Expert Meeting
on
Climate-Related Transboundary Pests and Diseases Including Relevant Aquatic Species
FAO Headquarters, Rome, 25-27 February 2008

Options for Decision Makers

Introduction

The movement of animal and plant pests and diseases,* and invasive alien aquatic organisms across physical and political boundaries threatens food security and creates a global public concern. Countries have always allocated extensive resources to maintain animal and plant health services and to limit the spread and control, for example, avian influenza, foot-and-mouth disease and locusts. They also have cooperated regionally and globally for prevention, early warning and control of pests and diseases.

Trade, traffic and travel, the traditional drivers of spread, are joined by climate change which is adding to the distribution, incidence and intensity of animal diseases, plant pests and invasive alien aquatic species. Climate change is also creating new ecological niches that allow the entry, establishment and spread of pests and diseases into new geographical areas and from one region to another.

Impacts on transboundary pests and diseases

Climate change will be especially important to vector-borne diseases and macroparasites of animals and may also result in new transmission modalities and changes in host species. Changes in species composition and interactions will augment the emergence of unexpected events, including the emergence of new diseases and pests. While most developing countries are already subject to an enormous disease burden, both developing and developed countries will be subject to newly emerging diseases. Temperate countries will be particularly vulnerable to invasions by exotic arthropod-borne virus diseases and macroparasites.

* Transboundary pests and diseases refer to animal and plant pest and diseases and relevant aquatic organisms that spread across national or geographical (physical) boundaries, indicating that disease or pest events in one country may have direct effects in another country.

Transboundary Animal Diseases (TADs) are defined by the World Organisation for Animal Health (OIE) and the Food and Agriculture Organization of the United Nations (FAO) as epidemic diseases that are highly contagious or transmissible and have the potential for very rapid spread, irrespective of national borders, and can have serious socio-economic and public health consequences.

Transboundary plant pests refer to quarantine pests. These include pests of potential economic importance to the area endangered, even if they are not yet present, as well as pests that are present but not widely distributed and that are officially controlled, and to migratory pests, in particular locusts, which have the ability to change from individual behaviour to collective behaviour in swarms that easily cross boundaries.

Contributors to transboundary pests and diseases

Factors that affect the entry, establishment and spread of transboundary pests and diseases include:

- globalization;
- human population growth;
- ecosystem diversity, function and resilience;
- industrial and agricultural chemical pollution;
- land use, water storage and irrigation;
- atmospheric composition, CO_2 and oceanic acidification by carbonic acid;
- species interactions with hosts, natural enemies and competitors; and
- trade and human movements.

These factors are not independent of each other and climate change interacts with each of them.

Animal threats. Bluetongue and Rift Valley fever, as well as tick-borne diseases, are examples of animal diseases whose distribution will be strongly influenced by climate change. After introduction in Europe, bluetongue virus is now transmitted by temperate autochtonous midge vectors. Rift Valley fever is a mosquito-borne animal and human disease in which the vectors are influenced by climate.

Plant threats. Change in plant pests is driven by increases in temperature, variability in rainfall intensity and distribution, drought, CO_2 concentration in the atmosphere and extreme events such as hurricanes or storms as well as intrinsic characteristics of pests (e.g. diapause, number of generations, host interaction), hosts and ecosystems (e.g. monoculture, biodiversity, natural enemies) characteristics. For example, the expansion of maize production in response to climate change will make more areas vulnerable to entry, establishment and spread of the corn root worm (Diabrotica) while climate change will considerably alter the range of fruit flies which have a high potential to affect international trade.

Forest threats. Mountain pine beetle (Dendroctonus ponderosae), a pest of North American forests, has shown decreases in generation time and winter mortality which increases the risk of range extension into vulnerable ecosystems. Conversely, some pests will be less damaging because of decreasing climate suitability or changes in interactions with natural enemies and plant defenses.

Aquatic threats. Aquatic animals are very vulnerable because water is their life-support medium and their ecosystems are fragile. Epizootic ulcerative syndrome (EUS), a fungal disease that affects more than 60 host species of cultured and wild fish in fresh and brackish water throughout Asia, recently expanded its distribution to southern Africa. Temperature and rainfall are critical ecological factors for the disease. Perkinsus olseni, a major mollusc pathogen, affects more than 100 host species and is temperature dependant. Many susceptible hosts are major food commodities. Red tides (harmful algal blooms) are influenced by climate change and spread into new locations through ballast water from ships.

Production of crops, livestock and aquatic animals will vary according to their exposure to climatic hazards such as droughts, floods, extreme temperatures, oceanic acidification and rises in sea level. The sensitivity of each production system to those hazards will notably depend on the breed or variety of the animal or crop, the pest or disease species involved, and the geographical location. Response options will be determined by the local biodiversity which can act, to varying degrees, as regulators of pest populations.

There is a need for a better impact assessment of climate change on animal and plant pests and diseases and invasive alien aquatic species. In the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, these risks are not addressed sufficiently.

The application of risk analysis to assess risks of entry, establishment and spread of threats within the context of climate change is resource intensive and requires more reliable data. In addition, risk analyses must be re-evaluated and updated as climate continues to change. Limited resources demand cost effective approaches to risk analysis that exploit minimum data sets. Generic modelling tools that are needed to answer questions related to numerous pests and diseases should be applicable on a global scale.

Impact on food security

Animal diseases, plant pests and invasive aquatic species reduce the availability of food of appropriate quality from domestic production and imports. Although quantification of losses and potential losses due to these transboundary pests and diseases is limited, historically, animal disease and plant pest entry, establishment, emergence and outbreaks have resulted in major food problems either directly through yield reductions of food crops and losses in animal production, or indirectly through the reduction of yields of cash crops through, e.g. rinderpest, potato blight or locusts. Climate change will increase production volatility, bringing additional crises to local agricultural and aquatic production. Although specific consequences will vary according to socio-economic groups and gender, small farmers and those involved in subsistence agriculture and aquaculture will be particularly affected.

Plant and animal pest and disease regulations are designed to facilitate trade while reducing the risk of international movement of restricted organisms whose introduction could require expensive eradication or control operations. Transboundary pests and diseases affect food access through reduction in yields of food and cash crops, reduction in forest productivity and changes in aquatic populations as well as the reduction of income from animal production and increased costs of control. They also may have a substantial effect on the stability of food supply through direct losses as well as through the reduction of income. The need for quarantine of animal diseases or plant pests has an indirect effect on access to international markets.

Food-borne zoonoses, unacceptably high levels of pesticide residues and veterinary drugs due to increased and inappropriate use, and presence of mycotoxins may make food unsuitable for human and animal consumption. National regulations set maximum residue levels for national production and for import. Changes in rainfall, temperature and relative humidity will result in further spread of zoonoses and the outbreak of plant diseases that produce mycotoxins in crops such as groundnuts, wheat, maize, rice and coffee, and also may increase pesticide residues.

Policy and implementation frameworks at national, regional and international levels

Management of transboundary animal and plant pests and diseases and invasive alien aquatic species has three components: prevention, early warning and early control through eradication or containment. In case eradication or containment are not feasible, then further actions may be required to adapt to the new situation. Additional research is required to provide the scientific underpinning and tools for all components.

National animal and plant protection infrastructure is often unable to execute the range of activities required to prevent and control transboundary animal and plant diseases and pests, particularly in developing countries. Climate change effects will further strain these systems.

Learning and sharing lessons from failures as well as from successes is important. When governments reduce funding in the absence of new pest and disease occurrences, they usually suffer later from having failed to maintain capacity.

Legislation and national systems that prevent the entry and establishment of invasive alien aquatic species and aquatic diseases exist in only a limited number of countries. There is great concern over the largely unregulated movement of ornamental fish species and aquatic organisms that spread disease or become pests that impact aquatic systems.

The introduction of diseases and pests will result in higher costs to the food industry of affected countries in relation to inspection, treatment and compliance to the obligations of importing trading partners. WTO trade disputes could become more frequent. Investment in early control and detection mechanisms will undoubtedly be valuable in avoiding the higher costs of eradication and control.

Information-exchange mechanisms exist at global and regional levels. In addition to government databases, many national databases are maintained by non-governmental organizations (NGOs) and universities. Data are, however, of varying quality and are often incomplete or out of date.

The existing regional and global regulatory frameworks and standard setting mechanisms provide the structure to serve also under climate change scenarios; but regional frameworks need strengthening in many aspects and the global framework is inadequate to address invasive alien aquatic species.

Requirements for capacity building

Insufficient legislation and resources at national level

At present, most countries have insufficient enabling legislation and resources allocated to:

- surveillance and monitoring;
- border control and inspections;
- risk assessment capability;
- diagnostic tools for early detection;
- expertise in diagnosis (taxonomy);
- data collection and access to information;
- tools for rapid response to entry, establishment and spread; and
- control measures at the source.

Strengthening of national veterinary and plant health services and systems is the top priority for dealing with animal and plant pests and diseases. This requires targeted legislation and enforcement as well as capacity building in diagnostic expertise and providing for adequate infrastructure, surveillance, border control and emergency preparedness. In addition, response to movements of pests and diseases requires rapid diagnostic tools and forecasting models as well as establishment and maintenance of expertise. Investment in capacity building will contribute to reduction of emerging animal and plant pests and diseases at the source, and benefit importing countries.

This indicates that governments should: give highest priority to basic sciences such as climate change science, taxonomy, modelling, population ecology and epidemiology; and legislate and seek to establish capacity to implement systems to prevent the entry and establishment of invasive alien aquatic species and aquatic animal diseases.

At the same time, national strategies should: seek to capture synergies across the agencies responsible for managing animal and plant pests and diseases; and consider moving toward biosecurity approaches.

Priorities for national, regional and international action

Impact assessment and cost-benefit analyses at national and regional levels and methods that take a wide range of factors into account should be developed and used in strategic planning.

Coordinated research, including the Consultative Group on International Agricultural Research (CGIAR) programmes related to climate change and food security, will be needed to improve the range of options available to countries. Better accessibility and analysis of existing historical data and more detailed data for all regions in relation to different climate change scenarios will improve the baselines needed for adaptation.

Global data exchange mechanisms that cover the distribution of diseases, pests, invasive alien aquatic species and correlated ecological conditions including climate will be needed to enable risk assessment, prevention, monitoring and control.

Formulation of local, national and regional strategies for adaptation to animal and plant diseases and pests, under climate change scenarios should consider the general adaptation measures listed in the Fourth Assessment Report of the IPCC. Early detection and identification, including genotypic characterization and preparedness for and rapid response to new and emerging pests, are critical elements.

In forestry, adaptation responses will need to take a long-term ecological view and increase monitoring to cover the lag phase in pest population growth after initial establishment. They also should include data sharing, enforcement of wood packaging standards, funding for emergency control operations, control of pest or disease spread after introduction, and capacity building for better compliance by trading partners. Particular risks associated with plants for planting pathways should be addressed generically.

Countries should consider mechanisms to make full use of synergies among national infrastructures involved in animal health, plant health and invasive alien aquatic species management. In addition, where nonexistent, countries should establish legislation and national mechanisms to prevent the entry and establishment of alien aquatic species and fish diseases.

Information exchange should be improved. This will require increasing cooperation among national, regional and global organizations, and specifying the data required and the safeguards that should be applied to protect national interests. Government agencies and relevant stakeholders should come together and discuss specifications and sustainable systems for practical use.

Climate affects ecosystem processes and production at local and regional scales. As many threats are transboundary, countries will not be able to address these issues individually. Regional cooperation is a high priority for risk analysis, standard setting, exchange of information and coordinated action. Countries should examine and, where appropriate, strengthen their regional organizations and cooperation on topics dealing with animal and plan.