Fact sheet #4
Climate information for securing food

www.wmo.int/wcc3

By the World Meteorological Organization (WMO), with the Food and Agriculture Organization of the United Nations (FAO), the International Fund for Agricultural Development (IFAD), the United Nations Convention to Combat Desertification (UNCCD), the World Food Programme (WFP) and other international partners

Climate is a key parameter in growing food. It controls the soil moisture level, the amount of sunlight plants receive and the conditions plants are subjected to on a daily basis. Changes in these variables can alter crop yields, affecting food supplies and farmers' livelihoods. Local climate variability and global climate change are rapidly altering the landscape for agriculture and land use, threatening water availability and causing extreme weather in some areas, while expanding growing seasons in other areas. Reliable climate information is needed to guide decisions in the food sector to ensure that food managers can adapt to changing conditions.

FAO projects that world food demand will double by 2050 due to population growth and socio-economic development. Climate change will add pressure to the already stressed food market, affecting not only agriculture and livestock but also global fisheries. The use of sustainable land management practices is an important measure in coping with this challenge.

Droughts, floods, wildfires, heatwaves, frosts and sand and dust storms all threaten the viability of crops. As global temperatures rise, the frequency and intensity of these weather extremes is expected to increase, stressing crops, forests and livestock. Land degradation will increase due to droughts and heavy rainfalls that cause soil erosion. Disaster risk management through early warning systems, emergency preparedness and response, as well as various types of insurance, is a vital part of climate adaptation.

Climate predictions on seasonal to multi-decadal time scales are another important tool. These predictions reduce production risk, enabling food managers to make informed decisions about managing water and crops. In developing countries in particular, water shortages could become more widespread, raising the threat of further food shortages. Climate predictions enable farmers to adjust planting dates, crop varieties and irrigation strategies based on the projected water availability. They also give advance warning of natural climate phenomena such as El Niño and La Niña, which bring droughts to some areas and floods to others.

Rising temperatures also pose a threat to agriculture in the form of diseases and pests. Cold weather often acts as a natural pest control, and rising temperatures could reduce this effect. Pests could spread through forests in particular, and forest lands will also be more susceptible to fires because of increased temperatures and drier conditions in many areas.

Although climate change poses new risks to agriculture, it could spur opportunities in some regions. Growing seasons will lengthen with warmer temperatures in some areas. Parts of Northern Europe that are typically too cool for vineyards, for example, are becoming more hospitable for growing grapes for wine production. Climate predictions highlight these new growth opportunities.

World Meteorological Organization
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www.un.org/climatechange

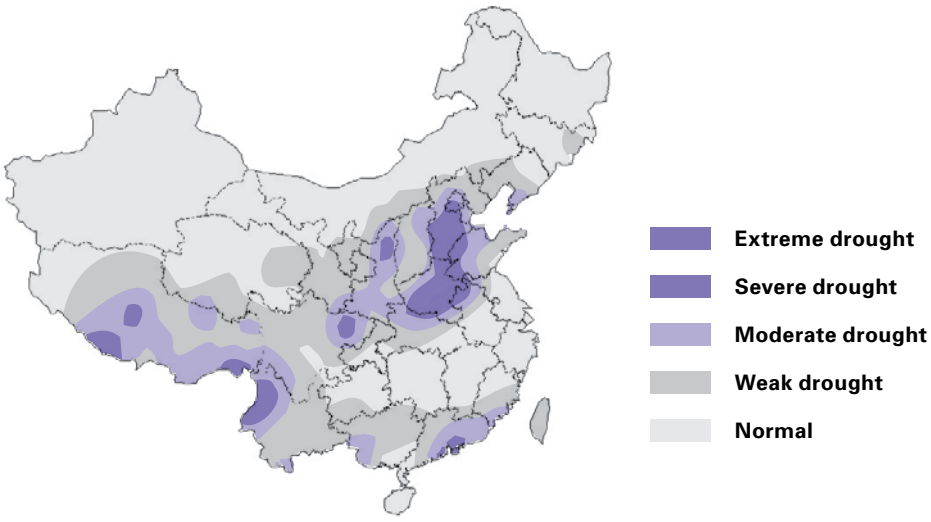
In addition to its effects on agriculture and food security, land degradation also affects plant biodiversity, the cycling of carbon in the environment and forestry management. The need to use climate information for food and land management is being increasingly recognized. Investment in sustainable land management must be an integral part of climate adaptation. This applies in particular to countries whose economies are weighted heavily toward agriculture and primary commodities. Climate predictions and information provide a scientific foundation for identifying vulnerable regions and resources and applying sustainable land management principles, as well as disaster risk reduction strategies.

Cultivating crops with climate information in China

The Chinese have cultivated crops along the Yellow River since 4000 B.C. Even small changes in this northernmost of China's major rivers can dramatically affect agriculture in the Ningxia Hui region. Already, changes in climate are altering the flow of this important water source. Higher temperatures are raising the threat of droughts, other weather extremes and drier soils. The Governments of the People's Republic of China and of the United Kingdom are now working together to better understand climate risks to agriculture in the region and to develop adaptation measures to deal with the challenges.

A recent report from the Impacts of Climate Change on Chinese Agriculture project predicts that China will see a reduction in yields of key crops, including wheat, rice and maize, as early as the 2020s due solely to climate change pressures. This prediction is the result of climate models that look at crop production under two different emissions scenarios for the next 70 years, which were developed by the Intergovernmental Panel on Climate Change (IPCC). The report notes that the net effect of climate change, combined with other pressures such as increased demand, land-use changes and water availability (also controlled by climate), is driving the need for new sustainable farming practices. Drought is the most significant threat to the Ningxia region. A major drought from 2004 to 2006 led to crop failures and significant economic losses.

Farmers and other stakeholders in the Ningxia region have implemented adaptation measures, but they have been hampered by a lack of funding, water shortages and poor infrastructure, according to the project report. Future adaptation activities could include the improvement of water allocation during droughts, better early warning systems, training in sustainable agricultural techniques and the promotion of long-term water conservation. The project has developed an adaptation framework to guide decision-makers in addressing the climate risks in Ningxia and securing the region's food supply. Many of the lessons learned in Ningxia are widely applicable to other rural regions faced with the impacts of climate change.



China's drought and flood monitors, such as this one from 6 February 2009, provides critical information for farmers to plan their crops.
Source: Chinese Meteorological Administration

Climate information in support of global agriculture

The Impacts of Climate Change on Chinese Agriculture project is just one of several collaborative projects designed to gain a better understanding of the role of climate in the food cycle and land management. Recent and ongoing efforts include:

A new joint initiative intends to provide poor rural farmers with financial protection following natural hazard events through the use of weather index insurance. Weather index insurance bases payouts on a meteorological index correlated with agricultural losses, rather than on the actual losses themselves. In projects supported by the World Bank in Ethiopia and Malawi, for example, the insurance is being tested to offer aid to governments before food crises occur. The insurance provides compensation to farmers when the rainfall during a growing cycle is insufficient for optimal crop yield. WMO and the International Research Institute for Climate and Society (IRI) will be supplying important weather and climate information in support of this effort, which was launched by the United Nations World Food Programme and the International Fund for Agricultural Development, along with the Bill & Melinda Gates Foundation. Several African countries, as well as Thailand and other areas around the world, are studying weather index and other types of crop insurance as well.

The Meteorological Department of Thailand provides climate information and other related meteorological services to Agricultural Research Centres, which help produce vital science-based information for policymakers working to reduce the vulnerability of food production. Training programmes in agrometeorological fields are organized for agricultural scientists and others to ensure the proper application of climate, weather and water information.

Working through WMO, several National Meteorological and Hydrological Services (NMHSs) organize Revolving Seminars on Weather, Climate and Farmers. These seminars increase cooperation between local agricultural communities and their NMHSs, giving farmers vital climate information to help protect and sustain their crops. The State Agency for Meteorology in Spain is now funding additional seminars in several West African countries.

WMO helps provide meteorological and related services to the agricultural community to promote the development of sustainable and economically viable agricultural systems. Its World AgroMeteorological Information Service maintains a dedicated Web server for disseminating agrometeorological products issued by WMO Members, including "locust weather bulletins" and region-specific bulletins.

The Indonesian Agency for Meteorology, Climatology and Geophysics, in cooperation with the Ministry of Agriculture and IRI, conducted an agricultural Field School in Indramayu Regency, West Java Province. The course focused on how to determine the onset of planting time, choose suitable crops and handle crop production by considering climate conditions in a certain area. Local farmers and participants from Asian countries were invited to attend.

Croatia has contributed to two research reports: *Impacts of Climate Change and Variability on European Agriculture*, through COST (European Cooperation in Science and Technology), and *Climate Variations and Change and Response in Affected Systems*, through the Ministry of Science, Education and Sports. The latter study assesses the impact of climate change on maize production and yields using various climate scenarios for the end of the twenty-first century.

Farmers in Honduras practice a local farming technique called Quesungual, which controls soil erosion by growing crops among the trees. This practice increases soil fertility and retention of soil moisture, resulting in higher yields over the long term, less variability in yields and better food security. It also contributes to the reduction of carbon dioxide emissions and reduces the occurrence of floods by promoting regular river flows. UNCCD supports such use of local knowledge to improve sustainable land management.

The Global Environmental Change and Food Systems project aims to deliver science-based tools to policymakers and managers to reduce the vulnerability of food systems to environmental change, including climate change. Part of the Earth System Science Partnership, which includes the WMO co-sponsored World Climate Research Programme, the project has launched regional research projects in the Caribbean, the Indo-Gangetic Plain and various parts of Southern Africa.

Facts and figures

- Meeting food demand in developing countries, largely in sub-Saharan Africa and Latin America, will require cereal yields to rise by 40 per cent, net irrigation water requirements to increase by at least 40 per cent and the addition of 100 million to 200 million hectares of agricultural land. [FAO]
- By the end of the century, 40 to 50 per cent of all undernourished people are expected to live in sub-Saharan Africa. [FAO]
- Crop cultivation worldwide uses 1.4 billion hectares of arable land, while 2.5 billion hectares of land are used for pasture. [FAO]
- Agriculture consumes 75 per cent of freshwater resources worldwide. [FAO]
- Agriculture itself is responsible for 25 per cent of carbon dioxide, 50 per cent of methane and more than 75 per cent of nitrogen oxide emitted annually by human activities. [FAO]
- Globally, the potential for food production is projected to expand with average temperature increases in the range of 1 to 3 degrees Celsius, but above this range, food production is projected to decline. [IPCC]
- At lower latitudes, especially in the seasonally dry and tropical regions, crop productivity is projected to fall with even small local temperature increases of 1 to 2 degrees Celsius. [IPCC]
- Crop productivity is projected to rise slightly at mid- to high latitudes with temperature increases of up to 1 to 3 degrees Celsius, depending on the crop. [IPCC]
- In some African countries, yields from rain-fed agriculture could decline by as much as 50 per cent by 2020. By the year 2100, parts of the Sahara are likely to have agricultural losses of between 2 and 7 per cent of gross domestic product due to climate change. [IPCC]
- More than 250 million people are directly affected by land degradation, and some 1 billion people in more than 100 countries are at risk. [UNCCD]
- Deforestation continues at a rate of 12.9 million hectares per year, mainly as a result of the conversion of forests to agricultural land. [FAO]
- The net loss of forests between 2000 and 2005 was 7.3 million hectares per year, with the largest losses reported in South America, Africa and South-East Asia. [FAO]

WCC-3 will initiate actions to enhance climate services for climate adaptation and the management of climate risks and opportunities around the world.

For more on climate and securing food:

Food and Agriculture Organization of the United Nations:
http://www.fao.org/climatechange/home/

United Nations Convention to Combat Desertification:
http://www.unccd.int/

WFP:
http://www.wfp.org/

IFAD:
http://www.ifad.org/

Regional Climate Outlook Forums:
http://www.wmo.int/pages/prog/wcp/wcasp/clips/outlooks/climate_forecasts.html

IRI:
http://portal.iri.columbia.edu/

Impacts of Climate Change on Chinese Agriculture:
http://www.china-climate-adapt.org/en/index.php

World AgroMeteorological Service:
http://www.wamis.org/

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