



Climate change and transboundary pests and diseases

Countries spend large sums of money to eradicate and control animal and plant diseases and pests. Climate change is now creating favourable conditions for animal and plant pests and diseases in new areas as well as changing the way they are transmitted.

Charting the change

While there is clear evidence that climate change is altering the distribution of animal and plant pests and diseases, the full effects are difficult to predict. Changes in temperature, moisture and atmospheric gases can fuel growth and generation rates of plants, fungi and insects, altering the interactions between pests, their natural enemies and their hosts. Changes in land cover, such as deforestation or desertification, can make remaining plants and animals increasingly vulnerable to pests and diseases. While new pests and diseases have regularly emerged throughout history, climate change is now throwing any number of unknowns into the equation.

Some of the most dramatic effects of climate change on animal pests and diseases are likely to be seen among arthropod insects, like mosquitoes, midges, ticks, fleas and sandflies, and the viruses they carry. With changes in temperatures and humidity levels, the populations of these insects may expand their geographic range, and expose animals and humans to diseases to which they have no natural immunity.

Other climate changes can create more opportunities for vector-borne diseases. In pastoral areas, for instance, drier conditions may mean fewer watering holes, which will increase the interaction between domesticated livestock and wildlife. Increased interaction between cattle and wildebeest in East Africa could lead to a serious outbreak of malignant catarrhal fever, a highly fatal disease for cattle, since all wildebeest carry the fever virus.

Aquatic animals are also vulnerable to emerging climate-related diseases, particularly since their

ecosystems are so fragile and water is such an effective disease carrier. A fungal disease called the epizootic ulcerative syndrome recently expanded to infect fish in southern Africa due in large part to increases in temperature and rainfall levels.

Protecting food and farmers

Pests and diseases have historically affected food production either directly through losses in food crops and animal production, or indirectly through lost profits from insufficient cash crop yields. Today, these losses are being exacerbated by the changing climate and its increasing volatility, threatening food security and rural livelihoods across the globe.

Developing countries with a high reliance on agriculture are the most vulnerable to today's changing patterns of pests and disease. Hundreds of millions of smallholder farmers depend solely on agriculture and aquaculture for their survival. As rural farmers struggle to produce food, poor people in nearby urban areas are left to contend with less availability in addition to higher food prices. National economies will also suffer as new pests and diseases either reduce agricultural products' access to international markets or incur higher costs associated with inspection, treatment and compliance.

Plant pests, which include insects, pathogens and weeds, continue to be one of the biggest constraints to food and agricultural production. Fruit flies, for instance, cause extensive damage to fruit and vegetable production and, as the globe's temperatures continue to increase, are finding more areas to call home. Controlling such pests often requires the use of pesticides, which can have serious side effects on

Key facts

- Pests, pathogens and weeds cause the loss of more than 40 percent of the world's food supply.
- Transboundary animal diseases such as foot-and-mouth disease, bovine spongiform encephalopathy, classical swine fever and, most recently, bird flu, are estimated to have caused economic losses in the tens of billions of US dollars.
- The 2003-2004 outbreak of desert locust in Africa affected more than 12 million hectares across 20 countries and cost more than US\$400 million to combat.
- The world's oceans currently absorb a million tonnes of carbon dioxide each hour, creating an increasingly acidic environment unsuitable for sea life.

human health and the environment. This is particularly true for poor rural people, who cannot afford to use the less toxic compounds or to own proper application or safety equipment.

Climate change may also play a role in food safety. A growing number of pests and diseases could lead to higher and even unsafe levels of pesticide residue and veterinary drugs in local food supplies. And changes in rainfall, temperature and relative humidity can readily contaminate foods like groundnuts, wheat, maize, rice and coffee with fungi that produce potentially fatal mycotoxins.

Strengthening cooperation and early detection

Climate change is a global problem that is affecting every single country. Global cooperation therefore is required to respond to it.

However, given the nature of plant pests and animal diseases, more localized or regionalized strategies will be needed to be effective. Investments in early control and detection systems, including border inspections, will be key to avoid the higher costs of eradication and management. Coordinated research, including programmes related to climate change and food security from the Consultative Group on International

Agricultural Research, will be needed to improve the range of options available to countries.

International trade and traffic spread transboundary animal and plant pests and diseases and alien invasive aquatic species. Countries take measures to keep new diseases and pests out. Such measures may hinder the free flow of goods and should therefore be scientifically justified and be as limited as possible in their effects on trade. New uncertainties and possibilities of introduction caused by climate change have the potential to increase these regulations and their effect on trade.

The containment of some pests and diseases may not be feasible because, for example, they are spreading too fast. New farming practices, different crops and animal breeds, and integrated pest management principles must be developed to help stem their spread. Governments may need to consider the introduction of biological control agents or new pest- or disease-resistant crops and breeds.

Governments need to strengthen national animal and plant health services as a top priority. They need to focus on basic sciences, such as taxonomy, modeling, population ecology and epidemiology. Governments should also consider how to better consolidate and organize their national animal and plant health services since they are often fragmented across different ministries and agencies.

Disease-causing insect moves north

Bluetongue disease is a devastating infection of ruminants that has historically been confined to southern Europe along the Mediterranean. However, since 1998, northern Europe has had increasingly warm weather and some midges that carry the virus that causes bluetongue have moved north. Changing temperatures have also allowed new, more populous insect species to transmit the disease, which has enhanced its spread. Bluetongue's biggest impact may be felt among cattle farmers; many countries will not accept meat exports from countries where bluetongue occurs.

Changing world of pest and disease

Climate change is only one of several "global change" factors driving the emergence and spread of plant pests and animal diseases. Additional factors include:

- globalization;
- human population growth;
- ecosystem diversity, function and resilience;
- industrial and agricultural chemical pollution;
- land use, water storage and irrigation;
- atmospheric composition;
- species interactions with hosts, predators and competitors;
- trade and human movements.

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