

## DROUGHT IN THE SAHEL

The Sahel is one of the world's most vulnerable drought hazard regions. Drought hazard can be defined as a condition of abnormally dry weather, resulting in a serious hydrological imbalance. The consequences for people can include loss of standing crops, water shortages for livestock and human populations, and damage to property.

Droughts are a 'creeping hazard' – they develop slowly, often over a period of months, and can have a prolonged existence – a period of many years, for major events. Their impact may extend over thousands of square kilometres.

Drought has many similarities to long-term degradation, and it is often difficult to tell when a drought ends and human-induced desertification begins. Overgrazing, poor cropping methods and improper soil conservation techniques need not in themselves create drought, but they frequently amplify the drought-related disaster. The human impact of drought depends on the extent to which a particular society relies upon the climate to make a living. In the Sahel, where societies are organised simply and dry conditions are prolonged, the worst impacts of drought are felt. This **Geofile** examines the causes and consequences of drought and the way in which this hazard can be managed.

### Types of drought

A variety of drought types can be recognised (see Figure 1). Four are outlined below:

- 1. Meteorological drought** – this involves a straightforward shortfall in precipitation. There is often no direct ecological or economic impact, and no effective human response.
- 2. Hydrological drought** – this mostly involves water resources in rivers and lakes and urban water supplies. Responses from local authorities and water authorities may involve managing the supply of, and demand for, water.
- 3. Agricultural drought** – evidenced from widespread regional effects in more economically developed countries, and mostly affecting farm production. Direct responses are typically at a national level, involving compensation or similar measures.
- 4. Famine drought** – this is the most severe type of hazard, which results in deaths from starvation. It is mostly confined to less economically developed countries which are dependent on subsistence agriculture. The response here is usually at an international level.

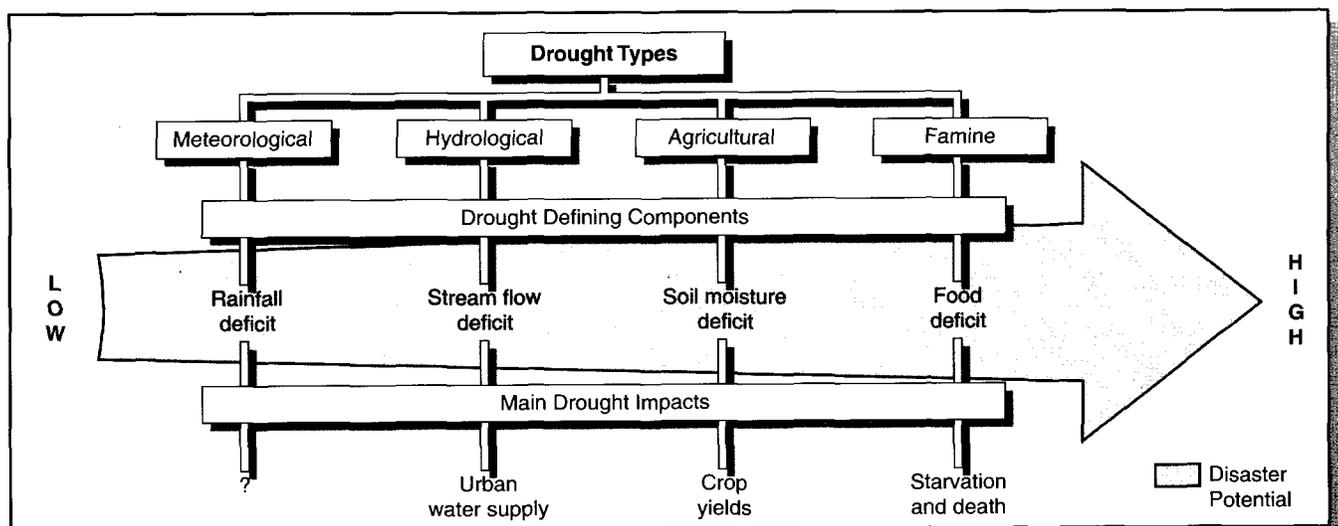
### Famine drought in the Sahel region

The worst disaster arising from drought is famine. The link is not direct, because drought is a physical hazard, while famine is a cultural feature. Famine droughts can be thought of as an extreme expression of agricultural drought, which reduces the food supply sufficiently to cause starvation. Famine drought appears to be a constant feature of some of the poorest countries of sub-Saharan Africa, those nations lying to the south of the Sahara desert in an area known as the Sahel (see Figure 2).

Sahel is an Arabic word meaning 'fringe', or the 'edge of the desert'. This area extends over 2.5 million sq. km of the African continent, between latitudes 13°N and 17°N. The annual mean temperature is 28°C to 30°C and the annual precipitation averages 250–500mm. The region is dry, with a short rainy season from July to September. It is also an area of relatively high population densities and widespread subsistence economies, and it is extremely vulnerable to drought.

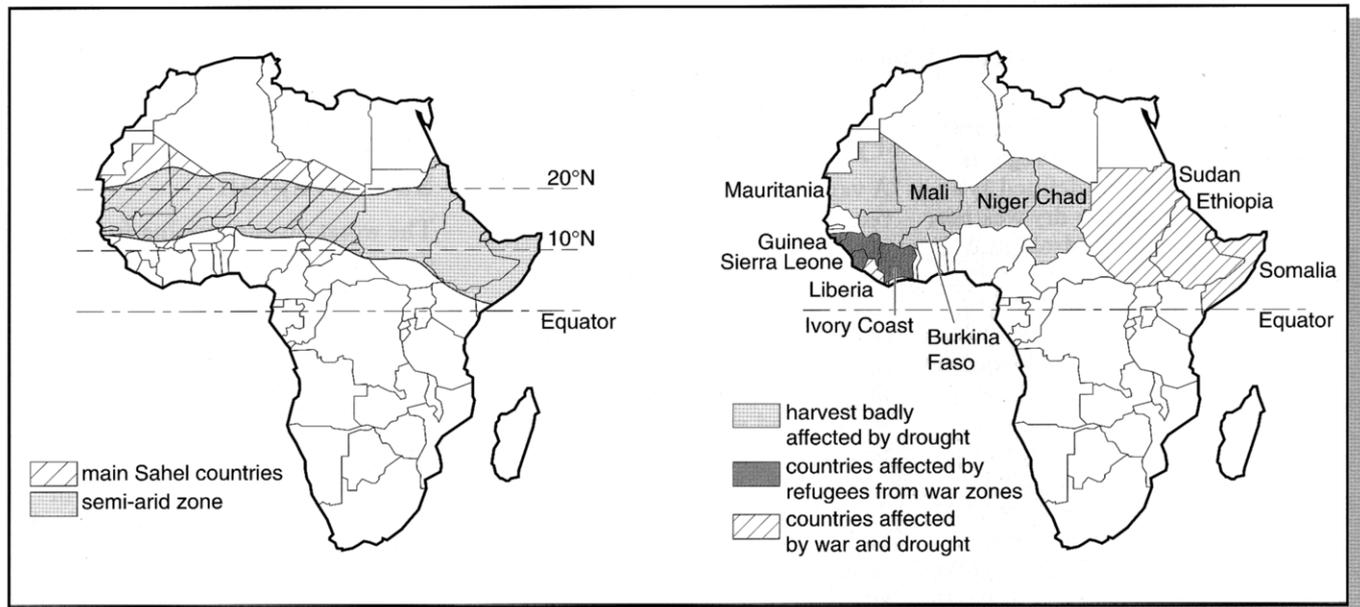
There is always a seasonal drought in the Sahel, occurring annually from October to June, during the normal dry season. When the normal rainy season is delayed or postponed for

Figure 1: Classification of drought and drought hazards



Source: adapted from Alexander (1993).

Figure 2: Drought and war in the Sahel



Source: adapted from Alexander (1993).

periods of time, this is known as contingent drought. The latter took place from 1969 to 1973 and again in the 1980s. The absence of rains has led to great suffering among the populations of countries such as Burkina Faso, Mali, Chad, Mauritania, Niger and Senegal (see Figure 2). The historical impact of drought has been as follows:

- 100,000 people were killed by drought in the Sahel in 1973; 25% all cattle died or were slaughtered; herds in Mauritania were reduced by 80%;
- 200,000 people in Niger were entirely dependent on food aid in 1974;
- 250,000 people were destitute in Mauritania in 1974, and around 200,000 refugees arrived in Mali from Niger;
- in 1984, 5 million people in Ethiopia suffered from several consecutive years of drought;
- in 1991, 4.28 million people in the Sahel were facing starvation after the rains failed.

### Causes of drought disasters in the Sahel

Droughts in the Sahel have been recorded for the last 6,000 years. Famine droughts are multi-causal and have often included an element of war or civil unrest. They can be attributed to the interaction of four factors: climate, reliance on rain-fed agriculture, poverty and population growth.

### Climate

Under normal conditions the Sahel is a semi-arid area. Rainfall varies across the zone: 100–200mm in the North, 400–800mm in the South and a central area of 200–400mm. Mean figures tend to be misleading because the rainfall pattern is characterised by high seasonality and variability (see Figure 3). Persistent lack of rain has been the ‘trigger’ mechanism creating famine (see Figure 4). The continuing drought in the region has developed gradually since 1968 and rainfall remained low in the 1980s, although there was higher rainfall in 1988, which caused floods in Sudan. Because the rainfall pattern had been ‘good’ in the 1950s and 1960s, this encouraged rain-fed agriculture in marginal lands and increasing herd sizes. Both these factors have made the current drought worse.

Lack of rain, combined with pressure on the land, has increased rates of desertification. Around 80% of drylands in the Sahel have suffered from environmental deterioration due to over-cultivation of crops, overgrazing of range lands, mismanagement of irrigated croplands and deforestation. There is evidence that the Saharan desert is advancing south and east and that 90% of pastureland and 85% of cropland in the countries closest to the Sahara have been affected.

Deforestation is a catalyst of soil erosion and albedo changes. Around 90% of all wood is used for cooking,

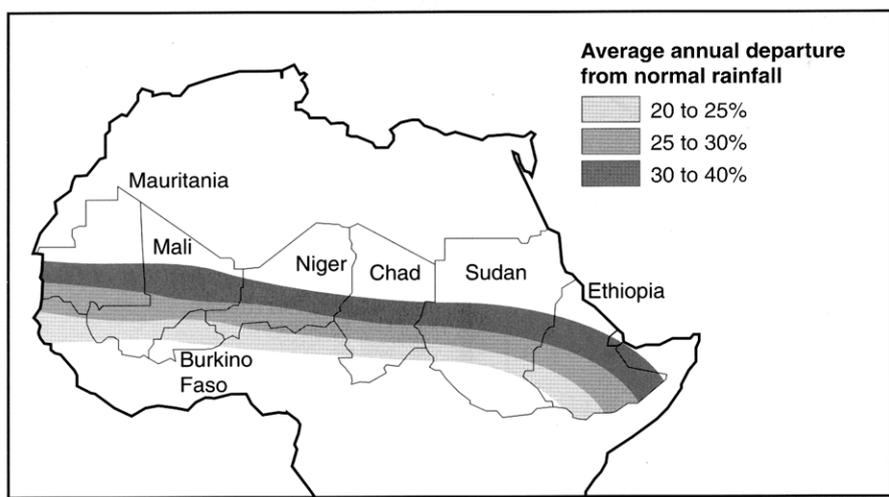
and the demand for fuelwood has risen as oil prices have changed. The oil crisis in 1973, for instance, had a dramatic impact on the cost of kerosene. The albedo, or reflectivity of the earth’s surface, increases as a result of vegetation loss. Higher albedo means greater reflectivity and more energy is bounced back into the atmosphere, evaporating water vapour and further reducing the potential for rain.

### Rainfed agriculture

Rainfed cropping accounts for 95% of the cultivated area in the Sahel. In drought conditions there are only a few management options: selecting a particular crop type and reducing the size of herds. Traditional patterns of nomadic pastoralism, prior to the sudden population increase, were well adapted to irregular and uncertain rainfall. Generally the northern Sahel was used for livestock and the wetter south used for food crops. The nomadic pastoralists followed the rains by seasonal migration, while the cultivators in the south grew a variety of drought-resistant crops such as sorghum and millet. Long fallow periods ( up to five years) were used to rest the land. A barter system operated between pastoralists and sedentary farmers involving an exchange of meat and cereals. Over the last 20 years this system has collapsed. Contributing factors include:

- increased pressure on the land due to population growth and

Figure 3: Rainfall variability in the Sahel



Source: Smith (1992)

- expansion into drier areas previously reserved for livestock, with a consequent overgrazing of rangelands;
- growth of cash crops as governments have tried to earn foreign exchange;
- expropriation by governments of dry-season floodplain grazing areas for commercial irrigated agriculture, e.g. sugar and cotton;
- discouragement of subsistence crops and a fall in prices;
- destruction of croplands due to civil wars;
- legislation by national governments against nomadism, in an attempt to control and settle herdsman;
- foreign aid earmarked for sedentary agriculture rather than pastoralism;
- lack of understanding of drought strategies and taxation of animals to force herdsman to sell;
- game preservation laws, which have restricted the possibility of hunting for meat during drought;
- enforcement of international boundaries and customs duties and competition from lorries have reduced caravan trading.

Recent droughts in the Sahel have exposed many underlying weaknesses: rural areas continue to rely on neglected traditional systems or 'modernised' systems which are not adapted to local conditions. Famine is not caused purely by lack of rain, and famine potential will not disappear when rains return to normal.

**Poverty**

Sub-Saharan Africa contains 29 of the world's 36 poorest countries.

Many are locked into an economic system which obliges them to produce goods they do not consume. Some researchers argue that colonialism, neo-colonialism and international trading systems have reduced the ability of these countries to cope with famine drought. There is a clear link between short-term famine and long-term poverty. All the African countries affected by drought are heavily in debt. Debts have increased rapidly in the last 15 years due to the loss of purchasing power from sales of primary products. In 1995 two out of every five sub-Saharan countries were living on foreign aid, creating an 'aid culture' of dependency. Not all the aid money has been invested wisely – around 80% has been spent on infrastructure, roads and services, rather than forestry or agriculture, i.e. prestige projects rather than local 'field action'.

**Population growth**

The link between population growth and food supply is critical. In most

Sahelian countries the population is doubling every 20–30 years, and countries are having great difficulty feeding themselves. By 2005 sub-Saharan Africa will have a population of 770 million, double the size in 1980. Population growth stands at 3.1% per annum, while food production is increasing by only 1.6% (see Figure 5). The long-term trend of per capita food production, in contrast to other regions, is therefore downwards.

**The response to drought**

**Household response**

Farming families in the Sahel have evolved survival strategies to overcome the effects of drought. These include:

- selling livestock;
- wage labour (although this can lead to the collapse of the precarious labour market if labour supply is greater than demand);
- borrowing cash or food from relatives;
- selling valuables such as jewellery or firearms.

Eventually all capital assets may be sold or lost. Repeated crop failures will, in the end, lead to the loss of all resources, and eventual out-migration.

**Community and political response**

Other factors to fight contingent drought include:

- carefully conserving food stocks;
- supplementary food supplies from international relief agencies;
- careful seed drilling to use pockets of moisture in the soil;
- use of drought-resistant crops, which have waxy surfaces, such as millet or sorghum;

Figure 4: Rainfall index for the Sahel

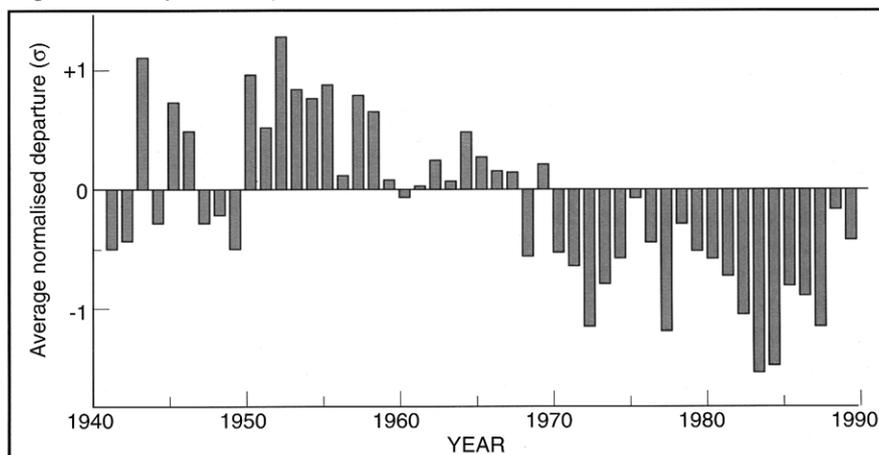
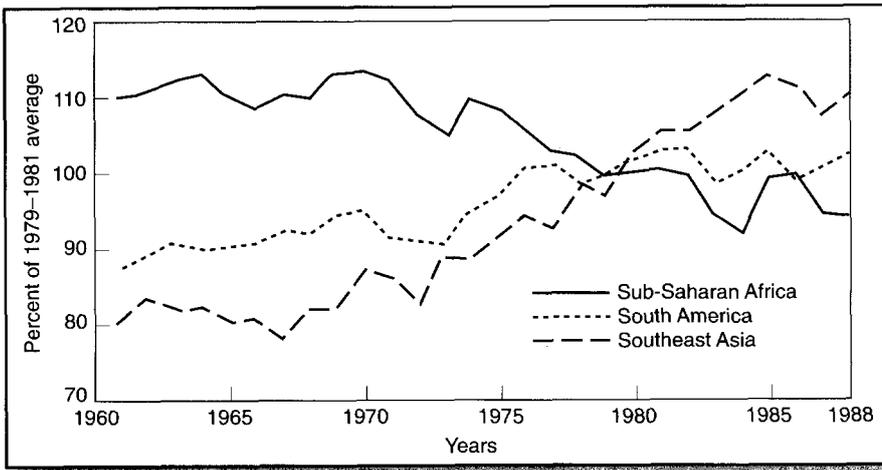


Figure 5: Per capita food production in the Sahel



- flexibility – rainstorms can be followed by ‘instant’ cultivations in order to benefit from one or two rainfall events a year.

### Obstacles to a drought strategy

Although it is possible to develop a strategy to deal with drought in the Sahel, there are many obstacles. These include:

- high rates of population growth (more mouths to feed);
- difficulties in increasing the carrying capacity of the land;
- dependency on food aid;
- falling yields per hectare (although overall yield and area under crops is rising);
- population growth outstripping food production;
- armed struggles which result in disruption, theft of food relief and mass migrations;
- difficulty of establishing social and economic stability;
- inappropriate imported high-tech solutions that fail to use local or traditional expertise.

### Drought reduction in the Sahel

Despite the difficulties afflicting the region, some steps have been taken to reduce Sahelian droughts. These include:

- drilling boreholes in dry areas (although this can make the situation worse, as the sites attract too many settlers and demand outstrips supply; every year about 5,000 ha come into use in this way while around 5,000 disappear);
- early warning systems for crop failures, e.g. using remote sensing

- to identify reduced vegetation growth;
- the AGRHYMET programme established by the World Meteorological Organisation, based in Niamey, Niger. This uses local expertise in agronomy, hydrology and meteorology to train local staff to improve agricultural productivity and drought response;
- use of knowledgeable ‘local fieldworkers’ and the release of local initiative to produce greater self-reliance;
- comprehensive food and nutrition surveillance systems which can detect food shortages early, using the concept of ‘rising risk monitoring’;
- change in government policies in deploying disaster relief, redirecting aid to small farmers;
- development of sustainable programmes in rural areas by donor countries;
- more research and investment in staple grains, dryland farming techniques (terracing, strip cropping, soil erosion controls);
- support for nomadic pastoralism;
- controlling population growth;
- ending civil wars and opening international borders.

### References

Alexander, D. (1993) *Natural Disasters*, UCL Press.

Smith, S. (1992) *Environmental Hazards: assessing and reducing disaster*, Routledge.

Wijkman, A. and Timberlake, L. (1984) *Natural disasters: acts of God or of Man?*, Earthscan.

## FOCUS QUESTIONS

1. Produce a flow-line diagram to show how the causes of drought are interrelated.
2. Carry out some further research into drought. For each drought type, produce short case study notes.
3. What can be done to tackle the drought hazard, and who is responsible?
4. Why does drought have a greater impact in the Sahel today compared to 40 years ago?