Access to Genetic Resources and Benefit Sharing
Perceptions, Practices and Expectations of Farming Communities

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Acronyms

ABS   Access to Genetic Resources and Benefit Sharing  
CBD   Convention on Biological Diversity  
CGIAR Consultative Group on International Agricultural Research  
CITES Convention on International Trade in Endangered Species of Wild Flora and Fauna  
DDC District Development Committee  
FAO United Nations' Food and Agriculture Organisation  
IPR Intellectual Property Right  
ITPGRFA International Treaty on Plant Genetic Resources for Food and Agriculture  
L/GMO Living/Genetically Modified Organisms  
LR Likelihood Ratio  
GR Genetic Resources  
PBP Participatory Plant Breeding  
PGRs Plant Genetic Resources  
GR Genetic Resource  
PIC Prior Informed Consent  
SAWTEE South Asia Watch on Trade, Economics & Environment  
SLC School Leaving Certificate  
TK Traditional Knowledge  
TRIPS Trade Related Aspects of Intellectual Property Rights  
UNCED United Nations Conference on Environment and Development  
VDC Village Development Committee  
WTO World Trade Organisation  
LI BIRD Local Initiative for Biodiversity Research and Development

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Chapter 1

Introduction

1.1 Background

The Convention on Biological Diversity (CBD), 1992 has conferred sovereign rights to states, particularly to those that are centres of origin of genetic resources, over their genetic resources. Thus, the parties to the CBD have unconditional rights over the genetic resources that exist within their territories. Ownership rights of genetic resources are bestowed to the local communities who are the actual custodians of such resources and related Traditional Knowledge (TK). The sovereign rights of states and the property rights conferred to the local and indigenous communities over their genetic resources have been established through the provisions of Prior Informed Consent (PIC) and benefit sharing out of the commercial use of their genetic resources. It is also important to facilitate access to the genetic resources and associated TK in the new paradigm set by sovereign rights of countries over their biological resources and associated TK. The intellectual property rights (IPR) on living forms and processes are debated (Ravi, 2005).

The PIC is viewed as central to securing rights of indigenous communities while providing access to their genetic resources and related activities. Several concerns are being raised about commercial biotechnology companies and public breeding institutions of acquiring and using GR and TK from local communities without their knowledge and permission. The breeders and biotechnology companies can privatize the GR once they manipulate the genes or develop new varieties out of such genetic materials. Such case is generally referred as biopiracy. Swiss Academy of Science defined biopiracy as the utilization and/or appropriation of GR that is not based on necessary access permits, or does not fulfill the agreed conditions and is therefore illicit (Biber-Klemm and Martinez, 2006). RAfi defined biopiracy as the use of intellectual property laws (patents, plant breeders rights) to gain exclusive ownership and control of biological resources and knowledge, without recognition, reward or protection to informal innovators (RAFi, 1996). For Nepal's condition, we can say that any access to our GR by foreign person (natural or legal) without adequate provisions for equitable benefit sharing is the biopiracy.

In that context, it is important to understand the perceptions and existing practices of farmers regarding the exchange of genetic resources, for both plant genetic resources (PGRs) and animal genetic resources. Understanding the perceptions, practices and expectations of farmers are important for formulating sound policy regarding access to genetic resources and benefit sharing. The present study aims to fill this information gap between the national level policy makers and local level farmers.

1.2 Rationale

The issues of access to genetic resources and benefit sharing are well discussed at the international level. The CBD was the first comprehensive agreement to this endeavor. But, the trade agreements like TRIPS agreement of the World Trade Organization does not count the
issues of access and benefit sharing. This has created a wide gap between the biodiversity rich less developed countries and technology rich developed countries.

At the national level, need for regulating the access to genetic resources is recognized and accepted. A draft bill is prepared by the government on "Access to the genetic resources and benefit sharing" five years ago. But, the draft is not yet to be finalized.

The levels of understanding of the actual owner of the genetic resources, the farmers, are less known. The draft bill has proposed provisions of PIC for the access to genetic resources. It is not clear how the farmers understand about the terms of access to the resources they are having. In this context, it is important to understand the perceptions, practices and expectations of the farming communities before we actually decide for a set of legal provisions. Empirical analysis is vital to assess the perceptions, practices and expectations of farming communities towards the access to PGRs and benefit sharing that is required under CBD. Such understanding will also be helpful to develop negotiating stand and regional alliance for international fora for intellectual property rights. Such negotiations are required for the conservation and bioprospecting of the genetic resources for future global food security.

1.3 Objectives

The aim of the study is to understand as a case how much the farming communities are informed about the concept and provisions of genetic resources. For this purpose, the perceptions, practices and expectations of farming communities of Nepal are assessed in relation to access to genetic resources and benefit sharing (ABS) and PIC for such access. The specific objectives were to:

- Assess the perceptions of the farming communities about access to plant genetic resources (PGRs) and the TK related to their utilisation.
- Explore the existing practices that relates to the inflow of PGRs to and outflow from the villages.
- Investigate the understanding of the farming communities on PIC for access to PGRs and related TK.
- Assess the expectations of farming communities regarding benefit sharing out of the commercial use of PGRs and related TK.

1.4 Methodology

The study methodology is based on literature review as well as household survey. Texts and related literatures on the CBD, Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS), International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and Bonn Guidelines (2002) on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilization are reviewed. Draft bills on access to genetic resources and benefits sharing and farmers’ rights and plant variety protection prepared by Government of Nepal are also reviewed.
1.4.1 Study Area

The study was conducted as a case study in Palpa district, which is a typical hilly district in the Western Development Region of Nepal with about 50,000 households and 268,000 population (CBS, 2002). The district is geographically at about the centre of the country. However the district is commercially intervened and farmers are growing cash crops there, government of Nepal has policy (MOAC, 2004 and MOAC, 2006) to transform other districts also to commercial farming. The situation of the district gives some future picture of the agriculture in Nepal. Stakeholder discussions (Focus group) with local government officials, local civil society representatives and like minded people were conducted in Palpa District.

Out of the 65 Village Development Committees (VDCs) two VDCs were selected randomly for sampling. The lone Municipality in the district was also selected for the study. A sample of 60 farm households was selected through random sampling method from the sample VDCs and the Municipality. The respondents are intercepted from the sample households, meaning thereby that the respondent is not necessarily the health of the household but an adult member of the household. As the aim of the study is to analyze a case of the farmers the sample size is compromised. Household survey of 60 randomly selected households was conducted using a structured questionnaire. The numbers of households are presented in Table 1.

<table>
<thead>
<tr>
<th>VDC/Municipality</th>
<th>Total households</th>
<th>Sample Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Madanpokhara VDC</td>
<td>1,235</td>
<td>15</td>
</tr>
<tr>
<td>2 Tansen Municipality</td>
<td>4,813</td>
<td>25</td>
</tr>
<tr>
<td>3 Telgha VDC</td>
<td>667</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6,715</strong></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>

1.4.2 Analytical Framework

The perceptions, practices and expectations of farming communities towards the access to PGRs and benefit sharing are assessed using analytical framework. For this purpose, the survey questionnaires were scrutinised for completeness and data compiled in STATA software. Descriptive statistical analyses were conducted to find means, ratios and percentages. For detecting the cause and effect relations between and access variables, awareness variables and individual and household characteristics, econometric analyses were conducted using the household level data.

Four study variables are identified for the study, namely, (i) readiness of the farmers to share their GR freely, (ii) readiness of the farmers to share their TK freely, (iii) perception of the farmers about the need of sharing benefits from bioprospecting, and (iv) their perception about the need of laws on access and benefit sharing. These variables are concerned with the formulation and implementation of ABS laws in the country. The following four sets of cause and effect hypotheses are tested using the household level data econometrically using STATA software.

a) Age, gender, education, ethnicity and family size of the respondents affect their readiness to share GR freely,


b) Age, gender, education, ethnicity and family size of the respondents affect their readiness to share TK freely.

c) Age, gender, education, ethnicity and family size of the respondents affect their feeling about the need of sharing benefits.

d) Age, gender, education, ethnicity and family size of the respondents affect their feeling about the need of laws on access and benefit sharing.

The hypotheses are tested using household survey data and econometric programme probit. The probit model emerges from normal cumulative distribution function. The decision of ith household to give access to genetic resources or traditional knowledge depends on an unobservable utility index $I_i$. This latent variable is also known as the normal equivalent deviate or normit and determined by one or more explanatory variables like age, gender, education, ethnicity and family size. The larger the value of the index, the greater is the probability of a household giving free access to the genetic resources and TK.

A probit model is an econometric model in which the dependent variable $y_i$ can be only one (give free access) or zero (do not give access), and the continuous explanatory variables $x_i$ are estimated in:

$$
\Pr(y_i=1/0) = F(x_i b)
$$

(1)

Here $b$ is a parameter to be estimated, and $F$ is the normal cumulative distribution function. The term 'xb' is called the probit score or utility index. Since 'xb' has a normal distribution, the probit coefficients are tested with Z test (Gujarati, 2003). Though the log likelihood method is developed for large samples the probit method is used here for demonstration. The interpretation of a probit coefficient, $b$, is that a one-unit increase in the predictor leads to increasing the probit score by $b$ standard deviations. The marginal effects (slope) of the variables are estimated using dprobit that gives the slope at the mean level.
Chapter 2

CBD, ITPGRFA and TRIPS

2.1 Scope and objectives of CBD, ITPGRFA and TRIPS

CBD is the first international treaty to introduce the concept of access to genetic resources and benefit sharing. The CBD has conferred sovereign rights over genetic resources to national governments. It aims to ensure that access to genetic resources is provided by sovereign states under mutually agreed terms between the parties seeking access and the parties providing access and that the provider parties get a fair and equitable share of the benefits arising out of the use of their genetic resources. It has also recognised the rights of local and indigenous communities over their genetic resources and associated TK.

More recently, the ITPGRFA has clearly recognised the rights of farmers over the genetic resources that they have conserved and made available to the world. It has reemphasised the need to regulate access to genetic resources and related TK and to ensure that benefits arising out of the use of genetic resources and related TK is shared in a fair and equitable manner with the providers of such resources and knowledge. But, such rights of the farmers are not recognized automatically. The rights are available upon the provisions of national laws.

The TRIPS Agreement within the package of the Uruguay Round agreement establishing the World Trade Organization does not recognise the rights of the farmers. It provides the rights to the plant breeders, the developers of new plant varieties using the existing plant genetic resources, over their development without recognising the source and value of the raw resources they are taking from the farmers. It is feared that the recognition of the rights of the plant breeders over the varieties developed by them without recognizing the rights of the custodians of the plant genetic resources which are used by the plant breeders to develop new varieties. Thus the greatest worry is that the TRIPS agreement is not in conformity with the CBD.

The major provisions of the CBD, the ITPGRFA and the TRIPS Agreement have been summarised in the following sections.

2.1.1 The CBD

Unlike the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES, 1973) that came earlier to the CBD and focuses only on specified endangered species, the CBD has taken the issue of biodiversity conservation holistically for all genetic variations, species variations and ecosystems. It was signed at the United Nations Conference on Environment and Development (UNCED)\(^1\) in 1992. Nepal ratified the CBD in 1993 and efforts are underway for its effective implementation.

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\(^1\) United Nations Conference on Environment and Development (UNCED) was held in Rio de Janeiro during 3-14 June 1992.
2.1.1.1 Scope and coverage of the CBD

The aim of the CBD is to protect all species and ecosystems in the world. The CBD defines biodiversity as the variability among living organisms from all sources including, among other things, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. The CBD covers the diversity within species, between species and of ecosystems. The within species variations are due to genetic diversity—the diversity of genes within a species. There is a genetic variability among the populations of the same species of plants and animals. The interspecies variations occurring in nature lead to species diversity. Similarly, the ecosystem diversity exists at a higher level of organisation. The richness in the different processes in an ecosystem to which the genes ultimately contribute is the ecosystem diversity.

The provisions of the CBD apply to the components of biological diversity in areas within the limits of national jurisdiction and to the processes and activities even beyond the limits of national jurisdiction.

2.1.1.2 Nature of the CBD

The provisions of the CBD are prescriptive in nature. It prescribes national governments to implement the provisions as far as possible and as appropriate. It is an international convention and has a reputation of international law. It takes into account all rights of a nation over its genetic resources and to technologies developed.

2.1.1.3 Objectives of the CBD

Essentials for human survival includes biodiversity that affect food and agriculture. Other benefits of biodiversity includes developing medicines, cleaning water, controlling flood. There are some resource-based industries that are essential for such as fisheries, and maintaining and ecological balance. Therefore, the major objectives of the CBD include the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources (CBD 1992, Article 1). The means for achieving these objectives include appropriate access to genetic resources, transfer of relevant technologies and funding.

The principle of the CBD is that the States have sovereign rights to exploit their own resources pursuant to their own environmental policies (CBD, 1992, Article 3). At the same time the States have the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States.

2.1.1.4 Mechanism of the CBD

Article 15 of the CBD addresses the terms and conditions for access to genetic resources and benefit sharing. It duly recognises the sovereignty of States over their natural resources and provides that access to these resources shall be subject to PIC of the country providing the resources. But, the providing party can exempt from the provision of the PIC. It also provides that access shall be based on mutually agreed terms in order to ensure the sharing of results of
research and development and other benefits arising from the commercial or other utilisation of genetic resources. For the sharing of results of research and development and other benefits, every party is required to take legislative, administrative and policy measures.

Access to benefit sharing mechanism under the CBD is a legitimate entitlement to the farming communities for rewarding and promoting their role in conservation and sustainable use of biological resources and associated TK. In such a situation, adequate mechanisms need to be developed to protect the rights of farmers as the conservators. The PIC is one of the known instruments to protect the rights of less informed communities over their genetic resources and TK. The rights over the TK of indigenous peoples relating to genetic resources and its uses are clearly spelled out in the CBD. Article 8 (j) of the CBD provides that TK, innovations, and practices of indigenous peoples relevant to the conservation and sustainable use of biodiversity must be preserved, protected and maintained.

Nepal, being a contracting party of the CBD, is required to enact laws in order to protect the rights and fulfill the obligations related to the conservation of biological diversity for the benefits of both present and future generations. National laws are required to protect the rights of the local communities (Box 1) and to share the benefits arising from the commercial and other utilisation of genetic resources in a fair and equitable way and also in effective participation in biotechnological research activities (CBD, 1992, Article 19).

<table>
<thead>
<tr>
<th>Box 1: Community Rights under CBD</th>
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<tbody>
<tr>
<td>1. The CBD recognises the sovereign rights of States over their natural resources and confers national governments the authority to determine access to genetic resources. Accordingly, access to genetic resources is subject to PIC of the country providing such resources. The sharing of benefits of the results of research and development and that arising from the commercial and other utilisation of genetic resources is also with the country providing the resources. The local community, who are the custodians of the genetic resources, is not referred in the mechanism of access, PIC and benefit sharing.</td>
</tr>
<tr>
<td>2. Article 8(j) requires every party to respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity. Such knowledge, innovations and practices need to be promoted for wider application with the approval and involvement of the holders of such knowledge, innovations and practices and the benefits arising out of their application should be shared in a fair and equitable manner. It means community rights are limited to the TK of such indigenous and local communities.</td>
</tr>
<tr>
<td>3. Article 10 (c and d) requires to protect and encourage customary use of biological resources in accordance with traditional cultural practices, and support local populations to develop and implement remedial action in degraded areas. Similarly, Article 10 (e) encourages cooperation of the private sector in developing methods for sustainable use of biological resources. Support to local communities under this article is subject to the conservation of biodiversity and not as a right of the local community. Thus the community rights in CBD are limited to their rights over TK.</td>
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Such provisions ensure the PIC of the national governments and not necessarily of the local communities who are the real custodians of the genetic resources. Apart from that, the main area of debate in this convention is the situation of development of biotechnology and subsequent provision for the protection of intellectual property rights. Therefore, national laws should address these issues; and for the implementation of such laws, perception and awareness of the farming communities are essential.
2.1.2 The ITPGRFA

Conservation and sustainable use of genetic diversity—particularly those essential for food and agriculture—is a must to meet the needs and aspirations of present and future generations. For continuing the exchange system of PGRs that global agriculture research systems have practiced for decades and necessary to food security, the Food and Agriculture Organisation (FAO) Conference\(^2\) approved the ITPGRFA\(^3\). The Treaty came into force on 29 June 2004 and as of 20 March 2007, the Treaty has 113 parties. Nepal missed the opportunity to sign the treaty within one year in accordance with Article 25 of the Treaty. Now it is again open for accession by all Members of FAO or the United Nations (Article 27). As a member of the FAO as well as the United Nations, Nepal acceded to the Treaty in January 2007 and is now in the process of depositing the instrument of accession to the Director General of FAO.

2.1.2.1 Scope and Coverage of the Treaty

The Treaty covers only the PGRs having actual or potential value for use in food and agriculture. Several PGRs are crucial for producing food to feed the growing population. The Treaty has identified 64 genera/species of plants highly regarded for food and agriculture, namely grains, pulses and some fodder crops\(^4\). The PGRs of these species are the raw materials that farmers and plant breeders use to improve the quality and productivity of their crops. As no country is self-sufficient in PGRs, the food security of future population depends heavily on international cooperation and exchange of food crops and their genes. The Treaty has set up a multilateral system of access and benefit sharing, though a multilateral material transfer system is yet to be decided.

The Treaty recognises the need for the farmers' rights (Article 9). It covers the rights of farmers including the rights over the genetic resources, commercial benefit of their use, traditional knowledge as well as right to participate in making decisions on matters related to management of PGRs.

2.1.2.2 Objectives of the Treaty

It is widely realized that the exchange of GR between member countries and between communities within country, that are vital for producing food, has declined because of the CBD. This is attributed to the cumbersome process of bilateral exchange of genetic resources. Thus, the objectives of the Treaty are to facilitate the multilateral exchange of PGRs, on the top of existing bilateral exchange, for the conservation and sustainable use of PGRs for food and agriculture; and to ensure fair and equitable sharing of the benefits arising out of their use. For sustainable agriculture and food security, it aims to achieve these objectives in harmony with the CBD. The Treaty is vital in ensuring the continued availability of PGRs for food and agriculture.


\(^3\) The Treaty defines the terms "plant genetic resources for food and agriculture" as any genetic material of plant origin of actual or potential value for food and agriculture.

\(^4\) Crops required to feed animals which give milk and meat.
2.1.2.3 Mechanism of the multilateral system

The members of the Treaty have agreed to establish an efficient, effective and transparent multilateral system to facilitate access to PGRs for food and agriculture, and to share the benefits in a fair and equitable manner. As per the agreement, the Governing Body constituted of the members of the Treaty will develop a standard material transfer agreement (MTA) that sets the conditions for access and benefit sharing. It will also address some important questions such as the level, form and manner of monetary and non-monetary system of benefit sharing on commercialisation of PGRs.

The resources may be obtained for conservation and utilisation in research, breeding and training. But, when a commercial product is developed using these genetic resources, the Treaty directs the bioprospecters to share the resulting monetary benefits with the original donors of PGRs equitably. The Treaty also provides for the sharing of non-monetary benefits in the form of information exchange, access to and transfer of technology and capacity building with the donors. Partnerships and collaboration in research and technology development are the main modes of sharing non-monetary benefits. But, for a country like Nepal, with poor human and financial capital, such modes of benefit sharing can be difficult to be materialized.

The most important feature of the Treaty is the provision to protect farmers' rights (Box 2). It recognises the valuable contribution that farmers and their communities have made to the conservation and development of food and agriculture related PGRs. This contribution is the basis for farmers' rights, which include the protection of TK, and the right to participate equitably in benefit sharing. Farmers are also given the right to participate in national decision making about PGRs. It explicitly gives governments the responsibility for implementing these rights which necessitate national laws for the protection of farmers' rights.

<table>
<thead>
<tr>
<th>Box 2: Farmers’ Rights under ITPGRFA (Article 9)</th>
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<tbody>
<tr>
<td>1. Right to protect TK relevant to PGRs for food and agriculture.</td>
</tr>
<tr>
<td>2. Right to equitably participate in sharing the benefits arising from the utilisation of PGRs for food and agriculture.</td>
</tr>
<tr>
<td>3. Right to participate in making decisions, at the national level, on matters related to the conservation and sustainable use of PGRs for food and agriculture. The only way to meet this objective of direct participation of farmers at the national level decision making is through public hearing and/or prior informed consent (PIC).</td>
</tr>
<tr>
<td>4. No limit on any rights that farmers have to save, use, exchange and sell farm-saved seed/propagating material, subject to national law and as appropriate.</td>
</tr>
</tbody>
</table>

Farmers' rights, as stipulated in the Treaty, are very weak since the Treaty has rested the responsibility for realising farmers' rights with national governments. The governments have now choice for protecting or not protecting the rights of the farmers. Though, there are several obligations of the governments to share the PGRs, the protection of farmers' rights is not an obligation of the Treaty. It states that in accordance with their needs and priorities, the national governments should, as appropriate, and subject to its national legislation, take
measures to protect and promote farmers’ rights. It means that protection of farmers’ rights is not an obligation of national governments.

Exchange of genetic resources is vital for the development of new varieties for food and agriculture. The sovereign rights of the countries over their genetic resources as conferred by the CBD and system of bilateral exchange for the genetic material substantially reduced the rate of exchange of genetic resources among the countries. The multilateral system of access and benefit sharing proposed by the Treaty recognises the sovereign rights of national governments over their own PGRs in line with the CBD. It also includes the authority to determine access to those resources, subject to national legislation. In the exercise of their sovereign rights, a multilateral system to be established is expected to be efficient, effective, and transparent. This is required for both to facilitate access to PGRs, and to share, in a fair and equitable way, the benefits arising from the utilisation of PGRs.

Legal and natural persons can get access to PGRs and related TK under certain conditions as given in the Box 3 below.

**Box 3: The conditions for multilateral material transfer (Article 12.3):**

(a) Access to PGRs shall be provided solely for the purpose of conservation and utilisation for research, breeding and training. Access under this Treaty shall not be provided for chemical, pharmaceutical and/or other non-food/feed industrial uses;  
(b) Access shall be accorded expeditiously and fee charged shall not exceed the minimal cost involved;  
(c) All available passport data and associated non-confidential information shall be made available;  
(d) Recipients shall not claim any intellectual property that limit the facilitated access to PGRs;  
(e) Access to PGRs under development, including material being developed by farmers, shall be at the discretion of its developer, during the period of its development;  
(f) Access to PGRs protected by intellectual property rights shall be consistent with international agreements and national laws;  
(g) The materials accessed shall continue to be made available to the multilateral system by the recipients; and  
(h) Access to PGRs found in *in-situ* conditions will be provided according to national legislation.

The ITPGRFA has a provision to adopt a compliance procedure (Article 21) asking for an effective procedures and operational mechanisms to promote compliance. But, the compliance to the Treaty is affected by the awareness of the providers of PGRs and sincerity of the receivers of them. These procedures of the Treaty include offering advice or assistance in particular to developing countries. Although these procedures address cases of non-compliance, they differ from a compliance procedure from a procedural and institutional perspective (Goote and Lefeber, 2004). The implementation of the Treaty is essential for Nepal to improve capacity for plant variety development suitable for Nepal's agro-climatic conditions that are required for food security and also for bioprospecting.

### 2.1.3 The TRIPS Agreement

The TRIPS agreement was developed (in 1994) to apply the basic principles of general agreement on tariff and trade (GATT) on the trade of intellectual property rights (IPR). It

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5 In the case of multiple-use crops (food and non-food), their importance for food security should be the determinant for their inclusion in the multilateral system and availability for facilitated access (ITPGRFA, 2001).
tries to ensure private IPR by developing multilateral framework of principles, rules and disciplines dealing with international trade in counterfeit goods.

2.1.3.1 Scope and coverage of TRIPS

The Agreement covers the trade of wide range of IPR from copy rights to the patents. The protected IPR includes the copy rights in accordance with the Berne Convention (1971) for printed matters, computer programs and rental rights. It protects any sign or any combination of signs which is capable to distinguish the goods or services of one undertaking from those of other undertakings— commonly called trade marks. The owners of a registered trademark and industrial design have exclusive right to prevent third parties from using identical or similar signs for goods or services or design. The agreement also protects layout-designs of integrated circuits and undisclosed information.

The TRIPS agreement also protects geographical indications— the indications which identify a good as originating in the territory with some quality, reputation or a unique characteristic.

The most controversial form of the IPR protected by the agreement is the patent on life forms including plant varieties. The Agreement stipulates that the patents are available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step (meaning a non-obvious finding) and are capable of industrial application (that is useful and marketable). The living things— plant, animals and micro-organisms— are not invented. Patentability of the living things violates the rule that only inventions can be patented. This violation widens the coverage of the patent to the nature which is the basic essence of the human survival.

2.1.3.2 Nature of TRIPS

The TRIPS agreement is a legal document that must be implemented by the members of the WTO. However, a country has discretionary power to exclude from patentability of inventions if commercial exploitation of which cause serious problem to morality, human, animal or plant life or health or environment. A country may also exclude from patentability diagnostic, therapeutic and surgical methods for the treatment of humans or animals and plants and animals. Similarly, the essentially biological processes for the production of plants or animals can also be excluded. The debate aggravates here as the countries are allowed to patent even the non-inventions, inventions that can harm human health, plant and animal health and the naturally occurring plants and animals. The countries may implement more extensive protection of IPR than required by TRIPS Agreement if such protection does not infringe this Agreement.

Moreover, the micro-organisms and non-biological and microbiological processes must be patented by all the countries. In addition, the countries must protect rights of plant breeders over their varieties. Though, an option is given that the rights can be protected either by patents or by an effective *sui generis* system or by any combination of them. However, the term *sui generis* is never defined by the agreement. There is no provision for disclosure of the parent materials and sharing benefits with the owners of the parent materials. This provision of compulsory protection of rights over the plants, animals and micro-organisms contradict with
the provisions of CBD that requires protection of the rights of local communities over their genetic resources and traditional knowledge.

There was a great deal of controversy during the agreement. At that time, the controversy was subdued by agreeing to review the provision by 1999. Unfortunately, the revisions are not yet agreed.

2.1.3.3 Objectives of TRIPS

The stated objectives of the TRIPS agreement are to protect and enforce IPR in such a way that it contributes to the promotion of technological innovation and transfer and dissemination of technology (Article 7). The foremost objective is to promote effective and adequate protection of IPR to reduce distortions and hindrances to their international trade. For this purpose, the principle of non-discrimination and transparency are applied in case of IPR as well. The rights to plant varieties are protected to reward the creativity by providing market based incentive to the private sector for the development of new varieties of plants and to of successful plant breeders.

2.1.3.4 Mechanism of TRIPS

The TRIPS agreement develops measures and procedures to enforce IPR. Members shall be free to determine the appropriate method of implementing the provisions of this Agreement within their own legal system and practice.

For saving the IPR from infringement the holders of such rights can lodge a law suite for injunctions. Legal provision is required to prevent the entry into the channels of commerce of imported goods that involve the infringement of an IPR (Article 44.1). Such measures are effective for checking the importation of counterfeit trademark or pirated copyright goods.

<table>
<thead>
<tr>
<th>Box 4: Farmers' Rights under TRIPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Farmers' rights are not the subject of the TRIPs Agreement. It makes no mention of the necessity to protect farmers' rights</td>
</tr>
<tr>
<td>2. There is however, a provision of compulsory licensing (Article 31). This provision can be used by government on request of a third party so that the third party can multiply such seeds to the benefit of the general farmers. This provision can be utilized to protect farmers from exploitation by the breeders charging exorbitant price or limited supply of seed.</td>
</tr>
</tbody>
</table>

The farmers have in fact no right as a farmer under the TRIPS agreement (Box 4). Some limitations of the IPR such as a compulsory licensing can be utilized for the protection of rights of the farmers that too in limited circumstances.

2.2 Interrelations among CBD, ITPGRFA and TRIPS

The Doha Ministerial Declaration (Paragraph 19) instructs the Council for TRIPS, in its review of Article 27.3 (b) and Article 71.1, to consider the relationship between the TRIPS Agreement and the CBD. Work focused on whether and how disclosure requirements would contribute to a more coherent and supportive relationship. One of the key provisions of the
CBD is the requirement that access to GR be subject to prior informed consent (PIC). The implementation of the PIC is one of the fundamental elements for ensuring the farmers' rights.

The CBD and the ITPGRFA are related with the TRIPS Agreement in two perspectives. Firstly, TRIPS does not recognize the contribution of local/indigenous people or farmers/farming communities in conservation, management and use of genetic resources as visualized by CBD and ITPGRFA. Second, the emergence of genetic engineering to modify plants that can be patented under the TRIPS agreement has forced the members to think for protection of the rights of the conservator farmers to meet the purpose of the CBD. The rights of the conservators that need to be protected are the customary rights to save, use, exchange and sell seeds and other planting materials. Limitation in the flow of PGRs under bilateral transfer that are essential for food raised urgency for the development of multilateral material transfer provision leading to enactment of the ITPGRFA. The major contradicting issues and provisions of the CBD, the ITPGRFA and the TRIPS Agreement in relation to ABS, PIC, research and commercial use of resources and knowledge and IPR are summarised in Table 2.

Table 2: Inter-relations and contradicting issues

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Criteria</th>
<th>CBD</th>
<th>ITPGRFA</th>
<th>TRIPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coverage of genetic resources</td>
<td>All the genetic resources</td>
<td>Plant genetic resources</td>
<td>Plant genetic resources and micro-organisms</td>
</tr>
<tr>
<td>2</td>
<td>Access</td>
<td>Bilateral</td>
<td>Multilateral for 64 genera and bilateral for others (Annex 1 crops)</td>
<td>Open access</td>
</tr>
<tr>
<td>3</td>
<td>Prior informed consent (PIC)</td>
<td>PIC of donor governments</td>
<td>No provision of PIC</td>
<td>No PIC</td>
</tr>
<tr>
<td>4</td>
<td>Benefit sharing</td>
<td>Monetary and non-monetary</td>
<td>Monetary and non-monetary</td>
<td>No benefit sharing; benefits biases towards innovators</td>
</tr>
<tr>
<td>5</td>
<td>Access to genetic resources for research</td>
<td>Benefit sharing required</td>
<td>No benefit sharing required</td>
<td>Open access</td>
</tr>
<tr>
<td>6</td>
<td>Commercial use of resources and knowledge</td>
<td>Benefit sharing</td>
<td>Benefit sharing</td>
<td>Open access</td>
</tr>
<tr>
<td>7</td>
<td>Intellectual property rights (IPR)</td>
<td>IPR is available but it should be supportive of and not run counter to the objectives of the CBD</td>
<td>No IPR that limits the facilitated access to PGRs in the form received from the Multilateral System</td>
<td>Very strong IPR on plant varieties, either by patenting or effective sui generis</td>
</tr>
</tbody>
</table>

The ITPGRFA has included some provisions, though not strong and effective, for protecting farmers who otherwise might be forced to lose their genetic resources and associated TK and to buy patented or other IPR protected seeds every season. Second, the sovereign rights of states over the genetic resources available within their territory as conferred by the CBD are not recognized by TRIPS. The ownership of and cumbersome process for bilateral exchange of PGRs spurred the urgency to have a system that facilitates the flow of PGRs.

Access to genetic resources is the concern of the CBD and the ITPGRFA, but not of the TRIPS Agreement. The TRIPS Agreement is not at all concerned with ABS, PIC and benefit sharing. The CBD and the ITPGRFA allow IPR protection under the condition that such IPR
do not run counter to the objectives of conservation of biodiversity and multilateral transfer of PGRs.
Chapter 3

Empirical Findings

The international provisions on access to genetic resources and benefits sharing, transfer of genetic resources and IPR over the GRs are well discussed in the literature. The ground reality of the level of understanding and the traditional practices of the farmers are, however, little known. Empirical analysis is important to assess the perceptions, practices and expectations of farming communities towards the access to PGRs and benefit sharing as provisioned by the CBD. For assessing the perceptions of the farming communities about access to genetic resources (GRs) and the TK related to their utilization sample households are surveyed.

The farmers have trade-offs. On one hand, if the flow of the genetic resources does not take place adequately, it affects their livelihood by decreasing the food production. On the other hand, if free movement of the genetic resources is allowed that may lead to the vulnerability of the GRs to the biopiracy. For maximizing the movement and utilization of the genetic resources among the farmers and reducing the chances of misappropriation of their GRs by outsiders for commercial purposes, adequate legal provisions and implementation mechanisms are required. But, for the implementation of such provisions, the farmers need to be empowered. For developing the programme for farmers' capacity building, the knowledge of the farmers and the practices of the flow of genetic resources from the villages need to be investigated. Traditionally, farmers' varieties and their population genetic structure are maintained by theory of meta-population dynamics and this includes seed flow between villages. But, in this study, GRs' exit from and entry to the village are only counted without considering the meta-population dynamics. The flows are taken into considered for three levels namely other villages, other locations in the country and with foreigners.

The understanding of the farming communities on PIC for access to PGRs and related TK is important in order to implement PIC, as required by CBD and ITPGRFA, at national as well as community and individual farmer level. As the majority of the farmers in Nepal is less educated and generous by their tradition, it is interesting to know how they react to the conditions related to the access to GRs and TK. Household survey is conducted for detecting the level of the understanding and belief of the farmers on access to genetic resources and benefit sharing.

3.1 Household Characteristics

3.1.1 Education, ethnicity and gender

For understanding the perceptions of farmers regarding access to genetic resources and benefit sharing, household survey was conducted. Nearly half of the respondents had primary education and 25 percent were illiterate (Table 3). As most of the people were either illiterate or just literate, the importance of genetic resources was difficult to communicate with them. In terms of ethnicity, most of the respondents were of Brahmin and Chhetri community.
Only 10 percent of the respondents were *Janajatis* (indigenous communities) and less than that were from the *Dalit* (occupational castes) community.

**Table 3: Education level of the respondents**

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Education</th>
<th>Respondents</th>
<th>% of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Just Illiterate</td>
<td>15</td>
<td>25.0</td>
</tr>
<tr>
<td>2</td>
<td>Primary (upto 5&lt;sup&gt;th&lt;/sup&gt; standard)</td>
<td>28</td>
<td>46.7</td>
</tr>
<tr>
<td>3</td>
<td>School Leaving Certificates (SLC)</td>
<td>11</td>
<td>18.3</td>
</tr>
<tr>
<td>4</td>
<td>Intermediate Level (two years after School)</td>
<td>3</td>
<td>5.0</td>
</tr>
<tr>
<td>5</td>
<td>Bachelor Level (5 to 6 years after School)</td>
<td>3</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Household survey 2007

**Table 4: Ethnicity of the respondents**

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Ethnicity</th>
<th>Sample households</th>
<th>% households</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dalit</td>
<td>5</td>
<td>8.3</td>
</tr>
<tr>
<td>2</td>
<td>Janajati</td>
<td>6</td>
<td>10.0</td>
</tr>
<tr>
<td>3</td>
<td>Other (Brahmin, Chhetri and Thakuri)</td>
<td>49</td>
<td>81.7</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Household survey 2007

Nearly 42 percent of the respondents were female (Table 5). All the respondents were found to grow crops and about 98 percent rear animals. As almost all the sample households were involved in agriculture, issues of access to genetic resources and benefit sharing and farmers’ rights were highly relevant to them.

**Table 5: Characteristics of sample households**

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Variable</th>
<th>Sample households</th>
<th>% households</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Female respondents</td>
<td>25</td>
<td>41.7</td>
</tr>
<tr>
<td>5</td>
<td>Crop growing households</td>
<td>60</td>
<td>100.0</td>
</tr>
<tr>
<td>6</td>
<td>Animals rearing households</td>
<td>55</td>
<td>97.7</td>
</tr>
</tbody>
</table>

Source: Household survey 2007

The education and ethnic composition of the sample households show that the sample is representative of the Nepalese farming community. As the sample is drawn from rural households, the percentage of households growing crops and rearing livestock is more than the national average.

3.1.2 **Practices of exchange of biological and genetic resources**

The survey of the existing practices of farmers regarding the flow of biological and genetic resources from their village to other places and vice-versa gave the following results. Baniya et al. (2002) reports that a large percentage of cultivated area in Nepal is planted with seed saved from the informal seed supply system. The result indicates that informal seed sources are a key element in rural livelihoods. Use of seeds from relatives is comparatively low. The out flow from and inflow of seeds and other genetic materials to the village are assessed in the sample households to understand the rate of inter-village flow of genetic resources.
3.1.2.1 Outflow of biological and genetic resources from the village

It is generally believed that in rural areas biological and genetic resources flow between villages as social custom and social connection with the help of social capital (Pretty and Smith 2004). To test this hypothesis the flow of biological and genetic resources from one village to another was surveyed. The results (Table 6) were that only 25 percent of the respondents had sent biological and genetic resources to other places during last year.

Table 6: Incidence of sending biological genetic resources out of the village during last year

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Type of household</th>
<th>Household</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Household providing genetic resources to farmers from outside the village</td>
<td>15</td>
<td>25.0</td>
</tr>
<tr>
<td>2</td>
<td>Household not providing genetic resources to farmers from outside the village</td>
<td>45</td>
<td>75.0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Household survey 2007

Table 7 shows that most of the households had sent buffalo out of their village. Exchanges of animals are good practice in the villages to avoid inbreeding. The other biological/genetic resources which were sent out of the village the most were cereal seeds and fruit seeds and saplings followed by vegetable seeds and coffee saplings. Such exchanges from village to village are also important to maintain meta population of certain landrace varieties to protect crops from stochastic events, for example, hailstorm, flood, landslide and drought for reintroduction or recolonisation.

Table 7: Type of plant or animals sent out of the village

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Type of biological/genetic resource</th>
<th>No of households</th>
<th>% out of sample</th>
<th>% out of those who sent out</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vegetable seed</td>
<td>2</td>
<td>3.3</td>
<td>11.8</td>
</tr>
<tr>
<td>2</td>
<td>Cereal seed</td>
<td>3</td>
<td>5.0</td>
<td>17.6</td>
</tr>
<tr>
<td>3</td>
<td>Fruit seeds and saplings</td>
<td>3</td>
<td>5.0</td>
<td>17.6</td>
</tr>
<tr>
<td>4</td>
<td>Coffee saplings</td>
<td>2</td>
<td>3.3</td>
<td>11.8</td>
</tr>
<tr>
<td>5</td>
<td>Buffaloes</td>
<td>6</td>
<td>10.0</td>
<td>35.3</td>
</tr>
<tr>
<td>6</td>
<td>Goats</td>
<td>1</td>
<td>1.7</td>
<td>5.9</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>17</td>
<td>28.3</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Household survey 2007

Table 8: Reasons for sending biological/genetic resources out of the village

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Reasons for sending out the resources</th>
<th>No. of respondents</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sold to other villages</td>
<td>14</td>
<td>82.3</td>
</tr>
<tr>
<td>2</td>
<td>Exchanged with other villages</td>
<td>1</td>
<td>5.9</td>
</tr>
<tr>
<td>3</td>
<td>Gifted to persons in other villages</td>
<td>2</td>
<td>11.8</td>
</tr>
<tr>
<td>4</td>
<td>Collected and taken away by Nepali</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>5</td>
<td>Collected and taken away by foreigners</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>17</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Household survey 2007

When asked the reasons for sending the biological/genetic resources out of the village, over 82 percent of the respondents said that they sold the resources out of the village and nearly 12
percent said that they had sent the resources out of the village as gifts to their daughters and relatives (Table 8).

### 3.1.3 Inflow of biological and genetic resources to the village

The household survey revealed that farmers bring biological and genetic resources to their village from other villages and markets. Half of the respondents said that during last year they had brought genetic resources to their village from elsewhere (Table 9). The rate of inflow of the GRs basically expected to depend upon education, social connection and accessibility of the site. Market for better quality seeds is the most popular mode of replenishment of the old crop variety. But, the danger is that the supply of better yielding marketed varieties can wipe out the landraces from the villages leading to genetic erosion over the years. Open pollinated seeds can also alter the genetic composition of the local landraces by cross multiplication.

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Inflow of genetic resources to the village</th>
<th>Household</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Household bring in genetic resources in the village</td>
<td>30</td>
<td>50.0</td>
</tr>
<tr>
<td>2</td>
<td>Household not bring in genetic resources in the village</td>
<td>30</td>
<td>50.0</td>
</tr>
</tbody>
</table>

Source: Household survey 2007

The types of biological/genetic resources that were brought in the village and the modes of transactions were also surveyed to understand the exiting practices of farmers. The survey revealed that the farmers bring in seeds, saplings and animals for production and reproduction to the villages. Of the total respondents who responded that they bring in resources to the village, nearly two third said that they had brought vegetable and cereal seeds (Table 10). Similarly, nearly one fourth said that they had brought buffaloes. Other biological/genetic resources brought into the village included fruit and coffee saplings and goats.

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Biological/Genetic resources</th>
<th>Household</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vegetable seed</td>
<td>13</td>
<td>38.2</td>
</tr>
<tr>
<td>2</td>
<td>Cereal seed</td>
<td>9</td>
<td>26.5</td>
</tr>
<tr>
<td>3</td>
<td>Fruit seeds and sapling</td>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td>4</td>
<td>Coffee saplings</td>
<td>1</td>
<td>2.9</td>
</tr>
<tr>
<td>5</td>
<td>Buffaloes</td>
<td>8</td>
<td>23.5</td>
</tr>
<tr>
<td>6</td>
<td>Goats</td>
<td>2</td>
<td>5.9</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>34</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Household survey 2007

Of the total respondents who responded that they had brought biological/genetic resources from out of the village, nearly 94 percent said that they had purchased the resources from either the market or from other villages (Table 11). This is because the study site is typically market oriented. The vegetable and cereal seeds were generally purchased from markets and other resources were brought from other villages. This shows the interdependence of the villages for sharing the GRs that are needed for food production.

Farmers’ practices of exchanging biological/genetic resources are limited to some animals, seeds and saplings. Generally they purchase vegetable seeds and in some cases cereal seeds from village agro-vets.
Table 11: Ways of bringing in biological/genetic resources to the village

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Modes of transaction</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Purchase from other villages and markets</td>
<td>31</td>
<td>93.9</td>
</tr>
<tr>
<td>2</td>
<td>Exchanged with other villages</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>3</td>
<td>Gift from other villages</td>
<td>2</td>
<td>6.1</td>
</tr>
<tr>
<td>4</td>
<td>Collection by self or family members from other villages</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>5</td>
<td>Given by a foreigner</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>33</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Household survey 2007

The sale and purchase of such seeds, planting materials and animals are general practices of market transactions. Farmers do not feel that they have been exchanging genetic resources. This is important perception as the transaction of seed (direct value) might have potential exploration value which is not known to farmers and this may lead to biopiracy. The farmers recognise the market value and generally not the option value or existence value of the GRs. Cases of sending out genetic resources from the village to other parts of the country or to foreign countries are not found in the survey.

3.1.4 Understanding of the Issues

In order to implement the draft laws on Access to Genetic Resources and Benefit Sharing (AGRBS) prepared by the Ministry of Forest and Soil Conservation and Plant Variety Protection (PVP) prepared by the Ministry of Agriculture and Cooperatives after their enactment, it is important to know the level of understanding of farmers on issues of ABS, PIC, access to research, access to commercial use of resources and IPR. Therefore, to find the level of knowledge of farmers on these issues, one research question was administered.

Experimentally, the respondents were asked to give some seeds of a crop they have. Majority of the farmers (85 percent) readily agreed to give seed without asking a single question (Table 12). It means that there are only a few farmers who understand the importance of PIC, although without knowing the term exactly. Otherwise, the farmers are neither aware of the benefits that their genetic resources could fetch, nor of the risk of biopiracy. The survey showed that they would readily give un-authorised access to their biological/genetic resources to any outside visitor. Though the farmers were asked for seed by a Nepali surveyor, keeping the ratio of the response in view, it can be inferred that even the foreigners can easily obtain GRs from some of the farmers.

Table 12: Response of farmers when the enumerator asked for some seed

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Response observed</th>
<th>Households</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Readily agreed to give seed</td>
<td>51</td>
<td>85.0</td>
</tr>
<tr>
<td>2</td>
<td>Asked the name of the crop</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>3</td>
<td>Asked the reason</td>
<td>2</td>
<td>3.3</td>
</tr>
<tr>
<td>4</td>
<td>Hesitated</td>
<td>4</td>
<td>6.7</td>
</tr>
<tr>
<td>5</td>
<td>Denied</td>
<td>2</td>
<td>3.3</td>
</tr>
<tr>
<td>6</td>
<td>Told that there is no enough seed to give</td>
<td>1</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Household survey 2007

Thus, it can be concluded that genetic resources owned by farmers are at great risk of getting unauthorized access by outsiders that may lead to bioprospecting of our genetic resources in
other countries without sharing the benefits with us. Such condition is generally understood as a biopiracy.

3.2 Perception of the Implementation of Issues

Most of the respondents said that the biological/genetic resources they have, are not of unique quality different from those owned by others. They are available also in other households, other villages and other districts. Only 30 percent of the respondents said that they have some plants unique in characteristics and are not available in other farms in the village (Table 13). In case of animals, the responses were still low in favor of uniqueness. Only 13 percent of the respondents said that they have some animals unique or exceptional among those available in the village. It shows that most of the biological/genetic resources in the village are commonly hold and therefore, access to these resources should be regulated mainly at the community level not at the individual household level. This fact is verified latter from the response that most of the farmers suggest to pay the benefits from bioprospecting to the community and only few ask for individual level payment.

Table 13: Perception of farmers about the ownership of genetic resources and TK

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Variable</th>
<th>n</th>
<th>Mean</th>
<th>Standard Error</th>
<th>Binomial Exact</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Have unique plants</td>
<td>60</td>
<td>0.30</td>
<td>0.06</td>
<td>0.19</td>
<td>0.19 - 0.43</td>
</tr>
<tr>
<td>2</td>
<td>Have unique animals</td>
<td>60</td>
<td>0.13</td>
<td>0.04</td>
<td>0.06</td>
<td>0.06 - 0.25</td>
</tr>
<tr>
<td>3</td>
<td>Have unique TK of plant</td>
<td>60</td>
<td>0.13</td>
<td>0.04</td>
<td>0.06</td>
<td>0.06 - 0.25</td>
</tr>
<tr>
<td>4</td>
<td>Have unique TK of animals</td>
<td>60</td>
<td>0.03</td>
<td>0.02</td>
<td>0.00</td>
<td>0.00 - 0.12</td>
</tr>
</tbody>
</table>

Source: Household survey 2007

Most of the plant and animal related TK that farmers have, are in public domain. Only 13 percent of the farmers felt that they knew something unique about some plants which others might not know. Regarding TK related to animals, the response is still low. Only three percent of the respondents felt that they knew something unique about some animals which other villagers might not know6.

On legislative aspect, some of the farmers felt that there is legislative deficiency to regulate the ABS mechanism. When asked whether they felt the need of a law to regulate the ABS mechanism, 58 percent of the farmers said that law is required.

To know their perceptions about their rights over their TK, the farmers were asked whether they were ready to share anything new they knew about plants and animals. In response, majority of the farmers (62 percent) said that they do not regard TK as their personal property and therefore, they are ready to share any knowledge or experience regarding the use of plants and animals for the betterment of humankind. Such perception of farmers7 is contrary to the

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6 This is because of the nature of the GR that are used for food purpose. There are several information not available in public domain, specially medicinal plants, that is not covered by this study.

7 The people feel themselves rich in traditional knowledge, for example, the traditional healers and handlers of medicinal plants may have different view, and not covered in the study.
perception of people in developed countries where every bit of knowledge is privatised in the name of intellectual property rights (Table 14).8

Table 14: Perception about laws and sharing of TK

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Responses</th>
<th>Sample households</th>
<th>% households</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Felt the need of a law</td>
<td>35</td>
<td>58.3</td>
</tr>
<tr>
<td>2</td>
<td>Ready to share TK</td>
<td>37</td>
<td>61.7</td>
</tr>
</tbody>
</table>

Source: Household survey 2007

To analyse the perceptions and to test the hypotheses econometrically, four study variables are identified (Table 15). On an average 85 percent (for a dummy dichotomous variable with zero-one value the mean represent the percent of the respondents) of the farmers are ready to give access to their biological/genetic resources unconditionally with a confidence interval of 73 to 93 percent. Thus, it can be inferred with 95 percent confidence that 73 to 93 percent of the Nepalese farmers are ready to give unconditional access to their biological/ genetic resources.9

Similarly, on an average 62 percent of the households are ready to give unconditional access to their TK, which means that we can infer with 95 percent confidence that 48 to as high as 74 percent of the Nepalese farmers are ready to give unconditional access to their genetic resources if a person with Nepali face asks for foreigners, it may be less but still substantial.

Table 15: Descriptive statistics of dichotomous study variables

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Variable</th>
<th>n</th>
<th>Mean</th>
<th>Standard Error</th>
<th>Binomial Exact 95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Readily agreed to give seed (genetic resources)</td>
<td>60</td>
<td>0.85</td>
<td>0.05</td>
<td>0.73, 0.93</td>
</tr>
<tr>
<td>2</td>
<td>Readily agreed to share TK</td>
<td>60</td>
<td>0.62</td>
<td>0.06</td>
<td>0.48, 0.74</td>
</tr>
<tr>
<td>3</td>
<td>Felt the need of benefit sharing</td>
<td>60</td>
<td>0.72</td>
<td>0.06</td>
<td>0.59, 0.83</td>
</tr>
<tr>
<td>4</td>
<td>Felt the need of laws on access and benefit sharing</td>
<td>60</td>
<td>0.58</td>
<td>0.06</td>
<td>0.45, 0.71</td>
</tr>
</tbody>
</table>

Source: Household survey 2007

Likewise, 72 percent of the respondents feels that the benefits accruing from the access to genetic resources should be shared fairly and equitably. Thus, it can be said with 95 percent confidence that 59 to as high as 83 percent of Nepalese farmers feels that there should be a mechanism of benefit sharing. It means even those households who want to give unconditional access to their GRs and TK, they expect sharing of the benefits if the option is available. The majority of the farmers agrees for unconditional access due to the lack of knowledge. Once they come to know that there can be a benefit sharing mechanism they revise their idea and claim for benefit sharing. If farmers are aware of the importance and potential benefits of the genetic resources, and possibility of getting some benefits out of them, they will not agree for unconditional access. This shows the importance of raising awareness among the farmers.

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8 The readers are requested to take into consideration the sampling error in these results as the sample size is small.
9 We are 95 percent confident that 73 to as high as 93 percent of the farmers are ready to give unconditional access to the seeds they have.
On an average 58 percent of the sample households feels that there is need of law on ABS/PIC; that is, with 95 percent confidence, it can be said that 45 to 71 percent of the farmers feel the need of benefit sharing.

These four study variables, namely access to GR, access to TK, need for benefit sharing and need for law, are regressed with explanatory variables including personal characteristics, household characteristics and ethnicity (Table 16). The average age of the respondents is 46 years and the duration of formal education taken five and a half years. The average family size is six persons per family.

Table 16: Explanatory continuous variables

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Variable</th>
<th>Unit</th>
<th>n</th>
<th>Mean</th>
<th>Standard Error</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age of the respondent</td>
<td>years</td>
<td>60</td>
<td>46.13</td>
<td>1.92</td>
<td>42.29 - 49.98</td>
</tr>
<tr>
<td>2</td>
<td>Duration of formal education of the respondent</td>
<td>years</td>
<td>60</td>
<td>5.47</td>
<td>0.54</td>
<td>4.39 - 6.54</td>
</tr>
<tr>
<td>3</td>
<td>Family size</td>
<td>Number</td>
<td>60</td>
<td>6.07</td>
<td>0.44</td>
<td>5.18 - 6.96</td>
</tr>
</tbody>
</table>

Source: Household survey 2007

The dummy variables are female with 42 percent and Dalit-Janajati with 18 percent (Table 17). In this sense, the sample is inclusive.

Table 17: Explanatory dummy variables

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Variable</th>
<th>n</th>
<th>Mean</th>
<th>Standard Error</th>
<th>Binomial Exact</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Female respondent</td>
<td>60</td>
<td>0.42</td>
<td>0.06</td>
<td>0.29</td>
<td>0.29 - 0.55</td>
</tr>
<tr>
<td>2</td>
<td>Dalit and Janajati</td>
<td>60</td>
<td>0.18</td>
<td>0.05</td>
<td>0.09</td>
<td>0.09 - 0.30</td>
</tr>
</tbody>
</table>

Source: Household survey 2007

To test the risk of multicollinearity among the explanatory variables, pair-wise correlation is estimated and tested for significance. Some of the correlation coefficients are significant but are within a limit of 0.4 pair-wise\(^10\).

The dichotomous dummy dependent variable probit analysis (a regression model for dummy dependent variable like yes or no) shows that the unconditional access to genetic resource are affected significantly and negatively by the age of the respondent and ethnicity like Dalit-Janajati (Table 18). It means that the older people and people of Dalit-Janajati community are less likely to give unconditional access to their biological/genetic resources as compared to younger people and other castes (details are available in Annex I). Some of Dalit-Janajati denied to give seeds stating that they do not have in stock. Gender, education and family size do not affect the readiness to give access to biological/genetic resources. It means that both male and female are equally ready to provide unconditional access to the GRs. Surprisingly, education of the respondents does not affect the decision.

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\(^{10}\) This is just a mathematical process without having policy implication.
Table 18: Readiness of farmers to give unconditional access to biological/genetic resources

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Explanatory variables</th>
<th>Coefficient</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age of the respondent</td>
<td>-0.047*</td>
<td>-0.096 0.001</td>
</tr>
<tr>
<td>2</td>
<td>Female respondent</td>
<td>-0.526</td>
<td>-1.703 0.651</td>
</tr>
<tr>
<td>3</td>
<td>Education of the respondent</td>
<td>0.021</td>
<td>-0.143 0.186</td>
</tr>
<tr>
<td>4</td>
<td>Ethnicity (Dalit and Janajati)</td>
<td>-2.296***</td>
<td>-3.682 -0.910</td>
</tr>
<tr>
<td>5</td>
<td>Family size</td>
<td>0.155</td>
<td>-0.085 0.396</td>
</tr>
<tr>
<td>6</td>
<td>Constant</td>
<td>3.373*</td>
<td>-0.194 6.941</td>
</tr>
</tbody>
</table>

| LR X^2(5) | = 22.74 | n = 60 |
| Probability > X^2 | = 0.000 | |

Pseudo R^2 = 0.448

Note: * means significant at 10 percent level and ** at 5 percent level.

Source: Household survey 2007

It is seen from the analysis that the farmers' decision for unconditional access to TK associated with biological/genetic resources is affected by ethnicity (Dalit-Janajati) and family size significantly and negatively (Table 19). It means the Dalit–Janajati and households with larger family size are less likely to give unconditional access to TK to others (see details in Annex II). They in fact believe more on their traditional knowledge than any other castes. Age and education significantly increase the likelihood of sharing TK with outsiders. It means the older people and educated are vulnerable to the piracy of traditional knowledge. Gender does not affect such decisions. It means the male and female are equally open to share the traditional knowledge with the outsiders.

Table 19: Readiness for unconditional access to TK

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Explanatory variables</th>
<th>Coefficient</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age of the respondent</td>
<td>0.038***</td>
<td>0.007 0.070</td>
</tr>
<tr>
<td>2</td>
<td>Female respondent</td>
<td>-0.332</td>
<td>-1.125 0.462</td>
</tr>
<tr>
<td>3</td>
<td>Education of the respondent</td>
<td>0.107**</td>
<td>0.001 0.213</td>
</tr>
<tr>
<td>4</td>
<td>Ethnicity (Dalit and Janajati)</td>
<td>-1.417***</td>
<td>-2.481 -0.353</td>
</tr>
<tr>
<td>5</td>
<td>Family size</td>
<td>-0.112**</td>
<td>-0.222 -0.002</td>
</tr>
<tr>
<td>6</td>
<td>Constant</td>
<td>-0.938</td>
<td>-2.876 1.001</td>
</tr>
</tbody>
</table>

| LR X^2(5) | = 21.81 | n = 60 |
| Probability > X^2 | = 0.001 | |

Pseudo R^2 = 0.273

Note: ** at 5 percent level and *** at 1 percent level.

Source: Household survey 2007

Factors affecting the farmers' perceptions for the necessity of the benefit sharing are less identified. The urgency of benefit sharing is significantly higher among Dalit–Janajati and other explanatory variables are not significant (Please see the results in Annex III). Similarly, feeling for the need of law on ABS/PIC is less determined. The sole variable affecting such response significantly is the age of the respondent. Older the age of the respondent, lower is the possibility of a response that there is need of law (Annex IV). Nepalese people, particularly the older generations believe on ethics and humanity rather than on the laws. For a community to be able to demand benefit sharing, full information is required to the local people.
3.3 Major Preconditions for Protecting Farmers Rights

For analyzing of the perceptions and understanding of the leader farmers, development workers, social workers and local leaders on the issues of access to genetic resources and benefit sharing a focused group discussion was organized in Palpa. Discussion revealed that the major pre-conditions for protecting the rights of the communities and farmers are the clear recognition of their ownership, regulation of access, prior informed consent for the access, benefit sharing mechanisms and disclosure requirement while granting IPR to the developers of the plant varieties.

3.1 Regulating Access to Genetic Resources

In order to serve the mutual interest of the farmers maintaining genetic resources and biotechnological industries utilizing commercially the farm saved biological resources\textsuperscript{11} and TK, the access and benefit sharing mechanism, which also ensures prior informed consent (PIC) of the concerned communities and farmers, has been seen as a trade off between the technologically strong North and the biodiversity-rich South (SAWTEE, 2006). Implementation of the provisions of the CBD and amendment of TRIPS in line with the CBD is beneficial to the farmers of Nepal. For a country rich in biological diversity, the CBD is good for conservation of biodiversity and protection of rights of communities. But there is need to sensitize the farmers and empower them for sound decision making in their part to regulate the PIC and other access conditions.

3.1.1 Conditions for access

The discussion with stakeholders in Tansen gives some different pictures than those given by the individual farmers in the villages. The FGD proposes that we need strong law to protect our genetic resources from unauthorized access or biopiracy by foreigners. We need strong laws to regulate bioprospecting and safeguard rights of the custodians, the farmers. We should not give access to some of the important genetic resources that are required for our future generations. The discussion recommends three terms for the access to the genetic resources.

a) In the case of 64 Genera listed under the annex of the Treaty, we need to develop research capacity and institutional mechanism to get access from multilateral system and utilise those PGRs for developing new varieties.

b) For the PGRs other than those covered under the Treaty, we need to develop laws to regulate the access from outside agents on benefit sharing basis. But, within the country we should encourage the flow of genetic resources from one place to the other so that we can promote evolutionary process of new diversity and harvest their potentials as much as possible.

c) The animal genetic resources are neither covered by the Treaty nor by the TRIPS. The CBD, however, covers all genetic resources holistically. We need national laws to restrict the export of animal genetic resources. Development of the domestic research capacity is necessary for utilizing the animal genetic resources.

\textsuperscript{11} We should think differently for the genetic resources that are available in public lands and water.
The participants of FGD raised an issue that what benefits we can get from the genetic resources that we already gave to other countries. Such benefits need to be shared with local communities as well. If we need to give access to further genetic resources, we can provide the access based on the protection of our rights and terms for sharing benefits. For protecting rights of local communities, local laws are demanded. It is important to strengthen plant breeding capacity of country to use domestic GRs and those that can be repatriated from Consultative Group on International Agricultural Research centres and other ex situ collections through material transfer agreements (MTA).

3.1.2 Mechanisms of access

If a GR is available only in a village in Nepal we can give full authority to concerned Village Development Committee (VDC) to regulate the access to the GR. But such a GR hardly exists. Most of the GRs are available in several VDCs and they can turn to be competitors and face a monopsony buyer of the GR.

For the genetic resources that are unique to some districts in the country and not generally available in other countries (for example loh b sala and yarba gumba) we should do tough negotiation to share the benefits as much as possible. The uniqueness in living things come either from genetic composition or from environment or both. If the unique trait is useful, then it has high use value. If such uniqueness comes more from the environment, we can use the geographical indication (GI) provision of the TRIPS agreement to protect the rights over the distinction of the product.

If there is an assurance of equitable benefit sharing by giving access to GR, the government should write to District Development Committee (DDC). Then the DDC in collaboration with District Forest Office (if forest genetic resource) or District Agriculture Development Office (if agriculture genetic resource) should write to Village Development Committee or Municipality from where the access is intended. Depending on the ownership of the genetic resources at the local level, the VDC/Municipality should reach to the owner concerned. The owner (individual, community or Forest Users’ Group) concerned should decide whether to give access to the particular genetic resource. If the genetic resources are in public land, the line agency concerned with the land and the local government should decide for the access in consultation with the local communities. While giving access to a genetic resource its long term sustainability and short term benefits should be the major concern.

But, when the uniqueness in terms of valuable traits comes from genetic composition, such GR may be available in wider geographic areas. For the GR that are available in other countries too, we can not have strong negotiating power individually. If a GR is available at the regional level, we should form a regional body so that the body can negotiate with the party that seeks access to that GR.

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12 The owner can be an individual if the genetic resource is in individual domain or community if the genetic resource is at the community domain or Forest Users' Group if the genetic resources are in community forest.
3.1.3 Prior informed consent procedure

The FGD demanded for a complete process of PIC from local communities. For this purpose, the nation should prepare inventory of its genetic resources and associated communities. In effect, they are demanding biodiversity registration that is already initiated in some of the districts at ad hoc basis. Since some unique GR can found with more than one community, the registration should establish the ownership of each community having such GR. The local communities should get full rights to decide whether to give access to their genetic resources. While respecting the international agreements we need to protect our rights and should also protect biological diversity.

For protecting biological diversity and getting benefited from the provisions of the CBD and the Treaty, implementation of Prior Informed Consent (PIC) is required before granting any access to foreign party to PGRs and related TK. The PIC is a necessary condition of the rights of indigenous and other local communities to participate in the management of GR they own. But, the level of awareness of the local farmers is a challenge. Even the commercially oriented farmers in Palpa district, they are not much aware about their rights over the GR, the implementation of the PIC at the local level is really a challenge.

The situation at the international level is different. Ensuring that the IPR system in PGRs adequately considers and implements PIC is one of the fundamental elements being negotiated in the Doha Agenda (Paragraph 19) that propose to review the Article 27.3(b) of the TRIPS agreement. The Doha programme proposes to examine the relationship between the TRIPS Agreement and the CBD taking fully into account the development dimension. One of the key provisions of the CBD is the requirement that access to genetic resources be subject to PIC. Implementation of the PIC provision of the CBD and the Treaty is a challenge for a country with large proportion of illiterate farmers who are legally not organised into an institution.

In the context of access to PGRs the PIC focuses preventing exploitation and movement out of the country of potentially beneficial materials. The PIC also emphasizes on ensuring the sharing of benefits derived from use of the materials accessed.

3.2 Benefit Sharing

Bioprospecting or commercial use of useful traits or commercialization of the GRs can generate benefits to the entrepreneurs and the community that conserve the GRs. But we do not have full information about the commercial value of the GR that we have. It is still difficult for us to understand the use values and non-use values of GR. Registration of important trait and valuation of these traits are necessary to have some idea necessary for negotiating the benefit sharing. The concern is that the benefits should be shared equitably among the contributors. Contribution from the farmers or custodians for bioprospecting is the genetic material whereas that form the bioprospecting company is capital goods and

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13 It is not like in the context of the hazardous wastes or genetically modified organisms where the PIC focuses on preventing adverse impacts of movement of materials into a country.
human resources. Without knowing the value of the individual GR we can not compare those with the capital goods and human resources that can be valuated at market price.

The equitable share of the benefits, monitory and non-monitory, to the farmers and local communities can be realized in different ways.

a) The benefits may be shared in terms of monetary payments like access fees or fee per sample collected, advance payments in lump sum or sharing the benefits after earning in the future or creating community conservation funds to support community development.

b) The non-monetary benefits may be in terms of sharing new varieties developed, research in local farms together with the farmers, joint ownership of varieties developed, social recognition or awards to the donor of the genetic resources or the development of social infrastructure like school, drinking water and road.

During the FGD issue was raised regarding the knowledge of the use of genetic resources. Until and unless people know the importance of the genetic resources they are not motivated for conservation and protection of them from biopiracy.

The FGD confirmed that having a law is not enough for benefit sharing. People's awareness and participation are essential. Their concern to the benefit sharing is that when the nation can not get enough benefits from the users of our genetic resources in other countries, then what can we share equitably with the communities.

3.3 Disclosure Requirements in Relation to IPR

The TRIPS agreement does not require the declaration of the source of genetic resources before granting IPR to the modified plants. This is feared to lead to biopiracy from technologically poor but biologically rich countries.

<table>
<thead>
<tr>
<th>Box 5: Addressing Biopiracy (Bridges ‘Trade BioRes, 2007)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. For preventing biopiracy, it is proposed to introduce an international certificate of origin for GR. The certificate would serve as a tracing mechanism to ensure transparency in the flow of such resources.</td>
</tr>
<tr>
<td>2. It is necessary to create an internationally recognized certificate of origin to comply with the CBD requirements on access and benefit sharing and to promote the use of indigenous knowledge and equitable benefit sharing.</td>
</tr>
<tr>
<td>3. A certificate of origin is a type of 'passport' or 'permit' that would accompany a GR along the whole chain of the access process, from the collection phase to the marketing of a resultant product.</td>
</tr>
<tr>
<td>4. The certificate could be verified at different points, including once the GR has left the provider country.</td>
</tr>
<tr>
<td>5. The main objectives of an internationally recognized system would be to ensure the traceability of GR, increase transparency, provide legal certainty to the access and benefit sharing arrangements and facilitate the flow of genetic resources.</td>
</tr>
</tbody>
</table>

Disclosure of the sources of genetic material while applying for IPR can minimize biopiracy to some extent. The disclosure requirements are not incorporated in the TRIPS agreement. In the proposed review of Article 27.3 (b) the Doha Ministerial Declaration (paragraph 19)
propose to consider the relationship between the TRIPS and the CBD. Work is particularly focused on whether and how disclosure requirements would contribute to a more logical and supportive relationship between these two Agreements.

But, the problem with the provision of the TRIPS is that it recognizes only the formally developed non-obvious technology and not the contribution of the farmers that does not follow an inventive step.

According to the CBD, each contracting party needs to respect, preserve and maintain knowledge, innovation and practices of indigenous and local communities. Each party needs to promote wider application of local knowledge, innovation and practices with the approval and involvement of the holders of them and encourage the equitable sharing of the benefits arising from their utilization (Article 8). Accordingly a person seeking access to genetic resources must obtain consent from every affected community in the traditionally recognized manner. Before seeking the consent, the person seeking access should make clear the objective and use of the resources to the local communities.

Considering the technicality of access conditions particularly PIC and benefit sharing, the level of the knowledge and understanding of the farmers are incomparably low. More than three-fourth of the farmers readily agree to share the genetic resources and TK with others. This is due to lack of knowledge to understand the value of genetic resources and TK. When asked for benefit sharing, their expectation is suddenly raised and major asked for a need of benefit sharing. There is need for international advocacy for incorporating PIC and benefit sharing for access to GR and disclosure requirement for registering an IPR. At the national level, there is need for strong legislative measures to check biopiracy and expensive to administer than investing in bioprospecting. At the local level, the farmers should be fully informed and empowered to decide for the access to GR and TK in their benefit.
Chapter 4

Conclusions and recommendations

4.1 Conclusions

The study reviewed major international agreements relating to the genetic resources. Empirical was study—Stakeholder Discussion and Farm Household Survey—was conducted to assess the perceptions, practices and expectations of the farmers in Nepal regarding access to genetic resource and benefit sharing. Out of the sample of 60 respondents, nearly a half were with primary education and a quarter illiterate. Most of the respondents were of Brahmin and Chhetri community and less than 20 percent of Dalit-Janajati. Almost all the sample households were involved in agriculture. The household survey and discussions are based on the review of the provisions of international agreements relating to genetic resources.

The review shows that the Convention of Biological Diversity (CBD), International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) are somehow concerned with the provisions of access, bioprospecting and benefit sharing, but quite differently. The parties to the CBD have rights over their genetic resources bestowed to the local communities. The CBD has conferred sovereign rights over genetic resources to national governments. Likewise, the ITPGRFA has clearly recognised the rights of farmers over the genetic resources. It also advocated to ensure equitable sharing of benefits arising out of the use of genetic resources and related TK. However, the TRIPS Agreement does not recognise the rights of the farmers. It provides the rights to the plant breeders over their effort to develop new plant varieties.

It is widely feared that the protection of the rights of the plant breeders over the varieties developed by them without recognising the rights of the custodians of the PGRs which are used by the plant breeders to develop new varieties. Protection of IPR over plant varieties and micro-organisms without adequately protecting the rights of the farmers has raised major concern on the biodiversity conservation. This necessitates the protection of rights of the farmers. The major pre-conditions for protecting the rights of the communities and farmers are the regulation of access, prior informed consent for the access, benefit sharing mechanisms and disclosure requirement while granting IPR to the developers of the plant varieties.

The CBD talks about bilateral access to genetic resources (both animal and plant) whereas the ITPGRFA considers multilateral access for 64 genera of plants that are directly concerned with the food and agriculture and bilateral for other PGRs. For the TRIPS agreement, the genetic resources without IPR are the open access and have no provision of benefit sharing. Access to genetic resources for research requires benefit sharing under CBD but not under the Treaty. Under the CBD, the IPR is available but it should be supportive of and not run counter to its objective. The Treaty allows for IPR under the condition that the IPR does not limit the facilitated access to PGRs in the form received from the Multilateral System.

14 No such compulsory provision is, however, there for animal genetic resources.
TRIPS agreement, however, has very strong IPR over plant varieties, either by patenting or effective *sui generis* but no provision of benefit sharing. Therefore, the access to genetic resources is the concern of the CBD and the ITPGRFA, but not of the TRIPS Agreement.

From the analysis of the responses from 60 households, it can be concluded that the farmers have practices of exchanging biological/genetic resources. Generally they either exchange/give as gift among themselves or purchase seeds from the market. In order to implement the laws on Access to Genetic Resources and Benefit Sharing and Plant Variety Protection, it is important to know the level of understanding of farmers on issues of ABS, PIC, access to research, access to commercial use of resources and IPR. When asked for some seeds, majority of the farmers readily agreed to give. The farmers are thus neither aware of the benefits that their genetic resources could fetch, nor of the risk of biopiracy. Thus, it can be concluded that genetic resources owned by farmers are at great risk of piracy and misappropriation.

This is because that the most of the farmers feel that the biological/genetic resources they own are not of unique quality since they are also available with other households in the village. Most of the plant and animal related TK that farmers have are in public domain. Some a half or more farmers felt that there is legislative deficiency to regulate the ABS mechanism. Similarly, majority of the farmers do not regard TK as their personal property and therefore, they are ready to share any knowledge or experience regarding the use of plants and animals for the betterment of humankind. Such perception of farmers is contrary to the perception of people in developed countries where every bit of knowledge is being privatised in the name of IPR. This poses a challenge to protect their rights over the TK.

Access to GR, access to TK, need for benefit sharing and need for a law are regressed with explanatory variables including personal characteristics, household characteristics and ethnicity. As all these four dependent variables are dummy dichotomous variables, probit analysis was done. The results show that the older people and people of *Dalit-Janajati* community are less likely to give unconditional access to their biological/genetic resources as compared to younger people and other castes. *Dalit-Janajati* and households with larger family size are less likely to give unconditional access to TK to others. But, the older people and educated ones are more vulnerable to the piracy of traditional knowledge.

The urgency of benefit sharing is significantly higher among *Dalit-Janajati*. The feeling for the need of a law on access to genetic resources and benefit sharing and prior informed consent (PIC) by an individual is less explained by the personal characteristics. Nepalese people, particularly the older generations believe on ethics and humanity rather than on the laws. For a community to be able to protect their rights and demand for benefit sharing some pre-conditions need to be developed.

The equitable share of the benefits, monetary and non-monetary, to the farmers and local communities can be realised in different ways. The benefits may be shared in terms of monetary payments like access fees or fee per sample collected, advance payments in lump sum or sharing the benefits after earning in the future. It can also be shared as non-monetary benefits terms of sharing new varieties developed, research in local farms together with the farmers, joint ownership of varieties developed, social recognition or awards to the donor of
the genetic resources or the development of social infrastructure like school, drinking water and road.

The major pre-conditions for protecting the rights of the communities and farmers are the clear recognition of their ownership, regulation of access, prior informed consent for the access, benefit sharing mechanisms and disclosure requirement while granting IPR to the developers of the plant varieties.

4.2 Recommendations

The aim of the study is to understand as a case how much the farming communities are informed about the concept and provisions of genetic resources in relation to access to genetic resources and benefit sharing (ABS) and PIC for such access. The study gives following major recommendations.

1. As the farmers are not generally aware of the importance of the genetic resources and same genetic materials are available with different communities covering different villages, different districts and different regions of the country, the registration of each and every diversity at genetic and species level and protection of their rights on the basis of such registration is not practical. Community Biodiversity Registration is being applied for this purpose. This practice need to develop some incentive mechanism to the community to register the most useful traits first. There are needs to maximise the utilisation of such useful diversity by simple identification and multiplication, and distribution within community. Further research is required to develop the actual mechanism for this purpose.

2. As it is practically unlikely to register and record each bit of genetic resource, attempting to register all of them will create a loophole to open misappropriation of genetic resources that may lead far beyond the feared biopiracy. Therefore, the legal rights to the farmers over their genetic resources need to be provided in blanket coverage that each bit of the genetic resource in the farmers' field belong to the farmers.

3. As the genetic resources owned by farmers are at great risk of piracy and misappropriation, legislation is required for striking a balance among the regulation of the access for protection of genetic resources, their conservation, promoting local exchange and bioprospecting.

4. As the Nepalese farmers, particularly the older generations believe on ethics, social responsibilities and humanity rather than on the laws and their enforcement, the community needs to be enabled to protect their rights and demand for benefit sharing using some pre-conditions like access regulation, PIC and benefit sharing. In order to serve the mutual interest of the farmers maintaining genetic resources and biotechnological industry utilizing commercially the biological resources and TK, the access and benefit sharing mechanisms need to be developed.

5. Within the country we should encourage the flow of genetic resources from one place to the other for research purpose so that we can harvest their potentials as much as possible for the benefit of the farmers. For the purpose of bioprospecting by
multinational companies the benefit sharing mechanism should be imposed even within the country. But, different terms of reference are recommended for providing the access to the genetic resources to foreign party as required and authorized by the international commitments of the country.

d) For the 64 genera of the PGRs, listed under the annex 1 of the Treaty, and directly required for food and agriculture, we need to develop research capacity and institutional mechanism to get access from multilateral system and to utilise them for developing new varieties within the country. Domestic research capacity is required for adding value to genetic resources coming from any sources either or not within the purview of ITPGRFA.

c) For the PGRs other than those covered under the Treaty, we need to develop suitable laws to regulate the access from outside agents on benefit sharing basis.

f) The animal genetic resources are neither covered by the Treaty nor by the TRIPS. The CBD, however, covers all genetic resources holistically. We need national laws to restrict the export of animal genetic resources. Development of the domestic research capacity is necessary for utilising the animal genetic resources.

g) We need to prepare inventory of high value traits of the genetic resources that we already gave to other countries and international organisations. Exploration study is required to find out that how can our farmers benefit from such genetic resources that are already out of the country, particularly for those that are taken away after 1992.

h) If we need to give and take access to further genetic resources, we can provide the access based on the protection of our rights and terms of equitable sharing of benefits. For estimating the value of equitable benefits valuation of important traits of the genetic resources is needed.

i) For the unique genetic resources that are available only in Nepal, we should do tough negotiations to get larger benefits. For this purpose, we need to develop inventory of such genetic resources with high value traits at the present level of knowledge and revise such list as and when new species are found or new technology is developed.

j) For the genetic resources that are available in other countries too, we should form a regional body so that it can negotiate with the party that seeks access to such genetic resources. For example, we need to develop a Nepal-China regional body to regulate the access to Yarcha gumba, and Nepal-India-Pakistan regional body to control the Basmati rice.

6. The benefits—arising from the genetic resources from bioprospecting, either from foreign companies or from domestic—should be shared with those persons or communities who are actually conserving the resources. Depending on the ownership of the genetic resources at the local level, the authority to give access should reach to the owner concerned (individual, community or Forest Users' Group. If the genetic resources are in public land the local government should be able to decide for the access in consultation with the local communities. The local communities should get full rights to decide whether to give access to their genetic resources. For getting benefited from the provisions of the CBD and the Treaty, implementation of Prior Informed Consent (PIC) is required before getting any access by foreign party to PGRs and related TK or the party that does bioprospecting within the country.
7. Nobody can estimate definitely that how much a particular genetic resource can earn after commercialisation. This makes difficulty in negotiation of the benefit sharing from the foreign parties. Therefore, we should focus the full utilisation of the resource within the country by sustainable harvesting or use through breeding. We can pay royalty to the inventors of the technology that is required for the commercialisation of genetic resources. In addition, we need to conduct valuation exercise of major useful traits of the genetic resources that are demanded by other on benefit sharing basis.

8. Considering the technicality of access conditions particularly PIC and benefit sharing, the level of the knowledge and understanding of the farmers are incomparably low. More than three-fourth of the farmers readily agree to share the genetic resources and TK with others. This is due to lack of knowledge to understand the importance of genetic resources and TK. Farmers capacity building for decision making for their benefits is necessary instead of taking decision for them by the government.

9. As the majority of the Nepalese farmers are ready to give unconditional access to the genetic resources and TK in the name of their traditional believe and attitude of helping everybody what they can, awareness campaign is required to make known to every holder of genetic resources and TK about the importance of their resources and knowledge and risk of piracy and misappropriation. They need to be advised not share their seeds with outsiders without knowing that the seeds will be utilised within the country and not taken to other countries without authorisation. As the village to village geneflow is an important process of food production and conservation by creating new diversity adapted to changed environment, such practice however, should not get affected adversely. Mass media, both the print and electronic, can be used for the purpose and local governments and civil societies can be mobilised to this end.

10. For a country rich in biological diversity, the CBD is good for conservation of biodiversity and protection of rights of communities. Ensuring that the IPR system in PGRs adequately considers and implements PIC is one of the fundamental elements being negotiated in the Doha Agenda (Paragraph 19 of Doha Declaration); and, it has proposed to review the Article 27.3(b) of the TRIPS agreement to check any relation with the CBD. Further, international lobby is required to amend TRIPS in line with the CBD under paragraph 19 of the Doha Declaration.

11. Until and unless people know the importance, they are not motivated for conservation and protection of genetic resources from the loss and biopiracy. There is need for international advocacy for incorporating PIC and benefit sharing for access to GR and disclosure requirement for registering an IPR. At the national level, there is need for strong legislative measures to check biopiracy. At the local level, the farmers should be fully informed and empowered to decide for the access to GR and TK in their benefit.
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Annexes

Annex I: Readiness of farmers to give unconditional access to biological/genetic resources

| S.N. | Explanatory variables | Coefficient | Standard Error | z     | P>|z| | 95% Confidence Interval |
|------|-----------------------|-------------|----------------|-------|------|------------------------|
| 1    | Age of the respondent | -0.047*     | 0.025          | -1.940| 0.053| -0.096 - 0.001         |
| 2    | Female respondent     | -0.526      | 0.601          | -0.880| 0.381| -1.703 - 0.651         |
| 3    | Education of the respondent | 0.021 | 0.084          | 0.250 | 0.801| -0.143 - 0.186         |
| 4    | Ethnicity (Dalit and Janajati) | -2.296*** | 0.707          | -3.250| 0.001| -3.682 - -0.910        |
| 5    | Family size           | 0.155       | 0.123          | 1.270 | 0.206| -0.085 - 0.396         |
| 6    | Constant              | 3.373*      | 1.820          | 1.850 | 0.064| -0.194 - 6.941         |

LR X²(5) = 22.74 n = 60 Probability > X² = 0.000 Pseudo R² = 0.448

Source: Household survey 2007

Annex II: Readiness for unconditional access to TK

| S.N. | Explanatory variables | Coefficient | Standard Error | z     | P>|z| | 95% Confidence Interval |
|------|-----------------------|-------------|----------------|-------|------|------------------------|
| 1    | Age of the respondent | 0.038***    | 0.016          | 2.410 | 0.016| 0.007 - 0.070          |
| 2    | Female respondent     | -0.332      | 0.405          | -0.820| 0.412| -1.125 - 0.462         |
| 3    | Education of the respondent | 0.107**   | 0.054          | 1.980 | 0.048| 0.001 - 0.213          |
| 4    | Ethnicity (Dalit and Janajati) | -1.417*** | 0.543          | -2.610| 0.009| -2.481 - -0.353        |
| 5    | Family size           | -0.112**    | 0.056          | -1.990| 0.047| -0.222 - -0.002        |
| 6    | Constant              | -0.938      | 0.989          | -0.950| 0.343| -2.876 - 1.001         |

LR X²(5) = 21.81 n = 60 Probability > X² = 0.001 Pseudo R² = 0.273

Source: Household survey 2007

Annex III. Farmers’ thinking for the need of benefit sharing out of the access to their GR

| S.N. | Explanatory variables | Coefficient | Standard Error | z     | P>|z| | 95% Confidence Interval |
|------|-----------------------|-------------|----------------|-------|------|------------------------|
| 1    | Age of the respondent | -0.021      | 0.015          | -1.370| 0.170| -0.051 - 0.009         |
| 2    | Female respondent     | 0.391       | 0.435          | 0.900 | 0.370| -0.463 - 1.244         |
| 3    | Education of the respondent | 0.089 | 0.057          | 1.560 | 0.118| -0.023 - 0.201        |
| 4    | Ethnicity Dalit and Janajati | 1.123* | 0.643          | 1.750 | 0.080| -0.136 - 2.383         |
| 5    | Family size           | 0.033       | 0.055          | 0.600 | 0.552| -0.075 - 0.140         |
| 6    | Constant              | 0.639       | 0.989          | 0.650 | 0.518| -1.299 - 2.576         |

LR X²(5) = 12.35 n=60 Probability > X² = 0.030 Pseudo R² = 0.173

Source: Household survey 2007
Annex IV. Farmers feeling for the need of laws to implement the benefit sharing

| Explanatory variables                  | Coefficient | Standard Error | z    | P>|z|  | 95% Confidence Interval |
|----------------------------------------|-------------|----------------|------|-----|--------------------------|
| 1 Age of the respondent                | -0.026*     | 0.014          | -1.830 | 0.068 | -0.054 0.002 |
| 2 Female respondent                    | 0.508       | 0.382          | 1.330 | 0.183 | -0.241 1.258 |
| 3 Education of the respondent          | -0.052      | 0.050          | -1.040 | 0.296 | -0.149 0.046 |
| 4 Ethnicity Dalit and Janajati         | 0.338       | 0.481          | 0.700 | 0.483 | -0.606 1.281 |
| 5 Family size                          | 0.082       | 0.053          | 1.540 | 0.123 | -0.022 0.186 |
| 6 Constant                              | 0.956       | 0.927          | 1.030 | 0.302 | -0.861 2.772 |

LR X²(5) = 9.19  n = 60
Probability > X² = 0.1017  Pseudo R² = 0.113

Source: Household survey 2007