November 2006 ENGLISH ONLY

COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

THE IMPACT OF DISASTERS AND EMERGENCIES ON ANIMAL GENETIC RESOURCES

by

Claire Heffernan[1] and Michael R. Goe[2]

[1]Livestock Development Group, University of Reading
in conjunction with
[2]Breeding Biology Group, Institute of Animal Science, ETH Zurich

This document assesses the significance of disasters and emergencies as a threat to the diversity of animal genetic resources for food and agriculture (AnGR). The potential of the disasters/emergencies themselves to affect AnGR is assessed, with particular attention being paid to the influence of the human responses to the events: preparedness prior to the disaster; salvage operations during the event; and subsequent rehabilitation activities. The document includes a case study on the impact of war and relief operations in the countries of former Yugoslavia. Decision-support guidelines for the management of AnGR during emergencies are also presented. Dr Claire Heffernan is a Senior Research Fellow and Director of the Livestock Development Group at the University of Reading in the United Kingdom. She is a veterinarian with a background in the social sciences, and is the main author of Restocking pastoralists: a manual of best practice and decision-support tool (2004). Dr Michael R. Goe is a lecturer/researcher in the Institute of Animal Science, Swiss Federal Institute of Technology (ETH), Zurich. His research focuses on livestock as a component of disaster risk management, with particular emphasis on how natural and human-induced disasters impact livestock production in transition and developing countries.

Executive Summary:

During this century, natural disasters such as droughts, earthquakes, hurricanes, tsunamis, tornados, etc. are predicted to increase in both incidence and severity (FAO, 2005a; World Bank, 2006). Combined with war and civil unrest, the global human and economic costs of such disasters are at an all time high and climbing (Freeman *et al.*, 2003; UNDP, 2004). The impact of such events in and of themselves, while devastating, can be manageable. However, the occurrence of such disasters often contributes to the development of a state of emergency in which there is a further breakdown of the political, economic and cultural institutions in the communities and nations involved.

In the South, little attention has been paid to the potential consequences of disasters on the livestock sector in general or animal genetic resources (AnGR) more specifically (Goe and Stranzinger, 2002a; Goe, 2005a). While disasters clearly have an overall negative impact on AnGR, the following report begins from the perspective that such events are not isolated happenings, and the effect on AnGR will be related both to the "consequent" effects of the hazard itself and the "contingent" (socio-economic and environmental) conditions in which it occurs.

Ultimately, it may be argued that it is the human actions that have the largest influence on the conservation or destruction of AnGR under disaster and/or emergency conditions. Prior to the onset of a disaster, a variety of preparedness activities may be undertaken, including creating registers for "at risk" livestock populations or those that have "special qualities" or are "prioritized" by farmers. An appropriate legislative or policy environment can be put in place. Mitigation activities (e.g. identification of temporary holding areas or structures to which animals could be evacuated; destocking followed later by restocking; creation of fodder banks or genebanks), can also be supported. During a disaster, genetic salvage operations may be implemented to preserve important germplasm. After a disaster, when livestock populations have been greatly depleted, the introduction of new species and breeds through restocking projects will also have a large impact on local gene pools.

The aim of the following report is to provide an overview of the form and content of disasters, and to discuss issues potentially affecting AnGR and livestock diversity. Overall, the discussion is framed by the following two questions. First, do existing levels of diversity have any influence on vulnerability to, and subsequent recovery from, the inciting disasters? Second, do emergencies drive a decrease in diversity, or is this solely a function of the interventions (i.e. restocking packages) devised in response? The document is divided into three sections. The first section offers a background to the issues, and offers examples of acute and chronic emergencies. In the second section, a detailed case study of the impact of war in the former Yugoslavia is described. Finally, section III offers decision-support guidelines for the management of AnGR, before, during and after a disaster. In this manner, the report provides decision-makers and practitioners with a set of guidelines to inform their actions when confronted with a disaster situation.

Table of Contents

Abbreviations and acronyms used

AnGR	animal genetic resources
AI	artificial insemination
BSE	bovine spongiform encephalopathy
CGRFA	Commission on Genetic Resources for Food and Agriculture
DAD-IS	Domestic Animal Diversity Information System
DNA	deoxyribonucleic acid
DOA	Department of Agriculture
DRM	disaster risk management
EFRP	Emergency Farm Reconstruction Project
FAO	Food and Agriculture Organization of the United Nations
FMD	foot-and mouth-disease
FYR	Federal Republic of Yugoslavia
HF	Holstein-Friesian
HIV/AIDS	human immunodeficiency virus/autoimmune deficiency syndrome
IFAD	International Fund for Agricultural Development
MACC	Mine Action Coordination Center
MOA	Ministry of Agriculture
MT	metric tons
NATO	North Atlantic Treaty Organization
NGOs	non-governmental organizations
OSCE	Organization for Security and Co-operation in Europe
TG	Tyrol Grauvieh
UNMIK	United Nations Interim Administration Mission in Kosovo
USAID	United States Agency for International Development
US$	United States dollars
UXO	unexploded ordnance

Note: Country names and UNDP country codes are based on FAO Terminology (FAO, 2005a).

Introduction

Natural and human-induced[1] disasters can have a direct impact on animal populations and livestock production systems within a country or region. Disasters can strike suddenly without warning. They can immediately wipe out modest productivity gains, drastically impair the ability to meet future demands for livestock and their products at regional and national levels, and have serious consequences for the livelihoods of smallholder farms. The literature contains general information about natural disasters (e.g. disease, drought, flooding, hurricanes and tsunamis) and how they can cause large losses of animals. However, there is very little documentation that examines the short and long-term effects of these events on different livestock production systems or on animal genetic resources (AnGR) in particular. Likewise, such information is also lacking for human-induced disasters (e.g. ethnic conflicts, wars, the spread of animal and human diseases and industrial accidents).

National and international emergency relief operations are frequently carried out after a disaster has struck. In some instances, these operations include a livestock component, such as restocking of live animals or the provision of artificial insemination (AI) services, feed supplies or veterinary inputs. Unfortunately, there is lack of awareness and understanding of how such operations, if indiscriminately implemented, can ultimately have a negative, rather than a positive impact on both the human and livestock target populations. There is a need to learn from past experiences and develop appropriate guidelines and tools so that livestock and AnGR become fully integrated components of disaster risk management (DRM) policy strategies and emergency relief operations.

The aim of the following document is to explore the impact of natural and human-induced disasters and emergencies on AnGR. On a global level, the frequency and intensity of natural disasters are predicted to increase in the coming decades[2], with human-induced events, unfortunately, remaining as ever-present hazards. Further, the costs of such disasters and subsequent emergencies are escalating. Freeman *et al.* (2003) report that global direct costs of natural disasters are estimated to exceed US$300 billion annually by 2050. According to UNDP (2004), the annual losses attributed to natural disasters alone have increased nearly nine times in a 30 year period from the 1960s to the 1990s.[3] The human costs associated with disasters and emergencies have also increased. It has been estimated that in 2004, 146 million individuals were affected by natural disasters. A further 45 million people were involved in a complex emergency (FAO, 2005a).

Nonetheless, while the literature on disasters, emergencies and recovery efforts is vast, little attention has been paid to the impact of such events on the livestock sector generally or AnGR more specifically (Goe and Stranzinger, 2002a; Goe, 2005a).

It may be argued that in the context of a humanitarian crisis, saving AnGR is a low priority. The aim of this report is not to detail compelling evidence to the contrary. Rather, the objective is to explicate the issues and impacts of potential disasters, and the responses by livestock practitioners, on AnGR. In this manner, the aim is to enable the actors and agents involved to make informed policy decisions that can be practically implemented before, during and after such events. The report begins from the standpoint that with a minimum of informed action, the

[1] sometimes referred to as "man-made, human-caused or originated" catastrophes, emergencies or events

[2] According to FAO (2005a): 'Weather related disasters continue to rise, from an annual average of 200 between 1993-1997, to 331 per year between 1998-2002 and the number of people reported affected by natural hazards is increasing dramatically (608 million people affected in 2002 against the annual average of 200 million in the previous decade)'.

[3] The average cost of natural disasters was estimated at US$ 75.5 billion during the 1960s, US $138.4 billion per year in the 1970s, increasing to US$ 213.9 billion/year in the 1980s and approximated US$ 659.9 billion during the 1990s (UNDP, 2004).

impact of disasters and emergencies on AnGR can be greatly obviated, thereby negating concerns regarding the potential prioritization of AnGR over human well-being.

The report explores the relationship between disasters, states of emergency and subsequent responses, with the view of identifying potential openings for interventions to support the livestock sector in general and AnGR in particular. As such, the document is divided into three sections. In Section I, a general background to the issues is offered and key terms explicated. The section ends by offering examples of acute and chronic emergencies and their impacts on AnGR. Section II presents a detailed case study of the impact on livestock of the war in the countries of former Yugoslavia. Finally, in Section III, decision-support guidelines are offered that link disaster management and AnGR. In this manner, the report provides decision-makers and practitioners with a set of tools to inform and guide their actions when confronted with a disaster situation that includes a livestock component. It is envisaged that use of these tools during emergency and relief operations will help to mitigate negative impacts on AnGR.

Section I: Key terms and background to the issues

This section begins by highlighting the current global situation of AnGR and defines some key terms used in the report. The different types of disasters and emergencies that can affect livestock populations are then briefly reviewed. This is followed by a discussion of their consequent phenomena and the potential impact on AnGR.

1.1 Animal genetic resources

The Commission on Genetic Resources for Food and Agriculture (CGRFA)[4] defines AnGR as follows:

> "Those animal species that are used, or may be used, for the production of food and agriculture, and the populations within each of them. These populations can be classified as wild and feral populations, landraces and primary populations, standardized breeds, selected lines, varieties, strains and any conserved genetic material; all of which are currently categorized as breeds."[5]

According to information given in the World Watch List for Domestic Animal Diversity, there are some 40+ species of domestic livestock, 14 percent of which contribute 82 percent of livestock's total contribution to the world's food and agricultural production. In total, animal production contributes directly or indirectly to 30–40 percent of the total value of food and agricultural production (FAO/UNEP, 2000).

An analysis of the Global Databank for Animal Genetic Resources (DAD-IS) carried out in early 2006 indicates that 16 percent of mammalian breeds and 30 percent of avian breeds (a total of 1 491 breeds) are classified as at risk. However, despite the continued updating of country information, deriving reliable estimates of risk status is difficult. Scherf *et al.* (2005) and Hoffmann and Scherf (2006) state:

"It is not easy to estimate the rate of loss of the AnGR. Besides knowledge gaps about the characteristics and the status of genetic resources, assessment is hindered because

[4] See Annex 2, *Working Definitions for Use in Developing Country Reports and Providing Supporting Data.* (FAO, 2001a).

[5] Breeds are further classified into seven categories: extinct, critical, critical-maintained, endangered, endangered-maintained, not at risk and unknown. Definitions and criteria for these seven categories are given DAD-IS, (http://www.fao.org/dad-is/) and in FAO/UNEP (2000).

methodologies for breed survey tools…and for assessing the risk status of populations…have not been standardized."[6]

Moreover, as they also point out global breed identification is not complete:

> "Many others [breeds] have not been formally identified and may disappear before they are recorded or widely known."

Against such a backdrop, it is clear that a lack of information about breeds remains a key obstacle to developing appropriate policies to reduce the further erosion of AnGR. The lack of financial and human resources for establishing and maintaining national, regional and international programmes is, of course, also a major contributing factor. Moreover, the wide-scale changes occurring in livestock production systems in the North and the South,[7] and consequently, the preferences of farmers for specific breeds also play important roles.

In light of the above, and given the figures previously cited for the occurrence of global disasters, one might assume that future disasters, and the consequent disruption of people's lives and livelihoods during emergencies, will exacerbate the loss of AnGR. However, as will be discussed below, such an assumption belies the complexities of disasters and the subsequent state of emergencies that they engender.

1.1.1 Breeds with "special qualities" or "priority" AnGR

The Global Databank for Animal Genetic Resources survey form includes a category called "special qualities" where information about the special characteristics of a breed can be listed (e.g. quality of products, health, resistance to disease, reproductive attributes or adaptability to a specific environment).[8] Such characteristics can distinguish the "use or value" of one breed relative to another within a particular production system. Breeds that have such special traits have been "prioritized" by farmers. This point is mentioned here only to highlight the importance of a breed's special qualities, and hence farmer preferences. This will be further discussed in the case study in Section II.

1.2 Restocking

In the literature, a variety of definitions have been offered for restocking (Iles, 1994; Forstater, 1996; Heffernan, 2000; Heffernan *et al*. 2004; Nielsen, 2004). While a range of approaches to the term have been taken, this report defines "restocking" as the provision of livestock to a household or a community by either external or internal agents (Heffernan, 2000; Heffernan *et al.* 2004). Within this definition, an external agent originates from outside the community. Conversely, an internal agent is from within the community itself. Thus, the definition accommodates both traditional and "agency-based" forms of restocking. The two forms of restocking do not exist in isolation. Indeed, after a disaster it is likely that both "internal" and "external" restocking mechanisms will be operating simultaneously.[9]

Restocking projects are also sometimes referred to as mechanisms of "herd reconstitution".[10] However, herd/flock reconstitution implies that beneficiaries are supplied with the equivalent of

---

[6] See Scherf *et al.* (2005) and Hoffmann and Scherf (2006) for the respective authors cited with regard to these methodologies.

[7] The term North–South came into widespread use following the North–South Summit held in 1981 in Cancun, Mexico where leaders from a total of 22 developed and developing countries held discussions on: food security and agricultural development; commodities, trade and industrialization; energy; and money and finance (MOFA, 1982).

[8] See FAO/UNEP (2000), p. 17.

[9] However, research has demonstrated that the beneficiaries of community-derived vs. external agency-led projects and programmes are likely to be very different (Heffernan, 1997).

[10] Herd or flocks.

their pre-existing animals. Given the costs, few projects are able to provide this level of aid. Projects are also sometimes referred to as "livestock dispersal" or "distribution programmes".

1.3 Disasters and emergencies

The literature on disasters and emergencies contains a variety of competing terms: natural disasters or hazards, geophysical hazards or phenomena, climatic and environmental hazards, complex emergencies, complex political emergencies, crises etc. (Oxfam, 1995; OCHA, 1999; PAHO, 2000; Von Braun *et al*., 2002; Shaluf *et al.*, 2003; IADB, 2005; USAID, 2006; World Bank, 2006)[11]. Nonetheless, there is generally a distinction made between disasters and the consequent state of emergencies that they engender.

1.3.1 Disasters

Disasters are commonly categorized into two types: natural and human-induced. [12] Within this typology, natural disasters, in particular, were frequently conceived as distinct and discrete events. In recent years, however, the division has been recognized as too rigid (Duffield, 1994; FAO, 2005a). Indeed, as the following example shows, natural disasters followed by human-induced events can have major secondary and inter-related impacts that affect both human and livestock populations.

Drought

Drought is a natural disaster that can cause widespread livestock losses, particularly in pastoral systems. For example, the extreme drought in Somalia that peaked in 1974 resulted not only in 20 000 human deaths due to starvation and diseases related to malnutrition, but also the loss of about 5 million animals (large and small ruminants, equines and camels) (Hitchcock and Hussain, 1987). Herd losses ranging from 50 to 90 percent caused by drought have also been documented for Afghanistan (Roberts and Williams, 1995; Nekzad, 2003), Kenya (Sperling, 1987) and Sudan (Walker, 1988). Such extreme losses have a devastating effect on livestock production systems and AnGR as a whole, because livestock populations are often unable to recover. In situations where animals do survive, they are often so weak and undernourished that they are unable to return to their previous levels of productivity (particularly in terms of reproduction) for several years.

Drought compounded by secondary human-induced events

Wars and conflicts

When wars or conflicts coincide with a natural disaster, e.g. drought, the threat to the health and survival of both human and livestock populations increases. In the late 1980s and early 1990s, interclan conflicts in Somalia resulted in the poisoning of wells, destruction of reservoirs and grazing areas, machine-gunning of herds and indiscriminate bombings that killed hundreds of thousands of livestock (Unruh, 1995). During interclan or ethnic conflicts, livestock are not only killed or injured, but are also often stolen. This can result in an increased risk of diseases being spread from one animal population to another when animals from different herds are mixed (Howell, 1997). Fighting may also prohibit pastoral groups who keep different breeds from moving herds to seasonal grazing areas. As noted by Kundermann (2000):

---

[11] It is not the purpose of this study to review the different terminology used for disasters and emergencies. For information on accepted terms, usage and glossaries, see, for exmple, FAO (2005a); UN International Strategy for Disaster Reduction Library (ISDR, 2006); Regional Disaster Information Center for Latin America and the Caribbean "Disasters Controlled Vocabulary" (CRID, 2006); USAID (2006); World Bank (2006).

[12] See, e:g. Maskry (1989); Duffield (1994); Abbott (1996); Von Braun *et al*. (2002); ADB (2005); Goe (2005a); OCHA (1999, 2006); USAID (2006).

> "In situations of civil war and conflict between different ethnic groups who are also differentiated by keeping specific animal breeds, restricted mobility can lead to the extinction of herds and thus, depending upon their range, to drastic reductions in the population of the breeds concerned. If the remaining gene pool falls below a certain species- or breed-specific level, this leads to the disappearance of the entire animal breed."

Similarly, when animals are taken out of their normal habitat and frequently moved for safekeeping, animal production, reproduction and health are negatively affected because regular feed and water sources are no longer accessible and animals are under stress.

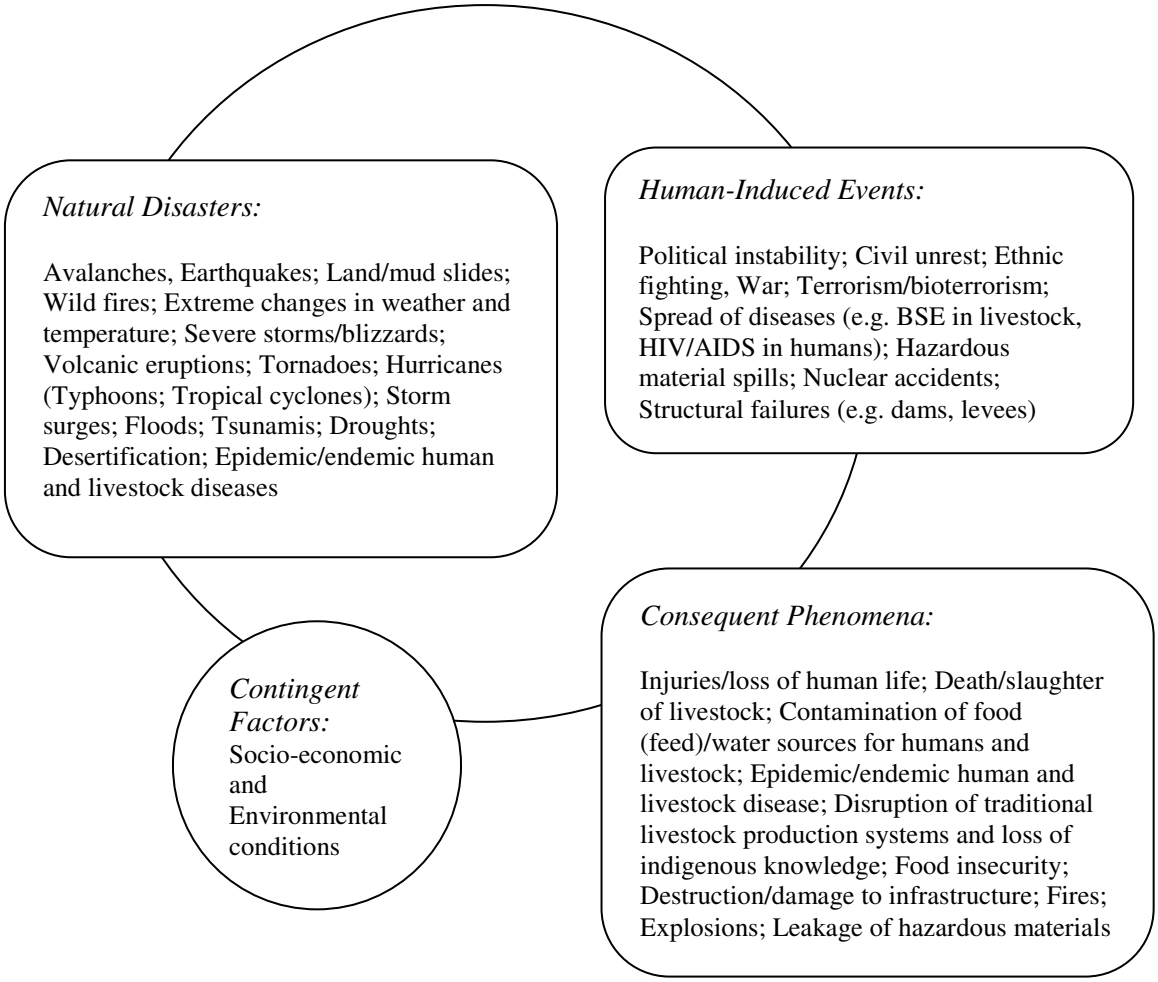
The moving of herds towards urban areas can provide greater security, but at the same time, means that livestock have to survive on a smaller and poorer-quality area of pasture (Kelly, 1995). Animals may consume more poisonous plants because of a lack of fodder resources. Concentration of herds close to towns can also affect the incidence and severity of parasitic diseases, as animal density increases around the remaining known water sources. Fighting can indirectly affect livestock populations when national seed banks are looted or destroyed, as lack of planting material affects crop production and, thus, crop residues (Raloff, 2002). The loss of working animals also has a direct impact on crop production, as well as transport (haulage), water lifting and other draught-related tasks.

Economic effects

A secondary economic effect of droughts, especially in dryland Africa, is that it can bring about polarization of wealth in pastoralist communities when livestock previously owned by smallholders is bought by larger herd owners, in particular absentee landowners (White, 1991). In former drought stricken areas of Mali, estimates of the proportion of livestock now belonging to absentee landowners are as high as 80 percent in some areas around Mopti (Shanmugaratnam *et al*., 1992). Absentee owners are less likely to have a good knowledge of breeding and reproductive management. Genetic potential can be negatively affected as herd structures are changed or animals are slaughtered or sold indiscriminately. Such actions can have direct repercussions for local breeding programmes and selection of animals for different traits (milk, meat, work, disease resistance, etc).

As the above example demonstrates, disasters do not exist in isolation, but are often inter-linked with subsequent human-induced events. The vulnerability of both human and livestock populations to a disaster will depend on the conditions under which the disaster occurs. Therefore, underlying every disaster will be a set "contingent factors" that will differ and bring about multiple reactions, with a variety of associated "consequent phenomena" (Figure 1).

Figure 1 Natural disasters and human-induced events that can impact livestock production systems and AnGR.



Source: adapted from Goe and Stranzinger (2002b) and Goe (2005a)

Interestingly, within the wider agricultural sector, there is a general notion that geological natural disasters are of lesser importance than those created by adverse climatic events. As ECLAC (2000) notes:

> "… the [agricultural] sector is usually most affected by those [disasters] of a hydro-meteorological nature – such as tropical storms and hurricanes, floods, frosts and droughts – whereas the impacts of disasters of a geological nature – earthquakes, volcanic eruptions and tsunamis – may only be indirect and marginal …"

While this statement may be true for crop production, it is less accurate with regard to the livestock sector. The tsunami that struck South and Southeast Asia in December 2004 caused losses of livestock in many coastal areas. In Thailand alone, about 4 800 farmers lost or had animals injured. The tsunami also destroyed animal shelters, feed supplies and grazing areas (GOI, 2004; FAO, 2005b). Moreover, the statement also ignores the secondary effects on the animal husbandry and veterinary services that can occur in an affected area. [13]

[13] In Thailand, not only did a high percentage of staff lose their lives, but many of the survivors are too traumatized to perform their duties. Thus, livestock owners in need of animal husbandry and veterinary services will not have access to them for some time (FAO, 2005b).

Obviously, not all disasters affect the livestock sector in equal measure, and the ability to predict, in advance, the outcomes of events are limited. However, while the actual impact of any given disaster on the livestock sector is likely to be unique, with differing levels of intensity across varying geographic areas, some generalities can be made.

For example, according to Roper (2005), the effects of an epidemic livestock disease on AnGR are as follows:

1. Direct mortalities from the disease itself;
2. the consequent impact of disease control measures, including slaughter and culling policies; and
3. the consequent impact of selective culling of specific genotypes deemed susceptible.

Conversely, the direct impact of a singular catastrophic event, e.g. an earthquake, may be primarily limited to the livestock mortalities caused by the event itself (Goe, 2001). Secondary effects such as water and feed contamination tend, for the most part, to affect the population as a whole and do not preferentially impact endangered or priority AnGR. However, not all disasters are acute in nature. Complex emergencies can cause ongoing livelihood disruptions that can have attendant consequences for the livestock sector.

1.3.2 Emergencies

Unlike disasters which are defined by the inciting event, the term "emergency" or "complex emergency" refers largely to societal impacts and the need for external intervention (Box 1).

Box 1 Complex Emergencies

A complex emergency is "a humanitarian crisis in a country, region or society where there is total or considerable breakdown of authority resulting from internal or external conflict and which requires an international response that goes beyond the mandate or capacity of any single agency and/ or the ongoing United Nations country program."

source: IASC (1994) cited in OCHA (1999)

Thus, within this discourse, an emergency is a state that demands large-scale action or intervention, whereas, in a disaster this may or may not be the case. Further, as shown in Box 2, a variety of other differences between disasters and emergencies have been proposed.

Box 2 Disasters vs. emergencies: institutional impacts

"… the fundamental difference between natural and politically induced disasters is the way institutions are affected. In natural disasters, there can be some significant interference with society and therefore institutional change arising from both the impact effects and the responses, but this is infrequent, mostly incidental and not normally widespread or long-term. In complex emergencies, most aspects of the impact and effects have deliberate institutional aims and overtones. Likewise, the response to this type of calamity is also bound to cause significant interference with society, which may be intense, long-term and mostly deliberate."

source: Albala-Bertrand (2000)

Thus, while natural disasters can destroy institutions, the rebuilding process does not generally alter the nature of the institutions. Contrarily, complex emergencies both destroy and fundamentally change the nature of the institutions involved. Thus, according to the above author, it is the duration of both the impact and the subsequent intervention that forms the largest difference between disasters and emergencies. Causality is another difference that has been used to distinguish between the two terms. As Duffield (1994) notes:

> "For the UN a complex emergency is a major humanitarian crisis of a multi-causal nature that requires a system wide response…this multi-causal model has become interchangeable with an earlier category of [human-induced] emergency. Both multi causal and [human-induced] emergencies are defined in opposition to implicitly mono-causal natural disasters."

Thus, it appears that a new typology of emergencies and disasters based upon causality is emerging, in which natural disasters are mono-causal by definition, and complex emergencies may have many contributing factors causing them to occur and exist for variable periods of time.

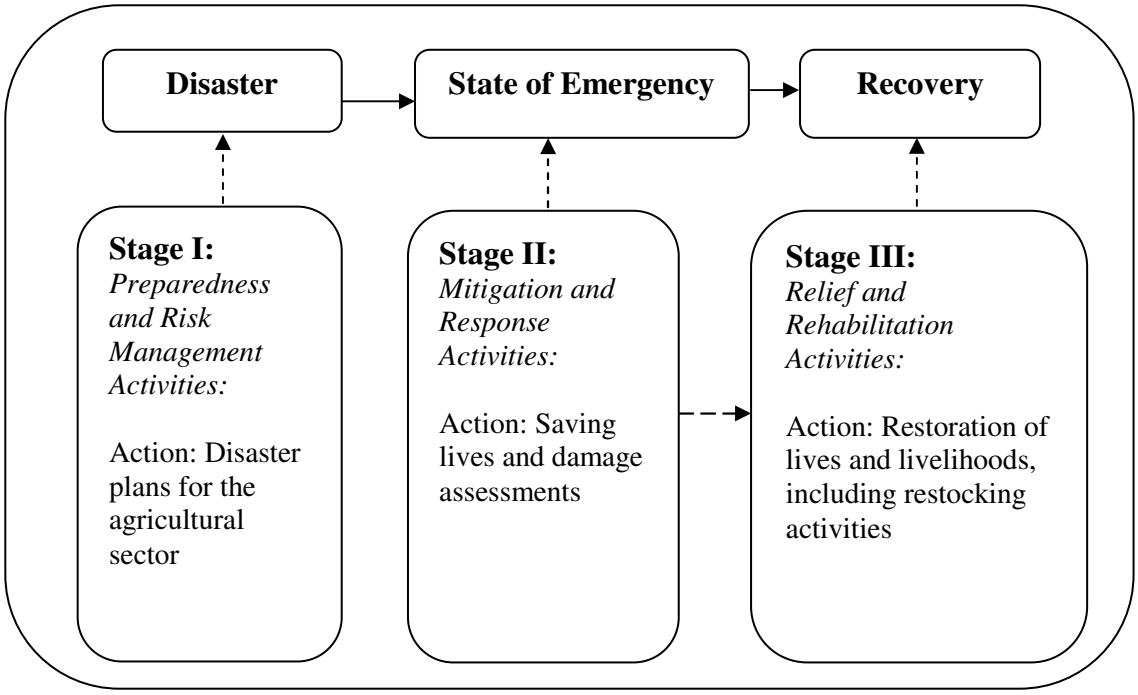
Interestingly, however, the literature on natural disasters also appears to be questioning the static notion of mono-causality. For example, FAO (2005a) collates specific geographic areas into hazard zones, thereby changing the frame from a single event-response dynamic to recognizing the risk to particular areas of multiple events. In this manner, the disaster and emergency discourse demonstrates a concerted move away from linear notions and discreet frameworks to recognizing the complexities, consequences and inter-relationship between events.

To further explore such inter-relationships, the following section examines the spatial ordering of events and the subsequent responses by the development community.

1.4. The spatial ordering of the response to disasters and emergencies

At the macro-level, there is an obvious, linearity to the relationship between disasters, emergencies, and the interventions by the governments, donors and voluntary organizations involved. Disasters are generally preceded by preparedness and mitigation plans. During and immediately after the event, a variety of activities take place in response. In general, efforts are made to provide relief to the victims and to assess the levels of damage and/or loss of life. With stabilization of the situation, rehabilitation efforts are implemented in order to restore and rebuild damaged infrastructure and economies (Figure 2).

Figure 2 Disasters and emergencies



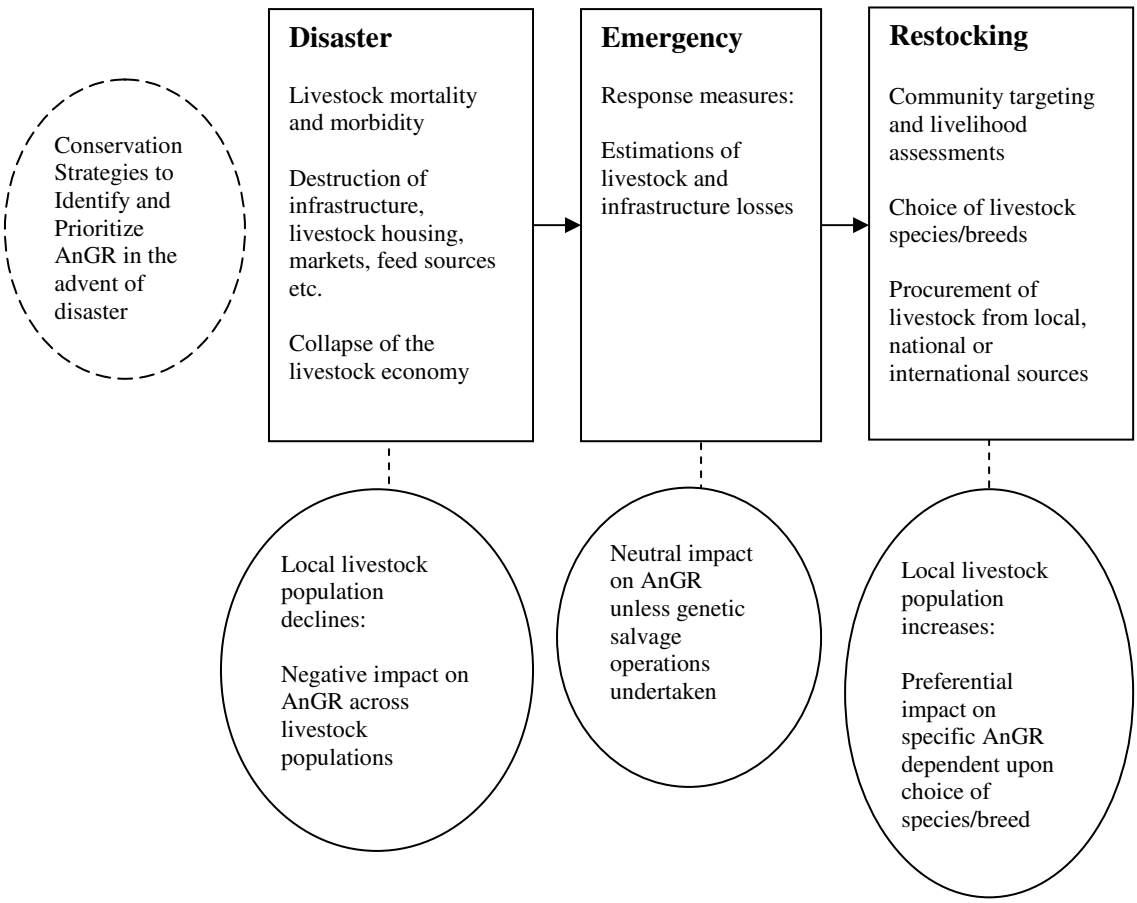
Within the above construct, the impacts and responses relating to the livestock sector require further explication. Historically, preparedness and risk management activities have often been implemented for the wider agricultural sector with little focus on specific recommendations for livestock. In recent years, there have been efforts to redress this deficit by a variety of international agencies. However, the influence of this work on policy is not clear. Further, emergency response activities in the South are generally geared toward saving human lives, with animal medical emergency teams being restricted to wealthier Northern countries.[14] Hence, Stage I and II activities have traditionally not had large livestock sector components.

Conversely, Stage III activities generally do include livestock-related components, mainly restocking. Therefore, with regard to AnGR, Stage III has historically been the stage with the greatest potential impacts. While it may be argued that mitigation and risk management strategies can save or conserve existing AnGR, it is during the rehabilitation stage that actors and agents have the largest influence over changes to the future genetic make-up of the livestock populations involved. Without external interventions, recovery of the livestock sector is a slow process, with the restoration of herds by farmers taking place over many years. With the intervention of external agents such as donors and NGOs, recovery of the livestock economy is rapidly accelerated. While farmers generally cannot obtain animals from regional, national or international sources, external agents can and do. In this manner, local livestock economies destroyed by the catastrophe, can be rapidly jump-started. Often, however, the unintended consequence of such an approach is large-scale and irreversible changes to the genetic make-up of local livestock populations. Thus, the decision regarding which species and breed to use for restocking has large implications for local livestock populations.

This is not, however, to state that conservation activities are not a priority. Rather, in relation to the response by the actors and agents involved, there appears to be a three-way relationship between disasters and emergencies, restocking and AnGR (Figure 3).

[14] see VME (1999); AVMA (2002; WSPA (2005)

Figure 3 Restocking, disasters and AnGR



Within this relationship, the influence of human intervention on the conservation or loss of AnGR is usually greatest prior to and after the disaster itself. Given that most disasters do not, in themselves, preferentially impact endangered or "priority" AnGR, it may be argued that the nature of the disaster itself is less important than the existence/strength of conservation policies,[15] the extent of subsequent restocking, and the species/breed chosen to repopulate herds.

If the state of emergency is in response to a discrete event, the damage to AnGR is likely to have occurred prior to this time-period. Nevertheless, if priority AnGR has been previously identified, genetic salvage operations, such as the harvesting of oocytes or semen from living or recently deceased stock, may be put in place. Such activities will obviously have a positive effect on AnGR. Conversely, under the multifactorial conditions of a complex emergency, damage to AnGR is likely to be ongoing. Thus, it is clear that in relation to AnGR, a distinction is required between the form and content of the states of emergency engendered by disasters, whether human-made or natural. Consequently, the following report divides states of emergency into two broad categories: acute and chronic.

Within the literature on disasters, the distinction between acute and chronic usually refers to the duration of onset of an event. However, within the following discussion the distinction refers to the intensity of impacts. For example, after an acute emergency (such the Indian Ocean Tsunami of 2004), restocking activities tend to be large-scale, and in terms of population dynamics, the

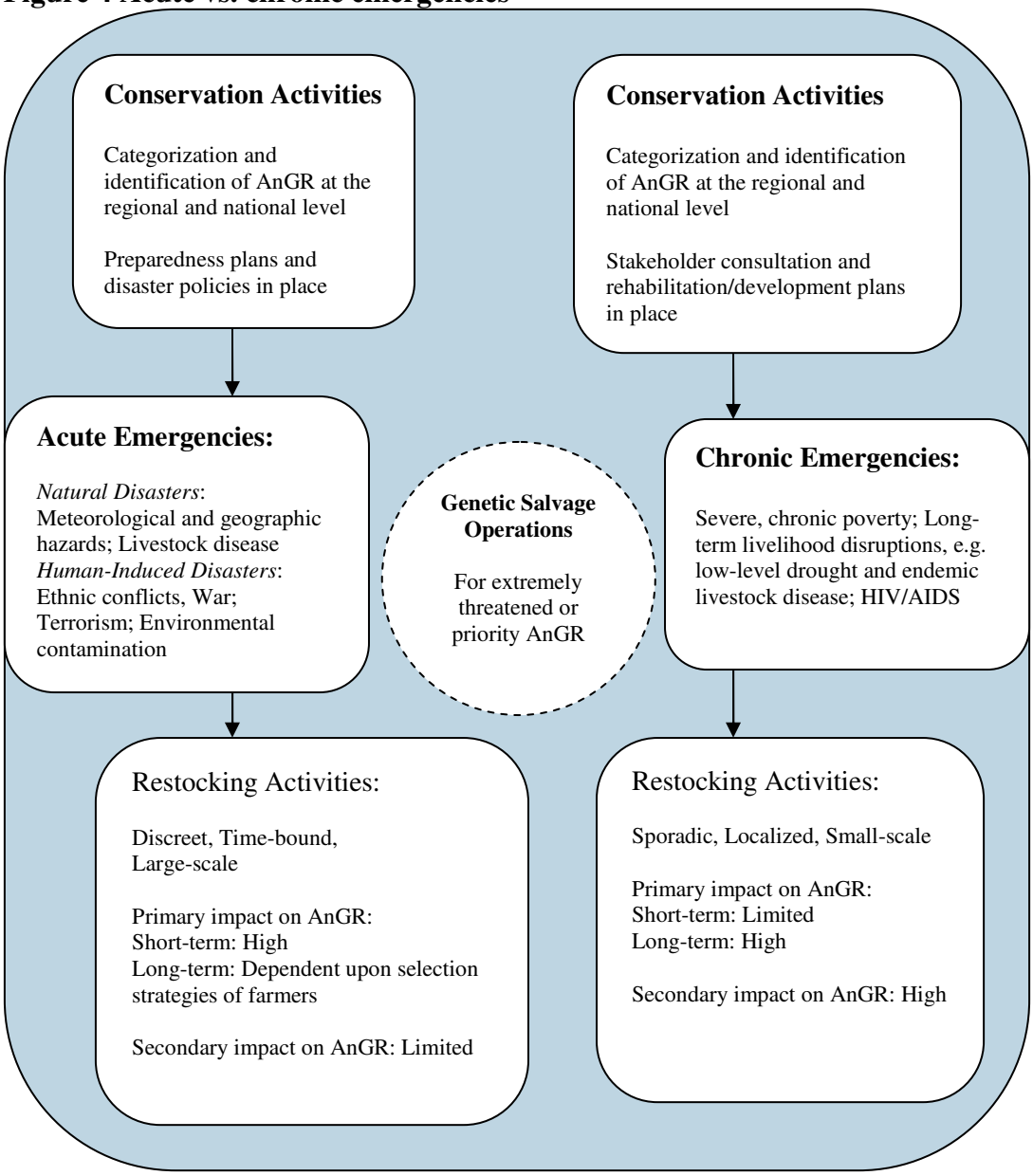
[15] During the FMD outbreak in the UK in 2001, threatened and endangered breeds were protected from the national cull by the passing of emergency legislation (Roper, 2005; DEFRA, 2002).

influx of new genetic material into the livestock population can be viewed as a single, discreet event during a limited time period. Restocking activities following the wars of the 1990s in the countries of former Yugoslavia were largely concentrated during a three year period (Goe, 2005a). Similarly, restocking activities initiated after droughts or extreme flooding are usually completed within a few years. As such, the short-term impacts of such acute events on AnGR can be high (depending on the breed used for restocking). Longer-term effects are largely dependent on the breeding strategies farmers pursue and whether restocked animals are preferentially selected. Secondary impacts within the context of an acute emergency (such as the contamination of water and animal feeds) tend to be of limited duration and, therefore, have lesser implications for AnGR.

Conversely, the response to chronic emergencies (e.g. intermittent low-level drought) tends to be much more sporadic, small-scale and takes place over a longer duration. For example, restocking activities among subsistence farmers are often designed to "pass on the gift", i.e. to transfer young stock to new beneficiaries (Heffernan, 2000; Neilsen, 2004). Some projects of this nature have been up to a decade or more in length. Hence, it may be argued that the initial impact on AnGR under such conditions is lower than in an acute emergency simply because of the smaller numbers of animal involved. However, the long-term impacts that such an approach can have on AnGR should not be underestimated. Indeed, as will be discussed further in the following section, a model exploring the impact of restocking on AnGR demonstrates that the initial input of 100 exotic cattle into a local population of approximately 1 500 animals can easily lead to a 34.5 percent decline in breed diversity after seven years. Further, the secondary impacts of chronic emergencies (e.g. changes to the livestock sector labour force because of HIV/AIDS[16]) also have implications for AnGR and, therefore, must be taken into account by the actors and agents involved.

[16] The linkages between HIV/AIDS and livestock production and the potential impact on AnGR, is discussed in Goe (2005b) and Goe and Mack (2005).

Figure 4 Acute vs. chronic emergencies



Thus, in advance of a major catastrophe, preparedness/conservation strategies are largely about estimating breed numbers and the location of priority AnGR. If such information is available, impacts on AnGR and the required level of genetic salvage (if any) can be determined in the immediate aftermath of a disaster. Conversely, with regard to restocking, projects tend to be large-scale but limited in duration. Alternatively, in a chronic emergency, conservation strategies should have longer-term aims and actively engage/involve stakeholders. As noted above, under these conditions, restocking activities are more sporadic and small-scale. During chronic emergencies genetic salvage operations can be undertaken, if warranted, for sufficiently endangered, priority AnGR. Longer-term cryoconservation strategies such as the creation of genebanks may also be appropriate under the conditions of a chronic emergency.

1.5 Restocking and AnGR

Within the literature on restocking, authors tend to mention, albeit often in a less than direct fashion, the potential impact of restocking on AnGR. The majority of authors argue that projects, by purchasing animals locally, do not affect the total size of the livestock population

(Kelly, 1993; Oxby, 1994; Toulmin, 1994). As Toulmin (1994) states: "... the main effect of restocking has been to redistribute animals in a local area, rather than to increase substantially overall livestock numbers." Thus, arguments principally relate to increases in the overall livestock population, and not explicitly to impacts on AnGR. However, a variety of inferences regarding effects on AnGR may be gleaned from this literature.

First, there is little evidence to support the view that livestock populations are not dramatically altered by restocking. Indeed, the broad intention of most projects and programmes in a post-disaster situation is to rehabilitate the livestock economy and repopulate herds. Restocking projects require large numbers of breeding-age females, which are often unavailable in a post-disaster environment (Heffernan and Rushton, 1998). For example, Hogg (1985) discussing a restocking project in northern Kenya notes that there was an inability to fulfil project quotas using only local sources. Livestock traders from nearby districts were required.

There are a number of risks in sourcing livestock populations from differing agro-ecological environments. Restocked animals frequently lack resistance to local diseases and often have difficulty acclimatizing to local conditions. For example, restocking in Mozambique faced major setbacks because of the high mortality of cattle imported from Zimbabwe (Hanks, 1998). Sourcing livestock from other countries or regions will clearly affect local AnGR. At minimum, it may be presumed that importing large numbers of animals into a local ecosystem will alter the population dynamics. At maximum, such activities can radically change the genetic make-up of the population in the long term.

Nevertheless, a number of fundamental questions remain with regard to the impact of acute and chronic emergencies on AnGR. These are:

1. Do existing levels of diversity have any impact on the vulnerability to, and subsequent recovery from, the inciting disasters?
2. Do emergencies drive a decrease in diversity or is this solely a function of the interventions (i.e. restocking packages), devised in response?

With regard to the first question, there is a general notion in the literature that declining diversity puts households at risk; as Köhler-Rollefson (2000) notes:

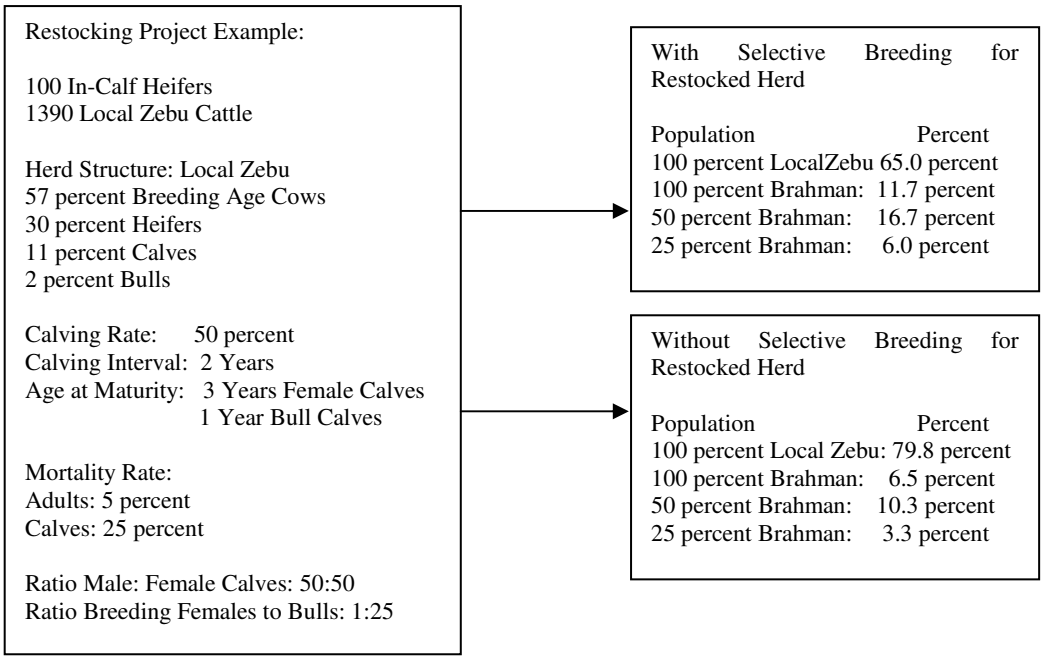
> "There are many cases where the substitution of native breeds through high-input-dependent exotic breeds or their dilution through cross-breeding has rendered communities dependent upon outside supplies and subsidies, as well as vulnerable to ecological calamities. Once the inputs stop or the economic scenario changes, keeping 'improved' animals is no longer technically feasible and economically viable. If the traditional stock has become extinct in the meantime, people are worse off than before."

Indeed, research has demonstrated that the debt burden of poor households is often increased rather than decreased with the introduction of improved livestock (LDG, 2003). Hence, the above author's claim appears plausible.

With regard to the second issue, tracing the progeny of the restocked animals offers a means of assessing the extent to which the introduced genetic material spreads through the population. A simple deterministic herd model can be used to simulate changes in population size over time. Estimates of mortality and parturition rates are required, but in a post-disaster, populations are being rebuilt, and it may be assumed that any sales or trades are made locally, and therefore animals are not leaving the population under consideration. If it is assumed that at a given point in time a restocking project introduces a specified number of animals into the population, and that after a certain period the male offspring of the introduced animals begin to interbreed with the local population, the population will come to consist of a mix of pure-bred local animals, cross-breeds, and pure-bred animals of the introduced breed. If the proportion of females bred to local vs. introduced males is known, then the proportion of pure and cross-bred animals in each generation can be calculated. Figure 5 illustrates the results of such a "progeny tracing model"

based on two different assumptions about breeding management in a situation in which a restocking project has introduced in-calf Brahman heifers into a population of local Zebu cattle: one the one hand, the Brahman bulls are always preferred for breeding purposes; and on the other, there is no preferential use of the for the introduced bulls.

Figure 5 The Impact of Restocking on AnGR



The model demonstrates that under the former scenario, the proportion of animals related to the original restocked herd after seven years is 34.5 percent, while under the latter it is 20.2 percent. It is likely that in a real-life situation, farmer behaviour with regard to selective breeding would vary between the two extremes. Nevertheless, the model illustrates the relatively rapid impact that the introduction of a small number of animals can have on a local gene pool.

1.6 Examples of acute and chronic emergencies and the livestock sector

The following section illustrates some of the issues raised above regarding the impact of acute events on AnGR. Two examples are offered. The first examines an environmental hazard (dzud in Mongolia). The second explores the impact of an epidemic disease (the 2001 foot-and mouth-disease (FMD) outbreak in the United Kingdom). The intention of this portion of the report is not to offer a comprehensive overview, but rather to highlight key issues. A more detailed case study of the impact of a complex emergency on AnGR is offered in the following section.

1.6.1 Environmental emergencies: the dzud in Mongolia

During the winter of 1999–2000 and again in 2000–2001, Mongolia suffered severe winter conditions (dzud) with high levels of snowfall and extreme cold (OCHA, 2001; UN, 2001a; World Bank, 2001).

Box 3 Definitions of a dzud

"Dzud is a Mongolia-specific disaster, caused by the interaction of extreme climactic conditions and man-made socio-economic factors. It undermines food security of livestock thus ruining welfare and food security of herder families. There are different types, each classified by their effects: "white dzud" is deep snowdrifts, "black dzud" is lack of precipitation and hence no water, "iron dzud" is the formation of impenetrable ice cover. All of them kill livestock and severely affect the human population which depends on animals. Since 1999, the combination of many causes and the severity of the summer droughts followed by unusually cold temperatures in autumn and then very heavy snowfalls and extremely low temperatures in winter, have given rise to the term "multiple dzud", to describe this complex phenomenon."

source: OCHA (2001)

The impact on lives and livelihoods of the disaster is described by OCHA (2001) as follows[17].

> "The 1999–2000 dzud killed about 3 million livestock (10% of the total herd) and caused immense suffering by damaging the livelihood of more than 450 000 herders in 13 out a total of 21 provinces. Some 2,400 herding families (about 12,000 people) were completely impoverished by the loss of all their livestock, and the dzud caused damage estimated at about US$ 84 million. A major contributory factor to the disaster was the summer drought, which affected grass regeneration thus preventing livestock from building up the necessary body weight, and reducing the yield of hay herders could cut and lay up for the long hard winter. Herd health conditions further declined due to poor or virtually non-existent veterinary services in most rural areas."

Other sources place livestock losses during this time period at between 2.7 and 3.5 million head, and further note that livestock herds were impacted by an epidemic of FMD (Hadrill, 2001). It is widely believed that overgrazing and desertification greatly contributed to the severity of the disaster (Hadrill, 2001; World Bank, 2001). As the World Bank (2001) notes:

> "The devastating impact of these consecutive years of dzud was exacerbated by historically high stocking rates. Having remained at a relatively stable level of around 25 million head for several preceding decades, largely owing to high autumn off-take encouraged by state-guaranteed livestock and meat marketing under agricultural collectivisation, total livestock numbers increased by 33 percent over the six year period 1993-1999, reaching a peak of over 33 million head."

The rise in the livestock population has been attributed to former state employees turning to livestock keeping as a result of the disintegration of national structures. Indeed, the number of livestock-owning households increased from 17 percent to 35 percent during the 1990s (World Bank, 2001). The new herders, however, tended to have smaller numbers of animals, were more localized in peri-urban areas, and were less experienced in herding strategies than their nomadic counterparts. Further contributing factors included the breakdown of state sponsored disaster mitigation programmes for livestock such as the State Emergency Fodder Fund (World Bank, 2001). Thus, the severity of the disaster is attributed to additional factors, principally

[17] see also Anon (2000); UN (2001a)

overstocking, and the lack/breakdown of sustainable pasture and fodder management regimes and disaster mitigation structures (ADB, 2005).

In this example, the inciting event in and of itself did not create such large livestock losses. Rather, it was the initial natural disaster (drought) followed by the dzud and consequent factors (the FMD epidemic) that severely disabled livestock production over the two-year period. Further, it can be argued that it was the underlying social, economic and environmental conditions which, in tandem with this cycle of hazards, gave rise to such severe consequences. While ostensibly, the loss of up to 7 million animals in Mongolia is attributed to a natural disaster, in reality it may be claimed that the combination of events and conditions met the criteria of a complex emergency. Overall, the combination of events is estimated to have cost the country a total of between US$80 million and US$100 million (ADB, 2005).

The development community responded to the emergency in numerous ways, with a total of US$24 million in developmental assistance provided by the UN, the World Bank and bilateral agencies (Hadrill, 2001). Given the large reliance of households on livestock, restocking was a favoured activity. Because of their prior experience of restocking in Mongolia, the International Fund for Agricultural Development (IFAD), Save the Children and FAO were major players in restocking. After the disaster, the World Bank also supported restocking in five of the most severely affected regions. In total, the World Bank project distributed an estimated 100 000 head of cattle to 1 728 households. IFAD also restocked over 1 000 households with 767 000 animals in two of the most severely affected regions (FAO, 2006).

FAO initiated a number of activities including the "*Pastoral Risk Management Strategy"* project. The main objective was to develop and pilot alternate risk management strategies to mitigate the effects of such disasters on lives and livelihoods. An additional project included "*Provision of Animal Health Inputs and Animal Feed to Assist the Restoring of Severely-Affected Households in Snowstorm-Affected Areas"*. The project aimed to assist vulnerable households in the most dzud-affected provinces to resume livestock production through the provision of animal health inputs and livestock feed. Kinship/community-based restocking schemes were also piloted in selected areas. Save the Children provided both microcredit for livestock loans and restocked animals (Marcus, 2001).

Overall, the design and implementation of the projects were largely similar. The projects were in-kind credit schemes implemented by local government partners. As such, repayment was generally in the form of the female offspring of the restocked animal. The repayment time period was over three years (Marcus, 2001). Ostensibly, livestock were purchased locally from the well-off and distributed to the poor, although the extent to which this was possible is not known.

With regard to diversity and AnGR, there is little evidence in this particular example as to the impact of restocking. There is little documentation of the impact of the dzud on local breeds of any of the affected species: horses, cattle, camels, sheep and goats. Therefore, in response to the first question (Do existing levels of diversity have any impact on the vulnerability to, and subsequent recovery from, the inciting disasters?) the answer with regard to restocking in Mongolia is largely unknown. While it is acknowledged that the dzud was uneven in its impact, with more severe consequences in 12 out of 18 provinces, there is little evidence to detail any preferential effects on threatened or priority AnGR.

Nonetheless, there is some information available, which when pieced together creates a somewhat clearer picture. First, it is known that the "new" livestock herders were largely ex-civil servants from the former state system. Given the proximity to urban centres, it is likely that much of this "new" livestock production centred on supplying milk to urban markets. Thus, it may be presumed that the growth in the livestock population over the ten-year period largely focused on cattle production. The assumption is largely borne out by official statistics (Table 1).

As the table displays, cattle and goats sustained the largest increases in numbers over the decade preceding the dzud. As the heavy snow and ice (conditions combining a white, black and iron dzud) prevented access to grazing, it is not surprising that cattle and small ruminants were the species most affected (Hadrill, 2001).

Table 1 Changes to the livestock population of Mongolia 1990–2000

Species (no of head)	1990 (1000s)	2000 (1000s)
Camel	537	323
Horse	2 262	2 661
Cattle	2 849	3 028
Sheep	1 5083	13 206
Goat	5 126	10 077

Source: ADB (2005)

Hence, in relation to AnGR, it is clear that across the production system, cattle showed the largest shifts in population both before and after the disaster. Further, the majority of restocking projects were based upon cattle. As such, cattle are the obvious starting point for any analysis of the impact of disaster and restocking on AnGR. Therefore, in response to the second question posed by this report (Do emergencies drive a decrease in diversity or is this solely a function of the interventions (i.e. restocking packages) devised in response?) it is likely given the widespread nature of the disaster that diversity was affected by the dzud. Given the lack of data, however, the full impact cannot be assessed. It is also likely that restocking altered the genetic make-up of herds, despite the stated aim of redistributing animals from the well-off to the poor. As detailed in the discussion of the literature, after a disaster the availability of breeding females in a local area is diminished. Consequently, in the most severely affected zones it is likely that the animals were procured from outside the locality, thereby making a genetically neutral "redistribution" process very difficult.

In the case of a small pilot restocking project sponsored by FAO in 1995 (25 households were restocked with a total of 782 animals), Swift and Erdenebaatar (1998) note that all of the livestock were procured from a 110 km radius. However, given the large-scale requirements of, for example, the World Bank and IFAD projects, with a combined need of nearly 900 000 animals, the ability of local production systems to provide a sufficient number of breeding females is clearly questionable.

The most interesting element of the Mongolian example, however, is the policy move away from restocking as a means of post-drought rehabilitation to better contingency planning. As such, many of the projects set up livestock indemnity schemes. Indeed, early projects such as the 1995 FAO, project linked restocked animals with an insurance scheme for the first year. The insurance covered herders for losses resulting from epidemic diseases, the dzud and other environmental hazards. Participating households paid a premium of 5 percent of the livestock's value (Swift and Erdenebaatar, 1998). Later, the World Bank created a "risk index-based livestock insurance scheme" (ADB, 2005) (Box 4). Under the scheme, private companies would offer insurance to individuals or groups owning livestock to cover the "co-variant risks" of natural hazards. The index was based upon a set of criteria, which could be independently verified, such as livestock mortality rates, weather data and rangeland indices. The cut-off point was set in line with historical data, and when exceeded, compensation was provided to affected households (ADB, 2005).

Box 4 Livestock insurance

The World Bank project provided insurance coverage for "replacement value of livestock; the value of goods or services to support risk preparedness and/or enhance livestock productivity, such as hay and fodder production or purchase, acquisition of veterinary drugs and services, construction of livestock shelters, and breeding services; and/or value of goods and services to allow policy holders to engage in alternative or supplementary livelihood strategies."

source: ADB (2005)

Insurance programmes are potentially an important strategy for disaster mitigation in the livestock sector. With regard to diversity, however, the impact of such schemes is unknown. It is possible that schemes will reduce the effect of restocking on local AnGR. On the one hand, by paying herders early in the disaster cycle for their losses, such schemes will result in many herders choosing to wait until the price of livestock declines during the recovery phase to restock. In these circumstances, restocking is likely to take place with locally available animals. On the other hand, if compensation is set too low, many households are likely to leave livestock production altogether. If compensation is set too high, herders might prefer to upgrade their stock. The ability of such schemes to save lives and livelihoods under the conditions of a severe disaster are as yet unknown.

1.6.2 Epidemic livestock disease: the impact of the foot-and-mouth disease in the United Kingdom

In 2001, the United Kingdom's farming industry was affected by an epidemic of FMD. The disease was first reported at an abattoir in Essex on 20 February 2001. The source of the primary outbreak, however, was a farm approximately 300 miles away. According to DEFRA (2002):

> "Because the primary outbreak occurred hundreds of miles away and probably many days before, it had already spread to the sheep marketing network before it was detected … according to MAFF estimates, the overall number of sheep moved after the disease entered the country and before the ban on movement was imposed on 23 February may well have been over 2 million."

By the end of the outbreak, there were over 2 000 confirmed cases across the United Kingdom. In total, 4 million animals were culled as part of direct control strategies (DEFRA, 2002). An additional 4 million animals were slaughtered on farm due to movement restrictions imposed to control the disease (Scudamore, personal communication, February, 2006).

While seemingly a rather straightforward example of an acute emergency, this particular example raises some interesting points. With regard to AnGR, the response to the epidemic was notable for the fact that measures were put in place to protect threatened and priority AnGR at the height of the cull. The 3 km contiguous cull raised concerns regarding threatened or priority AnGR (Roper, 2005). Subsequently, the European Union FMD Directive of 2003 contained provisions allowing (in prescribed circumstances) for the derogation of slaughter requirements in order to protect herds or flocks that are important from the perspective of AnGR conservation. As such, the example illustrates the role of control strategies in both the destruction and the subsequent conservation of AnGR.

Hence, with regard the first question framing this section, it appears that in the case of disease epidemics, existing levels of diversity do have an impact on vulnerability to, and subsequent recovery from, the inciting disasters. First, certain species are likely to be disproportionately affected. Second, specific traits may enhance susceptibility and/or resistance to the disease in

question. The second question framing this section is: do emergencies drive a decrease in diversity or is this solely the function of the interventions? The example demonstrates that unlike one-off events, disasters with significant roll-on effects such as livestock disease epidemics, or in some cases drought, where one locality is affected prior to others, significant efforts can be made during the event itself to protect threatened or priority AnGR. Consequently, control strategies during the epidemic are likely to be as vital as rehabilitation efforts after the emergency.

The following section explores the impact of an acute emergency on livestock populations in countries of former Yugoslavia.

Section II: Detailed case study: the impact of war and relief operations on AnGR in countries of former Yugoslavia[18]

2.1 Background

The Socialist Federal Republic of Yugoslavia (1945 to 1992) was comprised of six Republics: Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Serbia (which was further divided into two autonomous regions, Kosovo and Vojvodina) and Slovenia.[19] Under authoritarian communist leader Josip Broz Tito ethnic tensions between the republics were kept in check. The federation lasted for more than ten years after his death in 1980, but under Serbian nationalist leader Slobodan Milosevic it fell apart in bloodshed during the 1990s. In June of 1991, Croatia and Slovenia declared their independence, followed in September by Macedonia (now The Former Yugoslav Republic of Macedonia). Bosnia and Herzegovina declared its independence in 1992. The two remaining Republics, Serbia and Montenegro, later formed the Federal Republic of Yugoslavia (FRY), but in 2003 the FRY was transformed into the State Union of Serbia and Montenegro[20] (see map, Annex 1). The secession of Slovenia and the former Yugoslav Republic of Macedonia occurred relatively peacefully. The Slovenia conflict in 1991 lasted ten days, with fewer than 100 deaths. The Former Yugoslav Republic of Macedonia remained at peace through the Yugoslav wars of the early 1990s, but the influx of an estimated 360 000 ethnic Albanian refugees from neighbouring Kosovo in 1999 threatened to destabilize the republic. A brief armed conflict in March 2001 involving Albanian rebels in the north and northwest of the country ended with the intervention of a small NATO ceasefire-monitoring force, and government undertakings to concede greater rights to the Albanian minority. The situation was very different in the other republics, with devastating wars occurring in Croatia (1991–1995) and Bosnia and Herzegovina (1992–1995).[21] The 1996 conflict in Kosovo broke out into a full-scale war in 1999. The war in Kosovo ended in June 1999 with NATO intervention, although further widespread unrest occurred in Kosovo in 2004 (UNMIK, 2005).

---

[18] This section partially draws on information given in Goe (2005a).

[19] Country names and UNDP country codes are based on FAO Terminology (FAO, 2005c) and the United Nations Maps and Geographic Information Resources, Department of Peace Keeping Operations (UN, 2004).

[20] In June 2006 Serbia and Montenegro became independent states. However, the analysis on which the present study is based was carried out before this date. The text below thus refers to Serbia and Montenegro as a single country.

[21] There was bitter fighting, armed resistance and conflict between Bosnian Muslims, Croats and Serbs from 1992 to 1995 resulting in the deaths of about 250 000 people (U.S. Department of State, 1998, IMF, 2004). In 1995, the Dayton Peace Accords (formally known as the General Framework Agreement for Peace in Bosnia and Herzegovina) ended the fighting and provided for the continuity of Bosnia and Herzegovina as a single state. It also provided for two separate multi-ethnic constituent entities within the state: a Muslim/Croat Federation of Bosnia and Herzegovina, and the Bosnian Serb Republic, Republika Srpska, each with its own president, government, parliament, military and police.

The impact of the conflicts and war on the livestock populations in three of the countries of the former Yugoslavia is briefly reviewed here as a background to the follow-up emergency aid activities initiated by FAO, IFAD, the World Bank and other international organizations and NGOs. It should be noted that for some of the countries, despite the fact that livestock populations were severely affected by fighting and war (Annex 2), there is often little information available detailing the situation in the post-emergency period, particularly with regard to potential impacts on AnGR.

2.2 Countries

2.2.1 Bosnia and Herzegovina

Bosnia and Herzegovina is still struggling to recover from three years (1992–1995) of bloody interethnic war. During the war about 250 000 people lost their lives and more than half the pre-war population of 4.4 million people were internally displaced or fled abroad. Consequently, many rural communities were destroyed, with their populations displaced to urban centres or to third countries. Approximately 20 percent of the poor live in urban communities, and poverty is most common in smaller communities, which frequently suffered the worst damage during the war.

Bosnia and Herzegovina continues to have a major problem with landmines, explosive remnants of war, and unexploded ordnance (UXO). According to the Landmine Monitor Report (LM, 2006), the country

> "… remains one of the most mine-affected countries in Europe. At the end of December 2004, [it was] estimated that the total area potentially contaminated was some 2 300 square kilometres-approximately 4.4 percent of the total landmass of BIH [Bosnia and Herzegovina]."

The report goes on to state:

> "In southern and central BIH [Bosnia and Herzegovina], mines were often used randomly, with little record keeping. Some of the affected territory is mountainous or heavily forested, but the fertile agricultural belt in the Brčko District is one of the most heavily contaminated areas."

Although mine clearance has been under way since the cessation of the war in 1995, current trends indicate it will be decades before all mines and UXO have been removed. The situation affects all elements of society, but particularly those who have been returning to mine-affected areas and who are dependent on their land for their livelihoods (UN, 2001b; LM, 2003, 2006).

Interviews with 8 975 households indicated that families would be able to increase agricultural production by 11 percent, if they had complete access to their land (Andersson *et al.* 1995). Not only do landmines affect agricultural activities (particularly cropping and livestock grazing), and reduce the development of tourism, mined areas also obstruct environmental rehabilitation. Soil erosion, resulting from deforestation, poor land-management practices, and overgrazing by livestock, is an important environmental problem in all of the central/western parts of southeastern Europe. It is estimated that 10 percent of Bosnia and Herzegovina is badly damaged by erosion (SIDA, 2000).

2.2.1.1 Livestock sector

In 1991, prior to the war, there were 853 000 cattle, 1.3 million sheep, 617 000 pigs, 95 000 goats, 96 000 horses and 6.7 million poultry in Bosnia and Herzegovina. The livestock sector was seriously damaged during the fighting, with losses of farm animals estimated to range from 50 to 90 percent. Cattle numbers are thought to have declined by 60 percent, sheep by 75 percent, pigs by 90 percent, poultry by 68 percent and horses by 65 percent. In Republika

Srpska, the losses were lower. According to estimates by the Ministry of Agriculture, some 50 percent of cows and heifers were lost during the war (UNEP, 1999; SVABH, 2003; Teodoijević, 2003; USDA, 2003a).

By 2002, there was a significant recovery in the number of animals in Bosnia and Herzegovina compared to directly after the war in 1996, with the number of cattle having increased by 33 percent, sheep by 137 percent, pigs by 237 percent and poultry by 14 percent. The number of horses, however, has continued to decline. Within Republika Srpska, the number of farm animals has increased slightly on private farms, but has continued to decline on state farms. Cattle numbers increased by 5.5 percent from 1996 to 2002. Sheep numbers increased by one percent, pigs by 1.5 percent and poultry by 13.5 percent (SVABH, 2003).

In 1996, a three-year rehabilitation programme for the animal production sector was initiated with the goal of importing 60 000 high quality cows. Through a loan financed by the IFAD and coordinated by the Project Implementation Unit of the Ministry of Agriculture, approximately 10 000 pregnant heifers and 1 400 goats were imported into Bosnia and Herzegovina and distributed to beneficiaries.[22] Heifers were imported from Austria, Germany, Hungary and the Netherlands. Simmental accounted for 75 percent of all animals imported, Holstein Friesian (HF) 10 percent, Alpine Brown (Montafona) 10 percent and Grey Tyrolean (Oberinntal) 5 percent. Semen was also imported.

In addition, IFAD provided a loan for the importation of 2 000 heifers into Republika Srpska. The majority of the animals (about 80 percent) were Simmental, with the rest being Alpine Brown, Grey Tyrolean and HF. There were numerous relief and development organizations involved in importing and distributing animals to farmers, either as donations or on a commercial basis. However, from 1997 until 2003 there was no central database for recording the number and breeds of animals imported into the country, and by which organization (SVABH, 2003). Official livestock data collection for Bosnia and Herzegovina using a European Union Animal Identification System was to be in place by 2004. A tentative overview of the total number of cattle imported into Bosnia and Herzegovina from 1996 to 2002 taken from FAO's database is given in Table 2. The numbers of cattle imported in 1996, 2000 and 2002 are extremely high when compared to the other three years. The reasons for this fluctuation is not clear. Potential explanations include an error in the database, or the numbers may reflect the total numbers of animals imported by all other organizations during the same time period.

Table 2 Cattle imports into Bosnia and Herzegovina from 1996 to 2002

	1996 [a]	1997	1998	1999	2000 [a]	2001	2002 [a]
Cattle	160 200	39 500	39 700	32 000	101 600	25 000	272 876

[a] *Figures given for these years are listed by FAO as unofficial.*
source: FAO (2005e)

2.2.1.2 Animal genetic resources

Traditionally in the countries of southeastern Europe, cattle are usually used for both milk and meat production. Before the war, the Simmental breed and its crosses with Buša and other breeds represented over 60 percent of the total number of cattle in Bosnia and Herzegovina. Large state-owned dairy farms were based mostly on HF production. Conversely, cattle fattening was based mostly on Simmental crosses (principally with Buša) (USDA, 2003b). During the war, a nucleus herd of pure-bred Buša cattle established near Sarajevo was destroyed

[22] Farmers who had over 50 percent of their production assets destroyed and who had adequate agricultural land (one cow or five sheep per ha) (SVABH, 2003).

along with the breed book and other documentation. Whether there still exists a sufficient pure-bred population to start another nucleus herd has not been determined. The breeding and conservation programme for the Bosnian Mountain Horse was seriously affected. In addition, a number of flocks of the pure breed Sjenicka sheep (a heavier type of Pramenka) were completely eradicated as a result of the war and the displacement of the human population (SVABH, 2003).

As detailed above, four main exotic cattle breeds were imported after the war: Simmental, Alpine Brown, Grey Tyrolean and HF. In the northern part of the country the Simmental has replaced the local Posavsko cattle. The Alpine Brown and its crosses with the Buša have been well accepted by farmers in the hilly regions of Central and South Bosnia and Herzegovina. While the imported exotic breeds could clearly increase milk and meat production per cow, positive results have not always been achieved, primarily because of poor management practices, insufficient forage production and the low productivity of the pastures. The rehabilitation programme also failed to provide support measures such as animal health and milk collection schemes (SVABH, 2003). Further, there are reports that some restocked animals were slaughtered shortly after distribution and, thus, had no significant effect in terms of regenerating the livestock sector (USDA, 2003b).

Generally, current production levels of meat and milk are poor because of a lack of access to high-energy feeds, and haphazard genetic improvement plans (USDA, 2003b). Since 1996, the poultry and pork subsectors are reported to have nearly recovered, and are approaching pre-war numbers, while the cattle and sheep sectors are still recovering (USDA, 2003a,b). Figures offered in Table 3, illustrate the changes in the cattle population over a 12-year period.

Table 3 Changes in cattle population in Bosnia and Herzegovina

	1990	1996	2002
Cattle (head)	873 605	500 957 (57.3 percent)[a]	574 385 (65.7 percent) [a]

[a] *Index 1990 = 100 percent.*
source: (SVABH, 2003)

At present, there is no central institution in either Bosnia and Herzegovina or Republika Srpska that is in charge of livestock breeding and animal performance recording. Elements of the former breeding services have been preserved at the level of local communities, agricultural cooperatives and state farms. The establishment of a breeding service for Bosnia and Herzegovina is under consideration, pending policy approval within the strategy for agricultural development (SVABH, 2003). Breeding animals, semen and embryos are mostly imported into Bosnia and Herzegovina from Austria, Hungary, Croatia and Serbia. There are no official data on livestock imports. According to information provided by field veterinary stations (those stations approved for AI), semen from a number of breeds can be found on the market. Existing regulations state that all cattle should be artificially inseminated or mated with a licensed bull. However, there are no instruments in place that can successfully enforce the regulations. Controlled mating and AI have been used in only about 25 to 30 percent of animals. As Republika Srpska has decided to subsidize AI, it is expected that the percentage will increase, at least in this portion of the country. The market for bovine semen in Bosnia and Herzegovina is estimated to be about 270 000 doses annually (USDA, 2003b). Import tariffs for breeding heifers are 5 percent, for breeding cows 10 percent and other live cattle 10 percent (USDA, 2003a,b).

Before the war, the livestock sector was characterized by large state-owned farms and many small-scale private farms. The state-owned farms were relatively successful in terms of increasing productivity, due to the introduction of modern breeding techniques and the scientifically based selection of animals. Currently, most of these large farms are struggling to survive because of unsolved ownership issues. There are a few large private farms and a number of small farms with fewer than five animals. These small farms have been unable to increase in

size because of the lack of organized milk and meat marketing, and difficulty in accessing credit (USDA, 2003b).

2.2.2 Croatia

Croatia faces a similar problem to Bosnia and Herzegovina with regard to UXO. It is estimated that the total amount of mine-contaminated land amounts to about 1 175 square kilometres (approximately 2 percent of the country's land area), with mines and UXO in 12 of the country's 21 counties. Four of the counties are in the agriculturally fertile region of Slavonia. An estimated 54 percent of the country's mined areas are composed are woods and forests, 17 percent are agricultural land, and 9 percent are meadows and pastures. Farmers are among the most vulnerable sections of the population (UN, 2001b; LM, 2003, 2006).

2.2.2.1 Livestock sector

In Croatia from 1990 to 1997, there was a continuous decrease in the number of livestock. Cattle numbers decreased by about 45 percent, sheep by 40 percent, pigs by 25 percent and poultry by 36 percent (Par *et al*., 1999). A total of 13 000 cattle – 5 000 Simmental, 7 500 HF and 500 Brown Swiss – were imported into Croatia shortly after the war by registered organizations and private firms. The distribution of the cattle was generally as follows: HF to small and large dairy farms and Simmental and Brown Swiss to private (commercial) dairy farms. The majority of the cattle were distributed to semi-private and private smallholders in the continental region of the country (Ivankpvić, 2004).

2.2.2.2 Animal genetic resources

Croatian farmers have traditionally raised dual-purpose cattle for meat and milk, and in some areas for draught. However, market trends, insufficient domestic production and overseas competition are forcing producers to specialize in dairy or meat production. According to a USDA Global Agriculture Information Network (GAIN) Report, the Croatian Livestock Selection Center (which tracks about 220 000 head of cattle) reported that in 2002 pure-bred HF accounted for about 20 percent of the national dairy herd, while Simmental made up 75 percent. AI is used by 75 percent of farms; the 25 percent that do not are those located in remote areas (USDA, 2003c). The report further states that Croatia has about 280 000 breeding females, but requires 400 000 to meet the domestic demand for dairy and meat products. To meet such a shortfall it is likely that emphasis will be placed on pure-breeds or imported exotic semen, rather that the local breeds.

Prior to 2001, Croatia imported bovine semen and live bulls and cows for reproduction from a number of European countries and, in turn, exported live bulls and semen to a few countries (Annex 3). However, such imports and exports were stopped because of concerns over BSE[23]. The larger commercial (private) dairies import heifers from Israel, Australia and Canada. In 2002, Croatia imported HF semen to the value of $US112 000. There appears to be little import/export of cattle between Croatia and other countries of the former Yugoslavia, except for Slovenia (USDA, 2003c). Croatia purchases animals and semen from Bosnia and Herzegovina, Hungary and other EU countries (USDA, 2003c; Ivankpvić, 2004). Austria's Centre for Livestock Production (ACLP), which provided about 2 000 Simmental and Brown Cattle (Brown Swiss) to Croatia in 1996, continues to export animals to Croatia, and has close ties

[23] Because of import restrictions and inadequate production of Croatian cattle, it is projected that Croatia will face a beef shortage for the coming years. The country's 25 meat-processing plants are meeting only 19 percent of the country's demand. Croatia uses milk cows for slaughter employing a one cow/one calf system. Croatia has an estimated 170 000–190 000 milk cows leaving only 20 000 cows available for slaughter each year (USDA, 2002).

with the breeding and selection centre in Zagreb. Initial contacts between ACLP and Croatia in 1996 were facilitated through Grimex, an international trading company (Wetchy, 2003).

Table 4 Cattle imports into Croatia from 1992 to 2000

	1992	1994	1995	1996	1997	1998	1999	2000
Cattle	91 000	48 532	53 807	66 814	74 383	72 800	61 300	134 088

source: FAO (2005e)

Private milk processors also drive the use of pure-bred animals and imported semen. For example, Lura is the largest raw milk purchaser in Croatia, accounting for 50 percent of all purchases (over 220 million litres per year) from 25 000 farmers at 1 750 collection points in 14 counties of Croatia (Lura, 2005). The company provides technical assistance and training to farmers who wish to expand herd size (40–60 dairy cows) and production.

2.2.3 Serbia and Montenegro

The most mine-contaminated area following the 1992 to 1995 conflict was along the tri-border with Croatia and Bosnia and Herzegovina, in the vicinity of Jamena village. The mined area is partly covered by a dense oak forest, and partly by agricultural land intersected by drainage canals. Because of the mines, the fields have not been cultivated for over a decade, the canals are filled up and the land is often flooded. It is assumed that because of the flooding, many of the mines have moved position making any sort of agricultural production impossible (UN, 2001b; LM, 2003). Despite ongoing clearing operations, several other areas of the country remain contaminated by UXO, including aerial bombs, cluster bomblets, antipersonnel and antivehicle mines, with up to 24 square kilometres of land being affected (LM, 2006).

2.2.3.1 Livestock sector

The majority of agricultural production in Serbia and Montenegro is carried out on small private farms with a low to medium level of investment in crops and livestock. Private farms account for 75 percent of the cultivable land, with the public sector and cooperatives accounting for the remainder. Less than 5 percent of farms have over 10 ha of land. Private farms are usually 1 to 5 ha in size and consist of a number of small parcels distributed over large areas. Livestock production is present in all regions. There are two types of animal production system: a highly specialized high-input system, and an extensive low-input system based on combinations of crop/animal farming. With regard to cattle production, the large farms are generally in public ownership, whereas in the private sector, households generally keep one to two cows. The majority of the market-oriented livestock production is found on public farms and cooperatives, which are currently undergoing the process of privatization (FDPAGR, 2003).

Various breeds and breeding systems are developed in order to provide domestic and, to some extent, foreign markets. In localities such as Voivodina, where there is a high demand for milk, highly productive breeds such as HF predominate. In the other areas, such as central Serbia, milk/meat type animals are preferred. In areas where cattle are kept under extensive production systems, such as the mountain areas of Kosovo and Metohia, the Buša cattle and their crosses are more common.

2.2.3.2 Animal genetic resources

With regard to AnGR, some positive steps are being taken. For example, *in situ* conservation efforts are in progress for Podolian cattle. At present, only four breeders have stocks of these animals. However, other breeders and public organizations are showing great interest in becoming involved in their conservation. There is also an initiative to identify and form a nucleus herd of Buša cattle in the region of Vranje and Novi Pazar municipalities (FDPAGR, 2003).

2.2.4 Kosovo

The United Nations Mission in Kosovo declared in December 2001 that "all known" minefields and cluster munition strike sites in Kosovo had been cleared to "internationally acceptable standards". The remaining threat consisted primarily of limited numbers of subsurface cluster bomb units and other UXO located in remote, sparsely populated areas. According to the Mine Action Coordination Centre, the level of "contamination" would not impede social and economic development (UN, 2001b; LM, 2003). However, a recent reassessment indicates that cluster bombs and UXO remain a problem in certain forested areas (LM, 2006).

Overall, the war had a large effect on the agricultural sector. Indeed, livestock losses were estimated at 40 to 50 percent for large ruminants and 50 percent for small ruminants, or nearly half of the national herd (FAO, 1999, 2000). Cattle were left behind as people fled their homes and, consequently, many animals died as a result of theft, slaughter or starvation. The conflict in Kosovo, however, offers a classic example of how animals are often deliberately targeted during times of war, in an effort to destroy the morale of the enemy, and damage any attempts to salvage valuable herds. There are many reports of animals being indiscriminately shot and mutilated (WSPA, 2005).

2.2.4.1 Kosovo emergency farm reconstruction project

The objective of the World Bank/FAO Kosovo Emergency Farm Reconstruction Project (EFRP) was to help revive agricultural production and rebuild the rural economy in the province. The first phase of the EFRP began in 2000 and totalled US$12.36 million. While the project included components directed at the province level, most of the investment was focused on a limited number of municipalities where agricultural assets and production sustained the most damage. As such, the initial phase focused primarily on the three municipalities of Srbica/Skenderaj, Glogovac/Gllogoc, Decani/Decane.[24] The EFRP secured additional funding of US$5 million for a second phase of the cattle and mechanization components of the project in the municipalities of Vucitrn/Vushtrria and Klina/Kline, and a third phase in Pec/Peja, which extended the project to December 2002.

The Kosovo EFRP had the following components:

a) Support to re-establish the national cattle herd (US$4.4 million): Importation and distribution of pregnant heifers and bulls of Simmental, Brown Swiss and Grey Tyrolean breeds to vulnerable households in the three municipalities, with additional support for AI and feed.

b) Rehabilitation of veterinary services (US$1.3 million): Provision of surgical and AI equipment, vaccines, and medicine to veterinarians operating in 28 municipal veterinary stations throughout the province, with the rehabilitation of four animal health laboratories in the province.

c) Farm machinery repair and replacement (US$3.7 million): repair of an estimated 1 600 tractors and an unspecified number of combine harvesters. In addition, 120 new tractors were imported and distributed in the three municipalities to households with little means of cultivating.

d) Agriculture policy capacity building (US$0.9 million): support was provided to the United Nations Interim Administration Mission in Kosovo (UNMIK) and the Department of Agriculture to analyse the current legislative framework for agriculture and formulate

[24] These are the Serbian and Albanian names, respectively, given to these municipalities (OSCE, 2005).

appropriate legislative and policy proposals; staff training; refurbishing DOA premises; and establishment of an agriculture database.

e) Project management (US$1.9 million): the project management team operated under the umbrella of the FAO emergency coordination unit in Kosovo.

The following section focuses on the cattle distribution component. For an overview of the different project phases and other components given above, the reader is referred to Cossée (2000a,b; 2001a,b; 2002a,b,c; 2003), van Engelen (2002a,b,c), Jungbluth *et al* (2002) and other relevant documents cited in Goe (2005a).

2.2.4.2 The cattle distribution component

The main objective of the restocking exercise was to increase food security, and thereby reduce the vulnerability of poorer households (FAO, 2000, 2001b; Cossée, 2000a,b). A total of 4 489 cattle (4 399 pregnant heifers and 90 bulls) were procured, imported and distributed to selected beneficiaries in three phases:

1. 2 472 between September and November 2000, in Srbica/Skenderaj, Glogovac/Gllogoc and Decani/Decane.

2. 1 415 between October and November 2001 in Klina/Kline and Vucitrn/Vushtrria.

3. 602 in May–June 2002 in Pec/Peja.

The cattle were obtained from Austria and Germany (countries deemed to be free of BSE at the time). The animals were selected according to quality control protocols specifying an upper age limit of 30 months and good health status. Simmental and Brown Swiss breeds were chosen, as these were judged to be particularly well adapted to the climate and small-scale farming systems in Kosovo. Each imported pregnant heifer was expected to produce 3 500 litres of milk on average per year (FAO, 2000; Jackson, 2001). The cattle were transported to Kosovo by air, rather than by road or rail, as was the case in Bosnia and Herzegovina, in an attempt to lower mortality and abortion rates (Cossée, 2001b). A total of 37 flights (62–68 animals per flight) were made to import the pregnant heifers and breeding bulls for the first phase. No losses were reported during delivery, although about eight animals sustained injuries during transport. Losses after delivery at the holding farms because of deaths, or in the field (abortions), were minimal (<1 percent) (Friend, 2000a,b). An overview of the composition, distribution and status of imported cattle for Phase 1 is provided in the tables below.

Table 5 Cattle imported to Kosovo EFRP: Phase 1

Breed	Heifers		Bulls		Total	
	Number	Percent	Number	Percent	Number	Percent
Brown Swiss	678	27.94	13	28.89	691	27.95
Simmental	1 749	72.06	32	71.11	1 781	72.05
Total	2 427	100.00	45	100.00	2 472	100.00

Adapted from Cossée (2001b).

Table 6 Distribution of cattle by municipalities: Phase 1

Municipalities	Heifers		Bulls		Total	
	Number	Percent	Number	Percent	Number	Percent
Decani/Decane	701	28.9	14	31.1	715	28.9
Srbica/Skenderaj	774	31.9	14	31.1	788	31.9
Glogovac/Gllogoc	720	29.7	14	31.1	734	29.7
Minority areas	228	9.3	3	6. 7	231	9.3
Died in transit	4	0.2	0	0.0	4	0.2
Total	2 427	100.0	45	100.0	2472	100.0

Adapted from Cossée (2001b).

Table 7 Status of project animals: Phase 1 (as reported May 2001)

Status	Heifers		Bulls		Calves	
	Number	Percent	Number	Percent	Number	Percent
Live at farm	2 298	94.7	42	93.3	2102	92.2
Given / loaned / sold / stolen	84	3.5	-	-	6	0.3
Died / slaughtered / aborted	45	1.8	3	6.7	170	7.5
Total distributed/reported born	2 427	100.0	45	100.0	2278	100.0

Adapted from Cossée (2001b).

Based on experiences gained during the first restocking in Phase 1, the decision was made to import Simmental and Tiroler Grauvieh (TG) for the second and third phases of the project. The TG was selected over the Brown Swiss and other breeds[25] as it was considered a hardy dual-purpose breed, and easier to manage with regard to daily feed requirements, especially in upland and mountainous areas with poor pastures. It was also thought that the TG heifers would be more suitable for poorer families and women-headed households. The breed had been successful in Bosnia and Herzegovina, and was introduced into Kosovo by the Swiss NGO Caritas (Friend, 2001c; Etienne, 2004).

Hence, by the end of 2002, the total number of animals distributed and alive (including offspring) was approximately 9 000, or just under 5 percent of the estimated losses due to the war. Mortality rates were very low at only 3 percent. A further 2 percent of Phase 1 animals were slaughtered, principally for health reasons. Overall, 85 percent of the animals were reported to be in good health. An estimated 10 percent of the cows were sold, exchanged or given to another household to be raised. This latter group was mostly comprised of poor families who faced difficulties in taking care of their "project" cows because of labour shortfalls, or found it difficult to meet feed, health and breeding expenses. In most cases, the households replaced the project animal with a local one (Jungbluth *et al.* 2002; Ward, 2002).

[25] These breeds included HF, Jersey, Pinzgauer, Danish Red, French Montebeliarde and Ayrshire (Friend, 2001c).

2.2.4.3 Selection of beneficiaries

The Department of Agriculture (DOA) initially selected 230 families who had lost or sold their dual-purpose cattle during the conflict. A DOA veterinary advisor and an international EFRP livestock specialist then verified that those selected qualified (Friend, 2000a). Later, the selection of beneficiaries for the project was carried out by NGOs such as Action against Hunger and Mercy Corps International under FAO supervision. Village councils produced lists of eligible families which were subsequently verified by the NGOs. [26]

To be eligible, households had to meet the following criteria:

- prior experience in cattle husbandry;
- no cattle at present;
- access to sufficient fodder and grazing land (1 ha);
- adequate shelter for the animal; and
- no significant income sources other than agriculture.

Preference was given to female-headed households, households with the highest number of children below 12, the elderly and handicapped who have a higher need for milk and milk products. A variety of issues arose in with respect to the selection criteria including the fact that poorer households whose house and barn had been damaged during the war gave priority to the reconstruction of their home and often lack resources to reconstruct a barn. These people were often excluded from the beneficiary lists. Households who could afford quickly to build/rebuild a barn, in accordance with the recommendations of the project, probably had some additional source of income (Forni, 2001b).

2.2.4.4 Satisfaction with the breeds used by the projects

As many of the farmers were likely to have raised local breeds prior to the war, two surveys were undertaken to explore farmer preferences. The results were mixed. Data from the first survey administered to 146, farmers showed that the majority (95 percent) were either very satisfied or satisfied with the Brown Swiss and Simmental breeds provided by the project (Cossée, 2001b). However, in another survey which interviewed 150 beneficiaries about what breed they preferred, 25 percent replied HF and 11 percent Simmental. Interestingly, the majority of those questioned (42 percent) stated they did not know (Table 8). A possible explanation for the finding is the overall lack of experience of the people being questioned i.e. the women and younger men. The positive perceptions toward HF may be indicative of the situation in the survey area prior to the war, when farmers may have been exposed to the breed through government distribution or private sales.

As noted above, in some cases farmers exchanged the pure-bred animals for either a pure or cross-bred Buša. However, only a small minority stated that they preferred this breed (Table 8). While farmers stated that project heifers provided more milk, they also required better conditions and more feed than local cows (Cossée, 2001b).

[26] For more detailed information on the restocking activities (e.g. selection and training of beneficiaries, NGOs involved in cattle distribution, expected project outputs, support mechanisms for farmers, etc) see: AAH (200a,b); Buck (2001); Friend (2001a,b,c); Mercy Corps (2001); Agrisystems Ltd (2002a,b) and Black-Michaud (2002a,b,c,d).

Table 8 Breeds preferred by beneficiaries

Preferred Breeds	Number Responding	Percent
Holstein Friesian	38	25
Simmental	17	11
Cross-bred	13	9
"Heavy milker"	6	4
Buša	5	3
Other	8	5
Don't know	63	42
Total	150	100

Source: Cossée (2002b)

Hence, with such limited evidence it is difficult to gain an accurate notion of farmers' perceptions regarding the animals in their care. Nevertheless, it may be suggested that this is an area that requires more attention in future restocking exercises. Moreover, it can be demonstrated that farmers' choices and selection of traits have a large influence on the genetic make up of the overall livestock population.

2.3 Use of the progeny tracing model to assess the impact of restocking in Bosnia and Herzegovina

This section presents the results obtained by applying the progeny tracing model described in section 1.5 to assess the restocking carried out in Bosnia and Herzegovina following the war. Information regarding the breed composition of the national herd in the country prior to the war is patchy at best. The model parameters shown in Box 5 are based as far as possible on the available evidence, with exceptions noted.

Box 5 Parameters for the model

Estimated composition of pre-war national herd: Bosnia and Herzegovina

Buša: 20 percent ♦
Simmental: 30 percent*
Simmental-Buša Crosses: 30 percent*
Others: 20 percent (including Alpine Brown, Friesian, Gatacko, Holstein, Posavsko, Sava, Posavina, Tyrolean Grey)

Composition of the Restocked Herd:

Buša: 0 percent
Simmental: 75 percent
Other (Holstein Friesian, Alpine Brown, and Grey Tyrolean): 25 percent

After initial low calving rate in post-war period, calving rate approximates normal in Years 1–5.
Restocking inputs occurred in Years 1 and 3.

♦*Estimated from 1984 Herd Book: See Mason (1996) and Merck (1985) for a description of the breed.*
**Derived from the overall estimation of 60 percent offered by Goe (2005)*

Utilizing these parameters, the breed composition of the national population after the war is estimated as follows (Table 9).

Table 9 Estimated breed composition of national herd

	Buša	Simmental	Simmental X	Other	TOTAL (N)
Pre-War	170 600	255 900	255 900	170 600	853 000
Post-War	68 224	102 336	102 336	68 224	341 120

The composition of the restocked herd is listed in Table 10.

Table 10 Estimated breed composition of restocked herd

Breed	Buša	Simmental	Simmental X	Other	TOTAL (N)
Phase I	0.0	2 547.0	0.0	849.0	3 396.0
Phase II	0.0	8 550.8	0.0	2 850.3	11 401.0
Total	0.0	11 097.8	0.0	3 699.3	14 797.0

As described above, the majority of the restocked herd was made up of Simmental. Restocked herd inputs occurred in Year 1 and Year 3. The total livestock population over a seven year period is detailed in the following table.

Table 11 Total livestock population with restocked herd

	Yr 0	Yr1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Cows	194 484	194 484	220 245.7	244 942.4	257 476.1	270 764.8	284 798.5	299 590.0
Heifers	102 360	105 756	77 537.7	79 045.4	83 453.2	87 948.6	92 604.4	97 464.5
Female Calves	18 766	18 766	41 296.1	45 926.7	48 276.8	50 768.4	53 399.7	56 173.1
Male Calves	18 766	18 766	41 296.1	45 926.7	48 276.8	50 768.4	53 399.7	56 173.1
Bulls	6 824	7 700	8 900	9 900	10 450	11 000	11 600	12 200
Total	341 200	345 472	389 275.5	425 741.3	447 932.8	471 250.2	495 802.3	521 600.8

As the table illustrates, over a seven-year period, the livestock population increased by 35 percent. With regard to the ability of the households involved to selectively breed for the imported Simmental bloodlines, according to project documents, a limited number of stud animals were distributed in the restocking packages (in Phase II, 25 bulls were distributed).[27] Further, the access and availability of AI to participating farmers is unknown. While semen was imported, one project report notes that "because of the limited availability of artificial insemination, 25 breeding bulls were procured and distributed to farmers in villages far away from local veterinary stations" (IFAD, 2000). As such, given the limited number of stud animals

[27] The proposal for Phase I included 94 stud animals, however, the actual number of bulls procured and distributed during this stage was not listed in the available documents.

provided, it may be assumed that the farmers pursued an opportunistic, rather than selective breeding programme.

In this example, the restocking ratio is 1:23. The restocked herd represents approximately 4 percent of the total livestock population. As the restocked herd was comprised mainly of Simmental cattle (75 percent), the estimated change in the overall composition of the herd is as follows (Table 12).

Table 12 Estimated breed composition of national herd post-restocking

	Buša	**Simmental and Simmental Crosses**	**Other**	**TOTAL (N)**
Pre-War	170 600	511 800.0	170 600	853 000
Post-War	68 224.0	204 672.0	68 224.0	341 120.0
7 Yrs Post-Restocking	58 446.2	305 235.6	101 745.2	465 427.7[28]

The model estimates that as a result of restocking primarily with Simmental and other exotic breeds, the population of pure-bred Buša declined by 9 percent during the seven-year period. With increased political stability and better delivery of livestock services such as AI, it is likely that the decline of the breed will continue. Nevertheless, factors which would reduce or reverse the trend, such as farmer attitudes with regard to the desirability of the breed, and current breeding practices, have not been documented. Hence, the long-term outlook for this breed is unclear.

2.4 Conclusions to the case study

The detailed case study demonstrates the overall impact of war, and provides some preliminary information as to the results of rehabilitation efforts. Given the numbers of livestock being imported across the former Yugoslavia, the case study illustrates that following the cessation of an armed conflict, the livestock sector can rebound fairly rapidly. Remaining land mines and UXOs, however, are key constraints to the resumption of agricultural activities in general, and livestock keeping, more specifically.

While it is evident that large-scale restocking projects can directly affect the long-term genetic make up of the livestock population following a disaster, animals moved in by the private sector to meet demand will also have an effect. These animals need to be included in any assessment of the impact of the war on AnGR in former Yugoslavia. However, there is very little information on the specific breeds involved outside the restocking projects (Goe, 2005a).

Key to understanding the long-term changes to AnGR after any sort of disaster are the perceptions and attitudes of farmers with respect to specific breeds. While in former Yugoslavia there were some attempts to explore this issue, as noted above, the results are unclear. Local animals were considered to be easier to keep and some farmers sold their project animals to buy "more suitable" breeds. Nevertheless, many of those interviewed identified high producing animals as preferable. Further work is required to elucidate the differences between *stated* and *actual* preferences.

Thus, in relation to the first question framing this document (Do existing levels of diversity have any impact on the vulnerability to, and subsequent recovery from, the inciting disasters?)

[28] The total figure does not include the population of male calves/young stock as only a minority will survive to adulthood as stud animals therefore the likely contribution of this group to AnGR is minimal.

the answer, in this case, is likely to be no. While it may be argued that some farmers did exchange exotic cattle for local breeds, the extent to which this practice occurred is unknown. Existing levels of diversity at least ostensibly did not aid farmers in recovery. In response to the second question (Do emergencies drive a decrease in diversity or is this solely a function of the interventions, i.e. restocking packages, devised in response?) it can be considered that both the emergency itself and the restocking package contributed to a decrease in diversity. Not surprisingly, evidence suggests that breeds at risk were further depleted by the war.

The following section offers decision-support tools for practitioners and decision-makers.

Section III: Decision-support guidelines

As the previous discussion illustrates, AnGR-related activities during an emergency can be classified under three headings: preparedness (prior to the emergency); salvage operations (during the emergency) and rehabilitation (in the recovery phases). As noted in the introduction, with a minimum of preparation, many of the problems relating to AnGR can be resolved without large-scale investments during the emergency. The following section outlines key issues for consideration during the stages outlined above.

3.1 Considerations and actions pre-disaster: preparedness, AnGR management and risk mitigation

Disaster-preparedness activities generally focus on the following three broad areas: fostering an appropriate legislative environment for saving AnGR threatened by disasters (particularly in the case of roll-on disasters such as epidemic diseases, and potentially drought, where there is sufficient time to implement conservation or genetic salvage operations). Second, a variety of risk mitigation strategies may be undertaken such as the creation and support of fodder banks in areas that face ongoing risk of environmental events such as severe winter snows or drought. Other measures could include the creation of genebanks or destocking.

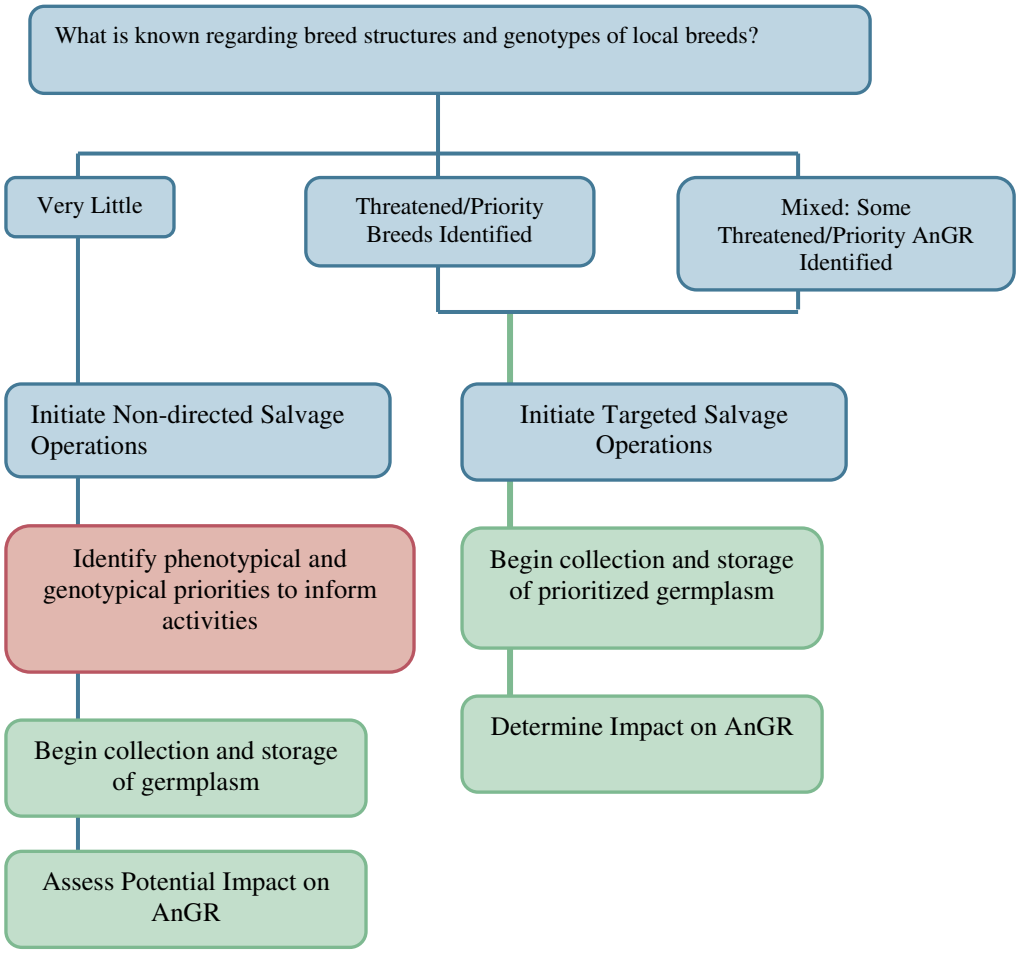
Another key activity to support preparedness is the identification of breed structures. In many countries, threatened or priority AnGR has not been sufficiently identified, thereby making informed choices during genetic salvage and restocking activities difficult.

3.2 Considerations and actions during the state of emergency: genetic salvage

Genetic salvage comprises a range of actions to conserve germplasm, including storing and collecting blood for subsequent DNA analysis, and the freezing/storage of semen and oocytes from threatened or valuable breeds.

During an emergency, there are two conditions under which genetic salvage operations can and should be undertaken. One the one hand, such action should be taken where it is evident that valuable AnGR are at high risk of extinction. The identification of such situations requires that sufficiently accurate information on the characteristics of the local livestock population, and the extent of the losses caused by the emergency are available. On the other hand, genetic salvage operations may be feasible/desirable in situations where little characterization of AnGR has occurred – and hence there is little known about the likely extent or significance of the losses. Under the latter conditions, genetic salvage can be regarded as last resort conservation strategy to ensure that some of the material survives for future generations.

Figure 6 Decision Tree for Genetic Salvage



3.3 Considerations and actions for rehabilitation: restocking

When faced with the task of repopulating herds after a disaster, decision-makers should first consider the role of livestock within the production system in question. Systems of livestock production reflect the geography and the wider agro-ecological and socio-economic environment. Following an acute disaster, it is generally not advisable to initiate a restocking project that changes the production orientation of the livestock keepers involved. For example, introducing dairy breeds in a post-disaster situation among households where livestock are primarily kept for meat purposes is not likely to be successful. Many of the inputs required to support such a change (e.g. increased feed and labour) are simply not available in a post-disaster environment. As such, restocked animals are often sold or consumed.

Thus, the aim and objective of restocking in an acute emergency should be to restore previous production levels, rather than dramatically to alter the production system or previous livelihoods of the affected households. Conversely, in a chronic emergency there is more leeway to support a change in the role of livestock. Indeed, there have been many cases of restocking projects that have introduced dairying to support local livelihoods, with much success (HPI, 2002). Generally, under these conditions dairying is a well-known livelihood strategy for the communities involved. Projects aid the involvement of targeted households in the livestock sector via the provision of microcredit (Nielsen, 2004). Nevertheless, sufficient labour and

access to resources remain important limitations. Hence, understanding the role of livestock and the key constraints faced by households is critical to establishing secure and sustainable restocking activities.

An additional issue in an acute emergency is how livestock losses are evaluated. This is important both from an AnGR perspective, and also in detailing the level of livestock aid required. At present, the quality of the data available to decision-makers post-disaster is being questioned. As Guha-Sapir and Below (2005) note "[in a post-disaster situation] … needs were addressed on an ad hoc basis … data were incomplete, outdated or unusable". The livestock sector is no exception.

Indeed, estimations of livestock losses after disasters are often extrapolated from limited field surveys conducted at species level. As such, the reliability of the figures is often uncertain. An accurate estimation of livestock losses is important in order to determine the scope of restocking required. Further, the level of losses will determine whether animals can be sourced locally, or whether regional, national or even international populations must be tapped.

Moreover, an accurate estimate of the level of livestock losses offers a future population base-line against which changes can be measured. Consequently, within the potential project area, prior to restocking, the existing breeds should be catalogued and any at risk breeds identified.

The level of livestock losses and the genetic composition of the replacement stock will clearly have a large impact on AnGR. Nevertheless, as noted above, when designing a project, an understanding of farmer perceptions regarding the breed and/or species to be utilized is important. The overall effect of restocking on AnGR will be largely determined by the breeding strategy that farmers pursue. As such, an understanding of the preferred traits will provide practitioners with a notion of what farmers will prioritize with regard to breed selection. In this manner, prior to restocking both the willingness and ability of farmers to pursue a selective breeding strategy should be evaluated.

Box 6 outlines key issues to be considered prior to restocking after a disaster.

Box 6 Key issues post disaster: restocking and AnGR

Livestock-keeping Strategies:

- What is the primary role of livestock for the households involved?

The Environment:

- Is the environment sufficiently secure to begin livestock distribution?
- Is there an appropriate level of feed, water and labour resources to maintain herds?
- What are the livestock population losses by breed?
- What method has been utilized to estimate breed population losses? Are the figures credible?

The Project

- What is the chosen breed?
- How many animals are required? At this level, can herds be reconstituted through local sources?
- If not, where are sufficient livestock numbers available?

Implications for AnGR

- What are the implications for the local gene pool of a potentially large influx of new animals?
- Does the local population include breeds at risk?
- How have the breeds been identified?
- What measures are being put in place to support the local gene pool?

Implications for Households Involved

- Is the species/breed chosen by the project acceptable to farmers?
- What are the main issues and constraints as detailed by the farmers themselves to restocking with this particular breed?
- What livestock traits are desired by the households involved?
- What is the likely selection strategy of the households involved?

Figure 7 Decision Tree for Restocking After Disaster

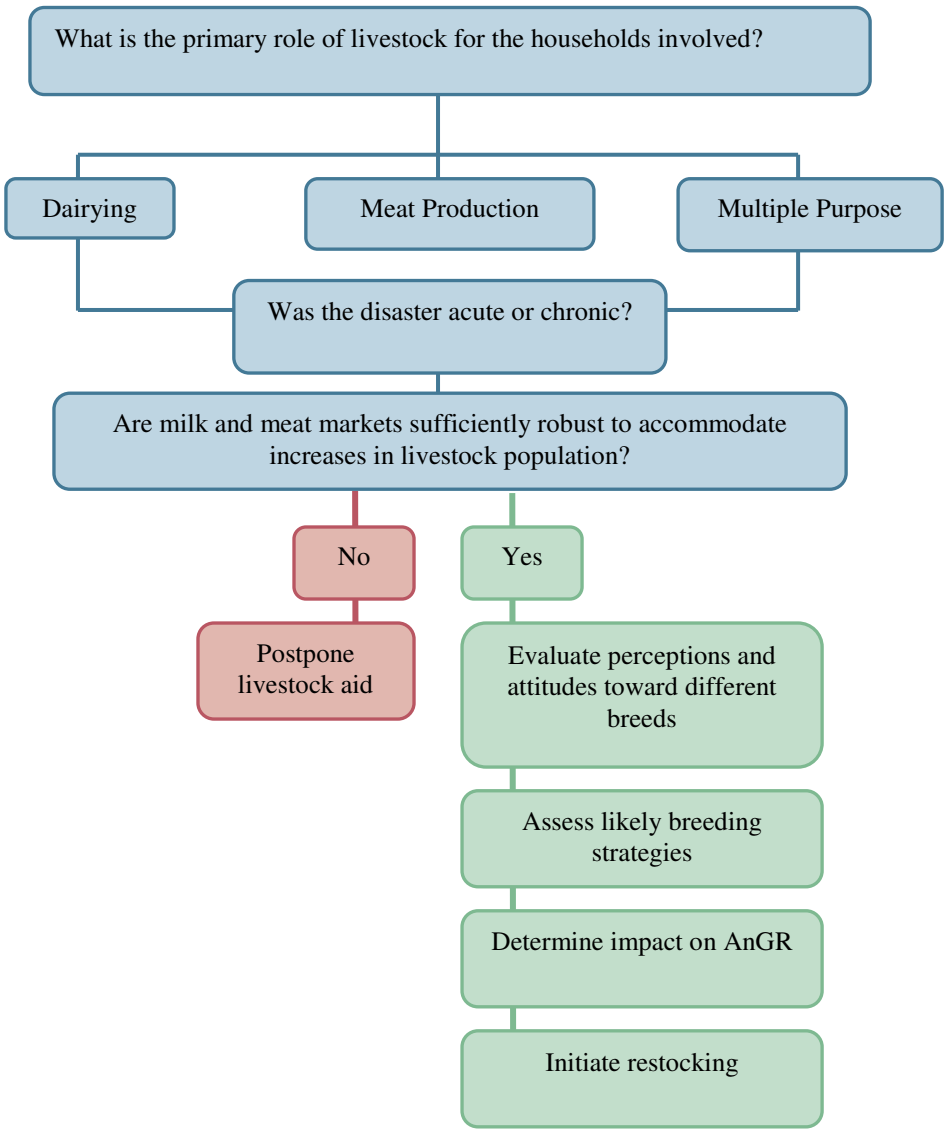


Figure 8 Restocking in an Acute Emergency

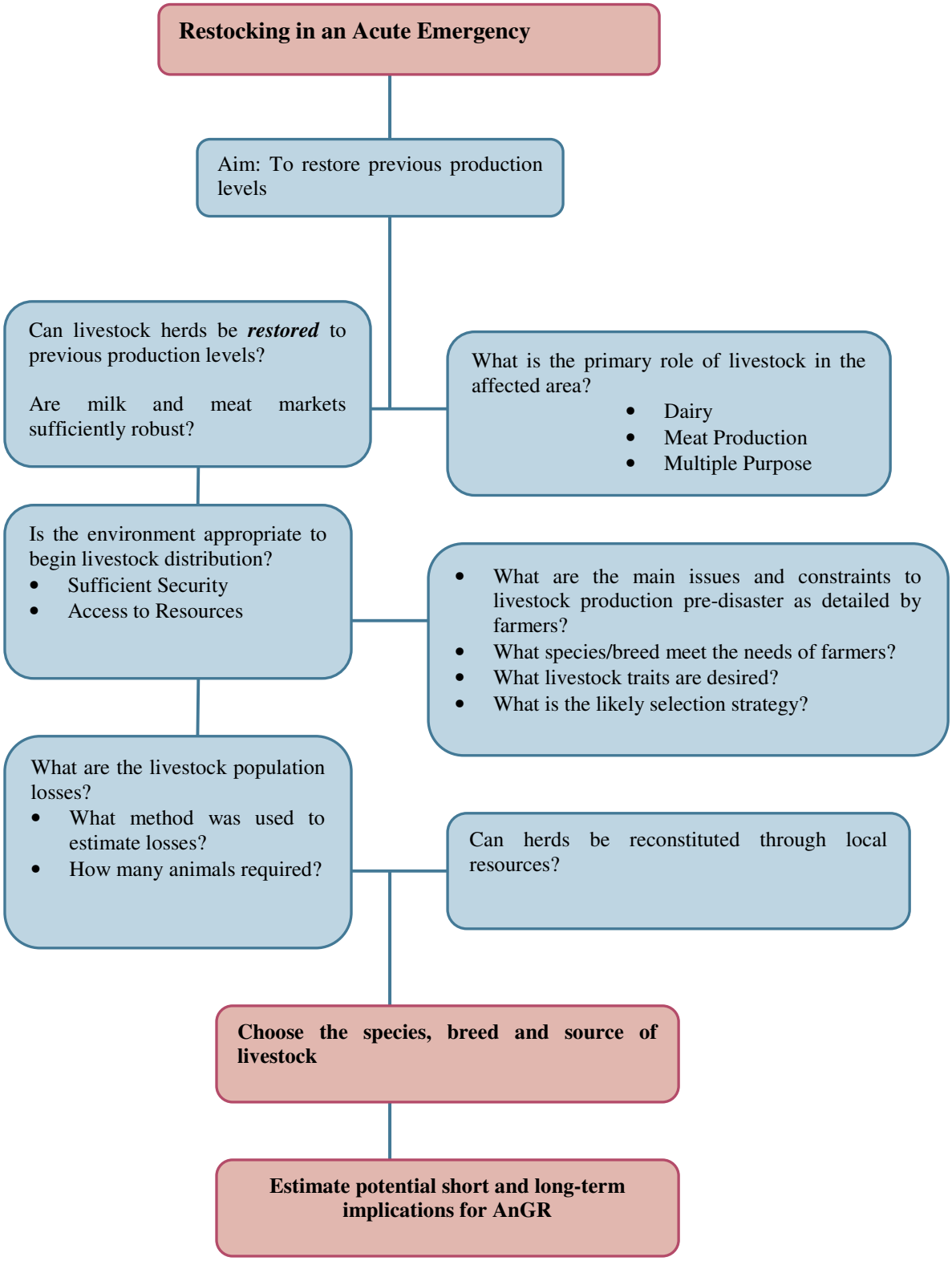
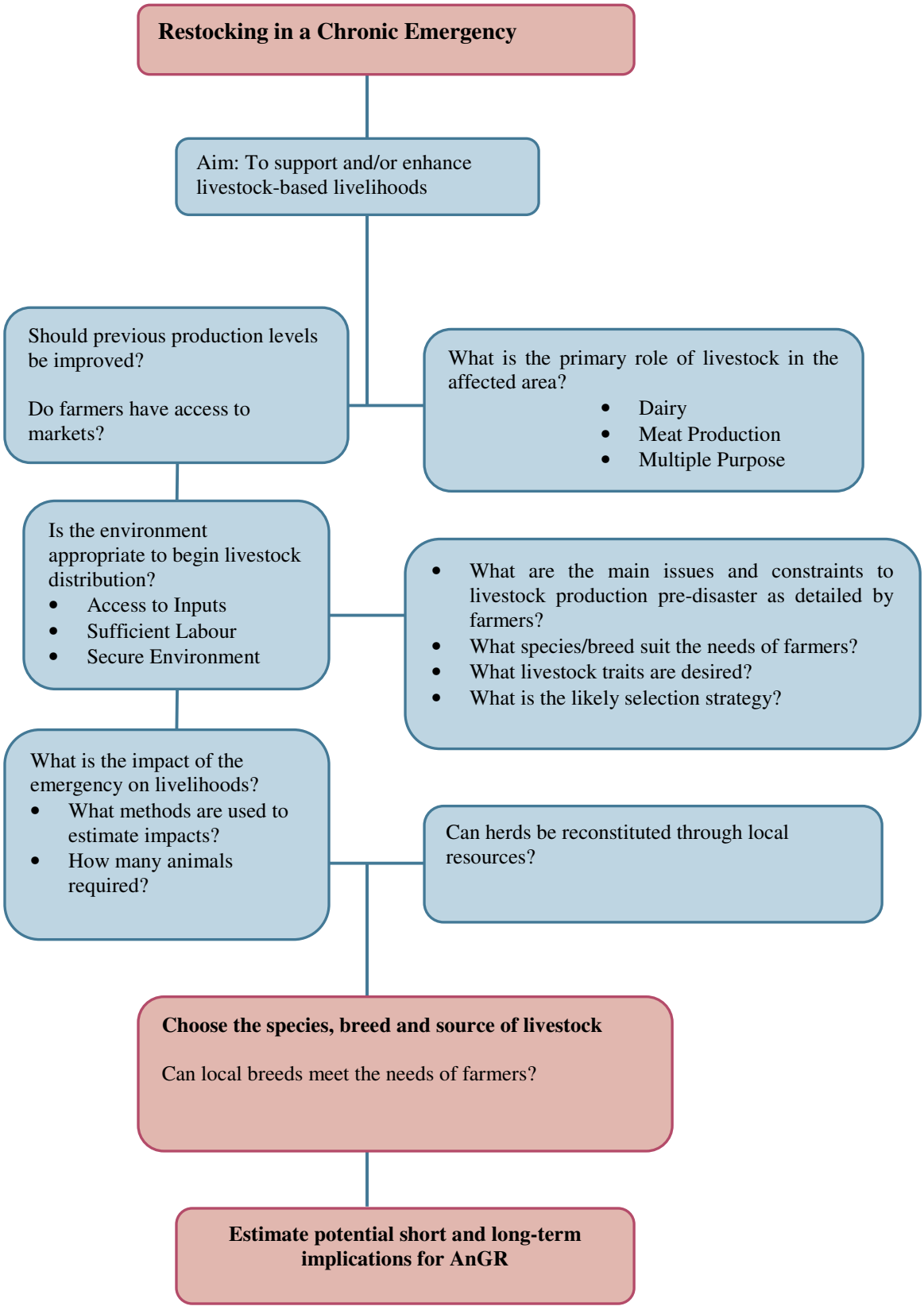


Figure 9 Restocking in a chronic emergency



Conclusions

The loss of AnGR during the last century has been both rapid and irreversible. While much of the loss can be attributed to changes in demand for particular breeds, disasters and the subsequent response by the governments and agencies involved have also played a role. On the most basic level, disasters and emergencies adversely affect nascent global efforts to characterize and prioritize AnGR. As such, there is an urgent need to better understand the impact of disasters on livestock diversity. Historical mono-conceptions of disasters and emergencies as human-made or environmental are not particularly helpful. The complexities of the relationship between disasters, consequent phenomena and the socio-economic and environmental context in which they occur must be acknowledged.

However, understanding conceptual distinctions alone is insufficient. Key to the destruction or conservation of AnGR is the response of the policy-makers and practitioners involved. Therefore, the report offers two broad contexts in which to situate potential action: acute and chronic emergencies. Within these contexts, three key stages which are significant to the conservation of AnGR are identified: preparedness/mitigation, response and rehabilitation. During each of these stages, specific actions are detailed to aid decision-makers. These actions range from breed identification and the creation of legislative frameworks, to genetic salvage operations and restocking.

To illuminate these issues, the report offers three examples: the dzud in Mongolia, the FMD outbreak in the United Kingdom, and the impact of wars in the countries of former Yugoslavia. The example from Mongolia demonstrates how the severity of a disaster can be significantly increased by underlying conditions such as the breakdown of formal and customary institutions. Conversely, the example of the FMD epidemic in the United Kingdom illustrates how measures can be implemented even during a disaster to support the conservation of specific AnGR. Such action, however, is only effective when AnGR has been sufficiently characterized. In many Southern countries, this is simply not the case. Finally, the case study on former Yugoslavia offers an example of wide scale destruction of lives and livelihoods, and the role of restocking in the recovery of the livestock sector.

In relation to the wider questions underpinning this document, the evidence presented illustrates the complexities and inter-relationships of contingent factors and their role in shaping both policy and practice with regard to AnGR. While it is clear that disasters have a negative effect on diversity, the effects of diversity on disaster mitigation are less clear. At present, there is little evidence to indicate that diversity either enhances or reduces vulnerability to disasters. Hence, the existing evidence offers little to explicate the role of diversity in disaster mitigation and rehabilitation. Further, research on this topic is required.

Inarguably, restocking aids the rebuilding of social and economic networks, and can assist recovery from psychological trauma among vulnerable populations post-disaster. While the poverty outcomes of projects have received much attention, little focus has been given to effects on AnGR. However, this impact can be significant and is, in most cases, permanent. Hence, it is imperative that projects and programmes understand the longer-term implications of livestock aid in general and restocking more specifically. The criteria for decisions regarding the distribution livestock as part of emergency relief efforts needs to be better determined. Are the animals to be used as a measure of emergency aid to those people affected (in the case of most recipients in the countries of the former Yugoslavia these were poor rural smallholders, many who owned only one to three cattle prior to the war) or is it to be part of a larger programme to develop the dairy economy? In each case, different approaches are required and thus, there will potentially be different impacts on AnGR.

Efforts to enhance production via the introduction of “improved” livestock can be counterproductive to both long-term poverty eradication goals, and with regard to the loss of diversity. As the example from the former Yugoslavia illustrates, restocking with improved

animals in a post-disaster situation can be less than helpful, when sufficient resources are unavailable to support the needs of these animals. However, even with the best of intentions, after a disaster, there is great pressure on the projects and programmes involved to act. Because of this, impacts on local AnGR are often overlooked. It is difficult to avoid the importation of exotic breeds or their crosses as part of emergency relief operations, if political agendas drive the process. However, sourcing sufficient livestock from local areas has often proved to be difficult. Therefore, long-term aims tend to be subjugated to short-term needs.

Local livestock breeds are the result of selection over many generations and as such, are suited socially and environmentally to the geographies from which they originate. The evidence largely indicates that the survivability of these breeds is higher in relation to specific forms of disaster such as drought and livestock disease. Further, within the context of acute and chronic emergencies, preparedness and mitigation activities are clearly less expensive options than genetic salvage and restocking. As such, while the conservation of diversity is often viewed as extravagant, it is likely that the above options may be less expensive than the cost of the current global destruction of AnGR.

References

AAH. 2000a. *Distribution report: Skenderaj and Gllogovc*, WB/FAO Emergency Farm Reconstruction Project, Project Management Team Prishtina. London. Action Against Hunger.

AAH. 2000b. *Distribution report Skenderaj and Gllogovc,* WB/FAO Emergency Farm Reconstruction Project, December 11. London. Action Against Hunger.

Abbott, P.L. 1996. *Natural disasters* (2nd edition). Boston MA, USA. McGraw-Hill.

ADB. 2005. *Country Environmental Analysis: Mongolia*. Asian Development Bank. Manilla, the Phillipines. (available at http://209.225.62.100/Documents/Studies/Ctry-Environmental-Analysis/2005/MON/mon-cea.pdf)

Agrisystems Ltd. 2002. *Emergency Farm Reconstruction Project, livestock and animal health components, Kosovo* (EFRP-OSRO/KOS/009/WB). Tenth Mission Report (Revised). November 20-30, 2001.

Agrisystems Ltd. 2002. *Emergency Farm Reconstruction Project, livestock and animal health components, Kosovo,* (EFRP-OSRO/KOS/009/WB). Eleventh Mission Report (Revised). May 8-22.

Albala-Bertrand, J. 2000. Responses to complex humanitarian emergencies and natural disasters: an analytical comparison. *Third World Quarterly*, 21(2): 215–227.

Andersson, N., Palha da Sousa, C. & Paredes, S. 1995. Social cost of land mines in four countries: Afghanistan, Bosnia, Cambodia and Mozambique. *British Medical Journal*, 311: 718-721.

Anon. 2000. *Mongolia – the nomads' despair*. *Economist,* 355(8168): 64.

AVMA. 2002. *Disaster preparedness and response guide*. Schaumburg, IL, USA. American Veterinary Medical Association.

(http://www.avma.org/disaster/responseguide/responseguide_toc.asp).

Buck, N.G. 2001. *Emergency Farm Reconstruction Project implementation phase*. (OSRO/KOS/915/WBK). Technical Report. Third Mission July 24-August 24. Rome. FAO.

Black-Michaud, A. 2002a. *Mission report, January 6-17. Emergency* Farm Reconstruction Project, (OSRO/KOS/009/WBK). Rome. FAO.

Black-Michaud, A. 2002b. *Mission report, September 11-27.* Emergency Farm Reconstruction Project, (OSRO/KOS/009/WBK). Rome. FAO.

Black-Michaud, A. 2002c. *Mission report, March 26-April 5.* Emergency Farm Reconstruction Project, (OSRO/KOS/WBK). Rome. FAO.

Black-Michaud, A. 2002d. *Mission report, June 9-21.* Emergency Farm Reconstruction Project, (OSRO/KOS/WBK). Rome. FAO.

CRID. 2006. *Disasters controlled vocabulary.* Regional Disaster Information Centre for Latin America and the Caribbean..

(available at http://www.crid.or.cr/crid/ing/vocabulario_controlado_ing.html).

Cossée, O. 2000a. *Report on first Kosovo mission by the monitoring and evaluation specialist*, June 1-13. Rome. FAO.

Cossée, O. 2000b. *Emergency Farm Reconstruction Project Kosovo. Results from the baseline survey,* (EFRP-OSRO/KOS/915/WB), December 14th. Rome. FAO.

Cossée, O. 2001a. *Emergency Farm Reconstruction Project Kosovo. Monitoring and evaluation,* Third mission report, (EFRP-OSRO/KOS/915/WB), March 18-April 2. Rome. FAO.

Cossée, O. 2001b. *Emergency Farm Reconstruction Project Kosovo,* Mid-term Review Report. Fourth Mission Report Final Version (EFRP-OSRO/KOS/915/WB), June 4-22. Rome. FAO.

Cossée, O. 2002a. *Emergency Farm Reconstruction Project Kosovo. Launching the final survey*, Sixth Mission Report, Final Version (EFRP-OSRO/KOS/009/WBK), July 29-August 9. Rome. FAO.

Cossée, O. 2002b. *Emergency Farm Reconstruction Project Kosovo. Results from the baseline survey* (EFRP-OSRO/KOS/915/WB), December 14 (Draft). Rome. FAO.

Cossée, O. 2002c. *Emergency Farm Reconstruction Project Kosovo. Training the enumerators for the final survey*, Seventh Mission Report, Final Version (EFRP-OSRO/KOS/009/WBK), October 27-November 1. Rome. FAO.

Cossée, O. 2003. *Emergency Farm Reconstruction Project Kosovo. Analysis of the final survey,* Final Version (EFRP-OSRO/KOS/009/WBK), 30 May. Rome. FAO.

DEFRA 2002. *Report of the Chief Veterinary Officer Animal Health 2001*. London. Department for Environment, Food and Rural Affairs.

Duffield, M. 1994. Complex emergencies and the crisis of developmentalism. *In* M. Buchanon Smith & S. Maxwell eds., *Linking relief and development*, IDS Bulletin Vol 25(4). pp. 37–45. Brighton, UK. Institute of Development Studies.

ECLAC. 2000. *Handbook for estimating the socio-economic and environmental effects of disasters*. Santiago Chile. Economic Commission for Latin American and the Caribbean.

Etienne, C. 2004. From a chaotic emergency aid-to a sustainable self-help programme. *BeraterInnen News,* 2: 25-28.

FAO. 1999. *Special report: food security and agriculture situation in the Kosovo Province of the Federal Republic of Yugoslavia, 28 July*. Special Reports and Alerts GIEWS. Rome.

FAO. 2000. Press release 00/61. 2,500 *Cattle for poor farmers in Kosovo flown in from Germany and Austria – Joint FAO/World Bank initiative*. (http://www.fao.org/NEWS/2000/001101-e.htm). (See full press release for 09 November).

FAO. 2001a. *Preparation of the first report on the State of the World's Animal Genetic Resources. Guidelines for the development of country reports.* Rome.

FAO. 2001b. *Cows for Kosovo, FAO helps get Kosovo's agriculture back on track.* FAO in Action. Rome.

FAO. 2005a. *Natural disaster risk management for sustainable rural livelihoods*. Programme Concept Note, April, 2005. Rome.

FAO. 2005b. *Tsunami reconstruction. Agriculture – coastal ecosystems, animals. Number of dead or missing animals* (Thailand).

(available at http://www.fao.org/ag/tsunami/assessment/assess-animal.html).

FAO. 2005c. *FAO terminology*, FAOTERM database

(available at http://www.fao.org/faoterm/nocs.asp).

FAO. 2005d. *FAO statistical databases (agriculture)*

(available at http://faostat.fao.org/).

FAO. 2005e. *Key statistic of food and agriculture external trade*. FAO Statistics Division.Rome. (available at http://www.fao.org/es/ess/toptrade/trade.asp).

FAO. 2006. *State of the world's animal genetic resources*. Country strategy paper: Mongolia. Rome.

FAO/UNEP. 2000. *World watch list for domestic animal diversity*, 3rd Edition, edited by B. Scherf. Rome.

FDPAGR. 2003. *First report on the state of animal genetic resources in Federal Republic of Yugoslavia*. Federal Department for Plant and Animal Genetic Resources, Beograd.

FMPP&E. 2000. *Biodiversity. Bosnia and Herzegovina: pressure*. Federal Ministry of Physical Planning and Environment. (available at http://www.grida.no/enrin/biodiv/biodiv/national/bh/pressure.htm).

Forni, N. 2001. *Mission report. Emergency Farm Reconstruction Project implementation phase* (OSRO/KOS/009/WBK), September 20-30. Rome. FAO

Forstater, M. (1996). *Restocking destitute pastoralists: a critical examination of experiences in Northern Kenya*. University of Newcastle, Newcastle, UK. (BSc. Dissertation)

Freeman, K., Keen, M. & Muthukumara, M. 2003. Being prepared: natural disasters are becoming more frequent, more destructive, and deadlier, and poor countries are being hit the hardest. *Finance and Development,* 40(3): 42–45.

Friend, A. 2000a. *Emergency Farm Reconstruction Project Kosovo* (EFRP-OSRO/KOS/915/WB), Livestock and Animal Health Components, Fifth Mission Report, October 9-November 11. Rome. FAO.

Friend, A. 2000b. *Emergency Farm Reconstruction Project Kosovo* (EFRP-OSRO/KOS/915/WB), Livestock and Animal Health Components, Sixth Mission Report, December 11-22. Rome. FAO.

Friend, A. 2001a. *Emergency Farm Reconstruction Project Kosovo* (EFRP-OSRO/KOS/915/WB), Livestock and Animal Health Components, Seventh Mission Report, January 20-February 10. Rome. FAO.

Friend, A. 2001b. *Emergency Farm Reconstruction Project Kosovo* (EFRP-OSRO/KOS/009/WB), Livestock and Animal Health Components, Eighth Mission Report, May 14-23. Rome. FAO.

Friend, A. 2001c. *Emergency Farm Reconstruction Project Kosovo* (EFRP-OSRO/KOS/009/WB), Livestock and Animal Health Components, Ninth Mission Report, July 8-22. Rome. FAO.

Goe, M.R. 2001. *Assessment of the scope of earthquake damages to the livestock sector in Gujarat State, India*. Consultancy Mission Report. Bangkok/Rome. FAO.

Goe, M.R. & Stranzinger, G. 2002a. *Livestock as a component of disaster risk management: quantifying the effect of emergency relief operations on animal genetic resources*. Concept Note prepared for FAO Animal Genetic Resources Group. Zurich, Switzerland. Breeding Biology Group, Institute of Animal Sciences, Swiss Federal Institute of Technology.

Goe, M.R. & Stranzinger, G. 2002b. *Developing appropriate strategies for the prevention and mitigation of natural and human-induced disasters on livestock production*. Internal Working Document. Zurich, Switzerland. Breeding Biology Group, Institute of Animal Sciences, Swiss Federal Institute of Technology.

Goe, M.R. & Stranzinger, G. 2002c. *Animal genetic resources and HIV/AIDS in sub-Saharan Africa*. *In* Proceedings of the 7th World Congress on Genetics Applied to Livestock Production, 19–23 August, Montpellier. Communication No. 27-02. Castanet-Tolosan, France. INRA,

Goe, M. 2005a. *Impact of war and relief operations on animal genetic resources in the countries of the former Yugoslavia*. Report produced for the FAO Animal Genetic Resources Group. Rome. FAO.

Goe, M.R. 2005b. *Livestock production and HIV/AIDS in East and Southern Africa.* Working Paper. Animal Production and Health. Rome. FAO. (also available at

http://www.fao.org/ag/againfo/subjects/documents/livestockprodhiv.pdf).

Goe, M.R. & Mack, S. 2005. *Linkages between HIV/AIDS and the livestock sector in East and Southern Africa.* Technical Workshop, Addis Ababa, Ethiopia, 8–10 March 2005. Animal Production and Health Proceedings No. 8. Rome. FAO. (also available at http://www.fao.org/docs/eims/upload/207140/hivlivestocksector.pdf).

GOI. 2004. *Impact of earthquake in Indonesia, A&N Islands and other coastal states-relief, rehabilitation and other follow up measures*. SPECIAL-SITREPX, No.32-5/2004-NDM-I, Annexure II. Ministry of Home Affairs, Government of India.

(available at http://ndmindia.nic.in/Tsunami2004/sitrep10.htm).

Guha-Sapir, D. & Below, R. 2005. *The quality and accuracy of disaster data: a comparative analysis of three global datasets.* Washington, D.C. The Pro-Vention Consortium, The Disaster Management Facility, World Bank.

Hadrill, D. 2001. *The international response to emergencies in Mongolia*. Presentation for Tropical Agricultural Association (Scottish and Borders Region), November, 30th, 2001.

Hanks, J. 1998. *The Development of a decision support system for restocking in Mozambique*. Field Report. Reading, UK. Veterinary Epidemiology and Economics Research Unit, University of Reading.

Heffernan, C. 1997. *The Socio-economic impact of restocking projects in Kenya*. Report for ESCOR. DFID, London. UK.

Heffernan, C. & Rushton, J. 1998. Restocking: A critical evaluation. *Nomadic Peoples,* 4(1).

Heffernan, C. 2000. *The socio-economic impact of restocking destitute pastoralists after drought*. University of Reading, Reading, UK. (PhD Thesis)

Heffernan, C., Nielsen, L. & Misturelli, F. 2004. *Restocking pastoralists: a manual of best practice and decision-support tools.* Rugby, UK. ITDG,

Hitchcock, R. & Hussain. H. 1987. Agricultural and non-agricultural settlements for drought-afflicted pastoralists in Somalia. *Disasters*, 11: 30–39.

Hoffmann, I. & Scherf, B. 2006. Animal genetic resources time to worry? In *Livestock Report 2006.* pp. 57–74. Rome. FAO.

Hogg, R. 1983. Restocking the Isiolo Boran: an approach to destitution among pastoralists. *Nomadic Peoples* , 14: 35–40.

Hogg, R. 1985. *Restocking pastoralists in Kenya: a strategy for relief and rehabilitation*. ODI Pastoral Development Network Paper 19c. London. Overseas Development Institute.

Howell, P. 1997. *Sector Paper: emergencies, ActionAid-Kenya Merti Da mid-term review (June).* London. Emergency Unit, ActionAid, UK.

HPI. 2002. *Project profiles: helping people around the world fight hunger and become self-reliant*. Little Rock, Arkansas. Heifer Project International.

IADB. 2005. *Draft-disaster risk management policy*. Washington, D.C. Inter-American Development Bank. (available at http://www.iadb.org/sds/doc/ENV-DraftDRMPolicy-12-21-05.pdf).

Iles, K. 1994. *Feasibility study for restocking displaced Dinka and Nuer People in Southern Sudan*. Report for UNICEF. Nairobi. Operation Lifeline Sudan.

IMF. 2004. Bosnia and Herzegovina: poverty reduction strategy paper-mid-term development strategy. Country Report No. 04/114. Washington, DC. International Monetary Fund. (available at http://www.imf.org/external/country/BIH/index.htm).

ISDR. 2006. *Glossaries*. International Strategy for Disaster Reduction Library. ISDR, Geneva. (available at http://www.unisdr.org/eng/library/lib-glossaries.htm).

Ivankpvić, A. 2004. Questionnaire response (personal correspondence). Department of Animal Production, Zagreb.

Jackson, R. 2001. *Emergency Farm Reconstruction Project implementation phase*, Technical Report First Mission (OSRO/KOS/009/WBK), January 27-February 23. Rome. FAO.

Jungbluth, F., Lugg, D., Marku, S., Veillerette B. & Heart. 2002. *World Bank Supervision Mission, December 2 – December 11, 2002, Aide Memoire*. Kosovo Emergency Farm Reconstruction Project. Washington D.C. World Bank.

Kelly, K. 1993. *Taking stock: Oxfam's experience of restocking in Kenya*. Report for Oxfam, Nairobi.

Kelly, M. 1995. Disaster in the Horn of Africa: the impact on public health. *In* J. Sorenson ed. *Disaster and development in the Horn of Africa*. pp. 228–248. Basingstoke, UK. Macmillan Press Ltd.

Köhler-Rollefson, I. 2000. *Management of animal genetic diversity at community level*. Eschborn, Germany. GTZ.

Kundermann, B. 2000. *Managing agrobiodiversity in disaster situations: determinants of animal and plant genetic resource loss and options for its mitigation*. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH. Eschborn, Germany.

LDG. 2003. *Livestock services and the poor*. Report for the Global Initiative on Livestock Services and the Poor. Rome. IFAD.

LM. 2003. *Landmine report 2003*. (available at http://www.icbl.org/lm/2003).

LM. 2006. *Landmine Monitor Report 2006*. (available at http://www.icbl.org/lm/2006).

Lura. 2005. *Lura's farmers.* (available at http://www.lura.hr/english/prikaz.asp?txt_id=171).

Marcus, R. 2001. *Social funds as instruments for reducing childhood poverty: lessons from Save the Children's experience*. London. Save the Children.

Maskrey, A. 1989. *Disaster mitigation: a community based approach*. Oxford, UK. Oxfam.

Mercy Corps. 2001. NGO final report. Deçan Municipality, 16 October – 30 June.

MOFA. 1982. *Revitalization of the world economy and contributions to the North-South problem,* Diplomatic Blue Book, 1981 Edition, Section 2. Ministry of Foreign Affairs, Japan. (available at http://www.mofa.go.jp/policy/other/bluebook/1982/1982-3-2.htm).

Nekzad, F. 2003. *Snows bring relief from drought.* Afghan Recovery Report No. 50. London. Institute for War and Peace Reporting. (available at

http://www.iwpr.net/index.pl?afghan_200302.html).

Nielsen, L. 2004. *Motivation and livestock-based livelihoods: findings from Kenya, Bolivia and India.* University of Reading, Reading, UK. (PhD Thesis)

OCHA. 1999. *OCHA orientation handbook on complex emergencies*. New York. Office for the Coordination of Humanitarian Affairs (OCHA) United Nations. (available at http://www.reliefweb.int/library/documents/ocha__orientation__handbook_on__.htm).

OCHA. 2001. *Mongolia winter disaster dzud United Nations and government of Mongolia appeal for international assistance*. February-May 2001. New York. Office for the Coordination of Humanitarian Affairs (OCHA) United Nations. (available at http://www.reliefweb.int/rw/rwb.nsf/AllDocsByUNID/97030524913db8f8c12569e4003eefaa).

OCHA. 2006. *Countries and emergencies*. Office for the Coordination of Humanitarian Affairs. New York. Office for the Coordination of Humanitarian Affairs (OCHA) United Nations. (available at http://www.reliefweb.int/rw/dbc.nsf/doc100?OpenForm).

OSCE. 2005. *Communities in Kosovo*. Vienna. Organization for Security and Cooperation in Europe..(available at

http://www.osce.org/kosovo/documents/reports/hr/part1/l_serb_d.htm).

Oxby, C. 1994. *Restocking: a guide*. Midlothian, UK. VETAID,

Oxfam. 2005. *Predictable funding for humanitarian emergencies: a challenge to donors*. Oxfam Briefing Note October 24, 2005. Oxfam International. (available at www.oxfam.org.uk/what_we_do/issues/conflict_disasters/downloads/bn_cerf.pdf).

Oxfam. 1995. *The Oxfam handbook of development and relief*. Oxford, UK. Oxfam,

PAHO. 2000. *Natural disasters: protecting the public's health*. Scientific Publication No. 575. Washington D.C. Pan American Health Organisation, WHO.

Par, V., Njavro, M .& Grgić, I. 1999. The place of Croatian livestock production in European agriculture. *Acta Agraria Kaposváriensis,* 3(2): 291–300.

Raloff, J. 2002. Afghanistan's seed banks destroyed. *Science News Online,* Vol. 62, No. 11. (available at http://www.sciencenews.org/articles/20020914/food.asp).

Roberts, S. & Williams. J. 1995. *After the guns fall silent – the enduring legacy of landmines*. Washington DC. Vietnam Veterans of America Foundation with Oxfam UK and Ireland.

Roper, M. 2005. Effects of disease on diversity. in SGRP (2006), In *Options and Strategies for the Conservation of Farm Animal Genetic Resources: Report of an International Workshop and Presented Papers* (7-10 November 2005, Montpellier, France) [CD-ROM]. Rome. CGIAR System-wide Genetic Resources Programme (SGRP)/International Plant Genetic Resources Institute. (available at http://www.ipgri.cgiar.org/AnimalGR/Papers.asp).

Scherf, B., Rischkowsky, B. & Hoffmann, I. 2005. Status of the farm animal genetic resources conservation – time for action? in SGRP (2006), *Options and Strategies for the Conservation of Farm Animal Genetic Resources: Report of an International Workshop and Presented Papers* (7-10 November 2005, Montpellier, France) [CD-ROM]. Rome. CGIAR System-wide Genetic Resources Programme (SGRP)/International Plant Genetic Resources Institute. (available at http://www.ipgri.cgiar.org/AnimalGR/Papers.asp).

Scudamore, J. 2006. Personal Communication. UK Chief Veterinary Officer to the Office International des Epizooties (OIE).

Shaluf, I, Ahmadu, F. & Said, A. 2003. A review of disaster and crisis. *Disaster Prevention and Management*, 12(1): 24–32.

Shanmugaratnam, N., Vedeld, T., Mossige, A. & Bovin, M. 1992. *Resource management and pastoral institution building in the West African Sahel*. Discussion Paper, Africa Technical Department Series No. 175. Washington, DC. World Bank

SIDA. 2000. Strategic *environmental analysis of Albania, Bosnia and Herzegovina, Kosovo and Macedonia. Final report*. Study prepared for SIDA by Scandiaconsult Natura Ab and the Regional Environmental Center for Central and Eastern Europe. Stockholm. SIDA.

Sperling, L. 1987. Food acquisition during the African drought of 1983–1984: a study of Kenyan herders. *Disaster*s, 11(4): 263-272.

SVABH. 2003. *Animal genetic resources in Bosnia and Herzegovina. State Veterinary Administration of Bosnia and Herzegovina*. Sarajevo.

Swift, J. & Erdenbaatar, B. 1998. *Restocking pastoral households in Mongolia*. Report for FAO. Rome. FAO.

Teodosijević, S.B. 2003. *Armed conflicts and food security*. ESA Working Paper No. 03-11. June. Agricultural Development and Economics Division. Rome. FAO.

Toulmin, C. 1994. Tracking through drought: options for destocking and restocking. *In* I. Scoones ed. *Living with uncertainty*. pp. 95–115. London. Intermediate Technology Publications.

UN. 2001a. *United Nations in Mongolia, United Nations Mongolia News. United Nations and government of Mongolia appeal for international assistance Mongolia – winter disaster – dzud*.(available at http://www.un-mongolia.mn/index.php?name=News&file=article&sid=218).

UN. 2001b. *E-mine: the electronic mine information network*. United Nations Mine Action Service. (available at http://www.mineaction.org/).

UN. 2004. Cartographic Section, Maps and Geographic Information Resources. New York. DPKO, United Nations. (available at http://www.un.org/Depts/Cartographic/english/htmain.htm).

UNDP. 2004. *Reducing disaster risk: A challenge for development*. New York. United Nations Development Programme.

UNEP. 1999. *Countries of south-eastern Europe task force (BTF) Situation Report No. 13.* UNEP/UNCHS (Habitat) (available at http://www.reliefweb.int/rw/dbc.nsf/doc100?openForm).

UNMIK. 2005. *News and developments*. United Nations Interim Administration Mission in Kosovo. (available at http://www.unmikonline.org/index.html).

Unruh, J.D. 1995. Pastoralist resource use and access in Somalia. *In* J. Sorenson (ed), *Disaster and development in the Horn of Africa.* pp. 126-150. Basingstoke, UK. Macmillan Press Ltd.

USAID. 2006. *Disaster assistance. Annual reports index*. Washington DC.USAID.

(available at http://www.usaid.gov/our_work/humanitarian_assistance/disaster_assistance/publications/annual_reports/index.html).

USDA. 2001. *BSE-Slovenia*. Foreign Agricultural Service GAIN Report #SI1001. Washington DC.

USDA. 2002. *Croatia livestock products, beef situation 2002*. USDA Foreign Agricultural Service GAIN Report #HR2007. Washington DC.

USDA. 2003a. *Bosnia Herzegovina livestock and products update 2003*. USDA Foreign Agricultural Service GAIN Report #BK3007. Washington DC.

USDA. 2003b. *Bosnia-Herzegovina livestock and products, animal genetics market and import procedures 2003*. USDA Foreign Agricultural Service GAIN Report #BK3009. Washington DC. USDA. (available at http://www.mac.doc.gov/Ceebic/countryr/bosniah/MARKET/genetics.pdf).

USDA. 2003c. *Croatia livestock and products, Croatian import market for bovine genetics 2003*. USDA Foreign Agricultural Service GAIN Report #HR3011. Washington DC.

US Department of State. 1998. Bosnia and Herzegovina country report on human rights practices for 1998. US Department of State. (available at http://www.hri.org/docs/USSD-Rights/1998/Bosnia.html).

van Engelen, A. 2002a. *Mission report* (first draft), September 11-27. FAO Emergency Farm Reconstruction Project (OSRO/KOS/009/WBK). Rome. FAO,

van Engelen, A. 2002b. *Policy advisory mission to the AI/BC in Kosovo*, 18 September-6 October. AIDE MEMOIRE. FAO Emergency Farm Reconstruction Project (OSRO/KOS/009/WBK). Rome. FAO.

van Engelen, A. 2002c. Policy advisory mission to the AI/BC in Kosovo, 6 November-17 November and 24 November-4 December. AIDE MEMOIRE. FAO Emergency Farm Reconstruction Project (OSRO/KOS/009/WBK). Rome. FAO.

VME. 1999. *DANR guide to disaster preparedness*. Davis, CA, USA. Veterinary Medical Extension, School of Veterinary Medicine, University of California.

Von Braun, J., Vlek, P. & Wimmer, A. 2002. *Disasters, conflicts and natural resources degradation: Multi-disciplinary perspectives on complex emergencies*. Annual report (2001-2002). Bonn, Germany. ZEF Bonn Centre for Development Research, University of Bonn.

Walker, P. 1988. Famine relief amongst pastoralists in Sudan: a report of Oxfam's experience. *Disasters,* 12(3): 197–202.

Ward, D. 2002. *Back to office report, Kosovo Province,* January 29-February 4, Emergency Farm Reconstruction Project (EFRP), OSRO/KOS/009/WBK. Rome. FAO..

Wetchy, H. 2003. *Lower Austria's centre for livestock reproduction*. Vienna.Grimex International. (available at http://www.grimex.at/pisma/pismo12.html).

White, C. 1991. Changing animal ownership and access to land among the Wodaabe (Fulani) of Central Niger. *In* P. Baxter & R. Hogg, eds. *Property, poverty and people: changing rights in property and problems of pastoral development*. Manchester UK. Manchester University.

World Bank. 2001. *Mongolia-Sustainable Livelihoods Project*. Report No. PID9725. Washington DC. World Bank.

World Bank. 2006. *Hazards of nature, risks to development.* Washington DC. Independent Evaluation Group, World Bank.

WSPA. 2005. Helping the animal victims in the Kosovo Crisis. World Society for the Protection of Animals. (available at http://www.wspa-international.org/site/index.php?page=56).