. IU Art. 1).

In conjunction with the end of the CBD negotiations, the "Nairobi Final Act" was adopted in May 1992 (cf. UNEP). The third resolution of the Nairobi Final Act stressed the link between the CBD and sustainable agriculture as well as the efforts that would be necessary to find a solution to the remaining questions regarding plant genetic resources. In an FAO conference in November 1993, Resolution 7/93 was adopted, one goal of which was to bring the IU "in harmony" with the CBD. A fundamental revision of the IU followed, which lasted from 1994 to 2001.

The result of the revision was the legally binding International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR or treaty), which took effect on June 29, 2004, 90 days after the filing of the fortieth ratification, acceptance, approval or accession document (according to ITPGR Art. 28). Currently 120 parties belong to the treaty and an additional 14 states have signed it. Its basic goals and mechanisms will be described in the following chapter.

As early as Article 1.1, the ITPGR affirms its compliance with the CBD: "The objectives of this Treaty are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security".

For the oversight and advancement of its goals, the ITPGR establishes a Governing Body that consists of representatives of all signatory states. The Governing Body meets at regular intervals, at minimum every two years (cf. ITPGR Art. 19.9). Decisions by the Governing Body are made by consensus, as long as a different decision-making process has not been agreed upon (cf. ITPGR Art. 19.2).

The signatory countries recognise farmers' rights through Article 9 of the treaty, considering the important contribution farmers make in preserving and developing plant genetic resources. For this reason farmers are granted, among other rights, a role in the decision-making process at the national level in addition to the right to retain harvested seeds for replication, breeding, exchanging, and selling. For the first time the ITPGR stipulates farmers' rights in an internationally binding contract.

2.2 ABS in the ITPGRFA – the multilateral approach

In the ITPGR, ABS is determined predominantly by the multilateral system ("multilateral system" or "MLS") collectively supported by all signatory states. The MLS is a core part of the agreement and defined in Section IV of the treaty: Article 10.1 initially affirms the recognition of national sovereign

rights over one's own plant genetic resources for food and agriculture. Expanding upon this, the member states commit themselves to exercising their sovereign rights to "establish a multilateral system, which is efficient, effective, and transparent, both to facilitate access to plant genetic resources for food and agriculture, and to share, in a fair and equitable way, the benefits arising from the utilisation of these resources, on a complementary and mutually reinforcing basis" (ITPGR Art. 10.2).

Elements of the multilateral system are the object of regulation (Coverage of the Multilateral System, ITPGR Art. 11) and the determination of how to proceed with the object of regulation, in other words, regulating the ease of access (Facilitated access to plant genetic resources for food and agriculture within the Multilateral System, Art. 12) and for the offsetting of advantages (Benefit sharing in the Multilateral System, Art. 13).

2.2.1 Object of Regulation of the Multilateral System

While the ABS regulation of the CBD is valid for all genetic resources, the ABS regulations of the MLS according to Article 11.1 are only valid for all plant genetic resources for food and agriculture (PGRFA) listed in Annex I. Analogous to the definition clause of the CBD for "genetic resources", PGRFA are defined in Article 2 of the treaty as "any genetic material of plant origin of actual or potential value for food and agriculture". Genetic material means "any material of plant origin, including reproductive and vegetative propagating material, containing functional units of heredity". In general, this definition is constructed so that functional hereditary entities, such as genes or genetic sequences, do not become objects of regulation (cp. i.e., FRALEIGH and DAVIDSON (2003):21).

The object of regulation of the MLS is further specified in Article 11.2: the multilateral system includes "all plant genetic resources for food and agriculture listed in Annex I that are under the management and control of the Contracting Parties and in the public domain". In contrast to the ABS conditions of the CBD, the scope of the MLS also covers material collected prior to the regulation taking effect.

Based on Article 11.5, Annex I Material which is located in the ex-situ collections of the Consultative Group on International Agricultural Research (CGIAR) is also affected. International Agricultural Research Centers (IARCs) have undertaken intensive collection efforts since the 1960s. They manage a large portion of the global plant genetic variety in their collections. As a result, they work independently from the states in which they are located. In its second sitting in 2007, the Governing Body decided that access regulations should also be applied to non-Annex I Material held by the IARCs (ITPGR (2007): pp. 10). Alongside state and supranational actors, natural and legal persons should also be encouraged by the signatory states to contribute their collections as Annex I material (ITPGR Art. 11.3). To incorporate resources in the MLS, the administrations of the affected gene banks should adjust to the stipulated regulations (cp. BEGEMANN and HIMMIGHOFEN (2008): 63).

The initially "unpopulated" multilateral system will thereby slowly become populated with the Annex I resources of the participating actors (states, IARCs, natural and legal persons). Some members have already followed up on the call for material contributions. On the website of the treaty, the "Letter[s] of Notification for the Inclusion of Material in the Multilateral System" of several countries are visible, including Germany, Namibia, the Netherlands, and Portugal. Preceding the third session of the steering committee in June 2009, the current lack of information provided about the state of Annex I Resource collection by the signatory states was criticised in the "Review on the Implementation of the Multilateral System" (ITPGR (2009a): 4).

Furthermore, the agreements with eleven international agricultural research centers of the CGIAR are listed. Collections not belonging to the CGIAR are also listed in the MLS, for example the Tropical Agricultural Research and Higher Education Center (CATIE). The first natural or legal person to add a collection was the joint Association pour l'Etude et l'Amélioration du Maïs (Pro-Maïs) and Association Française des Semences de céréales à paille et autres espèces Autogames (AFSA) in May 2009.

2.2.2 Access and Benefit-sharing within the Multilateral System

In Article 12 of the ITPGR, the contracting parties voted for the facilitation of access to plant genetic resources for food and agriculture within the MLS (ITPGR Art. 12.1) and agreed to meet further appropriate measures for carrying this out (ITPGR Art. 12.2). Article 12.2 of the treaty is thereby concordant with Article 15.2 of the CBD, which calls for all "contracting parties to establish preconditions that facilitate the access to genetic resources for environmentally sustainable use by other contracting parties."

Article 12.3 stipulates further preconditions to access. Article 12.3a is especially important, as it determines that material of the MLS exclusively "for the purpose of use and preservation for research, breeding, and training for food in agriculture", but not for chemical, pharmaceutical, or other use in a non-food/animal feed context. Consequently, not only does this make a difference between Annex I resources and non-Annex I resources, the type of use is also decisive in determining which of the MLS regulations is applicable (cp. MOORE and TYMOWSKI (2005): 89).

According to Article 12.3d, recipients of MLS materials are not permitted to claim any intellectual property rights or other rights to the plant genetic resources or to their genetic parts in the form that they were received from the MLS that would reduce the facilitation of access. According to COOPER (2002: 8), this clause was one of the most controversial points and was concluded at the very end of the treaty negotiations. This is often pointed to, among other reasons, for the lack of adoption of the treaty by the USA and Japan.

Intellectual property rights, as explained by MOORE and TYMOWSKI (2005: 92) for this context, include patents, plant breeding rights as well as enterprise and trade secrets. Other rights include, for example, property claims. It is however unclear if intellectual property rights (cp. ibid.: 92).

Contracting parties (first clause) and legal and natural sovereign persons belonging to the contracting parties (second clause) have a right to access the MLS. The IARCs of the CGIAR that have concluded agreements with the steering committee are equally granted the right of access (ITPGR Art. 15.2).

Article 12.4 of the treaty specifies that the so-called standard Material Transfer Agreement (sMTA) applies for the access of MLS resources. The sMTA acts as the central regulation device of the multilateral system. It seizes on the previously outlined access conditions and implements the standards of the treaty for benefit sharing.

The conditions for benefit sharing are determined in Article 13 of the treaty text. First, the advantages provided by the facilitation of plant genetic resource availability by the MLS is alluded to. It is also arranged so that all other advantages resulting from facilitated access are divided in a fair and balanced manner (ITPGR Art. 13.1). Furthermore, it is arranged that "that benefits arising from the use, including commercial, of plant genetic resources for food and agriculture under the Multilateral System shall be shared fairly and equitably through the following mechanisms: the exchange of information, access to and transfer of technology, capacity-building, and the sharing of the benefits arising from commercialisation" (ITPGR Art. 13.2).

Of special interest for this work is Article 13.2d – Sharing of monetary and other benefits of commercialisation. In this article, an appropriate payment is to be arranged by the receiver and made to the organ described in Article 19.3f (the Benefit Sharing Fund), if this "commercialises a product that is a plant genetic resource for food and agriculture and that incorporates material accessed from the Multilateral System". The payment should represent an appropriate portion of the benefits achieved through the commercialisation of the product. The payment must however not be made if the product is available without constraints to others for the purpose of further research and breeding. What is to be understood by the terms "commercialisation" and "without constraints" is not further defined by the text of the treaty. For COOPER (2002: 9), with the negotiation process in mind, the obligation to pay is triggered when the product is protected by patents or other intellectual property rights that limit the availability of the product.

Obligations for monetary benefit sharing do not occur when the commercialised product is for another purpose than a plant genetic resource for food and agriculture or when a "normal" commercial product contains an element produced by a cultivated plant that has been enhanced by MLS resources (cp. MOORE and TYMOWSKI (2005): 110).

Article 13.3 arranges for advantages achieved directly and indirectly from the use of MLS resources to be accorded to farmers. Those from developing and emerging countries who maintain and sustainably use the PGRFA take precedence. The focus of the article lies on projects to support the exchange of information, technology transfer and capacity building, management and preservation of PGRFA on-farm as well as through the sustainable use of plant genetic resources (cp. ITPGR 2007: Appendix D.1).

The sMTA was agreed upon during the first signatory conference of the treaty in June 2006 and has been a part of the treaty of the ITPGR since. The standard treaty must be used for every transfer of PGRFA within the MLS. As a result, the treaty guidelines regarding access and benefit sharing are carried over to a contract between provider and receiver of a resource of the MLS.

The term "standardised" in this context refers primarily to the conditions agreed upon once in the sMTA and guidelines that are consistent for all resource transfers within the framework of the MLS. This again stresses the contrast with bilateral access agreements through the CBD (CORREA, (2006): pp. 142).

Article 2 of the sMTA clarifies terminology that is missing in the treaty text. The term "available without constraints" is defined as the availability of a product to third parties for the purpose of research and breeding "without any legal or contractual obligations, or technological restrictions, that would preclude using it in the manner specified in the Treaty". The terms "commercialise" and "commercialisation" refer to the sale for compensation of one or more products on the free market.

Continuous reporting to the Governing Body about the completed material transfer agreements is a further requirement of the provider according to the sMTA (Article 5e).

In practice, the receiver receives the standardised material transfer agreement together with the resource ordered, whereas the acceptance of the material indicates and acceptance of the contract terms ("shrink-wrap function"). In contrast, the "click-wrap" standardised material agreement is concluded by clicking an icon when ordering material on the Internet.

2.2.3 Recent Developments in the MLS

The multilateral system is accessed over 100,000 times annually (cp. ITPGR (2009a): 11). However little information about the use of the sMTAs has been reported by the provider to the Governing Body, with the exception of the international institutes that have concluded agreements based on Article 15 of the treaty (ITPGR (2009b): 4).

The current state of benefit sharing appears as follows: While the existence of non-monetary benefit sharing by international institutes is not challenged, no information exists about the research and development of MLS material by the receiver (ITPGR (2009b): 7). In addition, no monetary benefit sharing has been deposited to the trustee account of the FAO for the commercialisation of a product containing MLS material (ibid. 7).

The lack of payments from benefit sharing requirements of the sMTAs into the fund can however be attributed to the long research, development, and commercialisation times for new plant varieties in plant breeding. On the other hand, contributions to the fund of the multilateral system have been made. Norway decided to voluntarily contribute 0.1% of its annual seed sales to the fund, which resulted in its first payment for the year 2008 (ITPGR (2009b): 8).

The member states have been called upon to contribute suggestions for the distribution of the funding. Thus far, eleven projects have been selected (the homepage of the treaty contains information about current developments: http://www.planttreaty.org, last accessed: Nov. 25, 2009).

2.3 Annex I of the Multilateral System

As elaborated in chapter 2.2 the application of the sMTA is limited to resources included in Annex I too the ITPGRFA. In the following sections criteria for the selecting of Annex I resources in the past and the development of negotiations are elaborated on.

2.3.1 Food Security and Interdependency

The international community of states has agreed on the establishment of a separate ABS system for the access to certain PGRFA, necessary for reducing the cost of transactions with genetic resources by means of a standardised access and contracting process. Additionally, the search for potential resources for plant breeding should be simplified by making available an information pool for PGRFA. What makes the plant genetic resources of Annex I so particular and justifies the cost of developing and implementing such a system?

The global exchange of plants and seeds over centuries has created an enormous variety of agricultural crops – 7,000 food plants are known today (cp. FAO (1997): 14). As a result, the actual country of origin of a plant variety is usually difficult to determine. For this reason the **Country of Origin Principle of the CBD** is often not applicable as a condition of benefit sharing for useful plants (cp. HALEWOOD and NNADOZIE (2008): 119).

Interdependency studies show that a majority of countries are highly dependent on the resources of other countries (cp. MOORE and TYMOWSKI (2005): 5). Especially for widely diffused food plants, the exchange of genetic materials across borders is thereby very important. International **interdependency** has therefore been selected as a further criterion for the admission of PGR to the Annex I list.

A further reason could be the use of plant genetic resources (for both cultivated and wild plant varieties) as a raw material for the development of new plant varieties for the purpose of food security. The demand owing to traditional breeding methods has been complemented by the biotechnological developments of the green revolution in the second half of the 20th century. In the 1970s, the international agricultural research centers called for a steady influx of genetic resources for research and breeding (cf. PISTORIUS (1997): 69). Also, PGRFA are necessary for global food security today. **Modified Environmental Conditions** (for example, climate change) create new challenges for the characteristics of cultivated plants. Access to PGRFA is necessary for research and breeding in the field of resistance to plant diseases, economies of scale and quality improvements. The multilateral system contributes to global food security by facilitating access to both raw materials bred in their original state as well as enhanced varieties.

In addition, it simplifies the cultivation of "forgotten" cultivation plant varieties, which complies with on-farm or in-situ conservation. As early as the 1960s and 1970s, researchers recognised the "genetic erosion" of cultivation plants and a resulting threat to the further development of agriculture (cp. Ibid.: 69). The **decline of the crop variety** is caused largely by the replacement of native varieties by "exotic" cultivation plant varieties and types (cp. FAO (1997): 33 - 40).

The **contribution to food security** is a further criterion for the admission of a PGRFA to Annex I. Article 11.1 of the ITPGR leaves the term "food security" open to interpretation. According to MOORE and TYMOWSKI (2005: 81), this should not focus on global food security alone; food plants that contribute to food security on a local and regional level should be equally considered. The nutritional value of a food source should also be evaluated.

2.3.2 Negotiation Process and Formation of Annex I

The negotiations regarding the content of the Annex I resource list spanned over seven years before the treaty took effect. The negotiating parties were advised by a multitude of scientific expert groups and technical workshops (MOORE and TYMOWSKI (2005): 81).

At the outset, the scope of the MLS was not yet defined and it was unclear if, for example, all plant genetic resources of the member states would be included or if it would only include the PGRFA. In 1995 the idea to compile a list of cultivation plants emerged for the first time. In 1999 the agreement for both the criteria "food security" and "interdependency" was reached (ENGSIANG and HALEWOOD (2008): 249 – 250).

Other factors also played a role in the negotiation process. Brazil, for example, signalised negotiating leeway in terms of the scope of the list as long as the MLS would include appropriate benefit sharing. COOPER (2002: 5) suggests that several countries valued bilateral agreements of the CBS as more lucrative and lobbied for a limited list as a result. Observers assume that strategic behaviour by the states had influence over the result of negotiations (cp., i.e. LOCHEN (2007): 198).

In 2001, shortly before concluding the treaty, today's Annex I list finally took shape. Prior to negotiations, the negotiating regions were requested to submit lists with resource suggestions that would be compiled into an initial selection based on the foundation of existing agreements and previously established criteria. The EU submitted a list with 273 entries. The African region in contrast preferred a list with only nine PGRFA. One motive for strictly reducing the list was also the desire to wait and see if the realisation of a benefit sharing agreement would succeed in the future. The option of expanding the list later was left open (CGRFA (2001): 1 -13).

MOORE and TYMOWSKI (2005: 82) remark that substantial species especially for the breeding of enhanced varieties were frequently eliminated from the list for political reasons. The currently valid list consists of 35 food plants (listed according to genus, limitations are cited in the third column) and 29 feed crops. By sub-categorising beyond the genus, more than 600,000 varieties are available to researchers and breeders (GTS (2008): 1). According to the treaty the MLS covers roughly 80 percent of global nourishment with its selection of food plants (cp. MOORE and TYMOWSKI (2005): 5).

The most important food plants such as wheat, rice, corn, and potatoes are covered by the list. However other globally utilised plants such as soy, tomatoes or sugar cane are missing. Additionally, genus plants such as tea shrubs and coffee plants as well as other plants used in industrial production such as flax and cotton plants or rubber trees. Cassava, despite its relatively small contribution to global food security (ca. 1.9%) was included in Annex I. The reason for which is likely to be the high level of regional importance of cassava in Africa (up to 50% of the energy supply) as well as its potential role in future global food security (LOCHEN (2007): 198).

2.3.3 The Expansion of Annex I

According to several accounts, an expansion of Annex I has been discussed very little in international forums (cp, i.e. BULMER (2008): 9; GTZ (2008): 1). However changes to the treaty as well as to Annex I can be made according to Article 19.3i.

Interest groups, primarily on the user side, call for a possible expansion to include other resources. The German Plant Breeders' Association (BDP (2008): 32 and 35) requests, for example, that the sMTAs also be used for vegetable and ornamental plants. The International Seed Federation also speaks out for the future inclusion in the MLS of further species and varieties that are regularly used in plant breeding programs and currently fall under the jurisdiction of the CBD (for example, plants used in industrial production) (cp. International Seed Federation (ISF) (2007 and 2008)). In addition to vegetable plants, ornamental plants, and industrial-use plants, it would also be conceivable to incorporate recreational plants, plants for the production of renewable energy, and additional "underutilised crops" in the MLS. Alongside the debate surrounding the expansion to include other PGRFA, the expansion of the fields of use is also an interesting topic.

For an amendment, the requirements of the treaty in Article 11.1 regarding the criteria of food security and interdependency must be considered when selecting PGRFA.

Since Annex I is to be treated as a component of the treaty text, and an amendment to the treaty text requires the consensus of the signatory states at a session of the steering committee according to Articles 23 and 24, then this rule also applies for the expansion of Annex I. Amendment proposals can be contributed by all parties in the treaty (ITPGR Art. 23.1). They are to be communicated to the other signatories at least six months before a session (ITPGR Art. 23.2).

3 Methods for Deriving a Resource Category System

In the following chapter, the derivation of applied methods for the first portion of this sub-project will be presented.

3.1 Overview and Goal of the Conceptualisation

The goal of this sub-project is to develop an exemplary system for the identification and consideration of criteria for the discussion of a multilateral ABS solution in the CBD, based on the economic analysis of a possible expansion of Annex I of the MLS. As this topic has thus far been focused on relatively little from the economic point of view, this study follows a predominantly exploratory approach. Accordingly, the review of theoretical hypotheses is not a focal point. The study will rather attempt to explore the research topic by applying New Institutional Economics and will attempt to develop independent assumptions. The application will include an empirical qualitative analysis, in which existing data sources will be consulted and new data will be collected.

The exploratory qualitative data analysis as a portion of the empirical analysis serves the theoretical acquisition of a complex research object by means of constructing types and structures (BORTZ & DÖRING (2002): 54, 386-388). The core portion of this study is thereby the derivation of a category system, based on the characteristics of genetic resources.

In the theory-based exploration, however, new hypotheses will be derived based on preexisting (scientific) theories (cf. ibid.: pp. 362). This exploration strategy also makes a contribution to the response to the research question regarding, as previously mentioned, the possibility that new institutional economics can be drawn upon as a possible means of explanation.

A comprehensive literature examination and review relating to this topic comprised the next step in this research project. Documents on the course of negotiations for the ITPGRFAs and the SMTAs as well as both contract texts were utilized as primary literature. The discussion papers of various workshops served as additional primary sources.

The secondary literature used consisted primarily of scientific publications. As the starting point for the analysis of the discussion regarding the extension of Annex I, official statements from stakeholders in the form of position papers and pieces in organizational publications were additionally analyzed.

Parallel to these sources, New Institutional Economics theory was studied and incorporated into the research process, providing the foundation for an allusion to a theory-based economic analysis.

To complement the literature review, experts were qualitatively surveyed. We selected experts based on the criteria of either actively having participated or still participating in the design of the MLS or being involved in the operational execution of the system, and therefore possessing specific knowledge about the MLS.

The exploration of the topic as well as the detection of further explanatory approaches to answering the research question at hand were further goals of the survey. Information obtained up to this point in time, along with theoretical assumptions, were incorporated into the survey and checked. The instrument utilized was a problem-oriented interview (Lamnek (2005): p. 363-368).

The expert interviews were conducted with the assistance of guidelines that made data collection within a previously structured “Question Framework” possible while leaving room for additional aspects resulting from the questioning (cf. BORTZ/DÖRING (2002): 315). To create the interview

guidelines, interesting questions were first collected (brainstorming), organised and divided into thematic categories. The guidelines call for open questions, meaning that the experts are not presented with alternative answer possibilities (cf. MAYRING (2002): 68).

3.2 The Resource Category System

Through the qualitative-interpretive evaluation of the text and interview material, a category system for the breakdown of resources based on their characteristics was established. The polytomous (multi-category) attributes of the resources were not immediately recognisable; rather they were developed as a result of the evaluation (cf. BORTZ/DÖRING (2002): 139).

The following conditions must be valid for the resource categories created (ibid.: 139-140):

- Accuracy Criterion, meaning that the categories must be defined clearly (i.e., concise descriptions)
- Exclusivity Criterion, meaning that the categories mutually disqualify each other
- Exhaustiveness Criterion, meaning that the categories must describe the attributes fully so that it is possible to assign any resource to a category

The resource category system is to be understood as a partial result that can comprise the foundation for Part C of this study. It also thereby serves the purpose of compiling further hypotheses.

4 The Multilateral and the Bilateral ABS Approach trough the Lens of NIE

New Institutional Economics (NIE) provides us with approaches to examining institutional arrangements through economic theory. In the following chapter, the ABS regulations of the CBD and MLS will first be detailed as institutional arrangements. This will be followed by a look at two theoretical approaches of NIE: the "property rights theory" and the "transaction cost theory". Part two of this chapter presents an analysis of a PGRFA transaction within the two systems, building upon the previously conducted theoretical analysis of the systems. As a result, the advantages of an ABS arrangement and the expansion of Annex I can also be evaluated.

4.1 ABS Regulations of the CBD and MLS as Institutional Arrangements

In order to conduct an analysis of the two ABS mechanisms based on new institutionalism, it is useful to clarify a number of terms. RICHTER AND FURUBOTN (2003: 7) characterise **Institutions** as systems with "rules that are connected to each other in a formal or informal manner that include a provision for their execution" that serve to govern the conduct of individuals. Examples of institutions are contracts, markets, companies, and states.

Institutional Arrangements should be separated from the **institutional environment**: While the institutional environment contains basic rules to govern individual conduct, institutional arrangements are explicit negotiation directives decided upon by contracting partners which serve to mediate the economic relationship (cp. SCHIRM (2004): 59). DAVIS and NORTH add in RICHTER & FURUBOTN (2003: 582f) that the negotiation instructions are a type of "oversight and execution system."

Within the framework of institutions, the economic **transaction** is carried out. According to RICHTER & FURUBOTN (2003: 592), a transaction is a "technical mechanism" for the "transfer of a good or a service across a technically separable barrier" as well as the "transfer of property rights."

A further term that is important to the context of this research project is the **international regime**. International regimes are bilateral and multilateral cooperations between states and special cases of rational contracts (cp. ibid. 582).

The CBD and the ITPGR are international regimes that create institutions on a multilateral level. Both agreements specify governing systems based on the foundation of political transactions between states in order to govern the global handling (conservation, sustainable use, ABS, etc.) of genetic resources (cp. Ibid.: 524)

Regarding the arrangement of the contract terms for access and benefit sharing, the two international regimes differ from each other. The CBD defines terms for the transactions of genetic resources on a multilateral level (according to CBD Art. 15). However the specific operational rules[19] can be implemented individually on the national level. In general the result is that transactions are negotiated bilaterally on a case-by-case basis between the provider and user. By contrast, both the general and specific operational rules of the transaction are negotiated multilaterally within the treaty.

[19] According to RICHTER AND FURUBOTN, specific operational rules of contracts for the allocation of certain resources include the phases before concluding a contract, during, and after conclusion, such as search, inspection, contract conclusion, compliance, oversight, and execution resources (cp. 2003: pp. 317).

The transaction through the ABS arrangements of both systems includes the transfer of PGRFA (in the case of the CBD this is defined even further) in return for benefit sharing (see Figure 14).

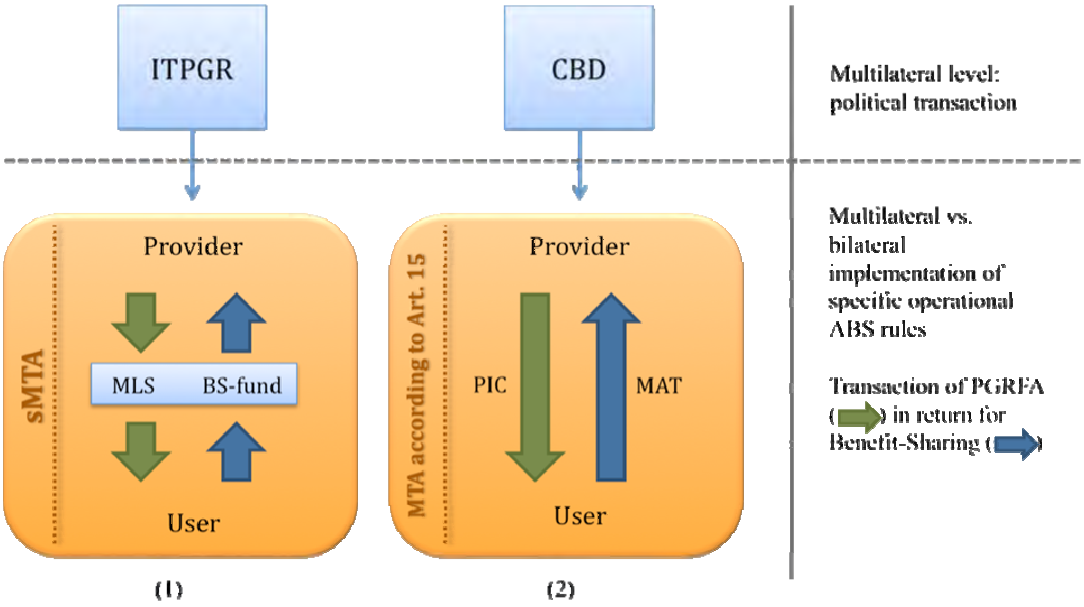


Figure 14: The ABS arrangements of the ITPGR (1) and the CBD (2) in comparison (simplified representation)

Source: Authors'.

The committee responsible for debating and deciding on a potential expansion of Annex I for PGRFA that do not currently fall under the jurisdiction of the ITPGR is the Governing Body of the ITPGRFA. The signatory states, as decision-making entities of this body, therefore determine which ABS system will be applicable in the future for their genetic resources.

It will be assumed for this study that the signatory parties and their natural and legal persons follow the given institutional arrangement (CBD as an international legal accord). Otherwise it would be necessary to consider the negotiation alternative of access to genetic materials other than those inventoried before 1992 without ABS regulations.

NIE explains the decision-making process on the state level based on the **principle of utility maximisation** in a restrictive environment (cp. RICHTER/FURUBOTN (2003): 3). So, each signatory state votes accordingly for the ABS arrangement that promises the highest level of individual utility from its perspective.

Since the ABS system of the CBD is generally valid for all genetic resources of the member states, this system acts as a point of reference for the MLS of the treaty. In other words, it acts as the negotiation alternative to an expansion of Annex I for the states. As a result, the theoretical analysis of ABS as an institutional arrangement serves as a comparison of both systems. One exception is when the user would like to access a PGRFA that was collected before 1992 (for example, by accessing PGRFA in national gene banks), for which the CBD is not applicable.

The principle of utility maximisation on the individual state level means that an individual signatory state will only agree to the admission of a PGRFA in Annex I if the utility of the transaction of this resource is higher in the multilateral system than the reservation utility - the utility of the next-best alternative. This could mean either the complete abandonment of a transaction of the raw material in terms of the "genetic resource" or a bilaterally negotiated access treaty for the genetic resource based on the ABS principle of the CBD.

The state positions represent an aggregation of the interests of national decision makers. This approach follows an article by MORAVCSIK (1997), which states that liberal or neoinstitutional theory assume influence of domestic actors. Thus, the utility maximisation of a state is significantly determined by various groups at the national level. In addition to the state as provider and private sector users of PGRFA of a country, so-called intermediaries also belong to this group. For this study, intermediaries are actors that act as both a user and a provider and transfer genetic material to a user. In the case of public gene banks and research institutes, they generally are not for commercial purposes.

Member states can represent primarily the provider's perspective, primarily the user's, or both perspectives equally.

For simplification, the (potential) providers, users, and intermediaries that are in direct contact with the multilateral system and are parties involved in reaching an sMTA agreement will be summarised with the term **"Stakeholder of the multilateral system"**.

All parties exerting influence over the state position in the debate surrounding an expansion of Annex I will be referred to in the following as **"Actors"**.

If one intends to determine the net utility on the national level, it is necessary to determine the costs and benefits of **all actors in a country** and to aggregate these. Differences between net provider countries (countries that make more PGRFA available than they use) and net user countries (vice-versa) can be expected.

To determine the cost-benefit components of both ABS systems in Chapter 4.3, groups of actors would only be considered if they were directly affected by the ABS arrangement – indicating the previously-mentioned stakeholders of a resource transfer. For simplification purposes, the provider is considered to be synonymous with the resource's country of origin. The user is defined as the end user that breeds a new (improved) plant variety from a material made accessible by an ABS agreement. The interests of the intermediaries will not be further examined in this study.

4.2 The Selection of ABS Arrangements as Explained by NIE

From the theoretical point of view provided by New Institutional Economics, transaction cost economics and the property law theory provide a solid basis for identifying relevant utility aspects of both ABS systems from the stockholder's point of view.

Property Rights Theory

International political arrangements create a system of operational and constitutional rules. Particularly the "definition, guarantee and transfer of political or economic property rights" are deemed as the central points of a global agreement. The regulations can be exercised with or without an explicit contract or with a hybrid form (cp. RICHTER and FURUBOTN (2003): pp. 525). Property rights in institutions determine who may use a resource (in this context this is not specific to genetic resources) and what the conditions of use may be.

The property rights theory differentiates between four types of property rights:

- the right to use the resource
- the right to retain the profits of the resource
- the right to modify the form or appearance of the resource
- the right to transfer the entire resource or portions of it to others and to retain the gains

The property rights theory assumes that the more property rights they can exert over the resource, the higher the net utility of resource holders. Since NIE asserts that actors seek to maximise their net utility, the logical consequence is that each actor selects the institutional arrangement that grants it the most property rights (cp. KIESER and EBERS (2006): 250). Therefore the property rights theory provides an approach to identifying the profitability of ABS systems.

The property rights approach is connected to the transaction cost approach, according to KIESER and EBERS (2006: 250): "the higher the transaction costs to regulate, transfer and execute property rights over the resource turn out to be, the lower the net utility achievable through the availability of the resource, all other conditions remaining equal". This aspect can contribute to the further evaluation of an ABS system. The next section is therefore devoted to the transaction cost theory.

Transaction Cost Theory

The transaction cost theory deals with the analysis of costs that arise from the planning and carrying out of transactions. Market transaction costs entail

- Search and information costs
- Bargaining costs
- Monitoring and enforcement costs
- Cost of investment in real capital (RICHTER and FURUBOTN (2003): 59-61).

Kieser & Ebers (2003: 278) modify the list to include the components of

- "Adjustment costs in the case of subsequent contract changes".

Political transaction costs, according to RICHTER and FURUBOTN (2003: 63-65), include "the costs of establishment, maintenance and modification of the formal and informal political order of a system" and the "operating costs of a state."

Transaction costs reduce the efficiency (and thereby the net utility) of a transaction. For this reason, this branch of theory assumes that the actor seeks out each institutional arrangement that minimises transaction costs and thereby contributes to net utility maximisation. The transaction cost analysis therefore also makes a contribution to the discussion of the relative profitability of both bilateral ABS arrangements from the viewpoint of the stakeholder. It is admittedly difficult to detect, distribute and quantify transaction costs fairly and according to their origin and cause (cp. KIESER and EBERS (2003): 280).

In the following, the transaction costs of an ABS arrangement will be presented based on several examples:

VISSER et al. (2000), following the revision of the IU, compared the transaction costs of bilateral agreements with those of a multilateral system in various forms.[20] They came to the conclusion that bilateral agreements entailed higher transaction costs in each example. The transactions examined in this study however were limited to the exchange of material unchanged by breeding between users and gene banks (national gene banks and CGIAR gene banks). Other types of providers were not considered.

[20] At the time of the study of VISSER et al., it had not yet been established what form the future multilateral system would take. For this reason the study worked with four options: from exclusively bilateral to unrestricted multilateral access to all PGRFA collections. (cp. Ibid.: 7).

VISSER et. al. identify transaction costs as the following components:

- Negotiation costs
- Costs that are connected to accessing the resource ("pre-distribution tracking costs")
- Costs following access to the resource for monitoring and enforcement of the contract ("post-distribution tracking costs").

The transaction costs of the provider and the user of the resource are equally incorporated in the calculations of VISSER et al. Especially "post-distribution tracking costs" contributed to high transaction costs of bilateral ABS agreements in the calculations, whereas this cost point for the MLS was found to be negligible. The reason for this is that hardly any measures have been stipulated in the MLS for post-distribution tracking.

The standardisation of the exchange modalities is a further fundamental factor that has been enacted to reduce the cost of individual transactions in the MLS in comparison to the bilateral ABS system. After the one-time standardisation agreement at the state level in the form of the SMTAs, no additional bargaining costs occur for future transactions at the user-provider level.

The reduction of transaction costs through the use of a multilateral system is a central argument for proponents of this option (cp., i.e. MOORE AND TYMOWSKI (2005): 10). It must however be noted that transaction costs are not completely dropped in a multilateral agreement. In fact, the reduction in bargaining costs of the bilateral transactions between provider and user were transferred to the international level where states and consultants negotiate. Consulting, negotiations for the treaty, and negotiations for the SMTA also generate costs, just as the operating costs of the organs of the MLS do, as they are charged with carrying out the ABS within the ITPGR. These expenditures are primarily political transaction costs. Therefore large portions of the market transaction costs of resource transactions are transferred into political transaction costs.

4.3 The Advantageousness of ABS Systems

This study does not attempt to conduct a comprehensive cost-benefit analysis for both ABS arrangements. It attempts rather to show the ordinal utility that can be used as a system for a stakeholder if an expansion of Annex I occurs for a PGRFA. For this purpose it must be determined which factors affect the utility of a system.

It will be assumed that a stakeholder is a member of the ITPGR (in the case of users, the country in which they are based) and can already utilise the benefits of a multilateral system. Users and providers do not thereby compare the entire advantages of both systems, rather the individual factors that would result from an expansion and are thereby directly connected to the PGRFA in question. The focus of the study is thereby exclusively placed on "resource-specific" factors. Since several components depend on the perspective of whether each factor is incurred as a cost or a benefit, the umbrella term "Determinants" will be used.

4.3.1 Determinants of Advantages from the User Perspective

The identification of advantage determinants from the user's perspective follows the development of an ABS transaction: First, access to PGRFA will be examined for determinants, followed by a comparative look at the advantages of the ABS approaches.

Access to PGRFA

The access to basic material for research and breeding is the reason a user makes an effort to initiate an agreement to transfer and negotiate genetic resources.

⇨ Transaction costs: Search and Information Costs for the identification of resources and providers:

Both ABS systems, the CBDs` bilateral and the MLS should facilitate access to PGRFA. Considering that the member states of the ITPGR have agreed to the collection of their Annex I resources and their "pooling" within the framework of the MLS, a large selection of potential PGRFA is available to users for various purposes. A user thereby circumvents the extensive search for possible provider countries or, at a later point in the research, the search for alternative resources. This reduces the transaction costs for the user, at this point primarily the search and information costs.

⇨ Transaction costs: Search and information costs for information about genetic resources:

Alongside the access to PGRFA, the MLS makes available *information* about PGRFAs free of charge. According to Article 13.2a of the ITPGR, this information include "catalogues and inventories, information on technologies, results of technical, scientific and socio-economic research, including characterisation, evaluation and utilisation, regarding those plant genetic resources for food and agriculture under the Multilateral System". The user can search for and access specific information through a central point. This aspect also reduces the transaction costs of a transfer through the MLS, since information here is treated as a public good. The access to information about genetic resources should also be facilitated in the ABS system of the CBD. In practice however there is currently no central and standardised system. Rather the user has to contact each country and its institutions and usually enter into contract negotiations in order to receive information about genetic resources. Information is not made available to the same extent preceding the transaction as it is in the MLS.

⇨ Transaction costs: Bargaining costs:

The costs of negotiating the contract are heavily reduced by access through the MLS, since there is a standardised contract to fall back on. Above all, the standardisation of the monetary benefit sharing through the MLS has an effect on the transaction costs of the contract's negotiation.

⇨ Ability to plan and security:

A further aspect that results from the pooled system of the MLS is an improved ability to plan research and breeding projects. With the broad assortment of possible research objects, a plant breeder can reduce his/her research expenditures. This was also expressed in an interview with Mr. Begemann of the Federal Office for Agriculture and Food (Bundesanstalt für Landwirtschaft und Nährung) (BEGEMANN (2009)). In addition, the securing of access through the MLS based on standardised conditions is more likely than case-by-case bilateral contract negotiations. The negotiation of benefit sharing in the bilateral ABS arrangement is empirically the critical point and would be avoided by standardisation.

⇨ Property rights: Exclusive Access:

Through the CBD it is possible for a user to assist in determining the conditions of access and to discuss individually the extent of the transfer of property rights. For example, the user can arrange for exclusive access to a PGRFA with a provider country and thereby exclude other plant breeders from using a particular genetic resource. This is possible as long as the provider possesses a monopoly of supply for the resource.

⇨ Property rights: Right of use:

With the transfer of a genetic resource under the framework of the MLS, the receiver obtains the right to use this resource – which signifies a transfer of property rights. The property rights of the user are however limited within the MLS, in terms of aspects such as the intended purpose. Additionally, there are stipulations for the subsequent provision of the modified resource and the capital gains achieved through commercialisation.

In contrast, the CBD offers more leeway for the negotiation of the agreement. This occurs, for example, in the form of exclusivity clauses and approaches to handling intellectual property rights resulting from use.

Benefit Sharing

Benefit sharing is to be assessed as a cost component from the point of view of the user. While ABS arrangements of the CBD suggest an array of monetary and non-monetary benefit sharing mechanisms, benefit sharing in the MLS is limited to two major options (see Chapter 2.2.2, Part C): Monetary benefit sharing can be avoided when the product resulting from breeding is made accessible to all members of the treaty without restrictions. In any case, monetary benefit sharing is only employed through commercialisation and is dependent on research results. The regulations for benefit sharing of the SMTAs thereby prevent that the user incurs investment risks in the form of advance payments for access to genetic resources.

In the ABS arrangement of the CBD, in contrast, up-front payments or access fees/fee per sample collected are options for monetary benefit sharing and are utilised in real cases (cp. CBD (2002): 18). On the other hand, the bilateral negotiation possibilities for individual cases draws up an optimal benefit sharing construct that reflects the realities of the transaction (insecurity, investments, etc., see Theory Chapter 2 in Part B).

4.3.2 Determinants of Advantages from the Provider Perspective

Article 13 of the ITPGR is useful as a basis for compiling the determinants of advantages from the provider perspective, as it establishes the benefit sharing components of the MLS. Regarding the advantages emerging from a bilateral resource transfer within the CBD, the Bonn Guidelines serve as a reference point.

In addition to illustrating the determinants of advantages from the provider perspective, this chapter will first outline the access-related determinants followed by those of benefit sharing.

Access to PGRFA

⇨ Transaction costs: Costs of providing resources and information:

The expansion of Annex I to incorporate further PGRFA includes the consequence that these resources must be organised by country of origin and made available in data form to the MLS. For the provider country this means that additional costs for the contribution of new resources.

In contrast, the resources for which access is granted through the CBD must be discovered in advance and evaluated with regard to benefit sharing. The latter does not apply in a multilateral system, since a contract with a standardised benefit sharing contribution is applied.

⇨ Property rights: Providing access:

Within the MLS, a country of origin can still use the plant genetic resources, however it has little influence over who else accesses the resource - apart from the limitation of the purpose of use (access to PGRFA within the MLS is exclusively for food and agriculture). In the CBD, the provider country can decide on a case-by-case basis if it allows access to its genetic resources.

⇨ Transactions costs: Bargaining Costs:

It is assumed that the standardised ABS conditions of the MLS reduce the negotiation costs of the country of origin when providing its genetic resources in comparison to ABS agreements within the CBD. The country of origin does not have to conduct any contract negotiations to secure access when contributing material to the MLS. This is because negotiations occur through the SMTA under standardised conditions. In the case that the country of origin is not involved at the conclusion of the contract for the contribution of material from the MLS, an SMTA will still be used for this purpose.

Benefit Sharing

⇨ Exclusion from benefit sharing

An important aspect for the discussion of benefit sharing in both systems is that some PGRFA have multiple countries of origin. With a bilateral agreement, some potential providers are thereby excluded from benefit sharing. The Benefit Sharing Fund of the MLS however bundles the payments and allocates them multilaterally in project form following the multilaterally-agreed upon principle of the member states of the ITPGRFA. For a majority of providers, the multilateral form of monetary benefit sharing can therefore be assessed positively. With this method, everyone has at least a chance to be granted a project and participate in monetary benefit sharing. This is not however true for the individual provider country that has the opportunity to enter a bilateral ABS agreement and thereby receive direct and unrestricted monetary advantages.

⇨ Property rights: Monetary benefit sharing

It is possible that a provider of a specific PGRFA is not be considered for the multilateral distribution of the money of the benefit sharing fund. Though, a provider can exert influence over the project-

related distribution of monetary resources through his or her voting right in the conference of the treaty signatories - the terms set for distribution cannot however be circumvented.

There are also differences between both systems regarding the property rights that the provider retains on the account of selling genetic resources. In contrast to the CBD, benefit sharing in the MLS is standardised. The provider has no influence over the amount and the type of benefit sharing in individual cases. The member states have agreed in advance on the amount of benefit sharing but they did not consider that some PGRFA have higher commercial potential value and could realise higher capital gains when transferred through bilateral ABS agreements.

⇨ Non-monetary benefit sharing

The ex-situ conservation of a resource when feeding it into the multilateral system provides multilateral advantages and benefits all users and providers partaking in transactions of PGRFR through the MLS.

Facilitated access to plant genetic resources for food and agriculture is also considered an inherent form of benefit sharing in the multilateral system (cp. ITPGR Art. 13.1). The individual country could benefit from access to improved varieties with particular value for the country, for instance regarding food security or for the generation of added value basing on the resource (processing industry).

Access to improved varieties through (private) ex-situ institutions can also be a component of the non-monetary benefit sharing arrangement in an bilateral ABS agreement, though. Moreover, the participation in research and development findings is explicitly recommended in the Bonn Guidelines (cp. CBD (2002): 19) and implemented in existing ABS agreements.

Furthermore, the access to and transfer of technologies (also with regard to modified varieties) is listed in Article 13.2b of the treaty as benefit sharing. Technology transfer include “the establishment and maintenance of, and participation in, crop-based thematic groups on utilisation of plant genetic resources for food and agriculture, all types of partnership in research and development and in commercial joint ventures relating to the material received, human resource development, and effective access to research facilities“ (cp. ITPGR Art. 13.2 bii).

Within the CBD, technology transfer can also make up the non-monetary benefit sharing portion of the ABS agreement (cp. CBD (2002): 19). This is also common practice for ABS agreements within the CBD (see elaborations in Part B of this report).

Both in the ITPGRFA (Article 13.2c) and in the CBD, “capacity building” is supported as an element of benefit sharing. In the treaty there is however no direct link between the act of provision (here the contribution of material in the MLS or the linkage of especially frequent accessing of contributed material) and receiving benefits from the MLS. For ABS within the CBD however, access and benefit sharing are also linked to capacity building.

⇨ Transaction costs: Cost of monitoring and enforcement

In contrast to the bilateral ABS agreement, the costs of monitoring and enforcement of the terms of contract are absorbed by the treaty when fed into the multilateral system and must not be carried by the provider country.

5 The Resource Category System for Illustration of the Selection of an ABS-system

In the negotiations for the revision of the International Undertaking, a developing country called for variable handling for different material categories in the newly established ABS regulations of the MLS (cp. IISD (2001): 1). In addition, the existence of an explicit resource list in Annex I of the treaty implies that PGRFA should be handled differently for the admission to Annex I. Some signatory states find it clearly more advantageous not to regulate certain resources with the MLS; rather they prefer to continue using the bilateral approach stipulated in the CBD.

This chapter seeks to discuss the distinguishing characteristics for PGRFA based on their general advantageousness and to develop a resulting resource category system. In chapter 5.1, a concept is presented to show how PGRFA can be isolated. With this background, chapter 5.2 outlines the resource category system for a PGRFA, from both the user's and provider's perspectives.

In this manner it can be deduced which ABS system a stakeholder prefers for each resource category.

5.1 Categorisation of PGRFA

The criteria of “interdependency” and “food security” presented in chapter x serve as a basis for the forming of PGRFA categories.

5.1.1 Distribution of a PGRFA

A criterion for the previous compilation of Annex I was the interdependency of the states in relation to PGRFA. This criterion continues to be relevant for the expansion of Annex I. However the treaty offers no definition of interdependency. Beginning at what level of “intensity” of interdependency can a decision be made on which plant genetic resource will be incorporated in the resource list of the MLS (FOWLER (2000): 4)? It can be assumed that the interdependency of the states has developed historically with regard to a PGRFA. The main crops are distributed across the globe because they prove to be nutritional and/or easily cultivated, causing new dependencies to arise. The international agricultural research centers of the FAO deal with crops that are relevant to global or supra-regional food supplies. National research institutes belonging to private or public actors also contribute to the research and breeding of crops used in their countries. As a result, the international distribution of a crop can be examined as an index for interdependency.

The distribution of a plant genetic resource can be divided into two extremes: the global distribution of crops on one hand and plant genetic resources that are thus far only present in their native region on the other.

Globally Distributed Crops

Globally distributed crops are those that are cultivated in several countries. In addition, they are present in large amounts in existing international and transnational ex-situ collections (cp. FOWLER 2002: 5). National gene banks also have accessions (gene bank samples) of such genetic resources.

One could quantitatively record the degree of distribution by looking at the number of accessions.

Relevant data can be found in the "State of the World's Plant Genetic Resources for Food and Agriculture[21]" of the FAO (1997: 83 – 135), in which international, national, and private gene banks are surveyed and the results published. According to this report, the most widespread crop is wheat, with a total of 784,500 accessions, followed by barley with 485,000 (cp. Ibid.: 92). Since less material is collected by gene banks since the CBD came into effect (cp. FOWLER (2004): 610), a majority of gene bank samples stem from the period before 1993.

Plant Genetic Resources with Limited Distribution

In contrast to crops utilised globally, some plant genetic resources for food and agriculture only spread beyond the borders of their region of origin to a very limited degree, in extreme cases not at all. The term "plant genetic resources" has been selected intentionally, as these plants typically consist of wild material[22] (wild plant species and varieties) or wild relatives of crops, rather than crops used in agriculture. Wildlings, that means cultivated crops that returned to wild, also fall into this category. According to the FAO, 18 percent of all granted accessions in 2009 were to wild material (FAO (2009): 60).

According to the preceding description, the majority of plants in this category are found in-situ and are not cultivated. Their genetic information could however be useful for breeding.

As a subcategory, "regionally disseminated crops" can additionally be defined.

Regionally Distributed Crops

PGRFA in this category are cultivated in a restricted region and contribute to regional or local nutrition in their home country. For this reason it is likely that these PGRFA can also be found in national gene banks or research institutes in the country of origin.

From a global perspective, these PGRFA are, for example, neglected and underutilised crops, as (old) country varieties are to a certain degree.

The majority of PGRFA can be classified into one of the three described categories, whereas there can be some overlapping. For example, this can occur when a local plant genetic resource is available in-situ in a country, or when it is additionally inventoried in national gene banks of other countries or in international gene banks.

A case-by-case decision is to be made for the allocation to a category, considering for example the determining form of conservation (in-situ, on-farm, or ex-situ conservation).

[21] More recent figures are included in the second "State of the World's Plant Genetic Resources for Food and Agriculture" (FAO 2009). At the time of this study, the report was only available in draft form with a limited scope.

[22] Wild material serves as a food source in many parts of the world for rural households, which is especially relevant in economically difficult times or in periods of hunger (cp. FAO (1997): 18).

5.1.2 Contribution to Food Security

For the compilation of Annex I, a PGRFA's contribution to food security was also examined. It should also be considered for the expansion of Annex I. Also at this point, the question of measurability of the criterion emerged. COOPER (2002: 5) cites indicators with possible significance: for global food security, the "entire global production" and the "contribution to human nutrition" in the form of energy, protein, or fat content. Future food security will equally depend on breeding advancements with regard to yields, productivity and quality of PGRFA. With this, future food security should also be considered when Annex I is to be amended. For this reason, two categories have been created for the classification of PGRFA concerning food security: "Crops with current significance for Food and Agriculture" and PGRFA whose future significance can (further) increase, namely "PGRFA with potential significance". The classification thereby follows the definition of plant genetic resources for food and agriculture in the treaty text: PGRFA is "any genetic material of plant origin of *actual* or *potential value* for food and agriculture" (cp. ITPGR Art. 2).

Crops with Current Significance for Food and Agriculture

All crops that currently contribute to food security on a global or regional level fall into this category. This category especially comprises the main nutritional plants wheat, rice and corn. Due to their large contribution to food security, they have largely been researched already including the examination of potential (commercial) use.

From the perspective of the private plant breeder – the main user in the following study – it is assumed that crops in this category possess few characteristics that are commercially significant for future breeding. Crops that hold potential to contribute to an increase in productivity are classified in the category "PGRFA with potential significance" (described in the following). It can occur that the general crop is classified in a category with current significance, whereas individual species of this crop or the cultivated varieties belong to the group with potential significance.

PGRFA with Potential Significance for Food and Agriculture

This category includes PGRFA that are interesting for research and breeding purposes, while they contribute to future food security through newly bred and improved varieties. This depends largely on the properties of the variety considered, such as genetic information with relevance to resistance breeding for crops or yield increase. Moreover, this category includes PGRFA that contribute to the adaptation of existing crops to altered environmental conditions. An equally important focus is the commercial interest of the plant breeder: If a PGRFA makes it possible to reach new markets (regions, consumer groups, etc.), it is attributed to this category as well. Regardless of a PGRFA's utilisation for commercial or non-commercial breeding purposes, resources of this type are connected by their intrinsic innovation potential. The potential significance for food security is vastly more difficult to measure than current significance. The evaluation should be specifically tailored for each PGRFA and take place with the assistance of experts.

5.1.3 Concept of a Market System for PGRFA

The distribution of a plant genetic resource can be interpreted as its supply, while its contribution to food security can be seen as its demand (Table 73).

Table 73: Supply and Demand in the Resource Category System

	Category	Name	Characteristics
Supply	S1	Plant genetic resources with limited distribution	• Low to no distribution • In-situ
	S2	Regionally distributed crops	• Regional cultivation • Inventoried in national gene banks
	S3	Globally distributed crops	• Global cultivation • Inventoried in international gene banks
Demand	D1	Crops with current significance for food and agriculture	• Significance for regional & global food security • Low innovation potential
	D2	PGRFA with potential significance for food & agriculture	• Significance for future food security • High innovation potential

Source: Authors'.

A PGRFA that is evaluated for the expansion of Annex I can be divided into groups S1, S2 or S3 concerning its supply and D1 or D2 in terms of its demand.

By compiling both category divisions, a "market" emerges, in which suppliers (provider country or gene bank) and consumers (user) exist for a PGRFA (Figure 15).

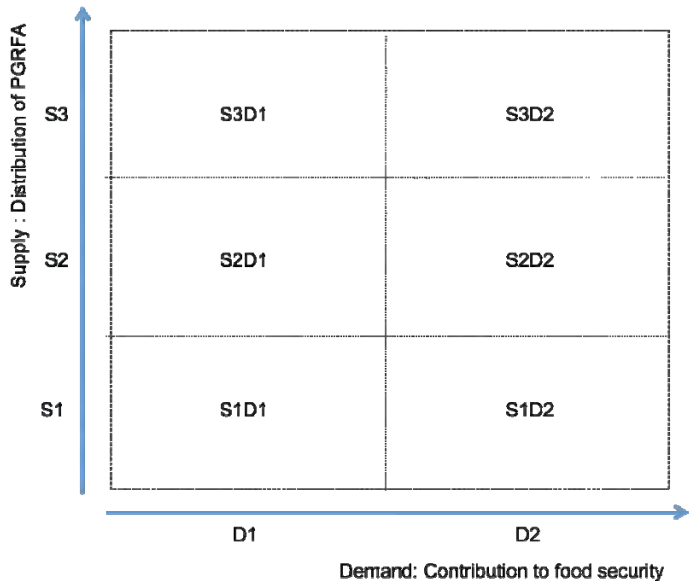


Figure 15: Scheme of the Resource Category System

Source: Authors'.

The "price" established by market equality includes all components of monetary and non-monetary benefit sharing. The evaluation with regards to price of the transferred material through the market mechanism is however not the focus. Rather an attempt is made to implement the resource category system in order to determine which ABS system (from the respective points-of-view) is preferred for a specific PGRFA.

The determinants described in chapter 4.3 have an effect on the resource category system. They vary from category to category and, accordingly, with the characterisation of the resource. Again the perspectives of both the user and the provider can be incorporated, as is the case in the following chapter.

5.2 Presentation of the Resource Category System

5.2.1 The Resource Category System from the User's Perspective

This chapter describes the resource category system from the point of view of potential private sector users of a PGRFA. It should thereby be determined for which type of PGRFA a user prefers access through the MLS. Determinants that affect the ABS system's advantageousness are incorporated into the evaluations. Through these, conclusions can be drawn about the ABS-system selection for each resource category. The MLS stands for a fully standardised ABS approach in contrary to individual bilaterally negotiated ABS agreements.

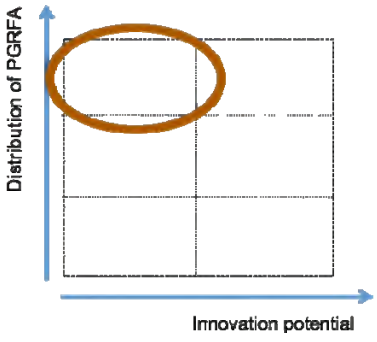
The user proceeds as follows in the application of the resource category system:

- ⇨ Examination of the PGRFA in terms of its usefulness (demand side) and distribution (supply side)
- ⇨ Classification in the corresponding category of the resource category system
- ⇨ Consideration of the advantages of each system for this category (Do determinants exist in the category? Comparison of the determinants for CBD and MLS)
- ⇨ Assessment: Which system (CBD or MLS) provides the higher net utility of the PGRFA for the user?

In the following, central resource categories are presented, including their determinants. The focus is placed on the predominant determinants for the respective category.

Category S3D1

The PGRFA is already inventoried in international ex-situ collections and has been comprehensively researched. It can occur that a plant breeder personally has material of this crop available (from his/her private gene bank). Due to the limited prospects of penetrating new markets or increasing productivity levels, this material is of mid-level interest to the potential user for research and breeding purposes.



Since the resources have long since been pooled by the international ex-situ collections, no additional savings of transaction costs (search and information costs for the resource, identification of the provider) arise for the user by incorporating the resource into Annex I.

The reduction of negotiation costs through the MLS is also not a decisive argument for an inclusion in Annex I, since this material is already made available through a CGIAR gene bank and thereby with an sMTA..On the other hand, transferring through the CBD would include the advantage of individual benefit sharing negotiations. The user could select from a variety of providers (also gene banks, national gene banks) and could thereby determine the “price” according to his/her terms in the form of

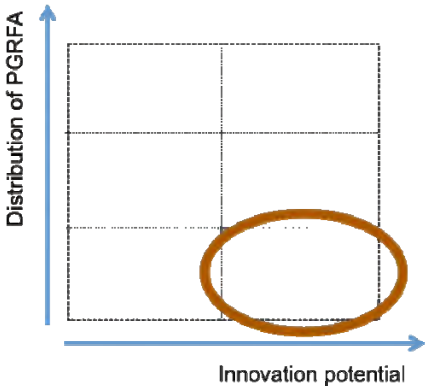
monetary and non-monetary benefit sharing.

Along with bilateral and multilateral transfers, a third variant is also imaginable: If the resource was on hand before 1993 in, for example, national gene banks, the user can access the resource without an ABS agreement.

For these resources there is little that supports the inclusion of a PGRFA in Annex I from the perspective of the user.

Category S1D2

A potential user of a PGRFA in this category has a strong interest in the access to these resources. The material is not available or only available in a limited number of national or international ex-situ collections. And when it is available, it is only with limited diversity (few wild varieties). The pooling of all wild varieties of this PGRFA through the MLS offers potential users a broad spectrum of source material for research and breeding.



This resource category acts antithetically to Category S3D1, since the majority of determinants have an effect on the user for these resources:

- ⇨ Search and Information Costs for Provider and Resource
- ⇨ Search and Information Costs for Technology
- ⇨ The user can access technologies for research and breeding

Negotiation Costs:

No negotiation costs are incurred for the user because of the standardisation of the sMTA

Planability of Research and Security:

The user receives a large selection through the MLS (for example various wild varieties) that can be used for research. Additionally, access is most likely granted.

Exclusive Access:

Depending on the innovation potential of the PGRFA, the number of users interested in the genetic material of the resource category varies. An exclusive access arrangement could be of importance for the individual users. Since these are solely available through the CBD, these determinants speak for the selection of the CBD.

Standardised Benefit sharing Terms:

The standardisation of the benefit sharing clause is potentially a further advantage of the MLS for the user. In bilateral access agreements, higher monetary benefit sharing payments or higher expenses for non-monetary benefit sharing could be negotiated due to strong demand. In addition, benefit sharing is first triggered by commercialization. The risk of a mistaken investment, as can be the case with up-front payments, can be avoided.

In summary, it can be noted that a majority of the determinants in Category S1D2 are appealing for the user, which favours ABS transfers over the MLS system. Solely potential exclusive access can be argued as favouring the CBD. The resulting net utility in this category for the MLS of the treaty is accordingly higher in most cases than that of the bilateral ABS approach.

Remaining Categories

Based on Category S3D1, the advantageousness of the CBD shifts towards the MLS from the user's perspective. Increasingly more determinants have an effect. When a resource is already available in national gene banks, for example, and appears very interesting to the user for research and breeding (Category S2D2), then an additional variety (meaning more diversity) would be available through this as a result of the additional incorporation of the material from national gene banks in the MLS to facilitate access. As a result, the search and information costs can be reduced and the planability of the project is increased. Additionally, negotiation costs for transactions with national gene banks can be diminished through the use of the sMTA.

The established assumption thereby reads: The less distributed a PGRFA and the more attractive it is for research and breeding purposes, the more a user supports its inclusion in Annex I, respectively a standardised multilateral solution (see Figure 16).

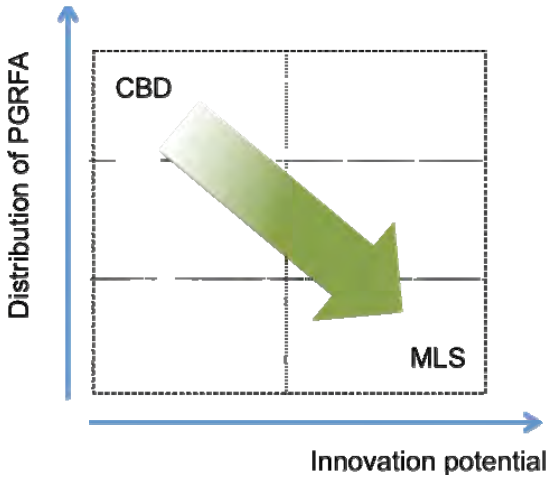


Figure 16: Choice of System from the User's Perspective

Source: Authors'.

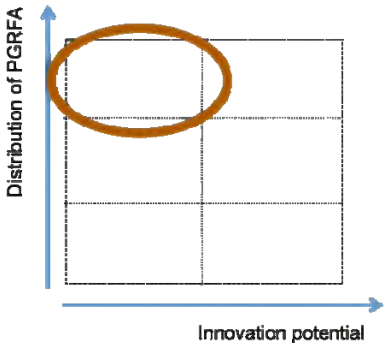
5.2.2 The Resource Category System from the Provider's Perspective

The resource category system can be applied in the same manner to the provider (Source country) of a resource. Depending on the category, the provider possesses the resource in-situ and/or on-farm. In addition, it can be available in the provider's national gene bank. The method of applying the resource category system corresponds with the method previously utilised for the user: The PGRFA is first evaluated based on its distribution and its contribution to food security and classified in the appropriate category. Thereafter the comparison of the determinants follows, along with the assessment regarding which system proves more advantageous to the provider based on this resource category. Subsequently the categories and the determinants for the ABS systems are described. The characterisation of the resource in a category does not change in comparison to the user's perspective, although the relevant determinants and their characteristics differ.

Category S3D1

The PGRFA in consideration is included in ex-situ collections and contributes to global and regional food security. It is cultivated in the provider country and contributes to food security there.

The following determinants are relevant for PGRFA in this category from the provider's point of view:



Cost of Providing the Resource and Information:

The acquisition of the PGRFA in this category should not be significant, as the majority of crop varieties are already accounted for ex-situ. An interview with Ulrike Lohwasser from the gene bank Gatersleben confirmed that previously inventoried material could be marked as Annex I material with little effort or cost.

Benefit Sharing in General:

Since the resource is broadly distributed, there are multiple provider countries for these crop varieties. While all potential provider countries of a resource but one are excluded in bilateral contracts, all member states of the treaty can profit from multilateral benefit sharing. It will tend to become more difficult for an individual provider country to negotiate bilateral agreements successfully when a resource is widely distributed and it is inventoried in a large number of ex-situ collections (cp. FOWLER (2002): 2; RAFI (1997): 1).

Non-monetary Benefit Sharing: Access to Raw Resource Material and Modified Resources:

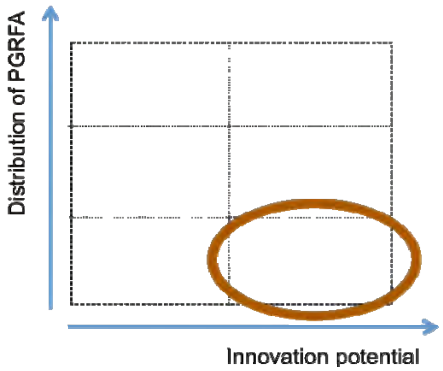
According to the treaty text, access to modified resources through the MLS should also be facilitated. Sine the resource also plays a role in agriculture in the provider country by definition of the category, access to modified varieties can be relevant for the provider country. Additionally, public institutes in

the country can use varieties of other provider countries as raw resource material for further research and breeding.

The conclusion of the outline of determinants for this category is that the net utility of the MLS tends to surpass that of the bilateral ABS approach from the perspective of the provider. A provider would thereby presumably prefer a transfer through the MLS.

Category S1D2

Resources in this category primarily constitute wild material that holds strong potential for innovation. The provider country considered is potentially the sole provider of the resource. The following determinants are noteworthy for the selection of the ABS system:



Cost of Providing Resource and Information:

Since in-situ material is involved for this resource, the collection of all wild varieties for the MLS likely comes with high costs for the provider country.

Monetary Benefit Sharing:

Standardised payments for benefit sharing can be considered as an advantage of the MLS when the resource is able to be assessed monetarily (causing a decrease in search and information costs). The potential benefit sharing of bilateral agreements should however far outweigh the standardised amount of the MLS as a result of the supply and demand constellation. In addition, the provider country does not have control over monetary benefit sharing when transferring material through the MLS.

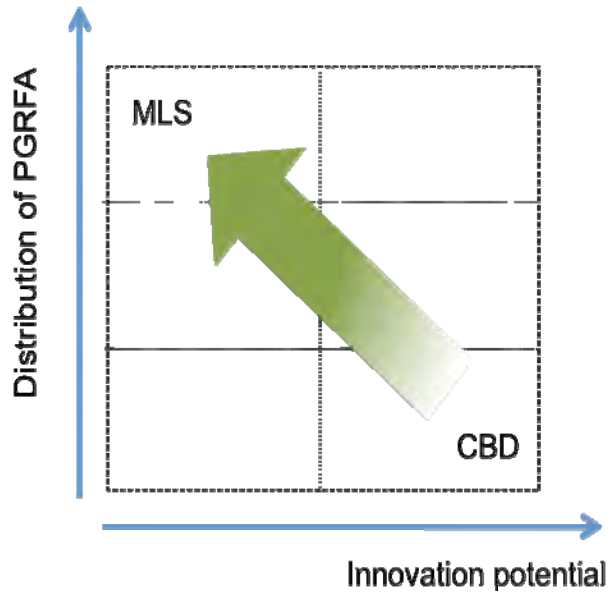
Non-monetary Benefit Sharing: Access to Modified Resources:

Since there is potentially no further provider country, the country in consideration cannot profit from access to other wild varieties of this material. In addition, access to modified varieties is at the moment not a valid argument for the MLS, since this resource contributes little or nothing to food security in the provider country.

Conservation:

A determinant that favours the MLS is the support of ex-situ conservation of wild materials through international agricultural research centers, in which case the burden on provider country is lifted.

Conclusion: In weighing the determinants that affect this category, the net utility of bilateral access agreements of the CBD is valued higher. The provider country will likely decide for a transfer through



a bilateral agreement as it is currently stipulated in the CBD, and as a result plead against an incorporation of the material in Annex I of the MLS (Figure 17).

The established assumption thereby reads: The more widespread the PGRFA and the lower the innovation potential for research and breeding, the more the provider country approves of the incorporation of the PGRFA in Annex I, respectively the application of a standardised multilateral ABS approach. For less widespread distribution and higher innovation potential, on the other hand, the sum of the determinants favours the bilateral-negotiation approach stipulated in the CBD more than the MLS. The interests of the user and provider of a PGRFA are inversely proportional when comparing both resource category systems.

Figure 17: Choice of System from the Provider's Perspective

Source: Authors'.

5.2.3 Sample Resources

The resource category system developed can be tested on the PGRFA currently listed in Annex I – for these categories the MLS was selected as the preferred ABS system in the treaty negotiations. A majority of Annex I resources are found in category A3N1. This primarily includes grains and legumes that are inventoried in a large number of international ex-situ collections.

It can be determined that in many cases the CGIAR Centers hold the highest number of accessions when going through each resource on the Annex I list (cp. FAO (1997): 92-93). Gene banks often represent the six largest collections of Annex I resources that do not belong to the actual country of origin. This indicates a widespread distribution of Annex I resources. PGRFA that ultimately do not end up being incorporated into Annex I as a result of negotiations are often found in large quantities in the gene banks of their country of origin. The majority of soy accessions, for example, are held by China's national gene bank (cp. Ibid.: 92).

Cassava is included in the Annex I list, although only *Manihot exculenta* is included (cp. ITPGR Annex I). The reason for this is presumably the innovation potential that other varieties of this species hold (cp. MOORE and TYMOWSKY (2005): 82).

Resources that have been excluded from the Annex I list during negotiations have been selected for

the further examination of the established resource category system.

Through the survey of the provider countries of this PGRFA, the hypotheses for the selection of a system should be examined and, if necessary, new explanations should be added. The survey approach and the results will be presented in the following two chapters.

6 Concept of the Empirical Survey

In order to test the empirical verifiability of the resource category system, representatives from individual provider countries were surveyed. The following chapter illustrates the goals and conception of the survey.

Resources can be arranged in a category system based on their distribution and innovation potential. The goal of the survey is to examine the concept of the resource category system including the resource-specific ABS determinants, and when applicable receive suggestions for the modification of the system. This is conducted by looking at selected PGRA that serve as representative studies for the most interesting categories. Qualitative statements should be collected related to the testing of the correlation hypothesis of the resource category system from the provider's perspective.

Resources have been selected as representative case studies that were discussed but not accepted into the original list of Annex I resources during negotiations. In addition, resources have been considered in the case that there is a special interest for them in the field of research and breeding.

For each of the selected resources, one country was examined based on its large biodiversity in terms of the selected resource as a country of origin or its availability of a specific in-situ variety. The selected countries are regarded as provider countries for the purpose of the study. One representative from each country, who is both an expert in the ABS topic and has knowledge of agricultural crops, was selected for the survey. The survey consists primarily of closed questions with a limited number of open-ended questions. The evaluation was conducted in an interpretative manner. The survey is available in its entirety in Appendix II.

At the request of those surveyed, the statements were rendered completely anonymous, which also excludes the naming of resources and countries.

The survey is build up from three thematic question units:

1. Classification of Resources in the Resource Category System

The classification of each resource in the resource category system based on previous research should first be looked at in terms of the specification of the distribution and innovation potential of the resource, as indicated by the party surveyed. (Questions A-1 to A-3).

A-1: Based on seven predetermined items, the representative is requested to describe the in-situ, on-farm, and ex-situ sources of the resource.

A-2: The representative is requested to evaluate the current significance of the resource for research and breeding as well as for cultivation by means of a ranking scale.

A-3: Also using a ranking scale, the representative should evaluate the future significance of the resource.

In order to determine which characteristics of the resource determine its innovation potential, the representative is requested to substantiate his/her assessments in an open-ended question.

The comparison of the current situation and future significance of a PGRFA can be deduced by the two ranking scales.

2. Significance of ABS Determinants

In the second block of questions, the determinants should be identified, based on the provider's perspective (B-1 to B-3).

B-1: The representative should evaluate the relevance of selected ABS components using a ranking scale based on the case that a user requests access to a specific PGRFA. Further determinants can be added and evaluated.

B-2: In order to examine whether this assessment correlates with the characteristics of the selected resources, the representative should here elaborate on whether his/her evaluation of the ABS components for PGRFA is consistent when there is a different constellation of characteristics. The question is open-ended.

B-3: The representative is requested to evaluate which ABS system (bilateral or multilateral) better implements seven selected ABS components from the provider's perspective. Further ABS components can be added and evaluated.

3. Question Block C: Selection of an ABS System

Question Block C has the goal of achieving an expression of preference for an ABS system.

C-1: The representative should indicate which system he/she prefers when a user requests access to the specified PGRFA.

C-2: The question in C-1 is repeated, although valid for all possible PGRFA. Alongside "MLS" and "CBD", "X" is a further option. The representative is also requested to name the reasons for the selection if this has not previously been indicated in the survey.

7 Results of the Provider-Survey

Four country representatives could be surveyed, each for a specific PGRFA. In this chapter the surveys will be assessed. In order to do this, the resources will first be classified in the resource .category system based on the responses of the survey participants. Thereafter, the evaluation of the assessment of the ABS determinants (for relevance and system comparison) will be presented as well as the case-by-case analysis of the system selection. Finally the noteworthy results of all surveys will be evaluated together.

7.1 Positioning of Selected PGRFA

The evaluation of the responses concerning the distribution of PGRFA and the innovation potential yields the following classification in the resource category system, see

Figure 18 (in order to preserve data anonymity, the resource names will not be named):

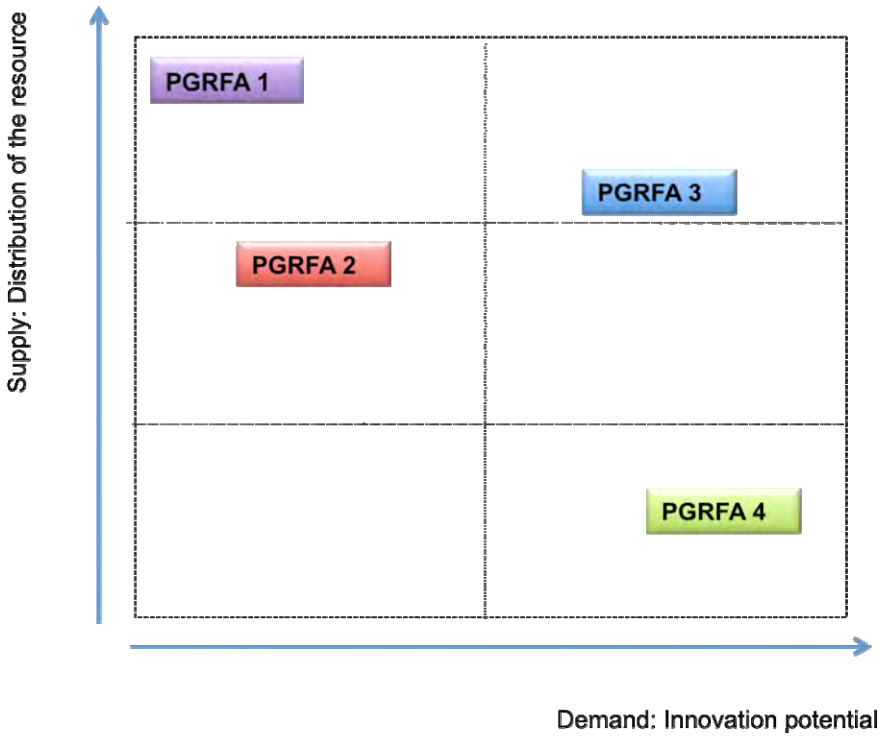


Figure 18: Examined PGRFA in the Resource Category System

Source: Authors'.

PGRFA 1 is widely disseminated and can be found in national gene banks as well as regional and international gene banks. Multiple countries make up its region of origin. It also contributes to global food security. The innovation potential of PGRFA 1 should be rated low since its future significance for research and breeding is decreasing outside its country of origin, according to survey respondents. The resource can however be utilised outside the field of food and agriculture for research.

⇨ **Positioning in Category S3D1**

PGRFA 2 is less widely distributed. The respondent indicated that the resource is inventoried in his or her own national gene bank and is additionally cultivated in his/her country. The respondent did not know, however, if the resource is also inventoried in other national, regional or international gene banks. Independent research on ex-situ accessions revealed that the PGRFA is inventoried in international agricultural research centers, although in low amounts compared to other crops. The country of origin holds one of the most extensive collections. According to the respondent, there is a decreasing level of interest in this PGRFA by plant breeders. For this reason we rank its innovation potential as low. The respondent however forecasts increased significance in the future for cultivation in his/her country.

⇨ **Positioning in Category S2D1**

PGRFA 3 is inventoried in the national gene bank of the country of origin and in other national gene banks. It is noteworthy that it is available in supra-regional collections, although the international agricultural research centers are not amongst the largest collections. The region of origin comprises multiple countries. The crop possesses a high level of innovation potential according to the respondent. Wild varieties of this crop contribute to improving commercial varieties. Various articles published on the topic support these estimations. In the provider country, the crop could also contribute more to food security, revenue generation, and research and breeding in the future.

⇨ **Positioning in Category S3N1**

PGRFA 4 is available ex-situ in national, regional and international gene banks, according to the respondent. The resource has multiple countries of origin. In the resource category system, it is nevertheless counted as one of the less widely disseminated PGRFA since the plant has an exceptional property: It is neither cultivated in its country of origin nor in other countries and is insignificant for the nutrition of all countries. It is presumed that PGRFA 4 is primarily inventoried for the purpose of conservation. The country representative refers however to the potentially large significance of the resource for research and breeding and for the food security of several countries. The reason for his/her assessment is that the quality of the commercial crop can be improved with the help of this wild variety. For this reason, PGRFA 3 is placed in the category of low distribution and very high innovation potential.

⇨ **Positioning in Category S1D2**

7.2 ABS Determinants and System Selection

PGRFA 1

According to the country representative, it is "important" to the provider of PGRFA 1 that granting access is associated with low costs and generates a high level of benefit sharing (Table 74). Additionally, the establishment of projects to maintain biodiversity and for the sustainable use of the resource is of great significance. The respondent evaluates the access to improved and new varieties of the crop PGRFA 1 as "rather important".

The ABS components that have been determined to be decisive can be met better within the framework of bilateral agreements, according to the respondent: Within this framework, the provider sees the possibility to achieve better benefit sharing conditions and to establish projects to preserve biodiversity. In practice, it is however questionable whether high benefit sharing amounts are in fact achievable due to the widespread dissemination of the resource. Many users have their own collections or have access to international collections. This supply-demand constellation likely leads to the limited willingness of potential users to pay.

The respondent could not evaluate which ABS system he/she considers to have the lowest transaction costs (answer selection "unknown"). According to the respondent, the access to improved resources would be better enabled by the MLS. In total, the country representative surveyed prefers the use of the bilateral ABS system for the resource at hand. The initial assumption that a provider would select a multilateral, standardised selection process for a resource in this category could thereby not be confirmed by this case study. It is possible that the provider revises his statement when presented with further information on the transaction cost differences of both systems (the MLS presumably creates less costs for the provider) and can consider the expected lower willingness of potential users to pay. The respondent indicated, however, that he/she also preferred a bilateral ABS solution for other resources. This statement concurs with the fact that the country from which the representative originates is not a signatory state of the ITPGR.

Table 74: Evaluation of the Questionnaire of PGRFA 1

Initial determinants according to chapter 5.2.2 / Selection of the system	**ABS components according to the questionnaire (evaluation of system)**	**Verification**
Transaction costs are less important	Transaction costs; „important" (-)	No
Access to basic resources	-	-
Access to improved resources less important	Access to improved resources; „rather important" (MLS)	To some extent
Monetary benefit sharing less important	Monetary benefit sharing; „important" (bilateral)	No
Technology transfer less important	Not relevant	Yes
-	**Projects**; „important" (CBD)	No (➔extension)
Selection of system: MLS	Selection of system: CBD	No

Source: Authors'.

PGRFA 2

The respondent rates the generation of high benefit sharing conditions, technology transfer and the establishment of projects for the conservation of biodiversity and for the sustainable use of the resource as "rather important" (Table 75). The high relevance of technology transfer and conservation projects as non-monetary benefit sharing components likely results from the widespread use of the resource in the provider's country. The list of determinants in this category should thereby be amended to include these two aspects. The determinants "transaction costs" and "access to improved varieties of PGRFA 2" could however be confirmed, as the respondent evaluated them as "rather unimportant" or "unimportant".

All three of the ABS components assessed as "rather important" are better implemented by bilateral contracts, according to the country representative. Even more noteworthy is the fact that he/she responds to the question regarding the selection of an ABS system for PGRFA 1 with "MLS". A possible explanation for this is that Annex I already contains varieties of this PGRFA. All things considered, the respondent is also aware of the demand situation and assesses the feasible benefit sharing amount within the framework of the CBD as low.

For the respondent, the selection of the ABS system for plant genetic resources generally depends on the characteristics of the resource.

Table 75: Evaluation of the Questionnaire of PGRFA 2

Initial determinants according to chapter 5.2.2 / Selection of the system	**ABS components according to the questionnaire (evaluation of system)**	**Verification**
Transaction costs are less important	Not relevant	Yes
Access to improved resources less important	Not relevant	Yes
Monetary benefit sharing less important	Monetary benefit sharing; „rather important" (CBD)	To some extent
-	**Technology transfer** „rather important" (CBD)	No (➔extension)
-	**Projects**; „important" (CBD)	No (➔extension)
Selection of system: MLS/CBD	Selection of system: MLS	Yes

Source: Authors'.

PGRFA 3

The representative from a country of origin of PGRFA 4 assessed technology transfer and the establishment of projects for the preservation of biodiversity and for the sustainable use of the resource as "important" ABS components (Table 76). This can be explained by the relatively low level of importance of PGRFA 3 for research, breeding and agriculture in the provider country. The provider country likely expects support through the ABS components so that the resource acquires a higher level of significance in the future. These determinants should be considered in the future for the resource category system.

The respondent evaluates the level of benefit sharing and the access to improved varieties as "rather important". Thereby the relevance of the determinants of category N2A3 could be confirmed. From the point of view of the country representative, the access to improved varieties and project establishment is better accomplished within the framework of the MLS, whereas a higher level of benefit sharing and technology transfer can primarily be asserted with the help of bilateral contracts. The respondent prefers bilateral contracts to grant access to PGRFA 3. He indicates that the selection of the system is dependent on the characteristics of the plant genetic resources.

Table 76: Evaluation of the Questionnaire on PGRFA 3

Initial determinants according to Chapter 5.2.2 / Selection of the system	**ABS components according to the questionnaire (evaluation of system)**	**Verification**
Transaction costs are less important	Not relevant	Yes
Access to improved resources rather important	Access to improved resources; „rather important" (MLS)	Yes
Monetary benefit sharing rather important	Monetary benefit sharing; „rather important" (CBD)	Yes
-	**Technology transfer** „important" (CBD)	No (➔extension)
-	**Projects**; „important" (CBD)	No (➔extension)
Selection of system: MLS/CBD	Selection of system: CBD	Yes

Source: Authors'.

PGRFA 4

According to the charges of the respondent, it is "important" in granting access to PGRFA 4, that the transaction costs are low, technologies are made available and projects for the preservation of biodiversity and for the sustainable use of the resource are established.

The respondent indicates that the access to new and improved varieties of PGRFA 4 is "rather important" (Table 77). The relevance of the ABS components "access to new and improved varieties" and "conservation" could thereby be confirmed (see Chapter X). Since the diversity of the resource is largely inventoried, the otherwise relevant costs of providing the resource for the MLS plays a subordinate role in this category. Category N2A1 should however be amended to include the determinants of "technology transfer". The provider presumably would like to see further support for research in his/her own country.

The relevance of monetary benefit sharing from the perspective of the respondent is surprising: He/she indicated that the amount of benefit sharing for PGRFA 4 is irrelevant, although he/she prefers a system in which his/her country could independently select research projects to support. The respondent sees the execution of monetary benefit sharing, technology transfer and in-situ conservation better carried out within bilateral agreements. Ex-situ conservation, which we evaluated ex ante as an advantage of the MLS, does not apply to any of the ABS systems from his point of view. Regarding transaction cost reduction and the access to improved varieties, the respondent find the MLS more suitable.

Overall, the respondent favours a transfer by means of a bilateral contract in which the initial assumption regarding the selection of the system for PGRFA in this category is confirmed. The respondent also indicates that the selection of the system is dependent on the characteristics of the resource, which also confirms the hypothesis of this study.

Table 77: Evaluation of the Questionnaire on PGRFA 4

Initial determinants according to chapter 5.2.2 / Selection of the system	**ABS components according to the questionnaire (evaluation of system)**	**Verification**
Transaction costs rather important	Transaction costs; „important" (MLS)	Yes
Access to improved resources rather important	Access to improved resources; „rather important" (MLS)	Yes
Monetary benefit sharing rather important	Monetary benefit sharing; „rather unimportant" (CBD)	No
-	**Technology transfer** „important" (CBD)	No (➔extension)
Conservation (MLS)	Projects; „important" (CBD)	To some extent (➔extension)
Selection of system: CBD	Selection of system: CBD	Yes

Source: Authors'.

7.3 Comprehensive Assessment

In summary, it can be stated that all of the parties surveyed from countries that are members of the ITPGR confirmed the initial hypothesis, namely that the preferred ABS system from the perspective of the provider depends on the characteristics of the genetic resource. This finding supports the concept of a resource category system. Solely the country of origin that is not a member of the ITPGR selected the CBD, regardless of the resource. One respondent additionally stated that the advantage of a system also depends on domestic circumstances (e.g. number of users in the country).

Three of the four assumptions regarding the selection of a system in the various resource categories were supported by the survey results. The reasons for which the respondent selects a respective system are not always conclusively evident. In some cases the assumed determinants of the resource categories could be confirmed, in others plausible determinants for the selection of the system had to be added. The respondents themselves added no further ABS components.

In addition, it became apparent that the ABS components were mostly interpreted in favour of a bilateral approach as stipulated in the CBD. Technology transfer, for example, is guaranteed in bilateral transaction projects according to all respondents. For three respondents, the amount of the monetary benefit sharing available solely through bilateral contracts is “important” or “rather important”. One country representative ranks the amount of benefit sharing as “rather unimportant”, however reinforces the significance of free usage terms for the provider.

The advantages of the MLS on the other hand are mainly seen in accessing improved and new PGRFA (three respondents) and in the reduction of transaction costs (three respondents).

8 Discussion of Results Part C

In this chapter we discuss the validity of the resource category system and whether is was supported by the survey results. Also, the operationalisation of the survey will be looked at critically. Secondly the findings are interpreted with respect to the overall research question, a comparison of the advantageousness of a multilateral versus a bilateral approach to ABS.

8.1 Discussion of the Resources Category System

The first step of the evaluation of the survey consisted of the positioning of the resources into the resource category system based on the statements of the survey participants. This classification of PGRFA succeeded without any major complications, what shows that the methodological standards for a “classification” were largely adhered to and that the category system is basically feasible for this aspect of the issue. However, the survey also revealed weaknesses of the resource category system. The “inventory” of a PGRFA in ex-situ collections as an indicator for the distribution of the resource should be examined critically: The survey shows that the characteristic “presence of a resource in an international gene bank” does by itself not indicate a widespread distribution. PGRFA 4 is contained in international gene banks, albeit for conservation purposes. Since PGRFA 4 concerns wild material, a rather low level of distribution can be assumed. The highest level of distribution (Category S3) is reached when a combination of the inventory in an international gene bank and the global cultivation of the resource can be established. As a measure for the latter, cultivation areas or production figures can be consulted.

Along with the criterion of resource distribution, the criterion of innovation potential of a resource is utilised for the categorisation. For innovation potential, objective indicators must be found or developed through further research.

In the survey statements of the providers regarding the distribution and innovation potential of a resource had to be supplemented with our own research. This is related to the fact that the survey participants are ABS experts with only limited knowledge of specific resources. If one assumes that the survey participants (country representative in ABS negotiations) level of information corresponds to that of providers in bilateral ABS agreements, an information gap in comparison to the user (plant breeders as “raw material experts”) is present. Asymmetrical information can lead to opportunistic behaviour of the party with information advantage. With regard to the above circumscribed situation it would be the user who might conceal information about the resource's value and therewith suppress its “price”.

The determinants included in the individual resource categories (cp. chapter 5.2.2) should be revised in accordance with the survey responses. This holds particularly for the categories S3D2 and S2D1, which should be supplemented with the components “technology transfer” and “establishment of projects to conserve biodiversity and for sustainable use”. According to the survey results, both components of non-monetary benefit sharing are better targeted in bilateral ABS agreements.

In further surveys the real “enforceability” of various ABS components should be addressed: Namely the country representatives in the present survey could indicate what value ABS components possess, but not if it would be possible to accomplish them. Monetary benefit sharing, for example, is evaluated in several cases as a “relevant” determinant. It is however not clear if the survey participant actually expects to receive high monetary benefits through bilateral arrangements for the respective resource. The same holds for the non-monetary benefit sharing component “access to other varieties and types

of PGRFA" within the MLS. Although these ABS components were considered relevant in a number of cases, for some PGRFA (especially wild material) no "relative" exists that could be incorporated in the MLS. Hence, it is unrealistic to receive access to these very resources.

As presented in the results, the survey participants fundamentally confirm the assumptions made in the theoretical portion of the study regarding the advantages of an ABS system for the several utility-components of ABS.

The initial assumptions about the selection of the ABS system could be confirmed in three out of four case studies (resource categories). One assumption was not supported, which likely is due to the fact that the corresponding provider country is not a member of the ITPGRFA. Because of the low case number in this study, further empirical studies are certainly necessary to verify the results. For a broader employment of the resource category system, for instance with other genetic resources and/or other utilisation forms than those stipulated in the MLS, we would have to extend the questionnaire according to the resource aspects of interest. However, the findings derived in this study provide the basis.

One survey participant indicated that the preference of an ABS system depends not only on resource characteristics (distribution and innovation potential), but also on country characteristics. This aspect will be addressed in chapter 8.3.

8.2 Discussion of the Results in the Context of the Study

If one is to assume that the opinion of the surveyed country representative corresponds with the position and the available information of political decision-makers in the provider country, then the survey confirms the research hypothesis that the resource characteristics influence the providers' position in negotiations on an expansion of Annex I. Or in a more general interpretation: Resource characteristics influence the advantageousness of a multilateral, standardised ABS approach like the ITPGRFAs' in comparison with a bilateral approach from the providers' perspective.

According to the resource category system, PGRFA with the highest level of distribution and a low level of innovation potential are the most likely to be "suitable" for incorporation in Annex I from the provider's perspective. Resources in categories S3D2 and S2D1 can also be taken into consideration for incorporation into Annex I.

In the following, recommendations will be discussed regarding the further development of the MLS for as prerequisite to incorporate additional resources into Annex I. The same considerations apply for design aspects of a comparable instrument under the scope of the CBD. Recommendations are based on the survey results and other theoretical aspects. This primarily concerns the comprehensive benefit sharing regulations.

If one once again assumes that decision-makers in ABS negotiations have a very limited or heterogeneous knowledge about resource characteristics, it would be useful to consult resource specialists during the expansion negotiations of the steering committee respectively in ABS negotiations in the CBD. This would serve to eliminate asymmetrical information between the country representatives. The experts could clarify information on the distribution of the resource and its innovation potential. Providers can then decide based on this information which ABS system they prefer for the resource in consideration. For a majority of PGRFA it is to be expected that no "buyer" is found through bilateral access agreements since the resources are already publicly accessible

through international agricultural research centres, are located in private collections, or are so widespread that the country of origin principle of the CBD does not apply (cp. FOWLER (2002); COOPER (2002): 11; HALEWOOD and NNADOZIE (2008): 119). A large number of PGRFA have achieved the highest level of distribution (Category S3). The provider's demands for greater benefit sharing within the framework of the bilateral ABS agreements are thereby unrealistic. On the other hand, the provider has several comparative advantages when incorporating the resource in the MLS. Knowledge transfer can therefore lead to the expansion of Annex I. Resources in the categories S1D1 or S1D2 could continue to be transferred under bilateral contracts, as stipulated currently in the CBD, since the criteria of food security and interdependency are not completely fulfilled anyway.

Monetary benefit sharing in the MLS is established as a multilateral fund. Money is distributed only in form of project funding. The survey participants indicated that independent from the resource category monetary benefit sharing is important, though. Hence, the funding system of the MLS should be reviewed in order to create incentives to incorporate further resources into Annex I, especially those from categories with low distribution levels and relatively high levels of innovation potential. Otherwise a standardised multilateral system will be considered not attractive for the providers.

The principles after which projects are selected for funding should also be revised. Providers are confronted with uncertainty concerning the acquisition of projects in various ways. A further disincentive is the lack of monitoring possibilities users compliance with benefit-sharing obligations is. A flat rate access fee or extraction fee could potentially be charged to the user of the PGRFA, particularly since the provider has to invest time and money for inserting resources into the system. This would also remedy the problem that contributions do not flow into the fund until a later point in time due to the long development period.

It is possible that a country of origin is neglected in the current selection process of the Benefit-sharing Fund. A part of the fund could be reserved for a selection process in which the number or “value/utility” of the resources are recognised. This would increase incentives for providers to make resources available, and tackle the so-called free-rider problem.

All of the survey participants rated the ABS component “technology transfer” as important in addition to recognising it is being a consistently advantageous aspect of a bilateral ABS arrangement, even though this is equally specified as under resource-specific benefit sharing of the MLS in the treaty text (cp. chapter 4.3.2). Three reasons can be deduced:

- The ITPGR has not yet been able to communicate that technology transfer is equally sought within the framework of the MLS.

- The survey participants were informed of technology transfer as a benefit-sharing component of the MLS, however this has not yet been implemented in practice by the treaty.

- The survey participants have been recipients of technology transfer within the MLS, although this is qualitatively not on the same level as technology transfer within the framework of a bilateral ABS agreement. For example, the ability to negotiate the terms of the arrangement individually can be an advantage of technology transfer regulated by bilateral agreements.

It can thereby be extrapolated that, for an expansion of Annex I to occur, it would be useful to implement technology transfer within the MLS according to the treaty and to communicate this as an essential component of benefit sharing. This would enable an alignment of the utility of the MLS with that of a bilateral ABS arrangement. Incorporating a resource into Annex I would become more attractive, especially for PGRFA from resource categories in which technology transfer is important (i.e., Categories S2D1 and S3D2). The transferred technology should above all be related to the resource incorporated into Annex I and, be oriented to the needs and wishes of the provider.

Further components of non-monetary benefit sharing within the framework of the MLS should also be communicated more effectively. Three out of four survey participants indicated that neither of the two ABS arrangements addressed ex-situ conservation in a better manner. Here one could point to the requirement that a PGRFA in the MLS be inventoried in an international gene bank. Provider countries could thereby be relieved, which should be considered an advantage of the MLS, especially concerning wild material. This aspect promotes the incorporation of resources from categories with a low distribution level (Category S1) into Annex I.

The establishment of projects to preserve biodiversity and for sustainable use of PGRFA was seen by a majority of those surveyed as strength of the CBD. Considering this, projects to preserve biodiversity and to promote sustainable use could also be established within the project-granting process of the multilateral fund. Again these advantages of the MLS should be better implemented and communicated. This can influence the decision of provider countries, especially when expanding Annex I to include neglected and underutilised crops (Categories S2D1 and S2D2).

All participants in the survey found the ABS component “access to raw materials and modified PGRFA” to be better served within the MLS. The advantages of the MLS can be further improved from the viewpoint of the provider by supporting signatory states with the expansion of agriculture within the framework of the ITPGR. With this assistance, it will be possible for the provider to more aptly use these ABS components. This is especially relevant for the expansion to include resources with a high level of innovation potential or those that will likely play a more prominent role in agriculture for a provider country (Category D2). The effect of such country characteristics on the position of the countries negotiating the Annex I expansion should be examined in further research.

8.3 Relevance of the Study for Determining State Positions and Negotiation Results

This work serves as a the basis for predicting the arguments in possible expansion negotiations, since the resource provider, whose perspective makes up the focus of the empirical portion of this work, are have veto rights in ABS negotiations within the ITPGR. Also in the CBD negotiations, provider countries would have to support a paradigm shift towards a multilaterally standardised approach.

The category system can serve to divide genetic resources into groups based on their suitability for a multilateral approach from the provider's perspective. However, in addition to resource characteristics (distribution and innovation potential determine the resource category), country characteristics presumably influence the provider's position. It is therefore possible that two provider countries come to two different conclusions since they may have different opinions on the significance of the determinants of advantage of both systems. Country characteristics could include, for example, the “state of agricultural development” of a provider country. This influences the functional use of several ABS components, such as “establishing projects”, “technology transfer” and “access to raw materials for research and breeding” and thereby also the advantages of the ABS system.

Further country characteristics could include the level of the current construction of the national ABS system within the CBD. A country that already has a functional system for regulating bilateral ABS agreements and has invested in the implementation of institutions as a result is presumably going to reach a different conclusion than a country that has not established such a system. Such country characteristics should also play a role in the analysis of the expansion of Annex I. It was however not possible to elaborate on the influencing factors within the framework of this study.

In addition to providers, further stakeholders influence the country positions and the resulting negotiation results. As presented in chapter 4.1, this includes users of genetic resources and intermediaries. The user's point of view was also examined theoretically (chapters 4.3.1 and 5.2.1) although not tested empirically.

A country is rarely an exclusive provider or user country. FOWLER (2000: 2f) determined that developing countries largely make up the recipients of material from the international agricultural research centers of the CGIAR – exactly the country group that makes available a majority of the MLS resources. A selective representation of countries as either providers or as users is therefore problematic. This study does not intend to determine state positions – this means whether or not a negotiating party behaves as the resource category system determines it should in the negotiations for the expansion of Annex I. For this, the position of the users and state intermediaries that are also present at negotiations must also be considered.

The verification of the validity of the resource category system in terms of the current Annex I list is also limited in applicability if other influential factors in the expansion negotiations are considered. Strategic behavior during the negotiations has been reported. For example, China spoke out against the inclusion of soy beans since Brazil blocked the inclusion of peanuts (cp. ETC Group (2001):7). This aspect also has an influence on the prognosis of future negotiation results.

8.4 Critical Assessment of the Study Part C

The primary goal of this part of the study was the creation of an explanatory model for the categorisation of genetic resources according to a potential expansion of Annex I of the ITPGR, respectively the choice between multilaterally standardised ABS system and bilaterally negotiated terms of exchange.

The resource category system represents a market system for genetic resources. Following the criteria of the ITPGR for the incorporation of a resource in Annex I (interdependency and contribution to food security), the availability of a resource in the developed market system is determined based on its distribution, while the demand is determined through its contribution to food security and/or innovation potential. By comparing the different characteristics of supply (three characteristics) and demand (two characteristics), a grid of resource categories can be established. A resource is distributed into a category based on its dissemination and innovation potential. In this category, the previously determined factors indicate the utility of an ABS system. From this, the system selection can be inferred. In this manner, one can determine, based on a corresponding category, whether the user or provider would prefer the incorporation of a resource into Annex I, respectively multilaterally standardised system under the CBD or if access through bilateral agreements would continue to be preferred.

The hypothesis deduced for the resource category system from the perspective of the provider is therefore: “The more widely disseminated the resource and the lower the innovation potential for

research and breeding, the more a provider country agrees to govern the resources in a multilaterally standardised approach, respectively incorporate it into Annex I."

The hypothesis deduced for the resource category system from the side of the user therefore reads: "The less widely disseminated a PGRFA and the more attractive it is for research and breeding, the more a potential user favours its incorporation into Annex I."

The resource category system established – including the assumption about the system selection for each category – was then examined by cross-referencing the existing Annex I of the ITPGR. Since these resources were chosen by the negotiating parties to be made accessible through the multilateral system as a component of Annex I, they should have a high level of dissemination and low innovation potential according to the theoretical model of the resource category system (from the provider's perspective). This could be confirmed within this study for many of the Annex I resources.

The third portion of the study focused on the survey of resource providers. This method was utilised to determine whether the expansion of the resource category system is viable and if its model could be confirmed. For this process, resources were sought that are presently not included in Annex I. The survey focused on country representatives of the provider country of these resources.

The survey demonstrated that a classification of the determinants for the resource category system is possible and that a resource categorisation in this form is viable. However the hypotheses of the concept, namely the determinants of some categories, had to be modified. The initial assumptions regarding the selection of an ABS system in specific categories could be confirmed by the surveys for three of four categories.

In addition, it could be determined by the information provided by the country representatives how a multilateral system should be configured so that an expansion of Annex I regarding certain resources could be approved by the provider. For this, relevant ABS components of each category should be adjusted in order to balance the net utility of the ABS systems for the resource provider.

A result of the evaluation of the survey was that country characteristics, alongside resource characteristics, influence the provider position concerning an Annex I incorporation of a specific resource, respectively the advantageousness of a multilaterally standardised versus a bilateral approach. Further research in this field should therefore concentrate on the analysis of the influence of country characteristics alongside resource characteristics.

Within this study, only resource providers could be surveyed. The concept of the resource category system has however also been examined and presented from the user's perspective. As a result, this study can be applied in further empirical studies in order to confirm the user perspective.

The overall conclusion of the study is that the application of a multilateral system for the exchange of further PGR will only be approved by the provider countries when the Benefit-sharing system is adjusted. The heterogeneity of the characteristics of several utility components for genetic resources must be considered more extensively. However, also when this succeeds, we expect there to be little support for an expansion of Annex I for resources with especially high benefit-sharing potential through bilateral agreements. From these findings we can learn, if a similar instrument would be considered for ABS under the CBD. Variation of resources and provider countries would need to be reflected. A single standard for the instrument (access, benefit sharing) would not acceptable.

Part D: Summary of Conclusions, Recommendations and Outlook

Summary of Conclusions, Recommendations, and Outlook

In the foregoing three parts of this report we elaborated on implementation problems for bilateral ABS agreements identified in user surveys. With the help of empirical surveys we investigated governance aspects of transactions with genetic resources and related services between users and provider entities in source countries. Finally we identified and tested factors determining stakeholders' - particularly providers' - assessment of advantages of a multilaterally standardised ABS system in comparison with a bilateral approach towards transactions with genetic resources. Based thereon we developed a system to differentiate genetic resources.

In this chapter the main findings derived in the course of the research project will be summarised with focus on the basic requirements for applying standardisation instruments which we identified in Part A of the report. Thereafter recommendations regarding the development of and design aspects for a model clause instrument and a standardised multilateral ABS approach shall be summarised. Finally, considerations for future research and general recommendations for measures to support the implementation of ABS that were not in the focus of this project but derived during our research shall be elaborated.

1 Overall Findings with respect to Requirements for Standardisation

Standardisation theories suggest that standards should only be applied as instrument to facilitate economic interaction, if the subject matter of interaction is similar and/or the context of interaction is stable. Depending on the instrument the similarity requirement enfolds either one of the criteria or both. For the model clause instruments mostly similarity of the subject matter of interaction matters, as the instrument tackles the transaction in the contracting phase. A standardised multilateral system enfolds all transactional steps in an ABS chain, and therefore requires that both criteria are fulfilled.

The empirical studies we conducted in the framework of this project showed that demand for genetic resources and related services is heterogeneous. Also, the way of utilisation, operationalised through transaction attributes (Transaction Cost Theory) and strategic factors (Strategic Management Theory), varies among cases and potential transactions. Accordingly we observe variation of contractual solutions for bilateral transactions with genetic resources and related services.

The provider survey presented in Part C of this report revealed that with varying characteristics of genetic resource(s) and presumably institutional capacities of provider countries the providers' assessment of ABS components varies. In some cases preferences for governing transactions are on a multilaterally standardised approach in other cases a bilaterally negotiated agreement promises more advantages. The providers' strategy towards ABS constitutes in this research the similarity criterion "context stability". We can note that the context of interaction is not stable for transactions with genetic resources.

The two similarity criteria for applying standards are obviously not completely fulfilled. Hence, full standardisation can be applied in neither of the two instruments under consideration. However, we found patterns to describe and group cases in accordance with attributes that matter for the respective transactional step. These patterns can be used to develop ABS instruments of both types, but with a lower level of harmonisation, meaning that menus of standards should be included to reflect heterogeneity. More specific suggestions and recommendations are elaborated in the following sections.

2 Recommendations for the Development of a Contract-standardisation based ABS instrument

The empirically verified associations between transaction characteristics (explanatory variables, such as the type of provider contribution, asset specificity, primary uncertainty of utilisation, frequency of interaction between user and provider) with characteristics of governance elements (contract duration, contract type, monetary benefit sharing and non-monetary benefit sharing as well as conflict resolution mechanisms) could be used to develop standardisation based ABS instruments that support bilateral ABS negotiations and contracting. However, we clearly recommend a voluntary tool, which reflects variation as it was described above. Menus of model clauses with accompanying guidelines for stakeholders to select model clauses with an appropriate design are supposedly the most feasible solution. A differentiation of instruments according to ”user sectors” as they are often indicated in the literature and presented in CBD related meetings seems inappropriate, or at least not advantageous. In this research we found empirical variation of transaction characteristics and governance solutions among and within user groups. Instead of sector wise adapted instruments we recommend that for each governance element (see above) options named in our survey evaluation should be transferred into model clauses. To support stakeholders with the selection of an appropriate model clause or clauses for a governance element, guidelines should be developed. These guidelines should be structured in a way that they reflect the linkages between a governance element one the one side and transaction characteristics identified as relevant (explanatory variables) on the other side. The transaction characteristics could be used as “decision nodes”, along which stakeholders can characterise their case. By working through such a decision tree all relevant aspects of a case would be characterised and adapted model clauses could be acquired and combined to a feasible governance solution.

The transfer of findings from this research into a concrete instrument (model clauses for ABS agreements and accompanying guidelines) should be done with the help of well grounded lawyers. Thereby, users representing the different characteristics of utilisation and demand should be involved. Regarding the applicability of the instrument in real cases and the acceptance it seems absolutely vital to involve lawyers representing the providers’ side in this process. Again, such experts should be chosen for their experience in drafting bilateral ABS agreements, though representing the providers’ interest therein. We stress this procedural requirement for two reasons: contracts for transactions with genetic resources (should) reflect the interests of both contracting parties, even if the method of user-survey was appropriate to investigate the explanatory contribution of governance theories we included in our research. If terminologies for model clauses are developed only on the basis of users’ perceptions, underlying information is biased. Such model clauses bear the risk of not being applicable and acceptable for both parties in practice. Secondly, provider entities would rather trust in the fairness of model clauses if “their representatives” contributed to designing the instrument. Mutual trust in actual projects could be better supported by an instrument developed in a participatory approach. Since mistrust was identified as central issue in bilateral ABS negotiations this aspect should be considered.

3 Recommendations for the Development of an instrument comparable to the ITPGRFAs Multilateral System

The primary goal of the study presented in Part C of the report was the creation of model for the categorisation of genetic resources according to a potential expansion of Annex I of the ITPGR. Findings from this research can be transferred to a more general level, though. We can use them to consider adaptations the multilateral approach would need in order to be more suitable for genetic resources under the scope of the CBD.

In our small survey providers' preferences for ABS-systems differ in accordance with the characteristics of the genetic resources. Relevant resource characteristics include the present and potential future economic value according to the innovation potential, the domestic relevance of the resource, and its distribution. The principle is: the higher the (potential) commercial value and the lower the distribution of a certain genetic resource is, the lower is the offspring of a transaction cost reduction and access to improved varieties the provider could realise by choosing a multilateral approach in comparison to the benefit sharing expectations in a bilateral agreement.

In addition to resource characteristics country characteristics presumably influence the provider's position. Country characteristics include the "state of agricultural development" of a provider country, since this influences the functional use of several ABS components, and thereby also the advantages of the ABS system. The same holds for the "state" of other industries in which genetic resources are utilised. Moreover, the current national ABS system might be relevant. A country that already has implemented a system for governing bilateral ABS agreements has a lower potential to save transaction costs by governing access through a multilateral system.

To reach consensus for the implementation of a multilaterally standardised ABS system under the scope of the CBD, or to extend Annex I of the ITPGRFA, the heterogeneity of the characteristics of several utility components for genetic resources must be considered more extensively. The approach to monetary benefit sharing would need to be more differentiated, for instance by designing a split fund: One part operates similar to the MLS fund under the treaty with similar objectives and criteria for the selection of projects for funding support. For the other part of the fund an approach which links the distribution of benefit sharing more closely to the providers' contribution in form of genetic resources inserted should be applied. This system should provide direct funding to provider countries aside from projects, in order for the providers to be able to choose freely how the funding is utilised.

Technology transfer and transfer of know-how in the scientific field would need to be institutionalised within the benefit sharing system as well. Measures should be related to the resources inserted in the system and oriented to the needs and wishes of the provider. In order to overcome limited capacities of small and medium size user entities, joint projects could be developed in which several users together conduct capacity building.

The resource category system developed in this study could be a starting point for developing a system to determine the providers' contribution, respectively the value of the resource and hence the benefit sharing claims. However, for a broader employment of the resource category system, for instance with other than plant genetic resources and/or other utilisation forms than those stipulated in the MLS, further aspects of relevance to determine the utility of ABS components would need to be identified, and tested in empirical research. The questionnaire we developed would need to be extended according to the additional aspects of interest, and the survey should of course include substantially more providers.

4 Relevant Aspects for Further consideration – Future Research

The findings of this project can feed into the development of a model-clause based ABS instrument, and they provide a concept for more in-depth research on a multilateral ABS system. However, several other aspects for consideration in future research and discussions on the implementation of ABS arose.

Amount of monetary benefit sharing

The ABS debate has not found a common understanding on how to evaluate fairness of the amount of (monetary) benefit sharing. So far, in practical bilateral cases this is most likely a product of the actual value of the resource for the user, negotiation power, the market situation and substitutability of the resource. In the framework of this study we did not address the issue of fairness / adequacy of the amount of monetary benefit sharing. However, this should be issued in further research, as it obviously is a central issue in negotiations. "Qualitative model clauses" do not resolve this problem in negotiations.

Stressing non-monetary benefit sharing

The real value of non-monetary benefit sharing measures for users and providers should be investigated more in-depth and communicated among stakeholders. The results of our research indicate that capacity building in provider countries can create synergy effects for users. Also for providers, non-monetary benefit sharing measures presumably create high values by building the foundation for development. Expenditures for capacity building are likely to have an efficient overall cost-benefit ratio. However, we learned that especially small companies and research institutes have limited resources to conduct capacity building. It should be investigated how such user entities could engage in non-monetary benefit sharing - for example in the framework of joint projects.

Supportive measures

Search costs and initiations costs in the chain of accomplishing ABS agreements were indicated by several users within our empirical studies. To reduce these transaction costs information measures and training of users or the implementation and training of central consultant entities could be more suitable. Also information systems in provider countries should be revised, and possibly harmonised to certain extend.

Users from public research institutes suggested the implementation of a superordinate entity (e.g. at the CBD level, with representatives of providers and users) to check best practise initiatives like codes of conduct, guidelines, etc. for ABS regarding their consistency with general ABS provisions in the CBD. Such an entity could also provide Guidelines for Memorandums of Understanding (MOUs). MOUs seem to be a useful tool to communicate complex research projects to providers of genetic resources. From the researchers' perspective, the clear communication of what they intend to do with the genetic resources is extremely important. Misunderstandings and mistrust are perceived as sources of impediments in research projects or even the breakdown of cooperation between users and providers.

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- http://www.bio.org/ip/international/200507memo.asp
- http://www.environment.gov.au; http://www.environment.gov.au/biodiversity/science/access/model-agreements/index.html
- http://ttb.nci.nih.gov; http://ttc.nci.nih.gov/forms/
- http://ott.od.nih.gov
- http://www.planttreaty.org/smta_en.htm
- http://sciencecommons.org; http://mta.sciencecommons.org/

Appendix I - List of Interview Partners

Interview partner	Institution
Belinda Brown	Department of the Environment, Water, Heritage and the Arts, Government of Australia
Frank Begemann	Bundesanstalt für Landwirtschaft und Ernährung (BLE), Leiter des Informations- und Koordinationszentrum für Biologische Vielfalt (IBV), Bonn
Jane Bulmer	IUCN Environmental Law Center, Bonn
Philip Desmeth	Belgian Co-Ordinated Collections of Micro-Organisms
Juanita Chaves; Selim Louafi; Kent Nnadozie	International Treaty on Plant Genetic Resources for Food and Agriculture, Rome
Dr. Ricardo von Gent	German Association of Biotechnology Industries (DIB)
Dr. Christoph Herrlinger	German Plant Breeders' Association (BDP)
Thinh Nguyen	Counsel for Science Commons
Prof. Wilhelm Barthlott	University of Bonn, Nees-Institut for Biodiversity of plants
Prof. Andreas Bechthold	University of Freiburg, Professorship of Pharmaceutical Biology und Biotechnology, Institute for Pharmaceutical Sciences
Dr. Reinhard von Broock	KWS Lochow GmbH
Prof. Dr. Wolf Dieter Bluethner	Firma Chrestensen (Erfurter Samen- und Pflanzenzucht GmbH)
Dr. Helge Bode	Saarland University, Institute for Pharmaceutical Biotechnology
Dr. Claudio Cerboncini	Research Centre Caesar (Centre for Advanced European studies and research)
Dr. Ulf Feuerstein	Euro Grass
Dr. Peter Goertz	Suedwestsaat
Dr. Cristoph Haeuser	Natural Museum of Nature Science Stuttgart
Prof. Juergen Heinze	University of Regensburg, Institut for Biology I (Evolution, Behaviour and Genetics)
Dr. Thomas Hurek	University of Bremen, Department General Microbiology

Dr. Walter an den Kerckhoff	Consultant for Intermed Discovery
Prof. Gabriele Maria Koenig	University of Bonn, Institute for Pharmaceutical Biology
Dr. Thomas Koths	Bayer
Dr. Wolfram Lobin	University of Bonn, Botanical Gardens
Lohwasser, Ulrike	Leibniz-Institut für Pflanzengenetik und Kulturpflanzenforschung (IPK), Abteilung Genbank, Forschungsgruppe Ressourcengenetik und Reproduktion, Gatersleben
Dr.Frank Petersen	Novartis
Dr. Manfred Reiffen	Boehringer Ingelheim
Professor Ernst Rühl	Forschungsanstalt Geisenheim, Section of Grapevine Breeding and Grafting
Dr. Walter Schmidt	KWS Saat AG
Dr. Nadja Seibel-Thomsen	DSM Nutritionals
Annika Wiekhorst	University of Mainz, Biota Project

Appendix II: Questionnaire Online-Survey with Companies Utilising Genetic Resources

Q2a: In which fields does or did your company use genetic resources?

Note: Multiple entry possible.

Pharmacy

Botanical Medicine

Personal Care and Cosmetics

Plant Breeding - Seed

Plant Breeding - Horticulture

Biotechnology, other fields than Pharmacy and Plant Breeding

Others:

Q3: Factors for the Selection of Supply Sources for Genetic Resources (If possible consider the activities of your company over the past 10 years.)

Answering categories: 1 // 2 // 3 // 4 // 5 // 6 // 7 // I do not know

1= not important at al ..... 7= very important

How important are the following aspects?

1: Short lead and start times

2: Standardized processes for material aquisition

3: No negotiations about the terms of trade with the provider

Q4: Please complete the following senteces and assess how important each aspect is for the selection of a supply source for genetic resources.

Answering categories: 1 // 2 // 3 // 4 // 5 // 6 // 7 // I do not know

1= not important at al ..... 7= very important

For some projects in our company was or is...

... the access to undiscovered genetic resources as a potential source of innovative products very important.

... access to properties of wild species of certain plants or animals very important.

... it very important to be able to study genetic resources in the context of their natural habitat.

... traditional knowledge about effectiveness of natural resources very important

... exclusive access or exclusive usage rights for genetic resources very important.

... it very important that the provider could deliver the genetic resource(s) as raw material on a intermediate or long-term basis in larger quantities.

Q5: Which methods of acquiring genetic resources has your company utilized in the past 10 years?

Note: Please mark in each line the response that applies.

Answering categories: never // rarely // sometimes // frequently // always // maybe

Collection of genetic resources in nature

Research partners have collected genetic resources in nature

Acquisition from official and authorised supplier institutes from the country in which the genetic resources appear in their natural habitat

Acquisition from international Ex-Situ collections (such as gene banks or microorganism collections)

Acquisition from commercial brokerage firms

Other sources of acquisition:

Q6: How relevant are the following characteristics of institutional frameworks of provider countries for your company in determining the selection of a provider country for genetic resources?

(Provider country: simplified term for the country in which the genetic resource can be found in its natural habitat.)

Answering categories: 1 // 2 // 3 // 4 // 5 // 6 // 7 // I do not know

1= not important at al ..... 7= very important

National regulations for the access and use of genetic resources are in place

Competent contact partners in the administration are designated and reachable

Information about the national system for access and use of genetic resources are available online

Information (as defined above) is available in English

Centrally managed access procedure for genetic resources

Clear competencies of actors for access negotiations

A reliable legal system

When necessary, an official representative facilitates communication with local / indigenous groups

Legal competency of participants in access negotiations

The provider country can provide information about its biodiversity

Provider has a concept for resource evaluation

Scientific competency of participants in access negotiations

Existence of potential research partners in the provider country

Self-interest of the government of the provider country to attract foreign companies for bioprospecting

Which other factors do you assess relevant:

Q9: Which strategies does your company use to minimize the transation costs involved in the acquisition of genetic resources from provider countries?

(Transaction costs indiclude the time invested by employees, costs for external expertise, and travel costs for initiation, communication, and monitoring measures and renegotiations.)

Note: Multiple entry possible.

We select provider countries with solid institutional frameworks.

We rely on previously established relationships.

We involve intermediaries.

We work with local research partners.

Others:

Q11: Please clarify in detail the field(s) of usage for the project you selected.

Note: Multiple entry possible.

Pharmacy

Botanical Medicine

Personal Care and Cosmetic

Plant breeding- seeds

Plant breeding - horticulture

Biotechnology, others than Pharmacy and Plant breeding

Others:

Q14: How large is the estimated timeframe from accessing the genetic resources to possessing a commercial product or intermediary product or it being evident, that such a product can not be achieved?

Less then 1 year

1 year up to 3 years

More than 3 up to 5 years

More than 5 up to 7 years

More than 7 up to 9 years

More than 9 up to 11 years

More than 11 years

I do not know

Q15: With which provider type did your company negotiate access and use for genetic resources and related services in order to reach an agreement for this project?

Note: Multiple entry possible.

National or regional authority in the provider country, such as environmental agency or ministry

Local authority in the provider country

A local group / indigenous community in the provider country

National biodiversity institute or equivalent institution that is authorized by the government to manage resources and grant access

Research institutes in the provider country (such as universities)

Others:

Q18: Approximately how long did the initiation of the agreement take? (in months / years)

(Initiation includes the timeframe from the initial contact to the first activity of the provider.)

……

Q19: Please characterize the service / effort of the provider respectively institutions in the provider country in this project.

Note: Multiple entry possible.

Collection permission

Access to previously inventoried resources in a national collection

Information (for example, traditional knowledge) about usage possibilities

Exclusive access to genetic resources

Provider executes collection activities

Preparation of the material

Evaluation of samples

Participation in advanced research

Provider grants exclusive usage rights for certain information

Provider grants exclusive research rights for resources in certain application areas

Others:

Q20: Did or will the services of the provider occur once or repeatedly over a longer period of time?

Answering categories: Once // Repeatedly

Q22: This block of questions addresses investments that your company made for the project in your company‘s home countries.

(Home countries means business locations that were selected independently of the project or previously existed.)

Answering categories: Yes // No // I do not know

Has your company invested or is your company investing for the use of genetic resources from this project in its home country/ies in ...

... Buildings (Laboratories, Plants)

... Laboratory equipment or other physical assets

... education / hiring of skilled employees

Q23: Specificity of investments in home countries for the utilization of genetic resources (and related inputs) from the project.

Can your company‘s investments in the home country be otherwise utilized if the project is called off before completion?

Answering categories: 1 // 2 // 3 // 4 // 5 // 6 // 7 // I do not know

1= only with high financial disadvantages ..... 7= without financial disadvantages

Q24: This block of questions addresses investments that your company has made for the project in the provider country.

(Provider country: simplified term for the country in which the genetic resource can be found in its natural habitat.)

Answering categories: Yes // No // I do not know

Has your company invested or is your company investing for the use of genetic resources from this project in its home country/ies in ...

... Buildings (Laboratories, Production Plants)

... Laboratory equipment or other physical assets

... education / hiring of skilled employees

Q25: Can your company‘s investments in the provider country be otherwise utilized if the project is stopped? (also including a sale of the project)?

Can your company‘s investments in the provider country be otherwise utilized if the project is called off before completion?

Answering categories: 1 // 2 // 3 // 4 // 5 // 6 // 7 // I do not know

1= only with high financial disadvantages ..... 7= without financial disadvantages

Q30: Please characterize the level of uncertainty involving the use of genetic resources from the project, based on the following statements.

Answering categories: 1 // 2 // 3 // 4 // 5 // 6 // 7

1= not correct at all ..... 7 = completely correct

The utilization process for genetic resources is completely unpredictable at the beginning of the

project.

The technology in our field of use changes quickly.

At the beginning of the utilization process, we are not able to anticipate commercial output at all.

The genetic resources from the project will be used for research and development of products for new /uncertain markets.

Q31: For what timeframe were mutual requirements made contractually binding with the provider?

Less than 1 year

1 up to 3 years

More than 3 up to 5 years

More than 5 up to 7 years

More than 7 up to 9 years

More than 9 up to 11years

More than 11 up to 13 years

More than 13 years

Q32: Which of the following two contract types is more applicable to the project?

The contract is largely negotiated and close to a final version before the start of the project

A tiered contract that is further developed and modified or replaced by additional contracts during the course of the project

Q33: Which conflict resolution mechanism was established for the project?

Note: Multiple entry possible.

Exact description of the mutual activities (for example, schedule, delivery quantities, prices, hight of

compensation payments) in the contract

Judicial authority

Arbitration with the assistance of an independent third party

Internal conflict resolution mechanism, harmonization of interests

Others:

Q35: Which form of monetary compensation does the provider receive from your company within the framework of the project?

Note: Multiple entry possible.

No, the provider does not receive any monetary benefits.

Weight-related, or hourly-wage compensation

Negotiated advance payments (lump sum)

Negotiated payments that are made after reaching certain steps in the usage process (milestone payments)

Payments tied to commercial output (e.g. royalties)

Output-related payments, that are negotiated over the course of the project, for example, when certain

operational steps are reached

The contract contains clauses for ex post negotiation of compensation in the case that the framework changes

Q36:Does your company also provide non-monetary benefit-transfer to the provider within the framework of the project?

Note: Multiple entry possible.

No

Yes, joint intellectual property rights to usage results

Yes, joint publication in scientific journals

Yes, support of inventory / taxonomy of Biodiversity

Yes, technology transfer

Yes, transfer of know-how in the scientific field

Yes, support of infrastructure measures

Yes, transfer of know-how in the field of sustainable use / cultivation of genetic resources

Yes, support of other measures to preserve biodiversity

Q37: What synergy effects (can) result for your company from non-monetary benefit transfers within the framework of the project?

Answering categories: 1 // 2 // 3 // 4 // 5 // 6 // 7

1= not correct at all ..... 7 = completely correct

Providers will be better positioned to provide the desired activity (for example, quality / continuity of material supply).

Local scientists will be able to conduct initial on-site evaluations of genetic resources, which will reduce costs for us in the long run.

Capacity building increases trust and facilitates communication with the providers.

Capacity building is the prerequisite so that scientific cooperation is possible.

Capacity building ensures the conservation and the long-term availability of genetic resources.

Capacity building is a fundamental requirement of the provider.

Others:

Q38: How would you most closely describe the type of agreement between your company and the provider?

We purchase genetic resources and possibly additional goods and services from the provider.

We carry out a scientific cooperation project with institutions in the provider country and receive access to genetic resources within this framework.

Our company participates in the provision process through considerable capacity building activities in the provider country.

Q40: How would you assess your company's (anticipated) effort for the initiation of the agreement, ongoing communication with the provider, renegotiations, as well as monitoring measures in this project?

Note: effort includes working hours, travel costs, and costs for external expertise.

Answering categories: 1 // 2 // 3 // 4 // 5 // 6 // 7

1= not correct at all ..... 7 = completely correct

The effort level is low in comparison to other cost components of the project.

The effort level is acceptable in comparison to the value of the resources and related services acquired

in the framework of the project.

Negotiations are / were tedious and difficult.

Q41: How much experience does your company have in executing complex projects?

Answering categories: 1 // 2 // 3 // 4 // 5 // 6 // 7

1= not correct at all ..... 7 = completely correct

Our company has a high capacity to execute long-term, complex projects.

Our company already has experience in the past of executing complex long-term projects.

Our company is experienced in projects with partners from developing or newly industrializing countries.

Q44: What is your company‘s assessment of the public perception of bioprospection / acquisition of genetic resources from provider countries?

Answering categories: 1 // 2 // 3 // 4 // 5 // 6 // 7

1= not correct at all ..... 7 = completely correct

In the past, our company has had negative experiences with the public perception of acquiring and using genetic resources directly from provider countries.

Damage to one‘s image is a potential risk in our industry when conducting bioprospection projects.

We are active in corporate communications / We participate in the public/political discussion to clarify issues surrounding bioprospection.

We only acquire genetic resources from Ex-Situ collections or commercial brokers because direct contact with provider countries carries a high risk of damaging our image.

Q45: The number of employees in your company in 2008

Under 10

10 up to 50

Above 50 up to 250

Above 250 up to 500

Above 500 up to 1.000

Above 1.000 up to 10.000

Above 10.000

No statement possible

Q46: Company turnover in the year 2008

Note: in Million Euro (in Million US Dollar)

Euro under 2 (US Dollar: under 3)

Euro: 2 up to 10 (US Dollar: 3 up to 15)

Euro: above 10 up to 50 (US Dollar: above 15 up to 74)

Euro: above 50 up to 250 (US Dollar: above 74 up to 370)

Euro: above 250 up to 1.000 (US Dollar: above 370 up to 1,500)

Euro: above 1.000 up to 5.000 (US Dollar: above 1,500 up to 7,400)

Euro: above 5.000 (US Dollar: above 7,400)

No statement possible

Q48: R&D Budget of your company

Note: in Mio Euro (in Mio US Dollar); approximate average between 2004 and 2008

Euro: Under 1 (US Dollar: under 1.5)

Euro: 1 up to 10 (US Dollar: 1.5 up to 15)

Euro: above 10 up to 50 (US Dollar: above 15 up to 74)

Euro: above 50 up to 100 (US Dollar: above 74 up to 150)

Euro: above 100 up to 250 (US Dollar: above 150 up to 370)

Euro: above 250 up to 500 (US Dollar: above 370 up to 740)

Euro: Above 500 (US Dollar: above 740)

No statement possible

Appendix III: Questionnaire for Provider-Survey Part C

universitätbonn

Rheinische
Friedrich-Wilhelms-
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Bonn,

Dear Sir or Madam

The Institute for Food and Resource Economics of the University of Bonn, Germany, is currently conducting a research project on the topic of access and benefit sharing (ABS) for genetic resources. The project is dealing with the question of an expansion of the Multilateral System of ABS under the International Treaty on Plant Genetic Resources for Food and Agriculture to additional plant genetic resources. In this context various factors of potential relevance from the viewpoint of the stakeholders are investigated.

In order to examine our theoretic conclusions, we would like to have the perspective of the provider countries for genetic resources. With this in mind, we have created a short questionnaire.
Through various publications we have learned that xxxxxxx is the country of origin of xxxxxxx. For this reason we are contacting you. We would like you to share your views and the views of your country with us on this topic and thereby support our research.

We would be very grateful if you or another representative from your team could fill out the attached questionnaire and email this back to us no later than xxxxxxx. If you are not the proper contact person, we would ask you to kindly forward this email to the correct person or to let us know.

We guarantee that we will treat this information confidentially and we are prepared to make the results of the survey anonymous should this be your wish.

Thank you in advance for your support. If you have any questions, Ms. Therese Jacob will be happy to assist you.

With best regards,

The following survey contains eight questions. Please send the survey back to us even if there are certain questions that you cannot answer.

First, we would like you to characterize the genetic resource xxxxxx.

Question A-1:	**How do you characterize the distribution of varieties of xxxxxx?**		
	Yes	**No**	**I don't know**
Varieties of xxxxxx originate in situ in our country.	○	○	○
Varieties of xxxxxx also originate in other countries.	○	○	○
Varieties of xxxxxx are cultivated in our country.	○	○	○
Varieties of xxxxxx are inventoried in our national gene bank.	○	○	○
Varieties of xxxxxx are inventoried in other national gene banks.	○	○	○
Varieties of xxxxxx are inventoried in regional gene banks.	○	○	○
Varieties of xxxxxx are inventoried in international gene banks.	○	○	○

Question A-2:	**Please evaluate the <u>current</u> significance of varieties of xxxxxx …**				
	important	**rather important**	**rather un-important**	**un-important**	**I don't know**
…for the securing of nourishment of your country	○	○	○	○	○
…for the securing of nourishment of other countries	○	○	○	○	○
…for research and plant breeding in your country	○	○	○	○	○
…for research and plant breeding in other countries	○	○	○	○	○
…for securing income in your country	○	○	○	○	○

Question A-3:	**Please assess the <u>future</u> significance of varieties of xxxxxx ...**				
	important	**rather important**	**rather un-important**	**un-important**	**I don't know**
...for the securing of nourishment of your country	○	○	○	○	○
...for the securing of nourishment of other countries	○	○	○	○	○
...for research and plant breeding in your country	○	○	○	○	○
...for research and plant breeding in other countries	○	○	○	○	○
...for securing income in your country	○	○	○	○	○

If you assess the future significance of xxxxxx varieties as rather important, please list the reasons for this (for example: I expect that xxxxxx varieties increasingly attract the interest of the food industry because...).

Now we would like you to answer a few questions about access and benefit-sharing (ABS).

Question B-1:	**Imagine the following situation: A plant breeder or another company in the area of food and agriculture requests access to varieties of xxxxxx for commercial use in the area of agriculture and/or nutrition.** **How do you evaluate the ABS components below, based on relevance for the negotiation of access to varieties of xxxxxx from a provider's point of view?**					
		important	**rather important**	**rather un-important**	**un-important**	**I don't know**
Granting access has low cost levels for our country (for example, cost of negotiations, costs of monitoring measures etc.).		○	○	○	○	○
Granting access to varieties of **xxxxxx** creates a high level of monetary benefit sharing possibilities.		○	○	○	○	○
In return for granting access our country receives simplified access to improved/new varieties of xxxxxx.		○	○	○	○	○
By granting access, technologies will be transferred to our country (for example, laboratory equipment).		○	○	○	○	○
In connection with granting access, projects will be established in our country that serve to maintain biodiversity and the sustainable use of xxxxxx.		○	○	○	○	○
Please list additional components if they are not currently present.						
Other components, such as:		○	○	○	○	○
		○	○	○	○	○

Question B-2:	**Please explain if and how the relevance of ABS components in negotiations differs when you are asked to grant <u>access to plant genetic resources</u> for food and agriculture other than xxxxxx varieties (for example, does the relevance of simplified access to improved/new varieties change?).**

Question B-3:	**Which access and benefit-sharing system in your opinion corresponds best with selected access and benefit-sharing components?**			
MLS - "Multilateral System of the International Treaty on Plant Genetic Resources for Food and Agriculture" **CBD - "bilateral ABS system of the Convention on Biological Diversity"**	**MLS**	**CBD**	**neither system**	**I don't know**
Granting access has low cost levels for your country (for example, cost of negotiations, costs of monitoring measures etc.).	○	○	○	○
The costs of in-situ conservation (in its natural habitat) of a resource are low for your country.	○	○	○	○
The costs of ex-situ conservation (for example, by a gene bank) of a resource are low for your country.	○	○	○	○
Granting access to a plant genetic resource creates a high level of monetary benefit sharing possibilities.	○	○	○	○
In return for granting access your country receives access to improved/new varieties to a plant genetic resource.	○	○	○	○
By granting access, technologies will be transferred to your country (for example, laboratory equipment).	○	○	○	○
In connection with granting access, projects will be established in your country that serve to maintain biodiversity and the sustainable use of a plant genetic resource.	○	○	○	○
Please list additional components if they are not currently present (see question B-1).				
Other components, such as:				
	○	○	○	○
	○	○	○	○

After you have evaluated several components of the ABS system, we would like you to provide an overall assessment.

Question C-1:	**Which ABS system do you prefer as a provider, in order to grant users <u>access to varieties of xxxxxx</u> for commercial use in the area of agriculture and/or nutrition?**
○	**the Multilateral System of the International Treaty on Plant Genetic Resources for Food and Agriculture (MLS)**
○	**the bilateral ABS system of the Convention on Biological Diversity (CBD)**

Question C-2:	**Independent from the given resource: Which ABS system do you prefer as a provider, in order to grant users <u>access to plant genetic resources</u> in general?**
○	**the Multilateral System of the International Treaty on Plant Genetic Resources for Food and Agriculture (MLS)**
○	**the bilateral ABS system of the Convention on Biological Diversity (CBD)**
○	**depends on the characteristics of the genetic resource**

In the case that the reasons for this preference have not yet been named in this questionnaire, please list the reasons why you prefer one system over the other.

Thank you for your participation!

Please indicate if you want us to apply any anonymization mechanism:

☐ Please do not interrelate my statements and our countries name/institutional name/my name in the study report.

☐ Please do not interrelate my statements with the word "xxxxxx".

☐ Please do not refer to our country/my institution/my name in the reference list of the report.

Appendix IV: Additional Evaluations of the Online User-Survey

Table A 1: Internet links on Model MTAs and experiences reported by responsible institutions

Name & Link
SMTA of ITPGR http://www.planttreaty.org/smta_en.htm
Model contract for ABS of the Australian Government http://www.environment.gov.au/biodiversity/science/access/model-agreements/index.html
BIO Guidelines & BIO Model contract for Bioprospecting activities http://www.bio.org/ip/international/200507memo.asp
LOC & MOU (US National Cancer Institute; http://ttc.nci. nih.gov/forms/
SLA: http://www.nhlbi.nih.gov/tt/docs/sla_mta.pdf UBMTA: http://www.nhlbi.nih.gov/tt/docs/ubmta.pdf
Science commons http://mta.sciencecommons.org/
MOSAICC, Model MTA and Checklist: http://bccm.belspo.be/services/bccm_mta.php ((in the final phase of this project we got notice that the Organisation is working on an updated instrument)

Source: Authors'.

Table A2: Test Statistics Measures of Association for Transaction Cost Assessment items in combination with Field of Utilisation

	Cramer-V	Approximate significance	N
The effort level is low in comparison to other cost components of the project.	0.298	0.809	31
The effort level is acceptable in comparison to the value of the resources and related services acquired in the framework of the project.	0.293	0.786	31
Negotiations are / were tedious and difficult.	0.375	0.470	28

Source: Authors'.

Table A3: Test Statistics Measures of Association for Transaction Cost Assessment items in combination with User Companies' Indirect Capacities

both variables aggregated, each 5 categories	Kendall-Tau-b	Approximate significance	N
The effort level is acceptable in comparison to the value of the resources and related services acquired in the framework			
…high capacity to execute long-term, complex projects.	0.1	0.426	29

…experience in the past of executing complex long-term projects.	0.1	0.574	29
… experienced in projects with partners from developing or newly industrializing countries	-0.1	0.547	28
Negotiations are / were tedious and difficult.			
…high capacity to execute long-term, complex projects.	-0.09	0.535	26
…experience in the past of executing complex long-term projects.	-0.03	0.819	27
… experienced in projects with partners from developing or newly industrializing countries	0.1	0.327	27

Source: Authors'.

Table A4: Test Statistics Measures of Association for Transaction Cost Assessment item in combination with Primary Uncertainty item

The effort level is low in comparison to other cost components of the project *	Kendall-Tau-b	Approximate significance	N
The genetic resources from the project will be used for research and development of products for new / uncertain markets	0.4	0.000	31

Source: Authors'.

Table A5: Test Statistics Measures of Association for Primary Uncertainty in combination with Field of Utilisation item

Field of Utilisation of Genetic Resources in Reference Projects aggregated in seven categories (Var_Sector_aggr3) *	Cramer-V	Approximate significance	N
The utilization process for genetic resources is completely unpredictable at the beginning of the project.	0.4	0.438	39
At the beginning of the utilization process, we are not able to anticipate commercial output at all.	0.4	0.136	40
The technology in our field of use changes quickly.	0.4	0.795	37
The genetic resources from the project will be used for research and development of products for new / uncertain markets	0.3	0.904	37

Source: Authors'.

Table A6: Crosstabulation and Test Statistics Measures of Association for Provider type in combination with Transaction Costs Assessment item

National, regional and, or local governmental administration entity versus Other provider types *
Negotiations are / were tedious and difficult

Measure of Association: Kendall-Tau- c: 0.4	**Approximate significance: 0.031**

Source: Authors'.

Table A7: Crosstabulation and Test Statistics Association Measure for Provider Contribution item in combination with Utilisation Field

Field of Utilisation of Genetic Resources in the Reference Projects aggregated in five categories (Var_sector_aggr4)	Provider executes preparation of the material		
	no	yes	all
Pharmacy; Pharmacy and Botanical Medicine	3	3	6
Botanical medicine, Care and Cosmetics; Botanical Medicine and Care and Cosmetics	0	3	3
Plant Breeders (Seed, Horticulture, and both)	22	5	27
Biotech others than Pharmacy and Plant Breeding	5	0	5
Biocontrol agents	1	1	2
Measure of Association: Cramer-V: 0.6	**Approximate Significance: 0.012**		

Source: Authors'.

Table A8: Frequency table: Type of Contract chosen to govern the project

	Frequency
The contract is largely negotiated and close to a final version before the start of the project	17
Tiered contract that is further developed, modified, or replaced during the course of the project	17

Source: Authors'.

Table A9: Frequency Table Stipulation of Conflict Resolution Measures in Contracts governing transactions with Genetic Resources

	Yes	No	All	Affirmation in % of valid entries
Exact description of the mutual activities (for example, schedule, delivery quantities, prices, height of compensation) in contract	18	20	38	47%
Judicial authority	7	31	38	18%
Arbitration with assistance of independent third party	12	26	38	32%
Internal conflict resolution mechanism, harmonization of interests	17	21	38	45%

Source: Authors'.

Table A10: Crosstabulation: Association between two items of Conflict Resolution

		Arbitration with third party assistance	
Exact description of the mutual activities in the contract		No	Yes
	No	11	9
	Yes	15	3

Source: Authors'.

Table A11: Test Statistics Measures of Association for Conflict Resolution Measures with Conflict Resolution Measures

	Exact description ...	Judicial authority	Arbitration	Internal conflict resolution...
Exact description of the mutual activities (for example, schedule, delivery quantities, prices, height of compensation) in contract	XX	Approx. Sig: 0.16	Approx. Sig: 0.06 Cramer V: 0.3	Approx. Sig: 0.97
Judicial authority		XX	Approx. Sig: 0.85	Approx. Sig: 0.91
Arbitration with the assistance of an independent third party			XX	X
Internal conflict resolution mechanisms & harmonization of interests				XX

Source: Authors'.

Table A12: Crosstabulation and Test Statistics for combinations of Monetary benefit sharing Measures with Provider Contribution Items

N: 38		Preparation of the material		
		No	Yes	All
Weight-related, or hourly-wage compensation	No	25	5	27
	Yes	2	6	11
	All	30	8	38
Phi-coefficient: 0.5	**Approximate significance level: 0.001**			
		Standard transactions of genetic resources		
		No	Yes	All
Payments tied to commercial output (e.g. royalties)	No	7	21	28
	Yes	7	3	10

	All	14	24	38
Phi-coefficient: -0.4	**Approximate significance level: 0.01**			
		Collection permission		
		No	Yes	All
Negotiated advance payments (lump sum)	No	22	8	24
	Yes	2	6	14
	All	30	8	38
Phi-coefficient: 0.4	**Approximate significance level: 0.01**			
		Evaluation of samples		
		No	Yes	All
Negotiated advance payments (lump sum)	No	23	7	26
	Yes	3	5	12
	All	30	8	38
Phi-coefficient: 0.3	**Approximate significance level: 0.03**			
		The provider grants some kind of exclusivity rights in connection with genetic resources		
		No	Yes	All
Negotiated, result based benefit-sharing payments (milestone payments, and / or Payments tied to commercial output (e.g. royalties)	No	22	1	23
	Yes	7	8	15
	All	29	9	38
Phi-coefficient: 0.6	**Approximate significance level: 0.001**			

Source: Authors'.

Table A13: Crosstabulation and Test Statistics for combinations Arbitration with third party assistance with User Companies' Investments in the Provider Country

		Investments in the Provider country		
		No	Yes	All
Arbitration with the assistance of an independent third party	No	17	9	26
	Yes	3	8	11
	All	20	17	
Phi coefficient: -0.4	Approximate significance level: 0.03			N: 37

Source: Authors'.

Table A14: Test Statistics Measures of Association for Assessment of Demand Aspects for Genetic Resources in combination with User Companies Sectors affiliation

Sector affiliation aggregated in five categories (sector_aggr5) * For some projects in our company was or is...	Cramer-V	Significance [a]
... access to undiscovered genetic resources as a potential source of innovative products very important.	0.32	.47
... access to properties of wild species of certain plants or animals very important.	0.33	.44
... it very important to be able to study genetic resources in the context of their natural habitat.	0.4	.05
... traditional knowledge about effectiveness of natural resources very important	0.43	.01
... exclusive access or exclusive usage rights for genetic resources very important.	0.41	.04
... it very important that the provider could deliver the genetic resource(s) as raw material on an intermediate or long-term basis in larger quantities.	0.43	.03
[a] **Based on 10000 sampled tables with starting seed 2000000.**		

Source: Authors'.

Table A 15: Results for Combined Evaluation of Explanatory Variables and Governance Elements

Contract type	**Frequency of economic interaction**
	Uncertainty of commercial output
Contract duration	**Strategic factors** - Providers will be better positioned to provide the desired activity - Capacity building increases trust and facilitates communication
Monetary benefit sharing	
Weight-related, or hourly-wage compensation	**Provider contribution: Preparation of material**
	Uncertainty: Demand uncertainty
Negotiated advance payments (lump sum)	**Provider contribution:** - Collection permission - Evaluation of material
Negotiated payments that are made after reaching certain steps in the usage process	**Provider contribution:** Exclusivity rights
Payments tied to commercial output (e.g. royalties)	**Provider contribution:** Exclusivity rights
	Provider contribution: Only access to previously inventoried GRs
Output-related payments, that are negotiated over the course of the project, for example, when certain operational steps are reached	no significant association
Non monetary benefit sharing	
Joint IPRs to usage results	**Asset Specificity**
Joint publication in scientific journals	**Provider contribution:** Contribution to advanced research
	Asset Specificity
Support of inventory / taxonomy of Biodiversity	**Provider contribution:** Collection activities
	Frequency

Table A 15 continued

Technology transfer	**Provider contribution:** - Contribution to advanced research - Exclusivity rights
	Strategic factors: - Capacity building increases trust and facilitates communication - Providers will be better positioned to provide the desired activity
	Asset Specificity
	Frequency
Transfer of know-how in the scientific field	**Provider contribution:** - Contribution to advanced research - Exclusivity rights
	Strategic factors: - Capacity building increases trust and facilitates communication - Providers will be better positioned to provide the desired activity - Capacity building safeguards long-term availability of GRs
	Asset Specificity
Support of infrastructure measures	**Asset Specificity**
Transfer of know-how in the field of sustainable use / cultivation of genetic resources	**Provider contribution:** Only access to previously inventoried GRs
	Strategic factors: Capacity building safeguards long-term availability of GRs
	Asset Specificity
Measures for biodiversity conservation	no significant association

Table A 15 continued	
Conflict resolution	
Exact description of the mutual activities (for example, schedule, delivery quantities, prices, height of compensation payments) in the contract	no significant association
Judicial authority	**Provider contribution:** - Collection activities - Only access to previously inventoried GRs
	Asset Specificity
	Uncertainty: resulting from technological change
Arbitration with the assistance of an independent third party	**Provider contribution:** Contribution to advanced research
	Asset Specificity
	Uncertainty: resulting from technological change
Internal conflict resolution mechanism, interest harmonisation	**Uncertainty:** - Demand uncertainty - Unpredictability of commercial output at the beginning of the utilisation process - Uncertainty resulting from technological change
	Strategic factors: - Providers will be better positioned to provide the desired activity - Capacity building increases trust and facilitates communication - Capacity building safeguards long-term availability of GRs - Capacity building is the prerequisite that scientific cooperation is possible

Source: Authors'.

Table A16: Test statistics Association Measure for Governance Elements in combination with Field of Utilisation indicated in reference projects

Field of Utilisation of Genetic Resources aggregated in 5 categories (variable: Sector_aggr_4) *	Cramer-V	Approximate significance	N
Type of relation between user and provider	0.4	0.3	34
Type of contract	0.4	0.2	34
Contract duration	0.4	0.9	39
Monetary benefit sharing * Utilisation field in 7 categories (variable: Sector_aggr_3)			
No, the provider does not receive any monetary benefits	0.5	0.1	38
Weight-related, or hourly-wage compensation	0.3	0.9	38
Negotiated advance payments (lump sum)	0.4	0.6	38
Negotiated payments that are made after reaching certain steps in the usage process (milestone payments)	0.3	0.8	38
Payments tied to commercial output (e.g. royalties)	0.5	0.08	38
Output-related payments, that are negotiated over the course of the project, for ...	0.6	0.05	38
The contract contains clauses for ex post negotiation of compensation in the case that the	0.5	0.3	38
Non-monetary benefit sharing * Utilisation field in 7 categories (variable: Sector_aggr_3)			38
No non-monetary benefit sharing measures are carried out in the framework of the project	0.4	0.3	38
Yes, joint intellectual property rights to usage results	0.4	0.3	38
Yes, joint publication in scientific journals	0.4	0.3	38
Yes, support of inventory / taxonomy of Biodiversity	0.5	0.1	38
Yes, technology transfer	0.5	0.08	38
Yes, transfer of know-how in the scientific field	0.4	0.3	38
Yes, support of infrastructure measures	0.5	0.2	38
Yes, transfer of know-how in the field of sustainable use / cultivation of genetic resources	0.3	0.9	38
Yes, support of other measures to preserve biodiversity	0.6	0.06	38

Conflict resolution mechanisms * Utilisation field in 7 categories (variable: Sector_aggr_3)			38
Exact description of the mutual activities (for example, schedule,	0.6	0.022	38
Judicial Authority	0.4	0.3	38
Arbitration with the assistance of an independent third party	0.4	0.3	38
Internal conflict resolution mechanism, harmonization of interests	0.5	0.3	38

Source: Authors'

Table A 17: Detailed Interrelation of Explanatory Variables with Governance Elements

Explanatory variables	**Association**	
Governance variable: Contract type		
Primary uncertainty of R&D with genetic resources		
Uncertainty resulting from technological change	-	Tired contract approach
Economic interaction takes place frequently over a longer period of time	+	Tired contract approach
Governance variable: Contract duration		
Strategic factors of capacity building		
Providers will be better positioned to provide the desired activity	+	Longer timeframes for contract duration
Capacity building increases trust and facilitates communication	+	Longer timeframes for contract duration
Governance variable: Monetary benefit sharing		
Provider contribution		
Exclusivity rights	+ +	Negotiated payments that are made after reaching pertain steps in the usage process Payments tied to commercial output
Only access to previously inventoried GRs	-	Payments tied to commercial output
Evaluation of material	+	Negotiated advance payments
Preparation of material	+	Weight-related, or hourly-wage compensation
Collection permission	+	Negotiated advance payments

Table A 17 continued

Asset specificity	+	Output-related types of monetary benefit sharing
Primary uncertainty of R&D with genetic resources		
Demand and Market uncertainty	-	Weight-related, and hourly wage compensation
Uncertainty about the development of the utilization process	+	Negotiated advance payments
Governance variable: Non-monetary benefit sharing		
Provider contribution		
Contribution to advanced research	+ + +	Joint publications Technology transfer Transfer of know-how in the scientific field
Collection permission	+	Support inventory and taxonomy of Biodiversity
Exclusivity rights	+ +	Technology transfer Transfer of know-how in the scientific field
Only access to previously inventoried GRs	-	Transfer of know-how in the field of sustainable use / cultivation of GRs
Strategic factors of capacity building		
Providers will be better positioned to provide the desired activity	+ +	Transfer of know-how in the scientific field Technology transfer
Capacity building increases trust and facilitates communication	+	Transfer of know-how in the scientific field Technology transfer
Capacity building safeguards long-term availability of GRs	+ +	Transfer of know-how in the scientific field Know-how transfer in the field of sustainable use and/or cultivation of GRs
Relation specific investments	+	Joint publications

	+	Joint ownership of IPRs to usage results
	+	Technology transfer
	+	Transfer of know-how in the scientific field
	+	Infrastructure measures
	+	Transfer of know-how for sustainable use / cultivation of GRs
Economic interaction takes place frequently over a longer period of time	+	Support of inventory and/or taxonomy of biodiversity
	+	Technology transfer
Governance variable: Conflict resolution		
Strategic factors of capacity building		
Providers will be better positioned to provide the desired activity	+	Internal conflict resolution and measures for harmonization of interests.
Capacity building increases trust and facilitates communication	+	
Capacity building safeguards long-term availability of GRs	+	
Capacity building is the prerequisite that scientific cooperation is possible	+	
Provider contribution		
Contribution to advanced research	+	Third party assisted arbitration
Collection activities	+	Judicial authorities
Only access to previously inventoried GRs	+	Judicial authorities
Relation specific investments	+	Third party assisted arbitration
	-	Judicial Authorities
Primary uncertainty of R&D with genetic resources *		
Demand and Market uncertainty	-	Internal conflict resolution and measures for harmonization of interests.
Uncertainty resulting from technological change	-	Internal conflict resolution and measures for harmonisation of interest
	+	Third party assisted arbitration

	+	Judicial Authority
Unpredictability of commercial output at the beginning of the utilization process	-	Internal conflict resolution and measures for harmonisation of interest
Economic interaction takes place frequently over a longer period of time	+	Internal conflict resolution and measures for harmonisation of interest

Source: Authors'.