

## **Managing Agrobiodiversity in Disaster Situations**

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### **Abstract**

Natural disasters and armed conflicts cause severe loss of genetic diversity in crop plants and farm animals. Determinants of disasters with respect to agricultural genetic resources are complex and need specific analysis. Disasters destroy plant and animal genetic resources directly and through indirect consequences. The study prepared by GTZ's sector project "Managing Agrobiodiversity in Rural Areas" reflects the current state of international debate following the adoption of the Global Plan of Action for the conservation and sustainable utilization of plant genetic resources. It provides recommendations aiming at a stronger emphasis on the relevant issues in both the preventive sphere before and intervention sphere after armed conflicts and disasters.

*Keywords: plant genetic resources, animal genetic resources, agrobiodiversity, crises prevention*

### **1. Introduction**

Natural disasters and armed conflicts cause severe loss of genetic diversity in crop plants and farm animals. The Global Plan of Action for the Conservation and Sustainable Utilisation of Plant Genetic Resources for Food and Agriculture adopted in 1996 in Leipzig (Germany) stipulates that assisting farmers in disaster situations to restore agricultural systems is a priority in in-situ conservation.

According to the adoption of the "Convention on Biodiversity" and the "Global Plan of Action", GTZ's Sector Project "Managing Agrobiodiversity in Rural Areas" provides support for the sustainable use of plant and

animal genetic resources, particularly, to poorer rural people in remote areas. The Project further provides for consultancy services to political decision-makers in both developing countries and Germany. The study summarizes the current state of international debate and delivers recommendations for improved consideration of the relevant issues in both the preventive sphere before and remedial sphere after crises.

This study is a survey on existing literature and strategies. It is based on an inquiry in various organisations to collect data and to get strategies and activities designed to save or restore genetic diversity in agriculture. Both national and international organisations working in the field of emergency, rehabilitation and development had been focused. Since only little experience is available with respect to experiences on strategies and activities of these organisations, the survey also included a desk review of existing literature and on assessment of reported case studies.

The study identifies the decisive elements of emergencies which are important when assessing specific disaster situations with respect to plant and animal genetic resources. The study reflects the current state of international debate and provides recommendations aiming at a stronger emphasis on the relevant issues in both the preventive sphere before and remedial sphere after armed conflicts and disasters.

It is important to note that most data found is on the plant genetic diversity, whereas investigations in the field of farm animal genetic diversity in disaster situation had not been reported up to now. As to the regional distribution, most data had been collected in regions touched by armed conflicts in Africa. Since the adoption of the "FAO-Global Plan of Action" for plant genetic resources, strategies have undergone an important progress.

## 2. Significance of farmer genetic resources management

Farmer seed systems – also described as local seed or informal seed systems – provide more than 80 % of the total amount of seed planted world-wide (Cromwell 1996). For farm animals, the proportion of local reproduction is probably identical. Landraces as well as local breeds of farm animals constitute an important factor of productivity and production stability. Local selection of seeds and breeds are of major importance, especially in isolated areas and under extreme conditions of production where land is semi-/arid or temporarily flooded . High genetic diversity in landraces and local animal breeds is of special interest for existing and future breeding issues.

Production, selection, storage and breeding activities in informal systems are executed in the same place or area. Therefore, resources are likely exposed to destruction and extinction in the event of a disaster. The fact that both the production for consumption and for reproduction is very closely related to each-other, also often results in a reduction of genetic resources in case of famines.

The disruption of agricultural production cycles, , is an important indicator to estimate potential loss of genetic diversity. This can be measured by the number of individuals displaced. The following table gives an overview.

Individuals displaced by natural disasters and civil wars by area\*

|                             | Natural Disasters | Wars and civil wars |
|-----------------------------|-------------------|---------------------|
| Total number of individuals | 4,872 millions    | 21,691 millions     |
| Asia (incl. Oceania)        | 84,1 %            | 19,0 %              |
| Africa                      | 11,2 %            | 54,3 %              |
| America                     | 4,1 %             | 6,4 %               |
| Europe                      | 0,5 %             | 19,8 %              |

\* average between 1993 and 1997 (resumed according to "World Disasters Report 1999")

When considering natural disasters, 69,0 % of displacement occurs in case of floods, 22,7 % through storms and 4,9 % is caused by earthquakes.

### **3. Differentiation of disasters with respect to animal and crop genetic diversity**

A differentiation of crises designed to estimate potential impact on agrobiodiversity follows different aspects (see also Grunewald 1998):

- *moments of occurrence of crises with reference to the agricultural, pastoral and non-farming calendars and the mobility of resources:* consequences will be different if a crisis occurs before sowing, while the crops are growing, at harvest time or when granaries are full, at farm animal reproduction period, fodder or water scarcity e.g.
- *duration of crises:* consequences will be different if a disaster is a punctual event, e.g. storm and earthquake or if it is a long-lasting armed conflict or several seasons persisting drought
- *regional extension of a disaster with reference to the occurrence of genetic resources:* consequences will be harder if the whole area is involved whereas losses to local disasters are likely to be compensated with the help coming from neighbouring areas
- *population shift into other areas and refugee camps:* a long absence of populations in different agro-ecological areas can specifically harm or extinct genetic resources
- *type of reproduction systems of genetic resources:* the local management of genetic resources or procurement from formal institutions will result in different situations
- *frequency of disasters and existence of early warning systems:* indigenous alert systems and external early warning systems as well as local and external strategies of conservation (in situ and ex situ) are important instruments to prevent losses and extinction

- *causes and context of crises and disaster:* in case of internal conflicts, different groups of a given population and their genetic resources are not always concerned to the same degree

#### **4. Loss of farm animal and plant genetic resources**

Disasters destroy plant and animal genetic resources both directly and through indirect consequences resulting humanitarian problems and accelerated processes of impoverishment. The cause-and-effect complexes associated with armed conflict are responsible for a broad array of specific impacts upon the management of genetic resources.

Direct losses of agrobiodiversity result from following causes:

- destruction of genetic resources through earthquakes, floods or armed conflicts
- direct consequences of disasters such as the outbreak of calamities, destruction of seed through humidity, devastation and looting
- losses due to humanitarian crises (selling of animals and seeds for procurement of food or consumption of genetic resources)
- losses due to the lack of adequate management (lack of veterinary services, restriction or suspension of field work and grazing of animals resulting from times of insecurity)

Indirect losses of agrobiodiversity result from following cause-effect complexes:

- complex of accelerated impoverishment (lack of capital for procurement and replacement of resources or rehabilitation of special farming sectors)
- transformation of farming structures or working fields as well as of markets and trade (periods of insecurity for instance make people

- give up pastoral systems, the disruption of marketing structures, economic and trade conditions make them give up crops)
- change in the social structure and the institutional sphere (changes of co-operation occurring between different groups of population or within communities and families, between women and men, especially in case of armed conflicts)
  - populations expelled or displaced (impossibility to continue reproduction of resources in other climatic areas or refugee camps)

Another important complex of indirect loss of agricultural genetic diversity is caused by inadequate emergency actions performed by international organisations. Since quick action is required in order to restore agricultural systems, seeds are supplied without the knowledge of local resources and profound analysis of local seed and farm animal supply systems. Efforts of rehabilitation and restocking of genetic resources within the context of emergency aid measures harbour a potential for further loss of farmers' varieties and indigenous landraces if local varieties and breeds are not taken adequately into consideration. They risk to be further reduced by absorption or substitution crossings associated with these efforts.

## **5. Initiatives and Strategies of intervention**

Local and regional initiatives and strategies in disaster-prone areas have been developed on farmers' level in regions, where natural disasters are traditionally known and managed. Whenever climatic irregularities do not reach the level of important disasters, local strategies save genetic resources to an important extent. Long time seed storage systems as well as farm animal management systems are part of farm management, especially in areas where drought occurs. Even the type of management developed under conditions with climatic stress should be considered as risk management against potential disasters.

Regional networks for seed security have been established in some areas, e. g. in Southern Africa. The SADC "Seed Security Network" for instance is composed of different intervention levels with an emphasis on farmers' varieties and informal seed systems. They include an action plan on the community level, national and regional activities to improve information systems, training and exchange.

At the international level, the conferences held under FAO auspices in 1997 and 1998, produced a series of proposals and measures aimed at promoting seed security as a prerequisite for sustainable food security, and assisting farmers to restore agricultural systems and seed security activities. Recent strategic proposals include:

- Establishment of a "Seed Security Consultative Group" under the auspices of FAO (including civil society, research and extension institutions, NGO's Farmers groups and public / private seed sector) in order to optimise the comparative advantages of the various stakeholders to assure seed security in disaster-prone regions
- Completion and consolidation of inventories of crop genetic resources and their availability through more user-friendly electronic information management systems as well as strengthening capacities to use these systems
- Development of methods to assure effective seed security needs assessment by stakeholders involved in emergency response (gender sensitive diagnosis of seed systems, guidelines and checklists for facilitation coherence of assessments and linkage to other sectorial assessments (e.g. food security)
- Improvement of ex-situ conservation through funds, creation of appropriate stocks of CGR (quality and quantity) and assurance of their availability in case of need

- Promotion of seed networks and mechanisms for co-ordination of procurement, multiplication and distribution of quality seed of locally adapted varieties at national or regional levels
- Encouragement and co-ordination of regional harmonisation of seed rules and regulations by FAO and all stakeholders (UN sanction mechanisms)
- Improvement of preventive measures and action plan measures, especially by donors

In the area of animal genetic resources, no measures have yet been taken with respect to the specific problems of loss in disaster situations, although there is a high level of awareness of the problems.

Activities in process are in general the improvement of information systems on genetic resources for food and agriculture such as DAD-IS (Domestic Animal Diversity Information System) and WIEWS (World Information and Early Warning System) managed by FAO.

## **6. Further needs and options for action on the national level**

Disaster-related loss of agricultural biodiversity can only be prevented by combining, in an appropriate manner, preventive in-situ and ex-situ conservation measures with improved intervention mechanisms of the organisations which provide emergency aid and rehabilitation in disaster situations. As there exist organisations which deal with emergency, rehabilitation and development, either active in one or two fields or, as GTZ, covering all of them, linkage between preventive activities and intervention after disasters should be strengthened. First approaches have been undertaken by IGR (Information centre for genetic resources) at Bonn acting as consultant for genetic resources on behalf of the ministry of nutrition, agriculture and forestry. GTZ is also looking for strategies combining genetic resources security in development, emergency and rehabilitation. Following propositions had been suggested to GTZ, but are also valid for other organizations.

The topic of agricultural genetic diversity in disaster situations is not yet considered as a top priority by most donor organisations, though that sensitisation should be an important activity in general for GTZ and other organizations to provide for more awareness of the problem at all levels.

Framework conditions of emergency aid also prevent adequate rehabilitation and restocking measures. Funding of emergency programmes is often conditioned by the procurement of goods on international or formal markets and for short delays that do not allow correct analysis of seed systems and local purchase of resources. Working towards more open regulations of purchase of seeds and breeds is an important precondition to favour the use of local resources and save agrobiodiversity.

Too little is currently known about the informal management of genetic resources, about indigenous prevention strategies and about the way genetic resources are managed in the event of crisis. There is very little research on the management of local farm animal breeds in disaster situations. When we look at the research programmes in German Universities and in International Research Institutions, we see that investigations related to disasters, except for cases of drought, are absent up to now. Any knowledge of both the existence and the management of landraces and local animal breeds should therefore be strengthened in order to provide useful data to improve preventive strategies and emergency interventions.

Except for individual concerns related to some isolated projects, co-operation activities in the field of development are non-existent, too. It is therefore important to deal with the issue in projects on strategic levels, designed to focus on prevention, such as agricultural policy and genetic resources consulting, crises and disaster prevention. On the other hand, projects in rural areas should improve the awareness of and the training on the existence, the use and the management of local genetic

resources as well as the promotion of disaster action plans at community level.

Another proposal with regard to preservation of genetic resources is the elaboration of a checklist in order to support emergency and rehabilitation activities during the analysis of needs after crises. This checklist should be prepared by combining food and genetic resources needs at the same time.

**Annexe:**

**History of International Conferences connected to Agricultural Gene-tic Diversity in Disaster Situations**

- 1992      United Nations Conference on Environment and Development
- Convention on Biological Diversity
- 1996      FAO Intern. Technical Conference on Plant Genetic Resources
- Global Plan of Action for the Conservation and Sustainable Utilization of plant genetic resources for Food and Agriculture
- 1997      International Workshop on Seed Security for Food Security
- 1998      International Workshop on Developing of Institutional Agreements and Capacity to assist Farmers in Disaster Situations to Restore Agricultural Systems and Seed Security Activities

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