Chapter 15
Slow-onset disasters

15.1 Introduction

Writing on disasters usually distinguishes between rapid-onset events and slow-onset events. The critical factor here is said to be the nature of the hazard concerned.

Hazards that arise suddenly, or whose occurrence cannot be predicted far in advance, trigger rapid-onset disasters. Earthquakes, cyclones and other windstorms, landslides and avalanches, wildfires, floods and volcanic eruptions are usually categorised as rapid-onset events. The warning time ranges from seconds or at best a few minutes in the case of earthquakes and many landslides, to several days in the case of most storms and floods. Some volcanic eruptions may be preceded by weeks or months of activity, but predicting volcanoes’ behaviour remains very difficult and the warning time for the eruption itself may be only days or hours. Most disasters are rapid-onset events.

Most discussion of slow-onset disasters concentrates on one hazard: drought. It can take months or sometimes years for the results of drought to become disastrous, in the form of severe water and food shortages and, ultimately, famine. Drought is not the only relevant hazard, though. Pollution of the environment can also be considered a slow-onset disaster, particularly in cases of growing concentrations of toxic wastes, which may build up over years. Human activities that degrade the environment and damage ecosystems – deforestation for instance – also contribute to disasters. Their cumulative impact may not be felt for decades, although the hazards that they make more likely, such as flash-floods and landslides, may be sudden-onset events.

To some extent, the distinction between slow- and rapid-onset disasters is artificial. Hazards certainly can be categorised in this way. Disasters, on the other hand, are the product of hazards and human vulnerability to them. The socio-economic forces that make people vulnerable may act quickly or slowly, but in most disasters it is likely that long-term trends will be more influential. When viewed in this light, it could be argued that all disasters are slow-onset. This Good Practice Review argues for a long-term, holistic approach towards managing risk that also breaks down the distinction between slow- and rapid-onset disasters.
Why then have a separate chapter on slow-onset disasters? There are two related reasons. First, because real-life disaster management often does distinguish between rapid- and slow-onset events. The approaches that have been developed for dealing with slow-onset hazards such as drought may differ from those used against other hazards. The documentation of such work is generally much better here than in other disasters, and there is a greater volume of high-quality research and analysis.

The second reason is that, in the management of drought and food security, and in environmental renewal initiatives, development agencies play a much more significant role than they do in sudden-onset disasters. This may offer lessons about how to get the development community more involved in disaster management generally. Mitigation of drought and food security is more advanced than mitigation of many other types of disaster in integrating livelihood issues with disaster management, adopting participatory and community-level approaches, and building upon indigenous knowledge, coping strategies and appropriate technologies.

### 15.2 Environmental degradation and pollution

#### 15.2.1 Environmental degradation

There is a strong link between environmental degradation and increased risk from natural hazards. Bad management of natural resources and destruction of the eco-system make disasters more likely. For example, the removal of trees, bushes and other vegetation in the course of building, farming or other commercial activities can create hazardous conditions. In agricultural areas it accelerates the loss of fertile topsoil to wind and water erosion. Water is no longer held in the soil by vegetation and so runs away rapidly, which increases vulnerability to drought. On hillsides, rapid water run-off can cause flash-floods and landslides. In coastal zones, the destruction of mangrove forests removes a natural barrier to the winds and sea surges created by tropical cyclones.

In all these cases, environmental protection or renewal is technically feasible. Natural resources can be managed and replenished through such measures as reforestation and other planting, waste management, environmentally sustainable farming and grazing practices, terracing, and building protective stone and earthworks to prevent rapid water run-off. Countless projects of this kind have been undertaken. Complementary activities include environmental education.

Attempts to protect the environment often challenge powerful interests that stand to gain from its destruction: timber companies from logging; ranchers
disaster risk reduction: mitigation and preparedness

from stripping land of woods, hedges and bushes; shrimp farms and hotels from tearing up mangroves. The example of the Afro-Honduran Garifuna communities in Chapter 12 illustrates how difficult and even dangerous it can be to make such challenges. More generally, economic and demographic pressures on poor countries, coupled with entrenched political and cultural attitudes, inhibit an effective response to recognised environmental crises. The failure of the Soviet Union and the post-Soviet Central Asian republics to deal with the drying up of the Aral Sea is a good example of this.¹

15.2.2 Pollution

Major industrial disasters are often rapid-onset: the result of industrial or transport accidents causing explosions and fires of flammable material or the release of oil, chemicals or radioactive material. The chemical leak at Bhopal in India in 1984 and the accident at the Chernobyl reactor in Ukraine in 1986 are the best known recent examples. Although the number of such industrial disasters remains low and there are still relatively few casualties compared to those from natural hazards, their numbers are rising with the spread of industrialisation in developing countries.² However, the impact of pollution may not be felt for decades as volumes of waste accumulate and growing numbers of people are exposed.

Although local-level management of some forms of waste and pollution is feasible, significant reductions in pollution and improvements in waste management require the involvement of the state in setting and enforcing standards and providing adequate public facilities. Communities and their organisations can encourage this through vigorous advocacy (see Chapter 12). In many instances, specialist scientific and engineering expertise will be required, especially in the case of extremely toxic wastes.

Community organisations, NGOs, researchers, governments and other agencies should work together to tackle major problems of this kind collectively—the ‘partnership’ approach to disaster management set out in Chapter 5. The difficulty of creating successful partnerships should not be underestimated, especially in the case of industrial pollution where the demand for better protection may conflict with business aims. Case Study 15.1 shows how agencies have responded to a major crisis resulting from groundwater pollution.

The connections between climate change and hydro-meteorological hazards such as droughts and cyclones are becoming apparent, backed up by a growing body of scientific evidence.³ Although climate change specialists and
In the early 1990s, high concentrations of arsenic were reported in groundwater in western Bangladesh. Arsenic is a cumulative and potentially fatal poison, and many of the more advanced symptoms of poisoning are incurable. About 25m people have been exposed through drinking water from tube wells, and over 7,000 cases of arsenic poisoning have been confirmed. Fifty-nine of the country’s 64 districts have some arsenic-contaminated groundwater.

There has been considerable debate about the source and release mechanisms. It is now widely accepted that the arsenic is of natural, geological, origin, although it is less certain how it gets from sediments into groundwater.

In response to a potentially massive disaster, international agencies, the government of Bangladesh, scientists and local NGOs have put considerable effort into researching the problem and identifying and implementing solutions. The costs of this work run into millions of dollars. Activities undertaken to date have included:

- testing water supplies (using specially developed field test kits) and monitoring cases of arsenic poisoning;
- data collection and analysis based on geochemical surveys and further research on the mechanisms by which arsenic is released;
- promoting methods of removing arsenic from water (e.g. filters) and researching new methods;
- finding arsenic-free sources of water (e.g. digging deep tube wells that go beneath the arsenic-bearing sediments, rainwater harvesting);
- training doctors and health workers to identify and treat arsenic poisoning, and developing patient treatment protocols;
- public education; and
- information dissemination and networking among professionals.


disaster managers have begun talking to each other, the way forward in coping with the threat remains far from clear.
At a global level, advocacy to reduce greenhouse gas emissions is essential, and there is already a substantial alliance of scientists, environmentalists and some businesses (notably insurers) engaged in this. At local levels, disaster managers are unsure what they can do about climate change beyond what they are already doing to minimise risk. How can they calculate the increased risk due to this problem? How far should their existing disaster planning be stepped up to counter the threat from climate change? As yet, there are no answers to these questions, but they are needed urgently.

15.3 Drought, food security and famine

More than 70m people died in famines during the twentieth century.4 There have been many major, high-profile food crises over the past 30 years. Most have been in Africa. Many have been triggered by drought, but other hazards including floods, harsh winter weather and diseases that affect crops and livestock can also act as triggers.

Natural hazards are only one factor in food crises. Political, economic and social factors, including conflict, can be powerful contributors. The macro-economic policies of governments and international agencies have played a considerable role in creating food insecurity and famine (see Case Study 2.2, page 18). In some countries, food aid has become a regular, even continuous, component of government development plans and programmes: Ethiopia and Iraq are prominent examples, though for different reasons. The food crisis in Southern Africa in 2002 revealed the influence of the HIV/AIDS pandemic on food insecurity. Research on the likely consequences of global warming indicates that areas already prone to drought are likely to suffer even more severely in future.

These are massive challenges to overcoming famine and food insecurity. Many argue that the challenges are growing and becoming more complex. However, understanding of the causes of food insecurity
and famine has advanced greatly in the past 30 years or so. Also during that
time, numerous advances in practice, from local to international levels,
have greatly enhanced the capacity to improve food security and predict
and prepare for crises. The adoption of community-based approaches,
appropriate technologies and indigenous knowledge is significant, as is the
growing integration of food security initiatives with those seeking to
support livelihoods more broadly.

Food security is complex, and the literature on the subject is extensive.
Experience is widespread among development agencies. There is plenty of
good general guidance on issues and operations for project planners, on
which much of this overview is based.5

15.3.1 Understanding ‘food security’

There is no fixed yardstick for measuring food security. It is not simply a case
of people having enough to eat; rather, it is:

\textit{when all people, at all times, have physical and economic access to suffi-
cient, safe and nutritious food to meet their dietary needs and food pref-
erences for an active and healthy life.}5

This depends on people being able to buy food or obtain it in other ways,
such as in exchange for their services (e.g. labour) or borrowing from
members of their extended family or community. This, in turn, depends on
them having sufficient income, savings and other material assets, skills or
social connections to obtain food. It also depends on external factors such as
the price of food in the market.

Control of the supply and distribution of food is another important dimension.
Some members of a household have little influence over how food is distrib-
uted. Children depend on the food they are given by adults. Male children and
adults often get more food than females. Providing adequate food for elderly
family members may not be a priority when times are hard. Sometimes deci-
sions about food distribution are made on the basis of economic rationality –
for instance, a family member who brings in a regular wage may get priority –
but power relationships and cultural practice are also influential.

There can be pockets of food insecurity almost anywhere – within countries,
communities and families. Hence, monitoring and analysis of food insecurity
should take place at different geographical and social levels, as well as at
different times of the year (see Section 15.4, below).
Food security is not a mere question of there being enough food available – rather, it reflects the fact that people do not have equal access to food because of differences in the resources they possess and other economic, social and political factors. This theory of people’s differing ‘entitlements’ to food, first advanced by the economist Amartya Sen in the 1970s, has transformed the way many aid and development agencies view food insecurity and famine, and has two important implications for any agency seeking to reduce the risk of food insecurity.

First, it shows that there are many different ways of overcoming food insecurity by improving people’s ability to obtain food. These include conventional food production practices (e.g. promoting improved farming techniques), standard drought mitigation practices (e.g. soil and water conservation), and better management of natural resources such as forests and watersheds. They can also include measures to support livelihoods generally, such as projects to create jobs and increase incomes, savings and credit programmes, improving the quality of water supplies and sanitation (poor health is an important contributor to malnutrition), better education for women (known to be an important factor in reducing malnutrition at household level), helping local markets for food and other products (through better access roads and footpaths, or better methods of packaging and preserving perishable products for sale), and encouraging wider community participation in economic and social development initiatives to improve the situation of marginalised groups. This opens the way for development agencies to combat food insecurity – and many are doing so.

The second point is that such initiatives can be undertaken locally, be it to tackle pockets of food insecurity or to contribute to more widespread programmes. There is ample opportunity for local-level organisations to become involved.

### 15.3.2 Drought and food security

Although the causes of food insecurity include political, social and economic factors, natural hazards, especially drought, remain important.

Scientists and geographers distinguish between three kinds of drought:

1. **Meteorological drought** is when rainfall drops below a certain level.
2. **Hydrological drought** involves a reduction in water resources such as rivers, lakes and underground water: this too is the result of lower rainfall, but it may take some time to be felt, and in the case of river systems may be the result of a drop in rainfall far away from the area in question.
3. Agricultural drought is the impact of the other two kinds on crop yields. Whilst it is obvious that places that receive little rainfall are drought-prone, drought can also occur where rain is normally sufficient – for example, parts of Bangladesh have suffered a number of droughts, some quite severe. A few weeks with little or no rain at a critical time of the year for crop growth can be devastating, even if the rest of the year is not dry. The important point is whether the amount of rainfall is sufficient for agriculture, livestock and other human needs at the time in question.

Drought’s impact is felt on different geographical scales. Climatic conditions can vary widely within a country. At local level, changes in land use can have a significant impact on watersheds, and hence the amount of water available through run-off or from rivers and ponds.

Some of the measures needed to mitigate water shortages and their effects are outlined below. Here, a more general problem should be noted: the difficulty of assessing the relative importance of drought on food insecurity compared to socio-economic factors. It can be hard to disentangle these causes, because they interact with each other. For example, a fall in crop yields may be due to lack of water (i.e. agricultural drought), but may also be the result of such factors as a lack of fertilisers or weeding, pests and crop diseases, labour shortages at critical periods and low prices for crops in the markets.

Drought can trigger other hazards: in Ethiopia in 1984, it contributed to an infestation by army worm that greatly increased crop damage.8

15.3.3 Coping with food insecurity and famine

Seasonal food insecurity is normal in many poor households, which suffer from a hungry period shortly before the harvest, as food gathered from the
previous harvest runs out. This problem is known as ‘chronic’ food insecurity, as opposed to one-off food shortages, which are classified as ‘transitory’ food insecurity.

When food insecurity is acute and prolonged, it can lead to starvation and finally to famine (famine is where there is a significant increase in sickness and death rates resulting from starvation and associated factors). The descent into acute food shortage and thence into famine can take weeks, months or even years. Except where conflict is a major contributing factor, famine should not be seen as inevitable because of the range of measures available at all levels to improve food security and strengthen livelihoods in the long term.

Take, for example, the mitigation strategies used by communities to protect themselves against drought and the food insecurity that results from it. These can be divided into two main types: agricultural and non-agricultural.

- **Agricultural mitigation strategies** are measures to maintain crop and livestock production. They include sowing again after a crop has been ruined by drought, sowing alternative crops, or moving livestock to other locations.

- **Non-agricultural mitigation strategies** include seeking off-farm employment in the locality or elsewhere, eating seeds or roots that were saved to be sown in the next growing season, reducing the amount of food consumed, eating wild food such as berries and roots, postponing social functions such as weddings, using up savings and selling assets (such as livestock, household goods and personal possessions), buying on credit, borrowing money or calling in favours from communities and kin.

Families only sell their livelihood assets when they have to, which is when other methods such as growing alternative crops or finding alternative employment are insufficient. Sale of assets is a good indicator of how severe the consequences of drought are. Poor families, those with small landholdings and the landless, are the first to resort to such methods. Only when all else has failed will whole families and communities migrate in search of food (e.g. Case Study 9.2, page 137).

The severity of a food crisis can therefore be judged by looking at food and livelihood coping strategies as well as at food supplies. Food insecurity among a particular population is likely to be acute if:

- People experience a large reduction in their major source of food and are unable to make up the difference through new strategies.
- The prevalence of malnutrition is abnormally high for the time of year, and this cannot be accounted for by health or care factors.
A large proportion of the group is using marginal or unsustainable coping strategies.

People are using coping strategies that are damaging their livelihoods in the longer term or incur some other unacceptable cost such as acting illegally or immorally – stealing, for instance.9

The most effective way to protect communities against food insecurity and famine resulting from drought is to strengthen these diverse mitigation strategies well in advance, especially those that enable them to preserve their productive assets, such as animals, seeds and tools.

Despite this, most external intervention is still in response to drought, not in helping to create more drought-resistant communities. Moreover, it often comes at a late stage, when communities are in crisis and may already be destitute, having been forced to dispose of productive assets. Typical interventions in such circumstances are to provide food, seeds, fertiliser, animals and agricultural equipment to replace that which has been used or sold, and to lend money. Where a crisis has become acute, with widespread starvation and migration, aid agencies’ interventions focus on emergency response, especially feeding and health care. Food-for-work and cash-for-work schemes are also common responses.

The boundary between disaster preparedness and response is blurred in food crises, because they can develop over such a long period. Some would argue that an emergency begins when hungry people are forced to dispose of their livelihood assets; others put it at the point where destitute, starving people leave their homes to beg for food, or even where large numbers begin to die of starvation. In this chapter, emphasis is placed on longer-term mitigation measures to maintain food production and incomes.

15.3.4 An integrated approach

The ideal approach to drought-related food insecurity addresses the different dimensions of the problem, using a range of methods.

An example of this range is given in Table 15.1, which highlights the main interventions in a joint UNICEF/WHO project that covered 600 villages in Iringa, Tanzania, in the 1980s. The project was a response to persistent food insecurity and malnutrition rather than to an individual disaster, and specifically nutritional aspects are emphasised in the interventions, but the basic approach is risk management, seeking to limit the likelihood of future disaster. Measures to combat chronic food insecurity are an important element of anti-famine initiatives.
Interventions should be linked as far as possible to the coping strategies that households use. As affected people are likely to employ a variety of strategies, and may alter the type and mix of coping methods in use quite rapidly, agencies need to be flexible in their approach.

Table 15.1 Interventions against malnutrition in Tanzania

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible causes</th>
<th>Programme interventions</th>
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<tbody>
<tr>
<td>1. Inadequate food in households (most severe a few months before the harvest)</td>
<td>• lack of household planning&lt;br&gt;• choice of wrong crops&lt;br&gt;• failure of rains&lt;br&gt;• poor crop management&lt;br&gt;• storage losses&lt;br&gt;• shortage of agricultural inputs&lt;br&gt;• lack of income to buy food</td>
<td>• training of trainers in household food planning&lt;br&gt;• promotion of drought-resistant crops&lt;br&gt;• improved storage</td>
</tr>
<tr>
<td>2. Inadequate nutrient intake (especially in children)</td>
<td>• poor economic resources&lt;br&gt;• nutritionally poor diet&lt;br&gt;• shortage of fuelwood&lt;br&gt;• shortage of fruits and vegetables&lt;br&gt;• scarcity of meat&lt;br&gt;• scarcity of beans and other legumes&lt;br&gt;• too much workload for mothers</td>
<td>• promotion of income-generating activities&lt;br&gt;• nutrition education, especially to mothers, through health workers&lt;br&gt;• training and other inputs for village forestation and home gardening&lt;br&gt;• training and inputs for small animal keeping&lt;br&gt;• promotion of grain milling and appropriate technology</td>
</tr>
<tr>
<td>3. Lack of awareness of good weaning practices</td>
<td>• lack of awareness of children's nutrient needs&lt;br&gt;• inadequate feeding frequency&lt;br&gt;• scarcity of energy-dense foods (e.g. groundnuts, cooking oil)&lt;br&gt;• dietary bulk</td>
<td>• provide weaning recipes based on local foods&lt;br&gt;• mobilise communities to provide extra food at child care posts&lt;br&gt;• campaign on use of kimea (flour with high nutritional value)</td>
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Interventions should be linked as far as possible to the coping strategies that households use. As affected people are likely to employ a variety of strategies, and may alter the type and mix of coping methods in use quite rapidly, agencies need to be flexible in their approach.
Some of the components that might make up an integrated approach are outlined in the following sections.

15.3.5 Protecting food production

Drought mitigation and food security projects often used to focus on irrigation or soil and water conservation techniques. Nowadays it is usual to attempt a broader mix of activities that support all aspects of agricultural production, but irrigation and soil and water conservation remain important elements of such work.

There are many different methods of protecting the soil against erosion from wind or water and preventing water run-off. These include terracing, digging furrows and ridges, planting grasses, bushes and trees, building walls of stone or earth, planting in holes and pits, and mulching. The most appropriate method for each location depends upon its physical features (the nature of the soil, the terrain and climatic conditions) and local capacities (the materials, skills and other resources available).

Intercropping (mixing different crops in the same plot) is a traditional coping strategy that has been undermined in some places by the advance of monoculture. Where the crops chosen differ in their resilience to drought, diseases or pests, intercropping is a way of spreading risk, since it increases the probability that some crops will survive. It can also be beneficial to growth: some plants give shelter or shade to others, or provide nutrients to the soil. Other agricultural practices that can be encouraged include alternative systems of crop rotation, manuring and composting. Integrated pest management, based on intercropping and the use of insect-repelling plants and crops or pesticides (including those made from traditional recipes using local plants), is another feature of many successful food security initiatives.

Farming should be considered as a process. In real life, agricultural methods are not fixed; the type and mix of crops vary. Farmers do experiment, if the risks of doing so are not too great. Supporting organisations should therefore aim to give food-insecure communities more livelihood options and greater flexibility. Initiatives that begin as narrow technical interventions often find that they have to widen their scope in order to become more effective, as well as sustainable.

Government agricultural extension services and some NGOs have promoted new, hybrid versions of staple food crops at the expense of traditional varieties. The newer varieties give higher yields, but usually only in favourable conditions with ample water and fertilisers. Traditional varieties tend to be more resilient to environmental stresses such as drought. This alone should
be a sufficient caution against using newer crops in drought-prone areas, but their heavy – in some cases, coercive – promotion has also threatened biodiversity and undermined traditional knowledge of alternative varieties.

Research in the past 10–15 years has uncovered extensive indigenous knowledge of agricultural plants and how to grow them. Many food security projects have found that, by protecting and sharing such knowledge, and the traditional seed varieties concerned, they widen the options open to communities and increase their resilience to hazards such as drought. Seed banks, fairs and demonstration plots are effective methods of preserving, promoting and sharing (e.g. Case Study 15.2).

**Case Study 15.2**

**Improving food security in a drought-prone area**

Chivi District, in Zimbabwe’s Masvingo Province, is an area of poor soils and low rainfall. In 1990, the Intermediate Technology Development Group (ITDG) began to explore methods of working with communities and local organisations in the district’s Ward 21 to improve food security among the 1,300 households there. This coincided with a period of drought that killed many cattle in Chivi.

ITDG intended a strongly participatory approach from the start, but still had to overcome considerable local cynicism about the value of outside agencies, while many villagers were puzzled that it had not come with a pre-formulated programme and was not offering financial or material support.

An extensive assessment process carried out with the community identified a wide range of problems in producing food and sustaining livelihoods. Only after this period of consultation, which took six months, did the project begin to set priorities and make plans – again involving the community, many of whom had never gone through a participatory process of this kind. The project worked with two main local institutions, farmers’ clubs and women’s garden groups, as these were most directly involved in food production.

The first phase of implementation, from 1992–95, addressed three needs: water for fields and gardens, pest and disease control, and fencing to protect gardens from animals. At the same time, over 1,800 community members took part in training to improve their capacity to identify problems and solutions, communicate, and manage their own organisations.

(continued)
During the first two years, a range of technologies were tried out by the farmers and gardeners through experimentation in their own fields. Those found to be most effective were quickly taken up by other community members. They included sub-surface irrigation using clay pipes, pots and bottles; terracing, rock catchments, ‘tied’ ridges, infiltration pits, mulching and the use of underground plastic sheeting to increase water retention; digging and improving wells; winter ploughing, intercropping, and the use of termite soil as a fertilizer and moisture retainer; growing ‘live’ fences of sisal and introducing two machines to make wire fencing at half the price of ready-made products.

Indigenous knowledge, often disregarded by outside experts, was used wherever possible. Seed fairs were held to revive local crop varieties, share information on them and demonstrate their value. Surveys and discussions showed that many farmers knew of local plants that could be used to make effective pesticides, but were reluctant to tell others because they feared their knowledge would be thought old-fashioned in an age of modern chemical pesticides. The project made sure that their knowledge was recorded and shared.

All of these methods were widely adopted and effective in boosting production. However, as the project progressed it was clear that it needed to pay more attention to marketing. Women gardeners carried out surveys of demand and prices for various vegetables, and as a result the groups began diversifying their production to meet these opportunities.

As the project took off, with widespread adoption of the various techniques and growing numbers of local people taking part, it also expanded into other wards. Reviews and evaluations over the years have found increased and more reliable crop yields and a steady growth in the variety of crops being grown. Buyers began bringing trucks into the area to buy up surpluses, and women began sending their husbands to neighbouring areas to sell the produce from their vegetable gardens. Some garden groups set up a revolving loan fund, and community organisations were seen to be far more confident not only in managing their own affairs, but also in their relationships with outside agencies and government agricultural extension workers.


Case Study 15.2 (continued)
Disaster risk reduction: mitigation and preparedness

Food production is inseparable from issues of access to land and land ownership. Many of the problems faced by poor communities in drought-prone areas arise from unequal distribution of land and natural resources, which is the product of historical, political and socio-economic forces. Some developing-country governments have attempted land redistribution, but this approach has fallen by the wayside with the current dominance of market-led economic policy. On the other hand, the protection of common property resources such as forests and grazing lands is definitely a ‘live’ issue, for which determined advocacy may be needed.

15.3.6 Preserving food: crop and seed stores and banks

Many drought mitigation projects include crop and seed storage among their interventions, and there is now plenty of guidance on this subject. Storage falls into two main categories: household stores and community grain and seed banks. Where people are poor and agricultural output is low or highly vulnerable to climatic variations, it is important to maximise crop preservation. Inadequate storage can lead to crops rotting, becoming diseased or contaminated, or being eaten by pests. The amount of grain and seed lost because of this varies greatly according to location, but in many cases may be as much as a third of the crop.

Crop stores and seed banks help to ensure that there is food to eat during the lean season, and that there are seeds to plant. They offer security against rising food prices during the hungry period. By storing a wide variety of local seeds, they maintain biodiversity. They can also protect crops and seeds against other natural hazards such as floods.

Appropriate technologies come to the fore here. Low-cost techniques and materials can often be used to make stores, while in some instances traditional knowledge and methods can be adopted, or adapted. Examples of appropriate technologies include sealed clay pots, baskets lined with clay or plaster, plastic sheeting, sacks, metal bins and some forms of underground storage such as lined and covered pits. Stores can be raised above the ground on wooden poles to protect them against rats and mice (with guards made of old tin cans on the poles to prevent the animals from climbing up). Certain varieties of crop and seed may be more resistant to pests and disease than others, and it is useful to explore traditional knowledge of this. Traditional pesticides such as ash, some types of edible oil, and certain local plants may preserve crops against insect attack. Some crops can be
preserved for longer by drying or smoking them. In other cases crop processing – into flour, oil, jams or pickles, for instance – is an effective preservative, as well as creating a product for sale. Exchange visits enable farmers to see different storage and preserving practices and discuss their effectiveness.

A few words of caution are needed, nevertheless. First, it is important to identify whether crop losses in storage result from poor storage itself, or from harvesting and post-harvest preservation practices. If the latter are inadequate and introduce disease or contamination into the crops, good storage systems will make little difference.

Second, community seed or grain banks present storage and management challenges that are quite different from domestic stores. The storage challenges are technical, arising from the scale on which produce has to be stored, but in many cases similar technologies to those employed by households can be used. The real challenge is management. A seed or grain bank is a bank, not merely a store. These banks can be run in different ways but the principles are standard: usually they buy grain from their members and sell it back at below market rates, or they run as savings and credit schemes. Procedures governing how households deposit seeds or grain with the stores, how to sell or lend seeds and grain back to them, and how to deal with defaulters must be worked out carefully, and they must be transparent.

Grain/seed banks must be planned with communities, built by them and managed by them – crucially, they must be run on behalf of the whole community. This may require training in organisational development, literacy and accounting procedures. Projects dominated by outside agencies are prone to failure. However, start-up funding may be needed to build stores and purchase initial grain stocks, and top-up funds or grain may be necessary if a drought hits before the scheme is securely established or at times of severe crisis. Any outside organisation attempting to introduce such schemes needs a high level of skill and experience in community development, in the broadest sense, and if it lacks this should bring in the relevant expertise. Moreover, there has to be a high level of trust between the community and the development or disaster organisation that is helping it, which may take years to build.

A further important point is that community seed or grain banks should be part of an integrated food security or rural development programme. On their own, they cannot provide complete food security. Other factors affecting success are outlined in Case Study 15.3.
Case Study 15.3
Cereal banks in Burkina Faso

Cereal banks were introduced to Burkina Faso in the mid-1970s. By 1986, there were an estimated 1,177 banks supported by government and NGO programmes. They had three basic elements in common: a storage facility; a ‘rotating fund’ in grain or cash that allowed the bank to buy, sell or lend grain; and a managing committee chosen by villagers.

In a 1987 study of nine banks supported by three NGOs, villagers were asked to identify their achievements and weaknesses. Among the benefits were: a measure of food security even during prolonged drought; reducing drought-induced emigration; savings in time because villagers no longer had to go to market to buy grain; enabling farmers to escape the high prices imposed by grain merchants; improved management skills that could be applied to other local projects and stimulating mobilisation of community members for such initiatives; facilitating emergency relief assistance; and generating funds for other community activities. The bank meetings often served as a forum to discuss other village matters.

Difficulties included: maintaining high rates of reimbursement (in several locations the pressure of a severe drought in the mid-1980s greatly reduced farmers’ ability to repay the bank for borrowed grain); the amount of time and effort needed to manage schemes; finding adequate ways of compensating the banks’ managers for their time; and tension when people were refused credit. The need to constantly remind villagers about how credit works was noted.

The study concluded that the cereal banks were best suited to dealing with yearly grain shortfalls during the planting and growing periods, and highlighted the increased organisational capacity of villages resulting from the initiatives. There were more questions about the banks’ ability to respond to prolonged drought and famine. They were able to blunt the impact of drought and mitigate or even prevent famine. However, they risked their long-term financial stability by doing so since farmers were often unable to reimburse them adequately after the crisis had passed. To protect them against this risk, special donations of grain or funds were needed to provide emergency supplies or replenish stocks.

15.3.7 Preserving water supplies

Water shortages affect crops, livestock and people. Town-dwellers rely on large-scale water infrastructure. In the countryside, communities may have access to a variety of sources: rivers, ponds, wells and small dams. The extent of access depends on distance, ownership of the water resource, and the cost and technical difficulty of collecting or extracting water.

During a drought, rural communities rely on local water sources, or move out of the area altogether. In some emergencies, governments and aid agencies may use tankers, but these are a costly, short-term response to the problem and are unlikely to reach the most remote communities.

There are two main options for improving water supplies. The first is to improve access to underground water sources, for instance by deepening wells or digging new boreholes. Such measures may be beyond the financial resources of many poor communities. If the water is fed into irrigation schemes, then the cost of installing and maintaining irrigation pipes and channels must be added, although in many locations these may be able to connect to traditional irrigation networks.

The second method is ‘rainwater harvesting’. There are many different ways of harvesting rainwater for agricultural and domestic use. They include:

- building water-storing dams and percolation dams (dams that slow the rate of rainwater run-off and so increase absorption into the soil, thereby recharging local groundwater);
- building community or domestic storage tanks;
- lining ponds with plastic to improve water retention; and
- putting up stone or earth bunds to improve absorption and reduce soil loss (brushwood and strips of grass or other plants can also be used).

Many of these methods are traditional, and hence the knowledge and skills needed to build and maintain them are present in the community. In other cases, the relevant technical expertise is easily acquired (see Case Study 10.6, page 160).12

Most rainwater harvesting methods are cheap compared to digging wells and pumping water from more remote sources. Communities can provide labour and in some cases building materials – bunds and some dams use just stones and earth. Many readily available materials can be used to catch, channel and store rainwater. A recent inventory of materials employed in Sri Lanka for
domestic rainwater harvesting listed tin sheets, palm leaves, plastic sheets, the stems of plants such as bananas and bamboos, tree trunks and rock cavities, as well as more conventional gutter pipes and tanks. Nevertheless, the cost to poor people is not always small (see Case Study 10.3, page 152). Even where freely available materials are used and labour is voluntary, the task of constructing larger-scale structures such as tanks and dams is substantial. Collective action is needed in such cases.

Rainwater harvesting can be highly effective. India, where there has been a considerable revival of traditional methods in the past decade, appears to have had considerable success. The expansion of rainwater harvesting there was assisted by the existence of centuries-old traditions and techniques, coupled with technical support and vigorous advocacy from Indian NGOs. It was further stimulated by prolonged drought. Case Study 15.4 illustrates the potential of rainwater harvesting, and the challenges to implementing successful schemes.

The choice of approach to water provision varies according to location, and may vary over even a small area according to such factors as the topography, the level of dependence on irrigation compared to rainfall, and the moisture-retaining capacity of different soils.

In some cases, the problem may be one of access to water, not its physical availability. Equitable water distribution is the goal. Communities in drought-prone areas often have sophisticated systems for this. Local management structures should be reinforced where necessary.

15.3.8 Preserving livestock

In many remote areas, poor people’s livelihoods depend on livestock. This is most obviously true in the case of nomadic pastoralists. However, farmers may also rely heavily on livestock if they work arid or hilly land that does not support intensive crop farming. Livestock are a valuable asset, providing food, income and agricultural inputs (manure, pulling ploughs and carts). Herds grow as new animals are born. They can be moved easily and looked after by children.

Some livestock, such as goats and camels, are good at withstanding water shortages. A one-year drought may have little effect on the size of a herd since the animals can be moved. But when the drought is prolonged, poor people are often forced to sell animals to raise money for food (usually, breeding animals are kept and others sold). If this happens on any scale, it drives livestock prices down, generally at the same time as grain prices are
Case Study 15.4
Rainwater harvesting in Kenya

A severe famine in 1979–80 in Turkana District in north-west Kenya led to a number of long-term development initiatives. Several agencies became interested in rainwater harvesting as a way of supporting the Turkana people, who, though essentially pastoralists, had traditionally grown crops, principally sorghum, during the wet season.

Many of the early schemes did not work well, for both technical and operational reasons, and in 1985 a group of NGOs began collaborating on a project in Lokitaung Division to test alternative approaches, based on simple construction and surveying technologies.

Local people were soon able to survey sites, and design and build water-retaining bunds of earth without assistance, but it took time to overcome other technical challenges. For example, although many rainwater harvesting methods were known, there was no consensus about the most appropriate techniques in particular geographical and socio-economic contexts. It was difficult to build structures that would hold enough water to flood a garden site in a year of poor rains, but that would also not be swept away by the pressure of floodwater when rains were heavy.

Digging water-retaining earthworks is time-consuming and labour-intensive. The project promoted the use of animals (especially donkeys and oxen) to help move earth, but had to develop suitable scoops and harnesses, and overcome resistance from herders who refused to let their own animals be used. Later, less labour-intensive methods such as stone lines and grass strips were introduced.

At the same time, understanding of the role of the sorghum gardens deepened. It was realised that, although rainwater harvesting could improve sorghum yields in some years, it could not provide the whole livelihood for any group of local people, even if they wished to give up their nomadic way of life. Improved gardens were now viewed not as a means of support for people made destitute by the earlier famine, but as a means of complementing existing pastoral livelihoods.

The project was handed over to local management in 1988, and a sister project in Kakuma Division was set up in 1989. The two projects support garden improvement through provision of local technicians.

(continued)
Agency interventions to protect livestock-dependent communities during drought crises are generally of the following main kinds:

- Increasing grain and fodder supplies to the area (the former to help keep grain prices down, the latter to keep animals fed).
- Removing surplus animals (e.g. by buying, slaughtering and processing them).
- Giving broader support to communities’ livelihoods, so that they do not have to sell their breeding animals.
- Where herds are severely depleted and their owners destitute, restocking with new animals.

In 1997, an evaluation of the Lokitaung and Kakuma initiatives observed that more than 2,000 people were involved in rainwater harvesting in the two projects, with 340 gardens covering 170 acres. There was a gradual increase in the number of gardens in most locations, even though food-for-work had long since ceased to be available for labour on construction. In years of medium and poor rainfall, the improved gardens increased sorghum yields by up to four times more than traditional plots. The reliability of crops was also much greater. Most of the work on the gardens was carried out by women, but they had relatively tight control over the use of the harvest. The sorghum grown was used mostly to boost household food supplies, to buy goats and as an investment in social networks (i.e. through giving or lending to other members of the community).


Case Study 15.4 (continued)

(fundis) to design structures, the sale or loan of tools, seed and grain storage facilities, and technical assistance for repairs.

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Most of these interventions are closer to the emergency response end of the disaster management spectrum than to disaster preparedness. Long-term livelihood support is needed to give greater security.

Pastoralists in particular have long-established methods of coping with drought, based largely on moving animals to other areas and partly on livestock sales (see Case Study 15.5). But with traditional grazing lands increasingly under threat from privatisation for ranching or other forms of development, coupled with conflict in African countries in particular, it is becoming harder for them to put these coping strategies into practice.

Where communities are heavily dependent on livestock that cannot easily be herded elsewhere (e.g. dairy cows), collective schemes might be established to maintain fodder supplies during droughts through bulk purchase and

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**Case Study 15.5**

**Pastoralists’ coping strategies**

The Gabra are a pastoralist tribe herding camels and goats over arid lands in northern Kenya and southern Ethiopia. Their economy depends on animal products. Like many other pastoral groups in the region, the Gabra were badly hit by drought and animal disease in 1991. Many animals died.

Owing to the severity of the crisis, community meetings were held to agree collective coping strategies. Rich families agreed to give goats to the poorest and to send them milk daily; meat from slaughtered camels was also distributed periodically.

Traditional reciprocal relationships with another pastoral group, the Borana, were invoked because of the emergency: the Borana were asked to give cattle.

In some cases, rich relatives and friends from other districts loaned animals to replace those lost to disease, until the herd could be built up again. In other cases, herders travelled far to meet relatives and friends and offer services in exchange for animals. Some children were sent to live with distant relations who were less badly hit.

Community-managed plantations. This has worked effectively in parts of India, but is likely to need strong institutional support.15

15.3.9 Food aid

Food aid is generally regarded as a matter for governments and international agencies, because only they have the capacity to purchase and distribute...
large volumes. It is possible to set up more local schemes, as Case Study 15.6 shows, but the challenges are considerable.

15.3.10 Nutrition

Being able to monitor and combat malnutrition is an important component of all food security work, including early warning. Assessment of nutritional deficiencies requires specialist expertise and is beyond the scope of this book, but several major agencies have produced technical guidelines for the management of nutrition in crises.16

Advances in nutritional assessment methods have increased agencies’ ability to monitor and manage crises as they enter the acute stage. Since the early 1990s, nutritionists have widened the focus of their work from malnourished individuals to larger populations, and from a narrow set of technical interventions to combat malnutrition to a broader range of strategies, policies and programmes that take account of related causal factors, such as water, sanitation, health and social care.

Multi-sectoral approaches are ideal in theory, but their complexity causes problems. In practice, nutrition initiatives often have to make the difficult choice between concentrating their resources on the direct alleviation of malnutrition – usually through feeding programmes – or addressing some of its underlying causes.

15.3.11 Protecting livelihoods

Where support to livelihoods is concerned, many of the steps that organisations will need to take in drought-prone communities can be regarded as general development interventions just as much as disaster mitigation.

A broad range of interventions will be needed to stimulate local economies so that poor people are no longer so dependent on agriculture for their food and income. Economic diversification is the key to success, through on- and off-farm enterprises. Where a family's income relies on a range of different economic activities, there is a greater degree of protection against the failure of any one of them (e.g. harvest failure due to drought).

Diversifying agricultural production is part of this. Many food security projects encourage farmers to grow a wider range of crops, establish kitchen gardens and orchards, keep poultry or set up fish ponds. This has the twin objectives of improving food supplies and generating produce that can be sold. Technical
assistance, if needed, must be supplemented by training in business skills, marketing and organising production to meet market demands.

Many drought mitigation projects, in Africa particularly, support household gardens in addition to farms. Gardens are typically used to grow vegetables that will give a more varied diet and can be sold. In many communities they are managed by women, who thereby gain more control over household food supplies and income.

Another common approach to enhancing livelihoods is by processing agricultural products – for example grain milling, oil processing, making jam and peanut butter, or fruit and vegetable drying. Processing preserves crops, and often adds value.

Off-farm employment may be regarded as more secure against drought than agriculture, but this impression can be misleading. Local industries that depend on water or agricultural products are also vulnerable: for instance, a grain mill stops working when there is no more grain to mill. In such cases, the impact of the drought may be delayed until some time after crops have failed, but this is only a delay. It is therefore common for people to migrate well away from their communities in search of work during a drought. In western India, for example, village men head for brickworks and building sites in the cities during prolonged droughts. The collapse of the agricultural economy also affects rural people's purchasing power, and so has a knock-on effect on shopkeepers and traders supplying goods.

Plans for local economic diversification must take hazards into account and, where possible, find productive activities that are unlikely to be directly affected. Artisanal crafts may be suitable, as the supply of raw materials may not be hit by a drought or other hazard and the markets may be some distance from the affected area. Creating alternative enterprises is a complex task, and likely to require support in technical and business skills, credit and market access. Specialist assistance should be sought to carry out such work.

The degree of complexity involved is illustrated by one aspect of economic diversification: the need for well-functioning local markets. These make it easier for vulnerable people to buy and sell at times of need and, by distributing efficiently and moderating shortages, help to keep down the prices of essential items such as food. Development and disaster planners will probably need to act in several ways to strengthen local markets and improve poor producers' access to them, by improving local transport infrastructure, helping to disseminate information about prices, lobbying against damaging
The Kebkabiya district in Darfur, western Sudan, was badly affected by the drought and famine of 1984–85. In 1985, Oxfam began a post-disaster initiative to improve food security. In the first phase of the project, 12 community seed banks were established to serve a community of 30,000. The second phase, which began in 1989, introduced other measures to improve food production: animal health care, the use of animals for ploughing, pest control, soil and water conservation and community development.

The project embodied community participation from the beginning, but its nature changed over the years. In the first phase, the seed banks were managed by local committees, almost exclusively male, nominated by existing village authorities. There was, however, extensive consultation with communities in planning and establishing the seed bank scheme. As the seed bank committees gained in confidence, they took more decisions on their own, and when the second phase of work was prepared in 1989 there was no need for Oxfam to be involved in day-to-day management. The committees also began taking on extra tasks, such as organising training for farmers and supervising revolving funds for buying seeds.

For the second phase, new structures were needed to manage this wider range of activities. These were far more democratic, with each village in a group of 5–12 electing one man and one woman to represent it on a Village Centre Committee. In turn, each of the 16 Village Centre Committees elected one man and one woman to represent it on the Project Management Committee which oversaw the whole project. In 1990, the Project Management Committee registered as a separate NGO, the Kebkabiya Smallholders’ Charitable Society, to take over the project from Oxfam. This is a membership organisation, with each household paying a small fee. Members elect representative committees at different levels.

The project was always staffed almost entirely by Sudanese, but a handover to the communities had been envisaged from the beginning. The approach was gradual, transferring authority over several years, and Oxfam continued to provide technical back-up when required.

market restrictions, promoting more efficient methods of storing, preserving and transporting perishable goods such as food products, supporting small-scale decentralised processing facilities (e.g. grain milling), and providing credit and training in small enterprise management.17

While communities with high incomes generally suffer less from malnutrition, the link between wealth and nutrition is not clear-cut: there can be considerable differences within communities and households. Other factors play an important role. For example, the level of education among women has a great influence on dietary, hygiene and health practices. The benefits of increased income also depend on who earns and controls the money.

Maintaining natural resources such as forests, grazing land and sources of water is important to food security, especially where these are held in common. More intensive use of common property – for grazing, collecting wild food and roots, or fishing – is an important coping strategy when there is a drought. Preserving these resources against encroachment by private interests or their destruction by alternative forms of commercial or state-sponsored development, such as farming, logging and the construction of dams, is usually difficult. Local voices are unlikely to be heard unless their campaigns are supported by organisations with resources and lobbying skills.

Reforestation to mitigate drought or other hazards presents significant challenges. Communities need to be convinced of the need for it, and must have strong incentives for investing in trees that may not produce anything of economic value for many years. Expertise in forest management is essential, and should be brought in from outside where necessary. There are many anecdotal accounts of tree-planting initiatives as part of disaster mitigation programmes (protecting land erosion or providing wood for disaster-resistant housing) that failed because project managers lacked experience of this kind of work.

15.4 Monitoring and warning systems

There are now many kinds of system warning of food shortage. The first major one was the FAO’s Global Information and Early Warning System (GIEWS), developed after the Sahel famines of the early 1970s to monitor food production and supplies at national level and assess emergency food needs in areas facing critical shortages. The African famines of the mid-1980s showed the need for improved warning systems, and several more were established in the Sahel and the Horn of Africa between 1985 and 1990. These usually combined hazard/meteorological monitoring (see Box 15.1) and assessments of food production levels after the harvest season.
Because they operate on national and regional scales, such systems are best managed by governments and international organisations. They are also geared to large-scale disasters requiring international aid.

**Box 15.1**

**Drought monitoring**

Drought monitoring systems look at two main indicators: rainfall and vegetation. The former is monitored by extensive networks of rain gauges, the latter mostly through remote sensing by satellites. In both cases, large amounts of high-quality data can be generated. These can be supplemented by other meteorological information (such as rainfall forecasts) and hydrological data (such as monitoring of groundwater supplies and the level of water tables).

Although rain gauges are relatively simple technologically, and collecting data often depends on local staff or volunteers, rainfall monitoring needs to take place on a large scale if it is to be of value in assessing overall needs and particular priorities. Management of such systems is generally taken on by government meteorological services, and feeds into the well-established and effective national and international meteorological information systems. Moreover, there is growing use of rain gauges that transmit data automatically to distant monitoring stations, using radio signals or other electronic means of communication (this is called telemetry). In the case of remote sensing of vegetation, which is the only really effective way of compiling information covering a wide area, the cost of procuring and analysing satellite data is so high that this task too is generally left to international and government services.

Monitoring of rainfall and vegetation does not indicate how much food people have, or need. Remote sensing does not distinguish between different kinds of vegetation, so does not show how well crops are growing. Since different food crops vary in their levels of tolerance to drought, rainfall monitoring is of limited value as an indicator of the availability of food. It is for this reason that food security or famine information and warning systems have become an increasingly important tool for disaster managers during the past 20 years.
However, local early-warning systems have an important role to play, and many have been established since the mid-1980s, often by NGOs. Many researchers and practitioners consider them to be particularly successful in monitoring impending food crises. They tend to draw on a wider range of indicators of food and livelihood insecurity than the larger systems. They also rely far more on qualitative data, and involve higher levels of community participation. They are better able to take account of local variations in food security, and are more sensitive to local coping strategies and vulnerability. They can recommend appropriate interventions to local decision-makers, who will have a better understanding of conditions on the ground and a greater sense of urgency in responding to problems. They are easier to manage than large-scale, centralised systems, but they tend to suffer from a lack of skilled personnel (see below) and are open to manipulation by powerful local interests.

Systems of all kinds have shifted their emphasis from the simple availability of food to considering which groups do not have access to food: this takes them logically into vulnerability and livelihoods analysis. As a result of these developments, the targeting of food aid has improved considerably.

The effectiveness of early-warning systems varies in practice. There are four main reasons for this:

1. The nature of the system itself and the information provided – the range of indicators used, accuracy of the data, the timeliness of warnings.
2. The institutional context within which the system is located, and institutional links to decision-makers.
3. The broader political environment. Decisions about when and how to intervene are political, and therefore influenced by many other factors.
4. Logistical obstacles to launching a timely and adequate response.

Most analysis of systems concentrates on the first and fourth of these factors, but research into responses to the African droughts of 1990–93 has shown that reasons 2 and 3 are most important in explaining if early-warning information is used, and variations in performance between different warning systems. Early-warning systems did sound the alarm about impending food crises, but the response systems failed to act early enough. Conventional systems are also much less effective in conflict-induced famine.

Early-warning systems take many forms in their institutional set-up and location, the resources available to run them, and the information that they collect and process. However, all are designed to stimulate action by
informing decision-makers about food security conditions and people’s needs. As information systems, their functioning is theoretically straightforward (see Figure 15.1), but in practice there are many obstacles.

An efficient, effective early-warning system for drought-related famine should have the following three characteristics:

1. It should be capable not only of warning of large-scale famine, but also should be sensitive to changes in food-security status before famine threatens, and able to detect localised pockets of acute food stress.
2. It should generate a response that provides assistance early in the ‘famine spiral’, before families and communities are reduced to destitution.
3. It should stimulate interventions that protect livelihoods before lives are threatened. This implies providing a wider range of relief than food aid, as well as a more developmental approach.

The rest of this section focuses on two aspects of warning systems for food insecurity and famine: the selection and collection of indicators, and the management of local-level systems. The discussion is necessarily brief, as this is a complex technical subject on which a great deal has been written elsewhere.

15.4.1 Data and indicators

Under the influence of Sen’s ‘entitlement’ theory, food security information and famine early-warning systems have increasingly incorporated a wider range of indicators of the availability of food and the ability to procure it. This includes data on the market price of food and other essential goods, family and community behaviour (the adoption of particular coping strategies) and the availability of employment opportunities in the area, as well as more conventional data on rainfall and levels of groundwater, crop production (surveys before and after the harvest), nutritional status and food supplies.

However, many early-warning systems still have too narrow a focus. They rely largely on indicators of food production and supply, instead of indicators of access to food. These are easier to collect and are often believed to be more accurate, though this may not be true in many cases. Socio-economic indicators, which tend to be harder to collect and draw more on qualitative data, are less influential in overall decision-making. They are more likely to be used in identifying those most in need of food aid. Coping strategies, which are difficult to monitor and interpret accurately, are rarely incorporated systemat-
disaster risk reduction: mitigation and preparedness

Figure 15.1
An early-warning system as information system

ically into early-warning systems. Officials are more likely to be impressed by conventional quantitative monitoring than community-based systems and local knowledge.

Multi-indicator systems are sensitive to the complexity of famine processes, and are therefore more likely to detect worsening food security early enough for agencies to intervene to protect livelihood assets and prevent starvation. However, information does not speak for itself. Data have to be interpreted. Options for intervention must be assessed. This presents many challenges where multiple sources of information are used.

The different types of data are not easily compared. For example, how does one weigh up the relative significance of data on grain prices in local markets compared to levels of rainfall or farm crop production, or sales of livelihood assets? To add to the problem, most systems depend to some extent on proxy indicators of food stress (e.g. the timing and extent of adoption of particular coping strategies).

Different methods are needed to collect different kinds of information, each requiring its own skills. Formal measuring systems can be used for some aspects of food security, such as crop production and food prices, that are quantifiable. Monitoring of nutritional status has its own methods. Assessing wider household food security status requires expertise in interviewing and participatory appraisal. These skills can be learnt and transferred, but this takes time, and specialist assistance will be needed as it is unlikely that any one local organisation or project team will have all of the relevant expertise in-house. Rapid staff turnover often prevents skills from becoming fixed within an organisation.

Some relevant information may have been collected by other people and for other purposes (e.g. a Ministry of Agriculture will collect agricultural production data). It will have to be obtained from those users. This may not be easy, especially in countries with very bureaucratic administrations. Information from other sources may have been collected or aggregated on a different basis from that of the local monitoring system. For example, government data sets may gather information at village or even district level, rather than household level. Government officials prefer to use administrative areas as their units of analysis, and may not take account of geographical or social differentiation within an administrative area. Disaggregation of data by age, sex or occupation is likely to vary between different data sets, as will the timing and frequency of data collection.
Over-emphasis on data collection is a common failing. Information is often gathered for its own sake, without sufficient thought being given to what field agencies need to know. Local-level systems in particular are likely to find themselves unable to process all the information they collect. This can be a particular problem for those that use a wide range of data sources and indicators. There are several instances of projects having to scale down their data-gathering operations, or bring them more into line with operational needs.

At the end of this process, information has to be packaged in a way that is intelligible to decision-makers and that helps to guide them towards appropriate action. This link to action must be kept firmly in mind when planning and running early-warning systems. The system may have to supply information to a wide variety of users, ranging from government policy-makers to field managers. Each group may want different kinds of data, which may have to be presented in different ways.

Case Study 15.8 illustrates one agency’s approach to collecting and analysing food security information.

15.4.2 Maintaining local systems

Food security information systems are complex and difficult to manage. They can also be costly because of the considerable staff time required in collecting and interpreting data. This is true even with participatory data-gathering methods that involve community members, because the information still has to be drawn together from different sources, analysed and then packaged for decision-makers and field workers. As data often have to be gathered from communities dispersed over a wide geographical area, transport and subsistence costs can also be high.

Owing to these factors, the sustainability of warning systems is a major challenge. Systems need to be maintained continuously to give reliable data of patterns of food supply and demand over time. A secure funding stream is therefore needed. Lack of resources has damaged a number of government and NGO-run warning systems. The project-based approach that NGOs are generally obliged to adopt is an insecure foundation for such work because of its fixed time spans and the difficulty of obtaining repeat funding from donor agencies.

Both national and local warning systems must be integrated into the institutions that manage them. Many systems are purpose-built and tend to stand alone. Those who set up early-warning systems should plan their external linkages as carefully as their internal mechanisms. Local-level systems often
In the early 1990s, Save the Children Fund (UK) adopted a ‘food economy’ approach to analysing household food security. Food economy is defined as the sum of ways families obtain food. The food economy approach is most commonly used to estimate food aid needs, but it can also be used to inform other kinds of intervention to support food production or livelihoods.

Central to this approach is understanding rural households’ everyday circumstances. Knowing how people normally obtain food is an essential part of predicting how they will react in a crisis, be it a major disaster or a seasonal food shortage. Building up a ‘normal year’ or baseline picture helps determine key indicators of food security that can then be monitored. Baseline pictures contain information on how households normally obtain food and cash income, their connections with the market and social or kinship networks, their assets (land, food stocks, livestock, cash, goods, tools) and their expenditure patterns. Data collection is mostly based on fieldwork using RRA or PRA techniques and, particularly, semi-structured interviews with community members, individually and in groups.

The next steps are to identify potential problems – changes in agricultural, economic or security conditions – that could affect access to food, and to develop scenarios showing what the impact of such changes would be. For example, the impact of reduced crop production, milk yields, and income from livestock sales or wage labour can be translated into an estimate of the likely impact on food availability. Similarly, the potential role of various coping strategies can be estimated. A computer software program, RiskMap, has been developed for this scenario analysis, which can be complex, although for smaller data sets it can be done using a spreadsheet or even manually.

Data sets are grouped geographically into ‘food economy zones’: areas in which the same food and cash income options are available and relied upon to varying degrees by families with different levels of wealth. This makes it possible to identify particular groups in need, but data collected on the basis of food economy zones are often incompatible with other data sets gathered on the basis of administrative districts.

Owing to the methods used, much of the information collected in the field
disaster risk reduction: mitigation and preparedness

Case Study 15.8 (continued)

is, inevitably, quantitatively imprecise. However, data analysis is designed to point out inconsistencies in data and ensure that the overall picture adds up. Field information of one kind is checked against other kinds and compared to secondary sources. Analysis takes place in the field, so that contradictions or odd findings can be dealt with on the spot.

A major problem with this approach is the need for skilled staff and ongoing training. Well-educated and committed field staff are not always easy to find, and turnover can be considerable.

Another problem is over-reliance on standard reporting formats and guidelines, leading to standardisation of the information-gathering process and hence to poor results. Field staff need to be sensitive to local circumstances and interviewees’ needs, and ready to adapt their data-collection techniques accordingly. However, there is an ongoing tension between this need for flexibility, and the need for consistent data.

The food economy approach has been used widely by Save the Children Fund (UK) in Africa and Asia, and both it and the RiskMap programme have undergone considerable development during the past ten years. A manual has been produced and field training courses are held.


feed into national-level ones. But unless decentralised data are available for all the areas at risk, this can distort decision-making by giving undue prominence to particular districts.

Other problems include the lack of integration between different agencies’ early-warning systems, which hinders collective analysis and action. Failure to standardise data across systems is a major issue. Agencies fail to learn lessons from each other’s experiences, and even from their own similar programmes elsewhere.
Case Study 15.9
Sustaining food security information systems

In 1987, Save the Children (UK) established a local food security monitoring programme, Suivi Alimentaire du Delta Seno (SADS), in Mopti, Mali, in collaboration with Oxfam (UK) and the International Union for Conservation of Nature. The system was designed to monitor local food entitlements. Data were collected using PRA methods. This included information on agricultural production, fish production, livestock conditions, levels of on-farm stocks, off-farm employment, household consumption and migration. Food prices were also monitored, together with the marketing strategies of producers and traders. Secondary data sets containing statistical information were incorporated: these covered rainfall and flood levels and national and regional food production estimates. Several one-off surveys were carried out to improve knowledge of particular subjects, such as the use of wild foods. The system developed indicators of the food security of different groups at different times of year.

The system's focus on coping strategies greatly improved understanding of the complexity of local food strategies, and challenged the misconception that food supply alone determines the state of food security. But coping strategies were difficult to monitor because households change their strategies frequently, and good baseline information was needed.

SADS produced quarterly food security assessments for local, national and regional decision-makers in government and international agencies. It also intervened to support livelihood strategies, principally through a credit scheme introduced in 1991 that made loans for productive activities such as the purchase of seeds or fishing equipment, to establish cereal banks and for economic diversification.

The sustainability of the information system and its institutional linkages were not considered in depth at the start of the project because the main aim was to explore the nature of vulnerability. It was difficult for an NGO to maintain such a system, owing to the cost of field staff and data collection, and the need to train people to gather and analyse information. The information SADS produced was timely in alerting decision-makers to pockets of food insecurity that had sometimes been
Case Study 15.9 (continued)

overlooked by national systems, but its influence on decision-making was limited, largely for institutional reasons: it did not have direct links with government.

For these and other reasons, the information system was closed down in 1993. It was felt that it would be more appropriate to establish such a scheme within local or regional government structures; there was already a national early-warning system in Mali.


15.5 Chapter summary

- There is a close link between environmental degradation and increased risk from natural hazards. Environmental protection and renewal is feasible, but may challenge vested interests.
- Industrial and domestic waste can present a serious threat to public health, whose impact may not be felt until some time in the future.
- Significant reductions in pollution and improvements in waste management require the involvement of the state, but partnerships between government and other actors are desirable.
- Global warming threatens to undermine society’s resilience to environmental stress. The best ways of coping with the resulting increase in disaster risk are still unclear.
- Natural hazards such as drought are only one factor in food crises and famines. Political, social and economic factors can be influential.
- Food security is not merely a question of food availability. People do not have equal access to food because of differences in the resources they possess and other economic, social and political factors.
- There are many ways of overcoming food insecurity by improving people’s ability to obtain food. Such initiatives can be undertaken locally.
- The most effective way to protect communities against drought-induced food insecurity and famine is to strengthen existing coping and livelihood strategies well in advance. Yet most external interventions are still in response to drought and crisis.
The ideal approach is an integrated one that uses a range of methods to tackle different aspects of food and related livelihood insecurity. This is likely to include methods of protecting and increasing food production, better preservation of food crops, water conservation, preserving livestock and broader livelihood support.

Local food insecurity/famine early-warning systems are valuable, especially where they are based on a wide range of indicators and community participation.

Early-warning systems of all kinds need to stimulate appropriate action early enough to prevent destitution and starvation. In practice, they may fail to do so because of obstacles in the institutional and political environments in which they operate.

The selection of food insecurity indicators and analysis of data need to be planned and managed carefully to ensure the collection of appropriate types and amounts of information.

Food security information and early-warning systems are often costly, complex and difficult to manage. Sustaining such systems can be a major challenge.

More harmonisation and integration of systems is needed.

Notes
disaster risk reduction: mitigation and preparedness

8 Borton and Nicholds, *Drought and Famine*, p. 15.
9 Young et al., *Food-security Assessments in Emergencies*, p. 4.