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联合国粮食及农业组织 Food and Agriculture Organization of the United Nations Organisation des Nations Unies pour l'alimentation et l'agriculture Продовольственная и сельскохозяйственная организация Объединенных Наций Organización de las Naciones Unidas para la Alimentación y la Agricultura منظمة الأغذية والزراعة للأمم المتحدة

EUROPEAN COMMISSION ON AGRICULTURE

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The effect of climate change on animal diseases, trade and food security in the REU region

Executive summary

- FAO, working in close collaboration with OIE, EC, WHO, EBRD and other partners, has been providing assistance to Europe and Central Asia countries in response to emerging transboundary animal diseases (TADs) through technical guidance and capacity development on surveillance, outbreak management, laboratory diagnostics, awareness raising, and policy guidance.
- However, increasing temperatures and water stress in the region of Europe and Central Asia caused by climate change could accelerate the growth of pathogens and parasites, affect the quantity, seasonality and distribution of vectors, or even introduce new diseases in areas where livestock has never been exposed to them before.
- Considering the interlinkages between climate change and transboundary animal diseases (this paper) and antimicrobial resistance (AMR - reviewed in ECA document ECA/40/17/4), FAO, together with its partners, is supporting the implementation of the One-Health approach as well as supporting capacity-building, improving access to information and services as well as developing methodologies and tools such as disease occurrence tracking measures (reviewed in ECA document ECA/40/17/5).

Guidance sought

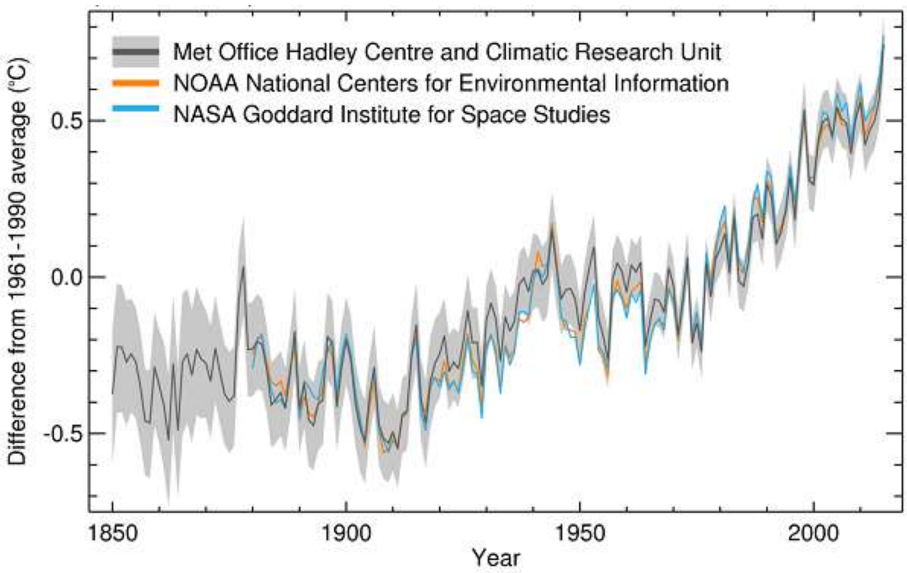
The ECA is invited to:

- Endorse the policy recommendations for members as outlined in paragraph 14.
- Endorse the policy recommendations to FAO as outlined in paragraph 15.

I. Introduction

1. Records of global average temperatures using three independent measures show that the world's climate has been warming since pre-industrial times and that warming has become more rapid since the 1970s. Europe (in particular Southern Europe) and Central Asia will see an increase in temperatures and water stress. For example, in the EU, the percentage of land area under high water stress is likely to increase from 19 percent today to 35 percent by 2070; by then the number of additional people affected is expected to be between 16 and 44 million. Furthermore, in Southern Europe and some parts of Central and Eastern Europe, summer water flows may be reduced by up to 80 percent.

Figure 1: Global average temperature anomaly for 1850–2015



Source: Met Office, 2016

2. Climate change, as well as other factors such as globalization and land cover change, all contribute to outbreaks of transboundary animal diseases – some transmissible to humans – that can affect food and nutrition security and livestock production and trade. Food safety impacts on human health and economic well-being is inextricably linked to the environment and organisms from which food is produced, and food-borne pathogens in the food chain are influenced by multifaceted interactions between the environment, micro-organisms and reservoir hosts. For example, Salmonella spp. infections increase by 5-10 percent for each degree increase in weekly temperature, at temperatures above 5ºC (Kovats et al., 2004). Some emerging studies indicate that due to increasing temperatures Europe could potentially see an extra 20 000 cases per year by 2030 and 25 000-40 000 by 2080 (EC, 2007).

3. The Europe and Central Asia region spans an extremely large diversity of agro-ecological environments. Animal production systems across this large area are correspondingly rather diverse: from strong predominance of intensive animal production in the northwest to much more extensive, even pastoralist, smallholders and animal husbandry systems in the southeast. Extensive belts of zonal environments, such as semi-deserts, steppes, forest-steppes, forests and tundra, sharing similar climatic and animal production characteristics, stretch in a longitudinal direction across Eurasia for thousands of kilometres. This significantly facilitates the longitudinal spread of diseases throughout similar agro-ecological settings. The most densely populated mid-latitudes of the area bridging Asia and Europe provide an "epidemiological Silk Road" for the spread of TADs in both directions. Middle latitudes of Eurasia experience complex climate change processes, whose effects on the epidemiology of animal

diseases need to be carefully analysed and monitored in the future in order to anticipate and prevent emerging epidemiological threats to animal production.

4. Increases in temperature could accelerate the growth of pathogens and/or parasites that live part of their life cycle outside of their host, negatively affecting livestock (Rojas-Downing, 2017). Climate change may induce shifts in disease spreading, or even introduce new diseases in areas where livestock has never before been exposed to them (Thornton et al., 2009). Evaluating disease dynamics, prioritizing the impact and assessing livestock adaptation will be important to maintain their resilience (McKintyre et al, 2017). Global warming and changes in precipitation affect the quantity, seasonality and distribution of vectors that transmit diseases, such as flies, ticks, and mosquitoes (Thornton et al., 2009). In addition, disease transmission between hosts will be more likely to happen in warmer and more humid conditions (Thornton et al., 2009). For example, Wittmann et al. (2001) used a model to simulate the response of *Culicoides imicola* in the Iberian Peninsula which is the main vector of the bluetongue virus that affects mostly sheep in southern Europe. They reported that the vector would spread extensively with a 2 C increase in global mean temperatures. What was not predicted, however, was that bluetongue virus could be transmitted through another species, *Culicoides obsoletus*, prevalent in cooler climates, which led to a major epizootic in northern Europe between 2006 and 2008.

5. It should also be noted that the effects of climate change are likely to develop over large spatial scales and accumulate over time before the effects become apparent. This calls for a change in the paradigm in which we perceive the problem of animal diseases, accounting for the broad environmental context of their epidemiology and expanding the range of disciplines and approaches likely to counteract these effects (wildlife ecology, climatology, remote sensing, GIS, niche modelling etc.). Modelled projections of how vector-borne diseases will respond to climate change can help when looking at which measures of mitigation or adaptation can be taken. Predicted spread may be prevented by good disease surveillance, improved biosecurity and early detection and reaction. Technologies such as DNA fingerprinting, genome sequencing, tests for understanding resistance, antiviral medications, cross-breeding, and understanding vector distribution will also aid in better understanding, preventing and controlling livestock diseases. Climate change is likely to cause vector-borne diseases to shift in distribution as the vector ecology and pathogen development rate strongly depend on environmental conditions. In some cases, shifts to previously unexposed populations of humans and animals could have severe or even devastating consequences (McKintyre et al., 2017). The effects of climate change on livestock diseases depend on the geographical region, land use type, disease characteristics, and animal susceptibility (Thornton et al., 2009). Animal health can be affected directly or indirectly by climate change, especially rising temperatures (Nardone et al., 2010). The direct effects are related to the increase (in scale and duration) of temperature and humidity, which increases the potential for morbidity and death. The indirect effects are related to the impacts of climate change on microbial communities (pathogens or parasites), spreading of vector-borne and food-borne diseases, host resistance, and feed and water scarcity (Nardone et al., 2010; Thornton et al., 2009; Tubiello et al., 2008).

6. In the Europe and Central Asia region climate variations have also been shown to have a profound effect on population sizes and species composition of wild and, to a lesser degree, domestic animals, through changing their reproduction or survival rates and demographic profiles (Kaeslin et al., 2012; FAO, 2013; Krivenko, 1991). Patterns of seasonal movements and distribution of waterfowl have seen dramatic changes in recent decades which might account for their increased involvement in avian influenza transmission cycles (Guillemain et al., 2013; Lehikoinen et al., 2013; Marchowski et al., 2017). These already occurring (as well as those anticipated) climatic shifts may bring about unexpected changes in endemic pathogen occurrence patterns, as well as creating opportunities for exotic pathogens to spread more extensively. Coupled with novel vectors and/or extended periods of exposure to native disease vector species all these factors may alter dynamics in the existing host-pathogen constellations and facilitate emergence and expansion of novel or exotic parasitic systems. Population and/or range expansion cycles are very well known for many highly productive species

such as, for example, rodents (Maksimov, 1984) or wild waterfowl (Krivenko, 1991), which under changing climatic patterns may behave differently from what is customary. Mass wildlife mortality events, such as the 2015 die-off of *Saiga Antelopes Saiga tatarica* in Kazakhstan (c. 250 000 antelope) also seemed to be linked to changes in climate (Putz, 2015).

7. In this regard, FAO has been providing assistance to the Europe and Central Asia countries in response to emerging TADs namely: African swine fever (ASF) in Eastern Europe; lumpy skin disease (LSD) in Balkan and Trans-Caucasus regions, and peste des petits ruminants (PPR) in Georgia. Support has included technical guidance, capacity development on surveillance, outbreak management, laboratory diagnostics, awareness raising, and the development of a practical manual for veterinarians on prevention and control of ASF[1] and LSD.[2] In addition, FAO has also supported policy dialogue on a cost-sharing of ASF prevention and control programme in Ukraine and the development of a national strategy on PPR prevention and control for Georgia. FAO works in close cooperation with OIE and the EC under the framework of the Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs), Europe, as well as in cooperation with WHO, EBRD and other partners. Finally, FAO provides capacity development and policy guidance to countries, such as Tajikistan and Kyrgyzstan, to enhance capacity of veterinary services in prevention and control of TADs.

8. The FAO European Commission for the Control of Foot-and-Mouth Disease (EuFMD Commission) works with its member countries on their preparedness to FMD outbreaks, including development of national contingency plans and their testing through real-time, field and table-top simulation exercises, disease modelling and online FMD preparedness courses. EuFMD works with European neighbours to put in place sustainable control programmes, and to support and promote the progressive control of FMD in all regions under the Global FMD Control Strategy of FAO and OIE. EuFMD is now assisting international organizations to introduce the principles of the progressive control pathway (PCP) for FMD across the world; it assists in development of risk-based strategic plans (RBSP) and supports online training and webinars. It operates a fund for applied research which supports small projects in areas of strong applied importance to Member States, and its training programmes are increasingly requested to assist countries with similar needs. It works through close partnership with DG-SANTE of the European Commission and with FAO and OIE under the GF-TADs framework to ensure coordinated support to countries which seek to progressively control FMD.

9. Climate change is also likely to impact trade through a shift in production potential and market price volatility for certain regions and the change in trade flows from higher to lower latitude areas. Water scarcity will drive trade flow in arable crops and animal feed. However a shift in trade patterns of live animals or animal products may increase the likelihood of disease incursion. Conversely, trade may be used to mitigate the impact of climate change, for example by prioritizing food imports of highly water-intensive food sourced from water-abundant countries. The 71st Session of the Committee on Commodity Problems noted that further analysis on the interfaces between climate change, trade, commodity markets and food security was needed (FAO, 2016c) and must be balanced against key political and economic drivers of trade agreements in the region which may lead to import substitutions (FAO, 2016d).

10. In this regard, the drivers of change are at the intersection of trade and food standards (for example, socio-economic factors, public health, new technology and climate change). This, therefore, requires strong national preparation and engagement in global systems for food standards, through tools provided by Codex, FAO and the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (WTO SPS) and TBT committees. For example, in December 2016, the

[1] www.fao.org/3/a-i7228e.pdf
[2] www.fao.org/publications/card/en/c/1fcf63b0-80e9-4f8e-825f-10ea6e998479/

e-learning course on Ensuring Agricultural Trade Policy Transparency was rolled out by REU to post-Soviet Union countries, with great success.[3]

11. Additional information can be found in the recent FAO-WTO joint publication on Trade and Food Standards. The publication focuses on food safety and food quality, contributing to SDGs 2, 3, 8 and 17 by providing governments with the ability to establish trade facilitation frameworks through international food standards and harmonized trade rules (FAO-WTO, 2017).

FAO REU's role

12. FAO Regional Office for Europe and Central Asia (REU) has been successful in delivering regional initiative (RI) activities for improving agrifood trade and market integration, for TAD control in the region and setting best practice on emergency preparedness, surveillance, outbreak management, laboratory diagnostics, awareness raising and communication under two RIs: "Empowering Smallholders and Family Farms for Improved Rural Livelihoods and Poverty Reduction" (RI-1); and "Improving Agrifood Trade and Market Integration" (RI-2).

13. RI-1 and RI-2 have already provided a mechanism for raising awareness and building partnerships, strengthening the work on value chain development and increasing capacity development in trade agreements and food safety standards. The newly created RI-3 on "Sustainable Natural Resource Management under a Changing Climate" has the opportunity to strengthen regional efforts in tackling the key challenges related to livestock and climate change.

Recommendations for members

14. The ECA may wish to recommend that members actively participate in the following actions:

1) **Raise awareness** of sustainable agricultural systems under climate change and create public communication programmes, in particular on TAD issues, to ensure behavioural change and active participation of all stakeholders in risk mitigation and management.
2) **Support** efforts to empower smallholders and family farms in rural economies and help them to address the issues and barriers to improve their livelihoods, in particular in improving access to information and services needed to deal with TADs.
3) **Support** capacity-building and training, the preparation of materials and manuals, and conduct simulation exercises to promote practical implementation of One-Health and animal informatics.
4) **Invite** REU countries to consider building cooperation with European Commission for the Control of Foot-and-Mouth Disease (EuFMD Commission) or joining it.

Recommendations for FAO REU

15. The ECA may wish to recommend that FAO REU:

1) Through the new REU Regional Initiative 3, **strengthen** support mechanisms for developing regional plans, improving policies and building capacity in addressing TADs.
2) **Support** the development capacity of REU member countries in WTO Sanitary and Phytosanitary Measures (WTO-SPS), in particular for compliance with TADs prevention and control measures.
3) **Promote** a One-Health approach in Europe and Central Asia and strengthen support mechanisms to member counties on issues related to early warning and responses to emerging and re-emerging transboundary animal diseases, involving multidisciplinary teams from FAO and its partners from GF-TADs Europe, Crisis Management Centre – Animal Health (CMC-AH), and OIE/FAO network of expertise on animal influenza (OFFLU).

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[3] www.fao.org/europe/news/detail-news/en/c/456710/

4) **Support** the development of capacities for regional analysis and modelling/mapping on the impact of climate change on TADs and wildlife and vector ecology. Develop predictive tools for emerging diseases, identifying regional differences in disease impacts.

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