Sustainable Utilization of Crop Genetic Diversity through Property Rights Mechanisms?

The Case of Coffee Genetic Resources in Ethiopia

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April 2002

The Economics of Incentive Mechanisms for Biodiversity Conservation:

Property Rights

BioEcon Workshop

May 30 – May 31, 2002

Abstract

The new legally binding "International Treaty on Plant Genetic Resources for Food and Agriculture" (ITPGR) provides a framework to ensure access to crop genetic resources and to related knowledge, technologies, and internationally agreed funding. However, this treaty applies only for a list of selected crops. Other crops, as for instance coffee, are not included. Besides other issues, the question arises how to design the access and benefit sharing for those crop genetic resources, which are not listed in Annex I of the treaty. The paper contributes to this debate, by discussing possibilities of access and benefit sharing and the underlying perceptions of property rights systems outside of the ITPGR. The endangered unique wild coffee populations of *Coffea arabica* in Ethiopia are examined as an example, in which an access and benefit sharing agreement has to be institutionalized and the underlying property rights have to be enforced and protected to prevent the tragedy of loosing the unique coffee genetic resources. The paper analysis how bilateral access and benefit sharing agreements and their underlying property rights contribute to the conservation of crop genetic resources outside of ITPGR. The case of Ethiopia and its wild coffee populations in the montane rain forests will be taken as example.

The settlement and land use pressure on the montane rain forest of Ethiopia threatens the still existing wild populations of *Coffea arabica*. The increasing threat indicates that at national and at farm level the existing incentives are not sufficient enough to maintain the montane rain forest habitats and thus the coffee wild populations. Conservation and sustainable utilization of Ethiopia's wild coffee populations will only be feasible if long-term benefit sharing will take place and envisages an amount, which is larger than the costs arising through the conservation activities. According to principal economic theory, bilateral access and benefit sharing agreements are a promising instrument to provide sufficient incentives to maintain crop genetic resources outside of the ITPGR. However, reciprocal moral hazard symptoms seem to hinder the signing of bilateral agreements. The analysis of the contracting partners' interests gives a hint that moral hazard can be overcome. In spite of the identified mutual interests, it is crucial that the country providing the genetic resources has to enforce adequate policies to enable the genetic resources management. Only if the Ethiopian government enforces property rights, secures the sharing of benefits, empowers – in cooperation with a strong (non-governmental) organization - the local communities to conserve and sustainable utilize wild coffee populations as well as distributes the funds derived from the bilateral benefit sharing agreement, the genetic resources of the wild coffee populations can be protected.

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1. Introduction and Research Issue

In November 2001, the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR) was approved by the Conference of the UN Food and Agriculture Organisation (FAO), ensuring conservation and better use of crop genetic diversity by taking into consideration the particular needs of farmers and plant breeders, as well as the fair and equitable sharing of the benefits (FAO, 2001). The new legally binding international agreement, which is the follow-up of the International Undertaking and is in harmony with the Convention on Biological Diversity (CBD), provides a framework to ensure access to crop genetic resources and to related knowledge, technologies, and internationally agreed funding. It also provides the agricultural sector with a multilateral tool to promote cooperation and synergy with other sectors, particularly with trade and the environment. However, the multilateral system of the ITPGR shall cover only those plant genetic resources for food and agriculture (PGRFA), which are listed in Annex I of the treaty, being under the management and control of the contracting parties and in the public domain. This Annex was discussed and worked out according to criteria of food security and interdependency and as a compromise between the negotiating partners, based on skepticism regarding the effectivity of the treaty. According to Article 28 of the treaty, it "… *shall enter into force on the ninetieth day after the deposit of the fortieth instrument of ratification, acceptance, approval or accession, provided that at least twenty instruments of ratification, acceptance, approval or accession have been deposited by Members of FAO …*" (FAO, 2001). Besides the question how to deal with countries and companies, which are not

contracting parties of this treaty, one other fundamental issue still remains to further discussions: how to deal with other crop genetic resources, which are not listed in Annex I of the treaty.

This paper wants to contribute to the debate, by discussing possibilities of access and benefit sharing (ABS) and the underlying perceptions of property rights systems outside of the ITPGR. The endangered unique wild coffee populations of *Coffea arabica* in Ethiopia are examined as an example of an urgent case, in which ABS has to be institutionalized and the underlying property rights have to be enforced and protected to prevent the tragedy of loosing these unique coffee genetic resources (CGR). Because coffee is not one of the crop species under the multilateral system of the ITPGR with its suggested international financing, all countries and breeders interested in access and utilization of coffee genetic resources from Ethiopia have to sign a contract with the government of Ethiopia on access and benefit sharing. That is why the institutional structuring of the regulations for access and benefit sharing and their welfare impact on Ethiopia will be decisive as an incentive mechanism for the conservation of coffee genetic resources. However, the conservation of CGR in Ethiopia will only be secured, if the ABS-system has an impact at local level, where CGR are physically threatened and consequently where CGR have to be protected in concrete steps. Hence, the fundamental question that has to be raised, is: Can bilateral access and benefit sharing agreements and their underlying property rights contribute to the conservation of crop genetic resources outside of ITPGR? In the paper this question will be discussed and the case of Ethiopia and its wild coffee populations in the montane rain forests will be taken as example.

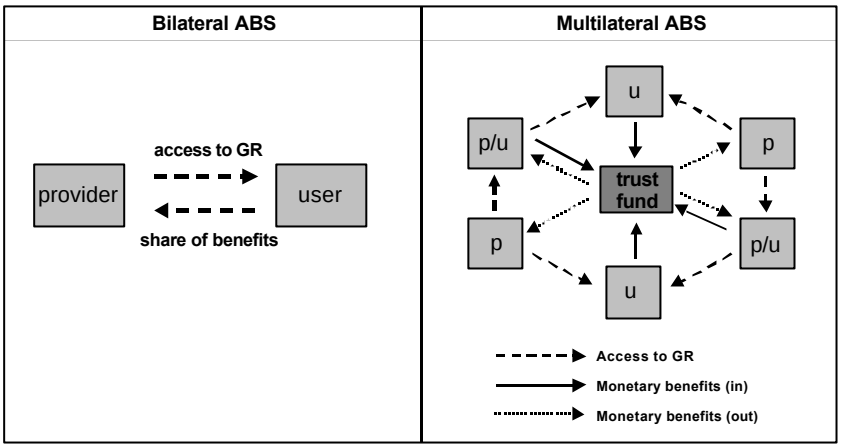
2. Market Failure, the Loss of Biodiversity and Property Rights

2.1. Genetic Resources and the Property Rights Theory

Before the CBD existed biodiversity was regarded as a "common heritage" and consequently as an open access resource. The adoption of the two international agreements (CBD and ITPGR), assigning the sovereignty over genetic resources and thus property rights to the states, is the attempt to internalize the existing global positive externalities, with which the locally produced goods "genetic resources" are characterized (Barbier, 2000). As long as the private costs of exploiting species and converting habitats do not include the opportunity costs of foregone global biodiversity benefits, an insufficient amount of biodiversity is realized, resulting in a market failure and a social welfare loss. With assigning property rights and hence internalizing the externalities, the existing market failure is to be removed. The CBD regulates the exchange of genetic resources in general and the benefit sharing in a bilateral way by private contracts between providers and users under specific conditions. Whereas the ITPGR specifies a multilateral approach for selected plant genetic resources in the area of agrobiodiversity and warrants free access to the resources and realizes the benefit sharing by a global fund (see Figure 1).

The bilateral access and benefit sharing approach describes an exchange between the provider and the user of genetic resources. The provider supplies access to genetic resources and the user compensates him by sharing the benefits, which arise out of the commercialization of genetic resources. The multilateral approach as stipulated by the ITPGR works in a different way. As in a bilateral contract the providers supply access to genetic resources, but in this case, the users do not pay the monetary benefits to the providers directly. Instead, according to Article 13.3 of the treaty, the benefits "*arising from the use of PGRFA that are shared under the Multilateral System should flow primarily, directly and indirectly, to farmers in all countries, especially in developing countries, and countries with economies in transition, who conserve and sustainable utilize plant genetic resources for food and agriculture*" (FAO, 2001).

Figure 1: Bilateral and Multilateral International Approaches for Biodiversity Protection

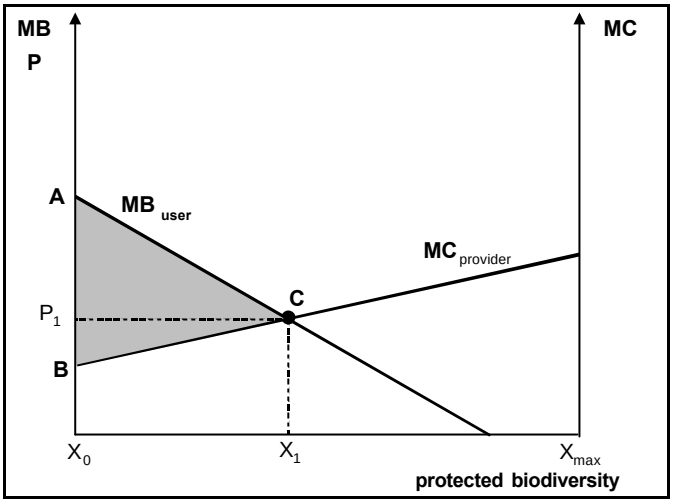


According to DEMSETZ the main function of property rights is the internalization of beneficial and harmful effects. Therefore incentives to establish property rights arise when the benefits or the costs resulting from emerged property rights have changed (Demsetz, 1967). The demand for and the utilization of genetic resources has increased as a result of the technical progress in biotechnology. Consequently, the benefits of genetic resources utilization have risen as well. However, for further progress in technical development intellectual property rights (IPR) (e.g., patents, copy right protection) are very essential. This relationship has been empirically proved by an increasing number of patent applications related to genetic resources (Lerch, 1996). Furthermore the transaction costs for the assignment and enforcement decrease by the establishment of property rights institutions, as for instance patents (Sedjo and Simpson, 1995). Therefore the adoption of the agreements can be interpreted as a reaction to the change of the cost-benefit-relation according to the establishment of property rights.

Within the property rights theory bargaining solutions are regarded as an internalized strategy for externalities. According to Coase a bargaining solution among different users of genetic resources will result in a pareto-optimal allocation of the resources, if property rights are defined and transferable, if there are no transaction costs and if all users hold the same information (Coase, 1960). The resulting allocation is independent of the initial distribution of property titles. Abstracting from some restrictions (which will be discussed later on), bilateral bioprospecting contracts as suggested by the CBD can be interpreted as "Coase solutions" (Lerch, 1996). The bargaining between the provider and the user of genetic resources can end in a pareto-optimal allocation (X_1 in Figure 2) when the user's marginal benefits (MB) equal the provider's marginal costs (MB) for biodiversity protection. The outcome of such a negotiation is a social surplus (ABC), which can be shared between the participating parties.

Bioprospecting is being understood as a specific search for commercially usable plant genetic material and is based on the state's sovereignty and sustainable development concept of the CBD. Accordingly the competence for regulating access and benefit sharing is assigned to the national governments, harboring the genetic material. Bioprospecting should be usually based on a contract between the provider and the user of plant genetic resources about the exchange of access to the genetic material for technology. Besides, there are also other types of benefits possible such as monetary and non-monetary approaches by which the provider of genetic material can receive other kinds of compensation. In analogy, the benefits of the users are not only restricted to the access to genetic resources as illustrated in Table 1.

Figure 2: Bilateral Agreements as Coase Solution



Source: adapted from Lerch, 1996

Table 1: Types of Costs and Benefits Arising out of ABS

providers' benefits – users' costs	users' benefits – providers' costs
non-monetary	**direct**
• technology transfer • free access to technology and products • co-ownership of IPR • acknowledgement in publication • joint research and increased scientific capacity • participation in planning and decision-making (incl. research results) • control of samples • voucher specimens deposited in national institution • increased conservation capacity	• biodiversity conservation • access to genetic resources • legal security • non-exclusive or exclusive user rights
monetary	**indirect**
• bioprospecting fees • per-sample fees • percentage of research budget • royalties as percentage of net sales or net profits • development of alternative income generating schemes • commitment to reinvest in source country • specific funds	• new inputs for research and development of products and processes • increased profits by new products and processes, protected by IPR • technical progress • increase in information and knowledge • publications

Source: based on Columbia University, 1999, Bonn Guidelines, 2001

All in all, bilateral contracts on bioprospecting seem to be a perfect solution because externalities are internalized, a social welfare benefit accrues and - as by-product - biodiversity conservation is realized. Nevertheless, some restrictions need to be considered. From an economic point of view, information asymmetry and the relevance of transaction costs, imperfect competition as well as the uncertainty about the global and intergenerational value of genetic resources are important reasons hindering the achievement of agreements. The value of any utilized PGRFA can seldom be determined a priori but only observed a posteriori, i.e., as a result of their development into a marketable product and its success on the market. Hence, the internalization of benefits as payment up front (a priori) will seldom reflect the true use value of specific

PGRFAs. The internalization of benefits as royalties (a posteriori) is for countries of origin the most appropriate solution. For individuals, however, royalties are seldom real incentives due to the intergenerative structure of benefits (von Braun and Virchow, 1997).

In addition, differences in the bargaining positions and difficulties in determining the conservation costs and access benefits are reasons for the failure of signing bilateral access and benefit sharing contracts (Lerch, 1996). Furthermore, the missing exclusiveness of other providers (many identical samples can be found in different countries or in different ex situ collections in more than 130 countries) enables the access to genetic resources even without the access to the country of origin.

All these issues and reasons are preventing the optimal production of "biodiversity conservation" through benefit sharing. It is obvious that especially in the case of agrobiodiversity, the potential transaction costs of establishing bilateral agreements seem to be too high so that in general a multilateral approach turns out to be the most beneficial way. However, due to the restricted list of crops included in the international treaty bilateral agreements are still necessary for the protection of agrobiodiversity. In addition, the ITPGR has yet to prove its effectiveness in conserving PGRFA and foremost, countries and companies have to join the treaty. So, bilateral agreements for the crops not listed in the treaty may show an alternative way of handling benefit sharing in agrobiodiversity. After all, the competition between the multilateral agreement on the one hand and crop specific as well as country specific agreements on the other hand may prove for which crop and which situation which agreement will be more effective. The question remains, therefore, how a bilateral agreement should be conceptualized for PGRFA trade and what kind of national and local institutional framework has to be put into place to profit from the shared benefits.

2.2. Relationship between Biodiversity and Intellectual Property Rights

2.2.1. The Economics of Intellectual Property Rights

Within bilateral agreements the exclusiveness of IPR for products derived from the collected samples of genetic resources plays a major role. This exclusion is the prerequisite and incentive for a potential user of genetic resources to conclude a bilateral access and benefit sharing agreement. Based on the assumption that access and benefit sharing agreements have a positive impact on the conservation of biodiversity IPR play a major role in this context: on the one hand they mitigate the risk of investment for the potential user of genetic resources and on the other hand they allocate an economic value to genetic resources. Intellectual property is based on knowledge, which can also be characterized by the two criteria of public goods: non-rivalry and non-exclusivity. Private investments in knowledge do not pay-off, when the new knowledge becomes public and has no restrictions for its access after it has been developed. The consequence is the dilemma of public goods, a non-optimal supply of knowledge and a decrease in research and technical progress (Maskus, 2000). The imitation of knowledge-intensive products is an obvious example. The research and development of such products take a long time and require large investments, whereas the imitation has very low costs. To obviate a sub-optimal supply of knowledge IPR have been established to provide incentives for research and the realization of technical progress.[3] IPR impart the holder exclusive disposals for a limited period, but they are combined with the liability for publication. An increase in research and development activities in the area of plant breeding and biotechnology create new possibilities

[3] Considering the imbalance of the distribution of intellectual property rights globally it can be expected that the described effects mainly occur in industrialized countries.

for using and commercializing genetic resources. A successful commercialization raises the value for the biological material and gives incentives for both the conservation and sustainable use of biodiversity if a fair and equitable sharing of the benefits arising of the utilization of genetic resources is applicable.

Nevertheless the negative welfare and environmental effects of patents and resultant license fees should not be underestimated. The assignment of IPR as patents grants the recipient a temporary supply monopoly, so that he can realize a monopoly profit by the selling of his products. In comparison to the situation of perfect competition the price of such a product is higher and the supplied amount is less, resulting in welfare losses. Patent and license fees do, however, not only charge the farmers. It has to be taken into account that the countries, not having any protection system for IPR, have to invest not only financial resources to establish such a system. Consequently these resources are detracted from the development potential of a country (Hilpert, 1998).

Eventually, it is important for biodiversity policy to consider both the positive and negative effects of the establishment of property rights systems and try to overcome the conflict between them by finding an adequate degree for the protection of these rights.

2.2.2. The International Intellectual Property Rights Protection

With establishing the World Trade Organization (WTO) and adopting the agreement on trade-related intellectual property rights (TRIPs Agreement) in 1995 the competence for the regulation of IPR has been transferred from the national to the international level. The TRIPs agreement co-ordinates and integrates already existing provisions on the protection of IPR and adjusts and restructures applicable measures to the demands of an ever increasing interdependency in the field of international trade (Senti and Conlan, 1998). The agreement's objectives are to contribute to the protection and enforcement of IPR, to the promotion of technical innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technical knowledge as well as to social and economic welfare and to a balance of rights and obligations (TRIPs Art.7).

Patents are regarded as the political and economic most significant part of the TRIPs agreement and are regulated very explicitly (Pacon, 1995). Excluded from patent protection may be plants and animals other than microorganisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes (TRIPs Art. 27.2). Members shall provide protection of plant varieties either by patents or by an effective *sui generis* system or by any combination thereof (TRIPs Art. 27.3b). It is assumed that many countries not having any intellectual property protection for plant varieties will implement protection rights by adopting the agreement of the International Union for the Protection of New Varieties of Plants (UPOV) or by developing rules following the UPOV regulations (Seiler, 1997). Two different versions from 1978 and 1991 exist, including "Breeders' Exemption". These rights permit the unrestricted use of protected varieties for research and breeding. The UPOV convention also enables countries to make a further exception from the plant protection rights regarding the seed production and its reuse on the same farm. This "Farmers' Privilege" was implicit under UPOV '78, it must be specifically defined in national legislation under UPOV '91. However, the plant protection right does not apply to subsistence farmers or amateur gardeners in UPOV '91 (UPOV, 1995; UPOV, 1992). UPOV does not regulate the enforcement of "Farmers' Rights", which was discussed in the process of the negotiations of the ITPGR. The responsibility for realizing Farmers' Rights, recognizing "*the ... contribution that the local and indigenous communities and farmers of all regions of the world, particularly those in the centers of origin and crop diversity, have made and will continue to make for the conservation and development of plant genetic resources which constitute the basis of food and agriculture production throughout the world*" (FAO, 2001: Art. 9.1) rests with national governments (FAO, 2001). The

application for variety rights through UPOV is more simple and at a lower cost than the one for patents. More details about UPOV 1978, 1991 and TRIPs are listed in Table 2.

Table 2: Main Provisions of Plant Breeder Rights under UPOV 1978, 1991 and TRIPs

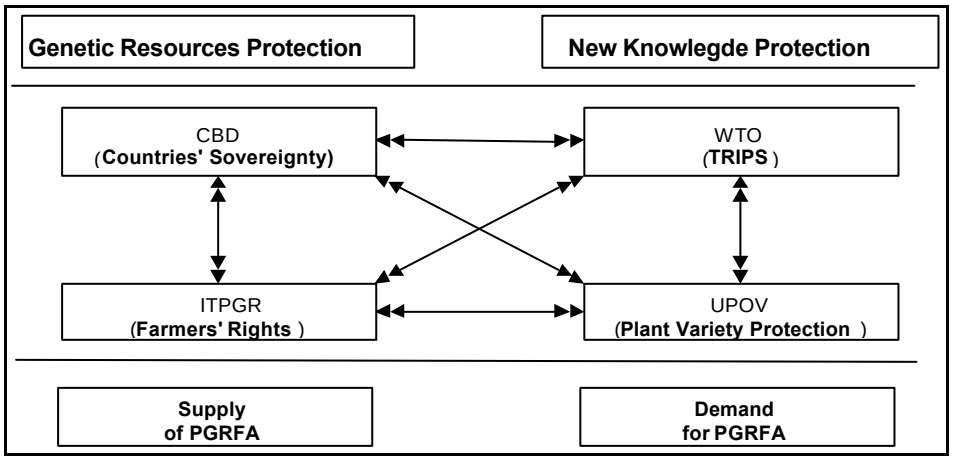
	UPOV 1978	UPOV 1991	TRIPs
Protection coverage	Plant varieties of nationally defined species	Plant varieties of all genera and species	Inventions
Requirements	Novelty Distinctness Uniformity Stability Variety denomination	Novelty Distinctness Uniformity Stability Variety denomination	Novelty Inventive step Industrial application Enabling disclosure
Protection term	Min 15 years	Min 20 years	20 years
Protection scope	Minimum scope - commercial marketing - offering for sale - marketing of propagating material	Minimum scope - producing, conditioning - offering for sale - export, import	Product/ process - making - offering for sale - using - import
Breeders' exemption	Yes, but restrictions for hybrids	Yes, but restrictions for hybrids and derived varieties	No
Farmers' privilege	Yes	Up to national law	No
Prohibition of double protection	Yes	No	Up to national law

Source: adopted from Dutfield, 2000

2.2.3. International Agreements on Intellectual Property Rights Protection and their Coherence

TRIPs and UPOV generally support the demand side for genetic resources, whereas CBD and the newly adopted ITPGR advocate the suppliers of genetic resources in their objective of benefit sharing. Because of differences in the alignment, the lack in coherence between the different agreements has emerged, complicating the development and adoption of an effective ABS system for PGRFA (see Figure 3).

Figure 3: Emerging Conflicts between International Agreements



Source: based on Virchow, 1999

UPOV '91 is taking a strong position in the breeders' exemption, while weakening the farmers' privilege. A prerequisite for future successful breeding is the free availability of plant germplasm for further research and development. This existing UPOV principle is doubly contradictory: it demands free access to PGRFA in situ and ex situ as well as the free and

unrestricted availability of protected varieties for further research and development. Consequently, UPOV's principle offends the Farmers' Rights of the ITPGR as well as CBD's country's sovereignty over genetic resources in general. On the other hand, UPOV's objective of free access to protected varieties for research and development conflicts with TRIPs' patent system.

Another potential conflict arises between UPOV and TRIPs for countries, which are members in both institutions. A double protection for different varieties of one crop species may occur due to different protection systems for different varieties of one crop, conflicting the breeder and farmer with respect to why the breeders' exemption and farmers' privilege exist for one variety but not for the other[4].

The TRIPs agreement sets minimum standards for the crop plant protection for all member countries of the World Trade Organization. Under TRIPs, every member country must evolve a protection system, which, however, can be adjusted to a specific situation in a specific country. In contrast to UPOV, TRIPs is not an institution solely aimed at the breeders and representing their interests of protecting newly bred varieties. Hence, the sui generis legislation is the protection system, which might incorporate the compensation idea from the concept of Farmers' Rights and enabling the partially realization of benefit sharing (Leskien and Flitner, 1997). For instance, India is developing a sui generis system, aiming to incorporate the concept of Farmers' Rights into the system by defining the right for compensation for past contributions to conservation (Swaminathan, 1996).

It seems unlikely that existing plant protection can be successfully used to define and enforce rights over traditional varieties because of the high variability and segregation of landraces which point towards a fundamental difference from protected varieties under the distinct, uniform, and stable criteria of UPOV (Lesser, 1994). Additionally, patenting landraces is not possible, because a patent must meet the criteria of novelty, which is difficult to certify for these genetic resources. A more feasible way is the definition of remuneration rights, with which no exclusiveness is achieved but a compensation for contributions made by communities (Correa, 1994).

3. The Case of Coffee Genetic Resources in Ethiopia

It has been shown that although bilateral ABS agreements provide theoretically a mechanism for optimal "biodiversity production" through internalizing the existing positive externalities of the locally produced good "genetic resources", the reality of institutional frameworks hinder an optimal output. In the following Ethiopia's institutional framework is elaborated as an example for sub optimal biodiversity levels.

Valuable Coffee Genetic Resources (CGR) in Ethiopia derive from the wild Coffea arabica populations, which can be found until today in the montane rain forests of Ethiopia, which are situated in the south and south-western parts of the country (Kumilachew, 2001). Wherever accessible, coffee is harvested directly from these naturally regenerating and unmanaged wild

[4] The new concept of 'essentially derived variety' is the first attempt to solve a problem arising through technological change. Essentially derived varieties are varieties with single gene changes introduced by backcrossing or genetic transformation as defined by the 1991 UPOV Convention (Semon, 1995). The breeder's exemption is coming to its limit if modern biotechnology is utilized in plant breeding, provoking an inequality in competition. If a breeder inserts a patented gene into a protected variety, he may protect, and exploit commercially the modified variety, whereas if a breeder inserts a foreign patented gene into his own variety, he either has to pay royalties to the owner of the patent or could be prevented from exploiting the modified variety. Due to the concept of 'essentially derived variety' both breeders must seek to reach agreement with the other involved breeder.

coffee trees. This forest coffee system contributes about 6% to the total coffee production in Ethiopia (Demel, 1999). Furthermore, there are wild coffee trees in inaccessible forest areas, which are not utilized at all.

Besides this "real" in situ existence of CGR, landraces of coffee exist in the other coffee farming systems of Ethiopia, the semi-forest coffee and home garden coffee system (Tadesse and Demel, 2001). In addition to the in situ and on-farm management, coffee genetic resources have been collected and conserved ex situ in field genebanks in Ethiopia as well as in various other countries (FAO, 1998).

Realizing this unique situation that in a country of origin the genetic resources are still existing in in situ, on-farm as well as in ex situ conservation facilities, it has to be noted that this situation is threatened and – without determined commitment right now – the valuable CGR may be lost in situ as well as on-farm in a couple of years.

3.1. Coffee Genetic Resources in Threat of Extinction in the Center of Origin

The threat of extinction for the wild coffee populations is based on the fact that the remaining natural montane rain forests of Ethiopia, the habitat of the wild coffee populations, are under constant pressure due to land use conflicts in forests and forest fringes. 100 years ago, the natural forest covered more than 40% of the country's highland area. These days it has decreased to less than 3% (Gebre and Deribe, 2001). Ethiopia's forests are threatened by demand for forest products on the one hand and by the conversion of forest areas into agricultural land or settlement on the other hand. The former is determined by the demand for fuel wood (95% of the whole demand for forest products), construction poles (4%) and industrial wood (1%) (Berhanu and Million, 2001). Underlying force is the population growth and the increase in energy demand and in construction activities. Due to the fact that the demand is higher than the supply uncontrolled wood harvesting is one of the critical results. The gap between the supply and the demand is increasing significantly to the disadvantage of the remaining forest, due to only minor reforestation programs (Berhanu and Million, 2001). It seems that this gap will increase, if in future still only little attention is given to the investment in forestry (see Chapter 3.2).

The conversion into agricultural or settlement land is the second major reason for the plight of Ethiopia's rain forests and thereby threatening the extinction of the wild coffee populations. The rapid rates of clearing to open up new agricultural and settlement land is driven partly by the need for compensation of land lost through degradation, but above all because of the necessity to accommodate the rapidly increasing population and their need for new agricultural land. The concentration of population in the Ethiopian highlands is threatening the remaining forest areas. 70% of Ethiopia's population is living in the highlands, which occupy only 40% of the total area of the country (Gebre and Deribe, 2001). Besides internal population growth, migration to forest areas is generated by various external pressures as for instance, poverty, lack of employment opportunities and droughts on the northern highlands leading to governmental planned resettlement schemes in the southwest rain forests (Tadesse et al., 2001; Yonas, 2001; Reusing, 1998; Alemneh, 1990). The resettlement schemes are, however, not a sustainable answer to the famines in the northern part of Ethiopia, because it can already be predicted that the migration will carry on, continuing to threaten the destruction of the rain forests and the survival of the wild coffee resources in the montane rain forests of Ethiopia (Yonas, 2001). Beside this inter-sectoral aspect of migration, the movement of existing people within the forests, determined by unsustainable shifting cultivation or by pressures to move exerted by forestry staff or by settlement policies is another reason for the deforestation process.

In addition, the rain forest areas are attracting the interests of investors due to their high ecological potential for growing coffee and tea. Hence, forest areas are in the process of being either thinned or cleared for coffee, tea or rubber tree plantations (e.g. the Chewaka-Utto Tea

Plantation or Ethio Coffee Plantation), having a negative impact on habitats of wild coffee populations (Kumilachew, 2001; Tadesse and Demel, 2001). But also the intensification of the forest coffee production system by replacing the wild coffee trees through more productive coffee trees from nurseries leads to a further threat to the extinction of wild coffee resources (Tadesse and Demel, 2001).

According to Demel (2002), deforestation of the montane rain forest, hosting the wild coffee populations, takes place at a pace of up to 200,000 ha p.a. At present, only 2.3 million ha of montane rain forest exist, of which 0.7 million ha is slightly disturbed and 1.6 million ha highly disturbed by human activities. Based on the deforestation rate of the 1990s, it can be expected that in less than 15 years the whole montane rain forest of Ethiopia, including all wild coffee populations will have disappeared.

To sum up, Ethiopia's montane rain forests are declining at an alarming rate, and with the forest, the endemic wild coffee populations of Coffea arabica are in the risk of being extincted. While various sustainable coffee movements have emerged in the last two decades, trying to create alternative market opportunities for specific certified coffees, little attention has been paid to the conservation of wild populations of Coffea arabica. These sustainable movements have made great strides in increasing awareness of the environmental and social issues among policy makers and consumers alike; however, the coffee wild populations are threatened by extinction (Alvarez, 1999). So up to now, it still holds true what Tewolde called out a decade ago: "Arabica coffee has the bizarre distinction of being commercially one of the most important and, at the same time, in terms of genetic conservation, one of the most neglected crops in the world." (Tewolde, 1990).

3.2. Policy and Institutional Deficiencies

The existence of wild coffee populations is very strongly interlinked with the fate of the montane rain forests. With the depletion of the forests the extinction of the wild coffee populations is determined as well. Both, the Ethiopian rain forests and the wild coffee populations are threatened by the high demand for forest products and by conversion of forests mainly into agricultural land. Underlying causes for this described continuous deforestation process can be traced back to the lack of policy commitment and to the lack of institutional arrangements.

In Ethiopia, one can state a lack of political will from the government to protect and develop the forest. According to Berhanu and Million, there is neither a Federal Government policy on forest conservation nor clear forest policy in general (Berhanu and Million, 2001). It can also be stated that the Ethiopian government has shown a gross negligence in the protection and development of forest resources (Melesse, 2001). The government of Ethiopia admits that it cannot effectively conserve and develop forest resources in the country. On the contrary, the communities, the NGOs, the private sector and professional associations are called upon by the government to be actively involved in the conservation of Ethiopia's forest (Mengistu, 2001). Even worse, the government encourages "investors" to open up land for food production, tea and coffee plantations and logging without conducting an environmental impact assessment beforehand (Yonas, 2001). Furthermore, the absence of integrated land-use policies and regulations as well as the lack of legal instruments for the management of conservation areas contributes significantly to the loss of the forest resources and biodiversity as well as the expansion of agriculture into forests (Kumilachew, 2001). According to the Ethiopian constitution, land belongs to the state and citizens obtain only use rights. The absence of a land use policy in Ethiopia creates spontaneous decisions in disorganized manner on land allocations – thereby the forest is always the one to suffer (Yonas, 2001). The insecurity of tenure is even increased by frequent land redistribution enforced by the government. Without secure forestland tenure, long-term investment in forestry by farmers will be hindered (Melesse, 2001). And without legal

instruments, it is difficult to prosecute the alleged offenders and impose adequate penalties. The underinvestment in reforestation and the little efforts by the government to allocate necessary financial resources for forestry conservation indicate the marginal governmental commitment to forest and wild coffee conservation. Between 1992 and 1999, only 0.1% of all investment projects in Ethiopia were related to forestry and just 0.04% of all financial resources were allocated to forest conservation and development (Berhanu and Million, 2001).

The Forestry Conservation, Development and Utilization Proclamation No. 94/1994 is the currently effective forest related legislation. It includes the idea of benefit sharing by the local people; however, detailed rules are not existent as to how the benefit sharing is going to be implemented. The absence of implementing guidelines and poor enforcement of the law are therefore the main reasons why most of the provisions of the legislation are not enforced (Yonas, 2001). Furthermore, since 1991, the national government of Ethiopia is embarking on a decentralization of political power. The responsibilities to establish, manage and utilize forests and most of the protected areas have been passed on to Regional Governments, who struggle with low technical and management capacity to execute the new responsibilities (Leykun, 2000). However, as Yonas points out, the decentralization process was carried out so quickly that the regions were not at all prepared for the new tasks, mainly without adequate financial and human resources. In addition further decentralization of forest resource management and utilization to local communities and peasant associations is still unclear (Yonas, 2001).

Besides very limited policy commitment by the national government, the institutional insufficiencies hinder the effective conservation and sustainable utilization of forests and the wild coffee populations. An institutional set-up at federal level has been created for the implementation of the conservation and management of species and ecosystem diversity, as core elements in the environmental policy and conservation strategy of Ethiopia (EPA, 1997). It seems, however, that institutional restructuring has been carried out several times but with minor impact.

Still, there are stable and strong institutions missing and the absence of coordination among activities of sectoral institutions and long term planning is hindering a successful conservation, development and utilization of forest resources (Melesse, 2001). As long as the integration of conservation efforts with other development activities is lacking and the severe constraints in adequate facilities and financial as well as human resources exist, the loss of genetic resources cannot be brought to a halt (Kumilachew, 2001).

The institutional framework for the implementation of any conservation strategy at regional and local level is still missing. According to Tadesse and Demel, effective conservation concepts for wild coffee populations and for the montane rain forests are impeded by the lack of integrated efforts, absence of clearly defined institutional tasks and responsibilities in resource management as well as the frequent restructuring and changes of institutional mandates (Tadesse and Demel, 2001). Furthermore, the fragmentation of the institutional set up, the unclear institutional arrangements and the un-coordinated decisions by the numerous public and private forest related institutions is weakening the implementation of any forest activity (Yonas, 2001). Last but not least, as long as the local people and the local communities are not involved in conservation and utilization management and the benefit sharing thereof, all other efforts to reduce the loss rate of biodiversity are in vain (Kumilachew, 2001).

The lack of policy commitment and of institutional arrangements, identified as the major underlying causes of continuous deforestation process, are creating a vacuum of power at all levels with the consequence of no one being responsible for the extinction of Ethiopia's rain forest and wild coffee populations. For example, it is clearly known that quite a significant part of the forest is lost due to clearing and burning enabled by the lack of responsible forest organization (Gebre and Deribe, 2001). Furthermore, there are not any strict and clear guidelines

governing investment in forest areas. So investors could practically invest in anything and anywhere in the forest they wish (Kumilachew, 2001).

4. Access and Benefit Sharing Agreements for PGRFA on Bilateral Level

Under present political and institutional conditions Ethiopia's wild coffee populations will be wiped out irrevocably. Based on the assumption that a radical change in the political and institutional framework of Ethiopia will not take place in the medium term, the question arises how ABS agreements could be implemented in such a framework. It has been made clear that ABS agreements are beneficial to protect and sustainable utilize endemic genetic resources. In the following, existing bilateral ABS agreements are analyzed and the principle problems are discussed.

There exist mainly examples of bilateral agreements in access to and benefit sharing of genetic resources in the pharmaceutical area of biodiversity utilization. The most popular example for bioprospecting is the contract between the company Merck & Co., a multinational pharmaceutical products and services company and INBio, a Costa Rican non-profit, scientific institution. Having a closer look at this INBio – Merck & Co. agreement in Costa Rica, some general recommendations will be drawn, which may be a starting point to secure endemic genetic resources in Ethiopia through bilateral ABS agreements.

4.1. INBio – Merck Agreement

The Costa Rican NGO INBio was officially established 1989, three years prior to the CBD. Its main objectives are to assume responsibility for developing and executing a national biodiversity inventory, to place national collections within one institution under a single administration, to centralize biodiversity information, and to accumulate information on biodiversity in an easily understandable form for a wide variety of users and promote its use by Costa Rican society. INBio's operation is overseen by a general assembly composed of 21 members from diverse backgrounds (Columbia University, 1999). The agreement between INBio and Merck was first signed in 1991 and is renewed every two years. The benefit of such an agreement for the provider and protector of genetic resources is to create a mechanism to give a market value to genetic resources and maintain the country's biodiversity with benefits arising out of bilateral contracts. Whereas Merck is mainly interested in reliable and sustainable access to genetic material for its research and development activities.

During the first two years of the agreement Merck paid US$ 1 million to INBio up front and additional US$ 130,000 worth of laboratory equipment and material (Guevara, 1998). If the genetic resources collected and provided by INBio are commercialized by developing products or processes based on the collected samples, INBio will receive royalties on all sales. The exact royalties between Merck and INBio were not disclosed, but it is assumed to be about 1-5% (Lerch, 1996). For these payments Merck gets in return the right to examine Costa Rican plant and insect species and microorganisms; additionally, Merck will be the exclusive owner of the patents on any drugs derived from the use of these samples. Partly the money was allocated to the Costa Rican government's conservation program, partly it is used by INBio for the complete inventory of the country's biological resources (Reid et al., 1993). Table 3 summarizes the agreement in detail, as far as it is known[5].

[5] Not many details about the agreement are available, because the contract contains a confidential clause, prohibiting the partners to release any information.

Table 3: Contributions of INBio and Merck within the Agreement

INBio	Merck
• Delivery of fixed number of samples (no indication of the habitat) • Temporary exclusivity (6 months to 2 years), but INBio is not the only institution, collecting samples in Costa Rican national parks • Merck has the sole right to apply for IPR protection if products can be developed	• Payment of US$ 1 million up front • Appropriation of equipment to analyze the samples • Payment of royalties • Training of scientists from Costa Rica

Source: Lerch, 1996

Despite its status as an NGO INBio has a special relationship with the Ministry of Environment and Energy (MINEA), based on a cooperation agreement signed 1994. This agreement, regulating INBio's responsibilities in the area of bioprospecting and the utilization of the payments, is valid for five years and is renewed for the same period automatically. According to this agreement an equivalent of at least 10% of each bioprospecting venture's budget is to support the management and protection of conservation areas; and 50% of any economic and material benefit (e.g., royalties), which INBio receives by concluding bioprospecting contracts, has to be transferred to MINAE, using the money for the management and conservation of wildlands (Columbia University, 1999).

The realization of the primary goal to support biodiversity conservation through the commercial exploitation of genetic resources can only be valued if the long-term implication of a bilateral agreement is taken into consideration. According to estimations only one out of 10,000 samples can be commercialized. Besides it may take 10-20 years for a product to reach the market after discovery, documenting that bioprospecting means a high risk for investing companies (Columbia University, 1999). Against this background up-front payments are very important for institutional and scientific capacity building and being a starting point for investments in biodiversity conservation. Even if the agreement between INBio and Merck fulfills the up-front payment criteria some concerns have to be mentioned. The lack of transparency and information doesn't facilitate an evaluation of the INBio-Merck agreement. Furthermore within the agreement no measures are established to ensure the participation and compensation of all the stakeholders, especially the local and indigenous communities, as well as the enforcement of their property rights (Columbia University, 1999).

INBio has not only signed an ABS agreement with Merck. Examples of some more benefit sharing agreements signed by INBio with companies from different industries include (Guevara, 1998):

- INBio – Givaudan Roure Agreement (exploring the potential of the biodiversity fragrances and aromas for the cosmetic company Givaudan Roure);
- INBio – DIVERSA Agreement (exploring new enzymes in aquatic and terrestrial microorganisms for the biotechnological industry DIVERSA);
- INBio – INDENA SPA (obtaining anti-microbial potential compounds for use as active ingredients in cosmetics);
- INBio- British Technology Group (BTG) (investigation, characterization and production of a product with nematic activity contained in a tree from the dry Costa Rica's forest).

Besides the industrial sector, INBio has also signed agreements with academic, non-government and government sectors. According to Carolyn Crook the total revenue of INBio's bioprospecting activities is about US$ 1 million per year, however, local communities have not yet shared in the economic benefits to any great extent (Crook quoted in: Eberlee, 2000). Compared with the other

forest income activities, as for instance Costa Rica's forestry industry (generating US$ 28 million per year) and tourism (US$ 421 million), the starting bioprospecting activities are generating only a fairly small faction (Eberlee, 2000). It can be expected, however, that in the medium term some drugs may be developed from Costa Rican genetic resources. According to the World Resources Institute, even if INBio receives only 2 percent of royalties on pharmaceuticals developed from Costa Rica's biodiversity, it would take "only" 20 drugs for INBio to be able to earn more funds than Costa Rica currently obtains from coffee and bananas, which are two major export products (WRI, 1993). Furthermore, bioprospecting has increased Costa Rica's scientific, technical, and institutional capacity to identify and evaluate promising species.

4.2. The Principal Agent Problem of Bilateral Access and Benefit Sharing Agreements

A bilateral agreement for the exchange of PGRFA is negotiated between the providing country and a country or company as user. It is formalized through a contract. This contract provides a framework for determining rights and obligations, and, in particular, attributing property rights, and regulating the sharing of benefits, in the case of the discovery of products or processes with new commercial applications. Benefits to providers of germplasm generally take the form of payments, beforehand, for the right to explore, or royalty payments deriving from the use of material discovered, for a given period, or both. Contractors obtain, in exchange, the right to patent, or otherwise exclusively exploit, materials discovered. As an instrument to internalize externalities these bilateral contracts usually result – abstracting from some restrictions – in a pareto-optimal solution (see Chapter 2.1)

Asymmetric information and the relevance of transaction costs can be, however, identified as main reasons of a market failure and of a sub-optimal output. In the case of bilateral ABS contracts between a user and a provider of genetic resources exists the post-contractual principal agent problem in the form of a reciprocal moral hazard (see Figure 4). In a bilateral contract moral hazard can exist on both participating sides either with the provider or with the user of genetic resources.

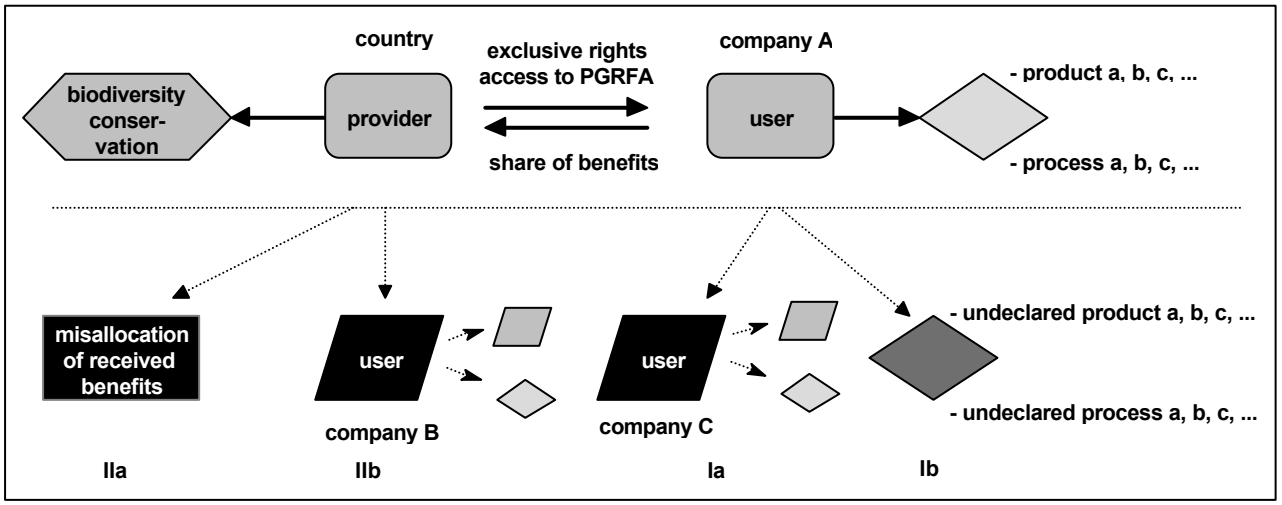


Figure 4: The Reciprocal Moral Hazard

In the first case the provider is the principal, unable to observe the actions of the user as soon as he has left the country with the collected samples of genetic resources. It is possible that at this stage the user does not meet the agreement. The user may pass on the samples to another company without the provider's consent (case Ia in Figure 4) or the user may develop products

and processes without informing the provider country (case Ib in Figure 4). Through the lack of information on the supply side potential benefits for the resource provider are lost and the provider – if aware – probably reacts with stricter access restrictions instead of facilitating access in the future.

In the second case of moral hazard the roles of the principal and the agent are reversed. The user is now the principal, incapable to observe the activities of the provider. According to the assumption and following the Bonn Guidelines (Bonn Guidelines, 2001), the benefits arising out of bilateral agreements should be allocated for biodiversity conservation measures in the provider country. This also reflects the fundamental idea of the newly adopted ITPGR. However, the responsibility for implementing Farmers' Rights (including the provision of farmers with incentives for their conservation efforts in the past, present and future) is left to the national governments, and no international mechanism or enforcement procedure is included in the treaty to back up national responsibility in this respect. It is not seldom that national short-term interests in agrobiodiverse countries are different to the objective of a long-term conservation and sustainable utilization of genetic resources. Due to these short-term interests the benefits (in terms of royalties or up-front payments) derived from the access to and the utilization of genetic resources may not be reinvested in the conservation of biodiversity but allocated to other national activities. In this case a problem of asymmetric information exists as well. The user, being the principal, is unable to control the allocation of the benefits at national level in the provider country (case IIa in Figure 4).

Besides the misallocation of received benefits, a second case of moral hazard is possible in this constellation. In general, the user is not only interested in the legal and secured access to genetic resources but also in the exclusiveness of this access. By approving an ABS agreement bioprospectors receive exclusive rights for a special region and a certain period of time. The user has, however, only limited information and control, whether the provider country provides the same samples of genetic resources to other, competing users (case IIb in Figure 4).

As a consequence of the lack of information or security (in case IIa and IIb), bioprospectors will react with a country substitution. According to the legal and institutional insecurity they search for material in countries, where the access and benefit sharing regulation is very clear and secure (including a secure exclusiveness) or they move their activities to countries, not having any access regulation at all, and where they do not have to pay benefits.

The described reciprocal moral hazard situation may hinder in theory the signing of any bilateral ABS agreement. To overcome the problem of moral hazard within ABS agreements it is necessary that in each case mechanisms are developed to generate additional reliable information for better control. This information should be generated and controlled by a third party as independent control mechanism. For instance, in the first described case of moral hazard, one possibility is an amendment of the international and national patent law as well as the plant variety protection law (TRIPs and UPOV respectively). Besides the already required criteria for patent application (novelty, inventive step, industrial applicable), the indication of the place of origin of the utilized genetic resources could be a possible criterion. This would on the one hand prevent bioprospectors from utilizing the samples in a way, which was not mutually agreed upon with the provider. This would on the other hand increase the control over the providing country not to supply other companies with the same genetic material.

Besides some specific control mechanisms, a closer look shows that mutual interests from both sides, from the supply as well as from the demand side, are the starting point to overcome the moral hazard situation. If the user fails to pay royalties, the user could well find himself denied access to genetic resources in the future, not only by the specific providing country, but by other biodiversity rich countries as well. Furthermore, many substances, once discovered, still cannot

be duplicated synthetically in the laboratory. Hence, the user would have to depend on a continued supply of these critical raw materials.

The second case of moral hazard may be overcome by a similar mutual interest of both contracting sides. Both, the provider country as well as the user are interested in an exact declaration, which genetic resources were incorporated into or used for the newly developed product or process. For the provider country the exact declaration secures the agreed upon royalties. The user's interest in exact declaration is to prove new products and processes of competing companies on the origin of the genetic resources utilized. Hence, the declaration of the origin of utilized genetic resources guarantees the provider country's royalties as well as protects the user's exclusiveness of genetic resources utilization. Furthermore, the user cannot be interested to forward genetic resources to other companies, which could produce new products or processes for less production costs (due to utilizing genetic resources without an agreement on benefit sharing payments).

Furthermore, if both, the provider and the user of genetic resources act according to the negotiated bilateral ABS agreement, a positive feedback may occur. A bilateral ABS agreement may lead to increased efforts for strong IPR protection internationally. Since the provider country counts on the revenue through the agreed upon royalties, it is interested in IPR protection of products based on their genetic resources. If private companies have such arrangements with several countries, these companies could induce IPR protection for all of their products on a much greater scale (Coughlin Jr., 1993).

The mutual interest may lead to a win-win situation, supporting bilateral ABS agreements and therewith the optimal conservation of biodiversity. It seems, however, that the crucial point of any bilateral ABS agreement is the risk that the provider country misallocates the received benefits, and threatening hereby the conservation and sustainable utilization of genetic resources. The practical conservation efforts or the concrete threat to biodiversity are taking place at local level, where the influence and sometimes interest of national decision-makers is restricted or low. Hence, the owner of genetic resources (the national government) is not always in control of maintaining and providing genetic resources, especially if no adequate laws and institutions are designed and implemented for genetic resources management. If the benefit sharing is understood – at least partially – as incentive for further conservation and secured utilization of the genetic resources, the user of genetic resources is interested in the appropriate use of the benefits, guaranteeing the conservation and further use of genetic resources. The user will suffer in the specific situation under the above described moral hazard case (IIa), however, the national policies are indicator enough for a user's decision in which country to invest. For instance, the national enforcement of property rights, the institutionalized sharing of benefits in the country and the empowerment of the local communities to manage the genetic resources are indicators for a user and the decision-making process.

The example of Ethiopia shall be discussed to show the need of restructuring national policies to secure the allocation of financial resources to the projected activities of conservation and sustainable utilization of genetic resources.

5. Can Ethiopia and Ethiopia's Wild Coffee Profit from Bilateral Access and Benefit Sharing Agreements?

It has been shown that royalties as specific percentage of net sales or net profits are the economic most efficient arrangement for benefit sharing. The implications of such an agreement seem to benefit the country maintaining and providing genetic resources as well as the contracting country or company using these genetic resources. The Costa Rican example shows clearly that although the property rights for the genetic resources are in the hands of the country, the primarily responsibility for their conservation and management lies in the hand of an NGO. This

NGO is firmly linked to the government on the one hand and to private companies interested in the genetic resources on the other hand. In this way, a flexible and responsible organization can manage the resources and even a weak public sector, as it is the case in Ethiopia, can benefit from its activities by receiving a specific amount of the annual revenues. And as a spin-off, the endemic genetic resources can be maintained.

However, as efficient as this bilateral ABS system may be, individuals and local communities do not experience any incentive through agreements based solely on royalties due to the time lack between access to the genetic resources and the time of developing and commercializing marketable products, which may take 10 or 20 years. Hence, the country and the contracting company (or country) must reallocate financial resources for conservation up front in order to bridge the time gap between the access to genetic resources (bioprospecting) and the outcome of one or more developed products on the market.

Transformed to the Ethiopian situation, the benefit sharing system for the access to and the utilization of coffee genetic resources should contain a lump sum up front as well as royalties after marketing the developed products or processes. The lump sum should be supplied by any country or company interested in testing and utilizing CGR as incentive for individuals and local communities for further conserving the wild coffee populations. Both, the lump sum as well as royalties should be divided by a strong and responsible organization between the government using part of the financial resources for general agricultural and rural development to reduce the pressure on the montane rain forest and partially for the local communities for further incentives.

One major weak point in the Costa Rican example is that the local communities did not yet receive a significant amount of the benefits shared already. In future, also for Ethiopia, the allocation of financial resources should be optimized between the general development efforts (channeled through the government), the incentives for local communities in the areas of the endemic genetic resources (channeled through a conservation and utilization organization) and the need for technological and human capacity building for improving the work of such an organization.

However, even a strong conservation and utilization organization on its own is not able to protect the threatened genetic resources. There is an enormous need to improve the institutional arrangements and to develop policies and regulations. This way, the benefits of the wild coffee resources can be distributed to those, who are going to bear the costs of any conservation concepts. Institutional arrangements and policies have to pave the way for benefit sharing at local level. Hence, enforced and protected property rights serve as incentives to maintain and sustainable utilize the montane rain forest and its flora and fauna, including the wild coffee populations. Consequently, there is a need of recognizing, implementing and enforcing property rights on national level for the coffee genetic resources of Ethiopia as well as on local or regional level for those communities and individuals, maintaining and utilizing coffee genetic resources.

In detail, the task of Ethiopia's national government can be divided into three parts:

1. *Enforcing the property rights and securing the sharing of benefits*

As discussed, coffee is one of the crops with high economic importance for over 80 developing countries (Raina et al., 1998; Cannell, 1983), but it is not integrated into the multilateral agreement of the ITPGR (FAO, 2001). Hence, and in harmony with CBD, the country of origin has the sovereign right over the CGR and, consequently, the responsibility to enforce and protect these rights upon those, who are interested in or in need of the genetic material of the wild coffee populations. However, besides negotiating and outlining benefit sharing agreements on bilateral basis with countries or companies interested in the access to and the utilization of CGR, this task also includes to empower local communities to manage these resources. There are two types of compensation for the access to and the utilization of genetic resources: a kind of "once-off

advance payment", which usually ranges from US$ 50 to 200 per sample for pharmaceutical plant samples (Laird, 1993) or royalties as second type of compensation, which amounts to one to 15% of net sales or up to 50% of net profits depending on the amount of information made available on the sample and on the work of purification already carried out on it (Laird, 1993). A contract should safeguard Ethiopia's interests in benefits from royalties, in capacity building and in access to information or other benefits resulting from the utilization of genetic resources.

The objective of the national government's involvement in the negotiations of benefit sharing is to utilize its organizational and institutional power for the benefit of the country and the local communities. These should be enabled and empowered to organize themselves and sell the genetic resources. Only if local communities are not well organized, the national government itself should do the transacting, ensuring the appropriate communities benefit from the royalties (Tewolde, 1996). For instance, as long as bilateral agreements for the utilization of CGR are not yet common and standardized, the national government should take the responsibility to protect the powerless farmers or communities and fetch a more reasonable negotiation result through its negotiation power.

In addition to the higher negotiation power, the national government is in general better aware and interested in the social benefit of the genetic resources than a single farmer or a single community can be. Furthermore, it could be considered whether it is legally possible and practical feasible to claim sole rights on the CGR stored in ex situ collections around the world as kind of treasures of Ethiopian history, which were seized "illegally".

2. *Empowering the local communities to conserve and sustainable utilize wild coffee populations*

Although in general it holds true that local communities know that they are the most affected due to depletion of resources around them (Regassa, 2001), this is not true for the wild coffee populations. The local communities on their own with their local traditional institutions and systems of management will not be able to maintain the coffee genetic resources in form of the wild coffee populations in the forests. This will not change unless there are incentives for the conservation of CGR and the local communities are empowered to protect these resources and forest areas. The national and international institutional, legal, political and economic factors influence the decision-making process on the local level. Those, who are utilizing the wild coffee populations, are farmers with minor institutional and political power. Although it is worthwhile for them to utilize the wild coffee trees, they have no incentive and power to maintain them. If the decrease in coffee prices continues, these farmers will be forced to earn their living with the cultivation of other, more beneficial crops. Hence, they themselves will have the incentive to transfer the rain forest and the wild coffee trees in more beneficial agricultural cropland. If the coffee prices are increasing, the small holders – if not empowered – will have to make way for powerful investors, invading and converting the rain forest to plantations.

Only if policies and institutional arrangements for the protection and sustainable utilization are installed, empowering local and regional communities and enabling the local communities to benefit significantly from the conservation efforts, the CGR can be conserved in situ in the center of their origin. Whether the wild coffee is maintained in gene reserves at strategic sites in Ethiopia, as Tadesse and Demel call for (Tadesse and Demel, 2001), or some other conservation and sustainable utilization concepts are implemented, the main issue is that sufficient incentives are available and a framework is created, in which local communities can react flexible and are empowered to protect the forest. Hence, it will be of crucial importance that the national and regional government set up the framework, in which the property rights, local communities are claiming, are recognized or defended (Regassa, 2001). The local communities should even be empowered to control the local institutions giving the national government the role of monitoring and facilitating the process. Only then incentives can be strong enough to maintain the endemic

genetic resources from wild coffee populations. Decentralization means not only to pass on the responsibility and the apportioning of blame to the local institutions but also to give them the power and a policy framework in which they can effectively conserve and sustainable utilize endemic genetic resources. In the medium term, the Ethiopian government has to consider whether there is another way to protect the wild coffee populations than to strengthen the base for implementing community IPR legislation, for instance as "Community Intellectual Rights" (Tewolde, 1996).

3. Distribute the funds derived from the bilateral benefit sharing agreement

As long as the benefits from the utilization of CGR maintain in the national budget, the local communities will have no incentive to maintain these resources. Only if the benefits deriving from the utilization of the coffee resources are shared on community level, there will be an opportunity that local communities may maintain these wild resources.

Hence, the national government has the obligation, if interested in maintaining the wild coffee populations and the montane rain forest, to share the benefits derived from the utilization of CGR with the local and regional communities. Furthermore, the government is responsible for the conservation of the forest areas as well as investing partially the benefits in improving agricultural development and thereby reducing the demand for more agricultural land as well as reducing the necessity of resettlement schemes. The discussion concerning the increasing demand for forest products made clear that the conservation of wild coffee resources and thereby the maintenance of Ethiopia's rain forest is only possible by investing in reforestation and afforestation programs so to reduce the gap between demand for and supply of forest products.

The world-wide spread of Coffea arabica is based on only a handful berries and trees. Hence, the genetic base of Coffea arabica in Latin America as well as in Asia is very narrow, exposing coffee production to the threat of broad disease outbreaks and the consequences of significant harvest and income loss. For instance, in Sri Lanka the coffee production had to be abandoned due to the outbreak of coffee leaf rust (Tadesse et al., 2001, Demel, 1999, Wrigley, 1988). In other words, the breeding value of the wild coffee resources in terms of potential to solve various agronomic and biotic problems is high and yet fully underestimated or even not yet quantified at all. Ethiopia's forest and wild coffee resources are under emergency situation. By quantifying the value of CGR and the value of Ethiopia's rain forest in general, the extent of financial loss, which Ethiopia accepts to let go due to policy and institutional deficiencies and false priority setting, would become obvious.

6. Concluding Remarks

Bilateral ABS agreements have the potential to promote the conservation and sustainable utilization of plant genetic resources for food and agriculture, which are not included in the ITPGR. The theoretical potential is, however, of less value as long as a form of a reciprocal moral hazard hinders the signing of such agreements. Only the clear understanding that in the medium- and long-term it is in the benefit of both, the country providing genetic resources as well as the user, to meet the contract that will enable negotiating parties to agree upon bilateral ABS agreements. In this context it is of importance that the existing international and national patent law and the plant variety protection laws are improved for the benefit of local genetic resources. As proposed, the indication of the place of origin of the utilized genetic resources could be a way to guarantee a minimum of reliable information. This would prevent on the one hand bioprospectors from utilizing the samples in a way that was not mutually agreed upon with the provider. This would on the other hand increase the control over the providing country not to supply other companies with the same genetic material.

The most crucial activity besides improving IPR is, however, to improve the institutional framework and policies in the providing country to enable the local communities to participate and profit from the benefit sharing agreed upon at national level. If these changes are implemented in agrobiodiverse countries bilateral ABS agreements may develop into an important alternative to the ITPGR for crops with clearly definable origin.

References

Bonn Guidelines, 2001: Report of the Ad Hoc Open-Ended Working Group on Access and Benefit Sharing. Convention on Biological Diversity, Bonn.

Alemneh Dejene, 1990: Environment, famine and politics in Ethiopia: A view from the village. Lynne Rienner Publishers, Boulder & London.

Alvarez, Juan Marco, 1999: Promoting Shade Grown Coffee as a Mechanism to Improve Buffer Zone Management and Biological Corridors. Paper presented at the 1999 Environmental Leader's Forum Center for Environmental Research and Conservation Columbia University, New York 1-9 June 1999.

Barbier, E.B., 2000: How to Allocate Biodiversity Internationally? In: Siebert, H. (ed.): The Economics of International Environmental Problems. Institut fuer Weltwirtschaft, Universitaet Kiel. Pp. 79-106.

Barton, J. and W. Siebeck, 1994: Material transfer agreements in genetic resource exchange. The case of the International Agricultural Research Centres. Issues in Genetic Resources, No. 1; IPGRI, Rome, May 1994.

Berhanu Mengesha and Million Bekele, 2001: Investment on forestry development in Ethiopia: opportunities and constraints. In: Biological Society of Ethiopia: Imperative problems associated with forestry in Ethiopia. Proceedings of a workshop. Addis Ababa University. Addis Ababa. Pp. 97 – 114.

von Braun, Joachim and Detlef Virchow, 1997: Conflict-Prone Formation of Markets for Genetic Resources: Institutional and Economic Implications for Developing Countries. In: Quarterly Journal for International Agriculture, 1/1997. Pp. 6-38.

Cannell, M.G.R., 1983: Coffee Biologist. 30:257-263.

Coase, R.H., 1960: The problem of social cost. Journal of Law and Economics (3). Pp.1-44.

Columbia University, 1999: Access to Genetic Resources. An Evaluation of the Development and Implementation of Recent Regulation and Access Agreements. Environmental Policy Studies Working Paper #4. Columbia University, School of International and Public Affairs, New York.

Correa, Carlos, 1994: Sovereign and Property Rights over Plant Genetic Resources. Commission on Plant Genetic Resources. Background Study Paper No. 2. FAO, Rome.

Coughlin Jr., M. D., 1993: Using the Merck-INBio agreement to clarify the Convention on Biological Diversity. Columbia Journal of Transnational Law 31 (2): 337-75. http://www.ciesin.org/docs/008-129/008-129.html

Demel Teketay, 1999: History, Botany and Ecological Requirements of Coffee. In: WALIA, Journal of the Ethiopian Wildlife and Natural History Society. No. 20, 1999. Pp. 28 – 50.

Demel Teketay, 2002: Personal communication. Ethiopia Agricultural Research Organisation, Director, Forest Research.Addis Ababa.

Demsetz, H., 1967: Toward a Theory of Property Rights. In: American Economic Review, 57. Pp. 347-359.

Dutfield, G., 1999: Sharing the Benefits of Biodiversity: Access Regimes and Intellectual Property Rights. Science, Technology and Development Discussion Paper No.6. Cambridge, MA, USA.

Eberlee, John, 2000: Assessing the Benefits of Bioprospecting in Latin America. In: REPORTS, Science from the developing world, March 28, 2002. International Development Research Centre. http://www.idrc.ca/reports/read_article_english.cfm?article_num=609.

EPA (Environmental Protection Authority), 1997: Environmental Policy of Ethiopia. EPA, Addis Ababa.

FAO, 1998: The State of the World's Plant Genetic Resources for Food and Agriculture. Background Documentation prepared for the International Technical Conference on Plant Genetic Resources, Leipzig, Germany, 17 - 23 June, 1996. FAO, Rome.

FAO, 2001: International Treaty on Plant Genetic Resources for Food and Agriculture. FAO, Rome.

Gebre Markos Selassie and Deribe Gurmu, 2001: Problem of forestry associated with institutional arrangements. In: Biological Society of Ethiopia: Imperative problems associated with forestry in Ethiopia. Proceedings of a workshop. Addis Ababa University. Addis Ababa. Pp. 45 – 80.

Guevara, A., 1998: Biodiversity Prospection. INBio.

Hilpert, H.G. 1998: TRIPS und das Interesse der Entwicklungslaender am Schutz von Immaterialgueterrechten in oekonomischer Sicht. In: GRUR, 1998, Heft 1. Pp. 91-99.

Kumilachew Yeshitela, 2001: Loss of forest biodiversity associated with changes in land use: the case of Chewaka-Utto tea plantation. In: Biological Society of Ethiopia: Imperative problems associated with forestry in Ethiopia. Proceedings of a workshop. Addis Ababa University. Addis Ababa. Pp. 115 – 122.

Laird, Sarah A., 1993: Contracts for biodiversity prospecting. In: World Resources Institute, 1993: Biodiversity Prospecting. World Resources Institute, Baltimore.

Lerch, A., 1996: Verfuegungsrechte und biologische Vielfalt: Eine Anwendung der oekonomischen Analyse der Eigentumsrechte auf die spezifischen Probleme genetischer Ressourcen. Hochschulschriften, Band 12. Marburg.

Leskien, Dan and Michael Flitner, 1997: Intellectual Property Rights and Plant Genetic Resources: Options for a Sui Generis System. Issues in Genetic Resources No. 6. IPGRI, Rome.

Lesser, William, 1994: Attributes of an Intellectual Property Rights System for Landraces. In: M.S. Swaminathan and Vineeta Hoon (eds.): Farmers' and Breeders' rights. Background papers, CRSARD, Madras. Pp. 233-250.

Leykun Abunie, 2000: The Challenges of Conserving Ethiopian Wildlife: Overview. In: WALIA, Journal of the Ethiopian Wildlife and Natural History Society. No. 21, 2000. Pp. 56 – 62.

Maskus, K.E. 2000: Intellectual Property Rights in the Global Economy. Washington D.C.

Melesse Damtie, 2001: Land use and forest legislation for conservation, development and utilization of forests. In: Biological Society of Ethiopia: Imperative problems associated with forestry in Ethiopia. Proceedings of a workshop. Addis Ababa University. Addis Ababa. Pp. 31 – 44.

Mengistu Hulluka, 2001: Opening address. In: Biological Society of Ethiopia: Imperative problems associated with forestry in Ethiopia. Proceedings of a workshop. Addis Ababa University. Addis Ababa. Pp. 5 – 8.

OECD, 1999: Handbook of Incentive Measures for Biodiversity. Paris, Organization for Economic Co-operation and Development.

Pacón, A.M., 1995: Was bringt TRIPS den Entwicklungsaendern? In: GRUR, 1995, Heft 11. Pp. 875-944.

Raina, S.N., Y. Mukai and M. Yamanoto, 1998: In situ hybridization identifies the dipoid progenitor species of Coffea arabica (Rubiaceae). In: Theor. Appl. Genet. 97:1204-1209.

Regassa Feyissa, 2001: Forest resources ownership and use rights and the role of local communities in forest management. In: Biological Society of Ethiopia: Imperative problems associated with forestry in Ethiopia. Proceedings of a workshop. Addis Ababa University. Addis Ababa. Pp. 81 – 96.

Reid, Walter V., Sarah A. Laird, Carrie A. Meyer, Rodrigo Gámez, Ana Sittenfeld, Daniel H. Janzen, Michael A. Gollin and Calestous Juma, 1993: Biodiversity Prospecting: Using Genetic Resources for Sustainable Development. World Resources Institute (WRI), USA, Instituto Nacional de Biodiversidad (INBio), Costa Rica, Rainforest Alliance, USA, African Centre for Technology Studies (ACTS), Kenya.

Reusing, M., 1998: Monitoring of natural high forests in Ethiopia. Ministry of Agriculture and GTZ. Addis Ababa, Ethiopia.

Sedjo, R.A. and R.D. Simpson, 1995: Property rights, externalities and biodiversity. In: Swanson, T.M. (ed.): The economics and ecology of biodiversity decline. The forces driving global change. Cambridge. Pp. 79-88.

Seiler, A., 1997: TRIPS und die Patentierung lebender Materie. Handlungsmoeglichkeiten für die Dritte Welt. In: Wechselwirkung, Nr. 8.

Semon S, 1995: The impact of the UPOV 1991 Act upon Seed Production and Research. Ms.C. Thesis, University of Edinburgh, Scotland.

Senti, R. and P. Conlan, 1998: WTO - Regulation of World Trade after the Uruguay Round, Zurich.

Swaminathan, M.S. (ed.), 1996: Agrobiodiversity and Farmers' Rights: Proceedings of a Technical Consultation on an Implementation Framework for Farmers' Rights. M.S. Swaminathan Research Foundation, Madras.

Tadesse Woldemariam, M. Denich, Demel Teketay and P.L.G. Vlek, 2001. Human impacts on Coffea arabica genetic pools in Ethiopia and the need for its in situ conservation. In: Managing plant genetic diversity. R. Rao, A. Brown, M. Jackson (eds), CAB International and IPGRI. (Seitenangabe fehlt?!)

Tadesse Woldemariam and Demel Teketay, 2001: The forest coffee ecosystems: ongoing crisis, problems and opportunities for coffee gene conservation and sustainable utilization. In: Biological Society of Ethiopia: Imperative problems associated with forestry in Ethiopia. Proceedings of a workshop. Addis Ababa University. Addis Ababa. Pp. 131 – 142.

Tewolde Berhan Gebre Egziabher, 1990: The importance of Ethiopian forests in the conservation of Arabica coffee gene-pool. In: Proceedings of the 12th Plenary Meeting of AETFAT (Ihlenfelft, H.D., ed.). Mitt.Inst. Allg. Got. Hamburg, 23a. Pp. 65 – 72

Tewolde Berhan Gebre Egziabher, 1996: A Case for Community Rights. In: Solomon Tilahun and Sue Edwards (Eds.): The Movement for Collective Intellectual Rights. Institute for Sustainable Development, Addis Ababa and The Gaia Foundation, London. Pp. 1 – 14.

TRIPs Agreement, 1994: The entire Final Act Embodying the Results of the Uruguay Round of Trade Negotiation April 15, 1994.

UPOV (Union pour la Protection des Obtentions Végétales), 1992: International Convention for the Protection of New Varieties of Plants of December 2, 1992, as Revised at Geneva on November 10, 1972, on October 23, 1978, and on March 19, 1991. UPOV, Geneva.

UPOV, 1995: Internationaler Verband zum Schutz von Pflanzenzuechtungen. Allgemeine Infromationsbroschüre. UPOV, Genf.

Virchow, Detlef, 1999: Conservation of Genetic Resources: Costs and Implications for a Sustainable Utilization of Plant Genetic Resources for Food and Agriculture. Springer-Verlag, Berlin - Heidelberg.

Voumard, John, 2000: Biodiversity - Access to Genetic Resources. Commonwealth Public Inquiry into Access to Biological Resources in Commonwealth Areas. Commonwealth of Australia. http://www.ea.gov.au/biodiversity/science/access/inquiry/appendix9.html.

WRI (World Resources Institute), 1993: Biodiversity Prospecting: Using Genetic Resources for Sustainable Development. With National Biodiversity Institute of Costa Rica, Rainforest Alliance, and African Centre for Technology Studies.

Wrigley, G., 1988: Coffee. Tropical Agriculture Series. Longman Scientific and John Wiley and Sons, Inc., New York.

Yonas Yemshaw, 2001: Status and prospects of forest policy in Ethiopia. In: Biological Society of Ethiopia: Imperative problems associated with forestry in Ethiopia. Proceedings of a workshop. Addis Ababa University. Addis Ababa. Pp. 9 – 30.