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One Health: Addressing Transboundary Plant, Animal and Fish Pests and Diseases: A Case for Regional Cooperation

Executive Summary

Efforts to build resilience and improve food security, nutrition and livelihoods in the Near East and North Africa (NENA) region are often challenged by the continuous threat of transboundary plant (including forests, hereinafter ‘plant’), animal and fish pests and diseases. Increased movement of people, plants and animals, accentuated by conflicts and crises in the region and lack of effective control measures and coordination multiply the risk of pathogens. In addition, climate change increases the risk of new pest and disease incidence and establishment. Because of limited capacities, inadequate quarantine and surveillance measures, funds and perception of risks towards transboundary pests and diseases and their food safety implications, many countries in the region have been unable to effectively implement and monitor, or take the required measures for prevention and control.

FAO is pursuing the One Health approach, a coordinated, collaborative, multidisciplinary and cross-sectoral effort to address potential or existing risks that originate at the animal-human-ecosystems interface, in collaboration with relevant stakeholders in human and animal health, food safety, environment and climate change sectors. Building on a comprehensive regional analysis and a technical consultation with regional experts, this paper addresses the risk and impact of transboundary plant, animal and fish pests and diseases in the NENA region and the potential reflection of climate change on those threats.

A proposal is presented to create a sustainable pest and disease management mechanism through the development of a regional cooperation programme, governed by a Steering Body (composed of NENA member countries and development partners) and supported and facilitated by FAO, while strengthening existing initiatives such as the Mediterranean Animal Health Network (REMSA) and the Near East Plant Protection Organization (NEPPO). The proposed programme is expected to boost

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regional and national collaboration through improved coordination, information sharing and early warning as well as to facilitate timely response to pest and disease incidence and outbreaks.

Guidance Sought from the Regional Conference

The Regional Conference may wish to:

- welcome the efforts and actions undertaken by member countries, FAO and partners in developing strategies and programmes for combating transboundary plant, animal and fish pests and diseases;
- call on countries to develop collaborative strategies and plans to manage risks of transboundary plant, animal and fish pests and diseases in times of crisis, including through monitoring and strengthening of cross-border surveillance and dialogue;
- call on FAO to support countries in the NENA region in developing a regional cooperation programme in line with the One Health Approach, aiming at:
 - coordinating regional efforts to combat the transboundary pests and diseases; and
 - improving the performance of national plant, animal and fish health services for better and timely control of transboundary diseases, particularly those that seriously affect the rural poor.

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I. Introduction

1. Risks of introduction and spread of pests and diseases have been dramatically exacerbated by the increased movement of people, plants, animals and their products, and by the recent influence of climate change. Frequent incidences of pests and diseases have been reported in places where they have not been reported before. As a result, transboundary plant, animal and fish pests and diseases have considerably and negatively affected agricultural production, and have caused serious damage and substantial economic losses, resulting in severe impact on producers' income and livelihoods, resilience, food security and nutrition, national economies and international trade. These include all pests and diseases affecting plants and animals, which are able to move long distances. Some of these diseases are able to move actively (for example, flying pest insects), but the majority is spread by many factors that allow and facilitate their passive movement from one region to another (i.e. travel, agricultural trade and vector movements).
2. Heavy annual losses in crop, animal and fish production are triggered by pests and diseases, estimated at 25 to 30 percent of global production, representing a considerable negative economic impact. Likewise, according to the FAO Global Forest Resources Assessment¹, forest pests damage some 35 million hectares of the world's forest annually, of which over five million hectares were reported from the Mediterranean region.
3. The effects of climate change on the increasing spread of new transboundary pests and diseases cannot be ignored. The distribution of pests and infectious diseases (affecting plants, animals and fish) and the timing and intensity of outbreaks are often closely linked to climate. Climate change has put many countries at significant risk, and its impact is exerting pressure on the scarce resources of these countries. Temperature is globally increasing, moisture is changing to higher or lower levels depending on the region and CO₂ atmospheric concentration is rising all over the world. Frequency of extreme meteorological phenomena (droughts, heavy precipitation events, inundations, etc.) is increasing, causing human and agricultural losses. In addition, the plant, animal and fish health situation is deteriorating in some NENA countries with poor services due to ongoing conflicts.
4. Antibiotic treatment is often carried out as one of the consequences of Transboundary Animal Diseases (TADs). Despite not having an effect on viral diseases, animals are often slaughtered without respecting the waiting periods for antibiotic residues in meat. This leads to a human intake of contaminated meat, affecting food safety and increasing the risk of developing antimicrobial resistance (AMR).
5. The food chains in the NENA region need enhancement to prevent foodborne diseases, food contaminants and ensure food safety management along food chains to guarantee food safety and to prevent trade disruptions. Appropriate mechanisms are needed to promote food safety emergency preparedness and to build resilient agrifood chains. Foodborne diseases and food contaminants still need more attention in the NENA region.
6. The aim of this paper is twofold: (i) to highlight the status of the most significant – in terms of economic impact – transboundary plant, animal and fish pests and diseases in the NENA region; and (ii) to propose a regional programme as a tool to strengthen regional cooperation in addressing transboundary pests and diseases. The programme aims to improve the performance of national plant, animal and fish health services of the NENA countries to enable better monitoring, prevention, early detection, and effective and timely control of transboundary plant, animal and fish pests and diseases.

II. Transboundary plant pests and diseases

7. Plant pests and diseases threaten food security and nutrition around the world and seriously compromise food security in the NENA region, with severe economic and environmental consequences.

¹ <http://www.fao.org/docrep/013/i1757e/i1757e.pdf>

Most of these transboundary diseases are transmitted by propagative plant material and have no curative measures. Therefore, prevention remains as the most efficient strategy. Some emergent plant pests and diseases with significant impacts in the NENA region are briefly described below; some are already reported in some countries while others pose an imminent threat in the region.

A. Transboundary plant insect pests

8. **Fall armyworm (FAW) (*Spodoptera frugiperda*)**. This insect seriously affects food security and nutrition in the NENA region. The FAW feeds on more than 80 plant species, and causes yield losses up to 100 percent. The pest has been spreading rapidly in the last years in the majority of middle and South African countries and has been introduced to the Sudan in late 2016. Other significant insect threats such as the **Red palm weevil (RPW) (*Rhynchophorus ferrugineus*)** cause the loss of tens of thousands of palm trees. The economic losses caused by RPW in 2009 in the Gulf countries ranged from USD 1.74 million to USD 8.69 million. Furthermore, the **fruit flies (*Bactrocera zonata*, *Bactrocera dorsalis* and *Drosophila suzukii*)** remain at the top of the list of devastating insects in the NENA region, causing severe losses to fruit crops. For example, the damage due to ***Bactrocera dorsalis*** was estimated at EUR 320 million in the Near East. Forests are also affected by such dangerous transboundary insects. A recent example is the **Western Conifer Seed Bug (WCSB) (*Leptoglossus occidentalis*)** detected in 2013 in Lebanon causing loss of pine seed production estimated at 10 000 hectares of stone pine forests.

B. Transboundary plant diseases

9. The latest outbreak of ***Xylella fastidiosa*** in Italy highlighted the potential danger of transboundary plant diseases when they turn into an epidemic. The diseases caused by a pathogenic bacterium introduced to Europe from America, infected more than 230 000 hectares causing losses to Italy's economy estimated at EUR 1 billion in 2016. The **Citrus greening**, known as ***Huanglongbing (HLB)*** is another example of transboundary plant diseases associated with the bacterium ***Candidatus Liberibacter*** that compromise citrus production in the NENA region. Economic losses caused by **HLB** in the United States in 2007-2008 season was estimated at USD 9.1 billion. Fungal transboundary pathogens like ***Fusarium oxysporum f. sp. cubense (Foc)*** the causal agent of **Fusarium wilt of banana** is considered as one of the most destructive of all plant diseases, responsible for losses estimated at USD 2 billion, at least. Other *Fusarium* spp. is: ***Fusarium oxysporum f. sp. albedinis*** the causal agent of **Fusarium wilt of date palm** (or Bayoudh), which destroyed 3 million date palm trees in Algeria and 10 million in Morocco. Forest diseases such as **Boxwood Blight** caused by ***Cylindrocladium pseudonaviculatum*** were introduced to the NENA region in 2012, causing sudden leaf and twig blight of up to 80 percent of the infected area.

C. Transboundary invasive weeds

10. Invasive weeds cause yield losses ranging from 30 to 70 percent and reach 80 to 100 percent in some crops. **Water hyacinth (*Eichhornia crassipes*)** is one of the most serious invasive weeds in the NENA region. This aquatic weed affects water quality and ecological communities of water in addition to fish. The annual economic impact in seven African countries has been estimated at USD 20 million. **Whitetop weed (*Parthenium hysterophorus*)** and **Silverleaf nightshade (*Solanum elaeagnifolium*)** are among the most dangerous transboundary weeds due to their various modality of spread making their control remarkably difficult. An example of forest transboundary weeds is **Paulownia tree** or **Kebreet tree (*Ailanthus altissima*)** that grows rapidly, outcompeting many other plant species for light and space and produces toxins that inhibit the growth of other plants.

III. Transboundary animal diseases

11. The NENA region, characterized by severe desertification and increasingly limited water resources, counts on livestock for food security, nutrition, employment and agricultural livelihoods. Livestock production systems are diversified with predominantly extensive and traditional animal husbandry using land areas where crop production is not feasible.

12. Zoonoses make up 26 percent of the infectious disease burden in the region. Furthermore, over 20 percent of animal production losses are caused by animal diseases, seriously affecting trade in livestock and their products, considered of great importance to all countries in the region. At present, the NENA region is affected by repeated transboundary animal disease outbreaks such as **foot and mouth disease (FMD)**, **peste des petits ruminants (PPR)**, and **highly pathogenic avian influenza (HPAI)**. Examples of animal diseases that are of major concern to the NENA region are described below.

A. Animal diseases (non-zoonotic)

13. **FMD**, caused by *Picornavirus*, is a highly contagious animal disease, causing serious losses in production and international trade, impacting the economies of affected countries (losses are estimated between USD 6.5 billion and USD 21 billion per year). **PPR** caused by *Morbillivirus*, is highly contagious and causes USD 1.5 billion to USD 2 billion losses each year, having a negative impact on food security. **Sheep and goat pox**, caused by *Capripox virus*, is also endemic in the region.

B. Zoonotic diseases

14. **HPAI**, caused by *Influenza* virus, causes severe economic losses for the poultry industry and affects the livelihoods of smallholders.

C. Aquatic animal diseases

15. Emerging aquatic animal diseases and climate change-induced problems threaten not only the marine ecosystem, but also the shrimp and tilapia aquaculture industries in the NENA region, with significant economic impacts. **White spot syndrome virus (WSSV)** affects shrimp, and is considered as one of the most pathogenic and devastating viruses for the shrimp industry worldwide. The total economic damage caused by WSSV to the shrimp aquaculture industry has been estimated at USD 8 billion to USD 15 billion since its emergence.

16. **Acute hepatopancreatic necrosis disease (AHPND)**, is caused by a virulent strain of *Vibrio parahaemolyticus*. Annual worldwide economic losses are estimated at USD 100 million.

17. **Hepatopancreatic microsporidiosis (HPM)**, is caused by *Enterocytozoon hepatopenaei* and affects shrimp.

18. **Tilapia Lake Virus (TiLV)** has been emerging as a significant disease of farmed and wild tilapia since 2009. The pathogen is suspected as the cause of a significant reduction in tilapia wild catch in the Sea of Galilee in 2009, putting at significant risk the USD 7.5 billion global tilapia industry.

IV. Climate change influence on plant, animal and fish pests and diseases

19. Temperature, moisture and CO₂ are the major climate components which are shifting due to climate change. Average global temperature is rising, moisture levels are fluctuating and atmospheric CO₂ is increasing. Climate change impacts will vary among regions. Extreme climatic phenomena such as exceptionally high temperatures and unusual flooding are expected to occur more frequently. All these climate changes will have crucial impacts on the evolution of pathogens and pests.

20. Regions with low temperature will likely harbour more plant pathogens with future rising temperatures caused by the global warming. For example, wheat leaf rust would develop earlier due to an increase of temperatures earlier in the season. Wheat yellow rust is now developing heat-tolerant strains that can make the disease spread more as epidemics. In case of moisture increase, many humidity-prefering pathogens such as apple scab and potato late blight will spread more extensively. In contrast, pathogens like the powdery mildew causal agent would develop better in lower humidity. For plants,

the higher CO₂ level would intensify growth resulting in bigger canopies and higher moisture favourable to the majority of pathogens.

21. Climate change will directly affect the behaviour, reproduction rates, geographic distribution ranges, overwintering success, and pesticide resistance and dispersal ability of plant transboundary pests. Climate change would also affect host-plant physiology, plant-pest interactions, plant pest enemy populations and management strategies of plant pests. It has been shown that rising temperature enhances the rapid multiplication of certain insects. Moreover, chemical pest management would undergo considerable modifications, for example, some pesticides, such as pyrethroids and spinosad lose their efficiency at higher temperatures.

22. Rising temperatures would enhance the expansion of invasive weeds into higher altitudes and latitudes. More rainfall and moisture would favour their development and higher CO₂ levels would stimulate their photosynthesis. In addition, any factor that increases the environmental stress on crops would make them less competitive against weeds.

23. Climate change influences livestock diseases through several direct and indirect ways. Vector-borne diseases are especially sensitive to climate change. Changes in rainfall and temperature and flooding due to extreme climatic events may affect the distribution and abundance of disease vectors. A rise in temperature increases the rate of transmission by increasing vectors' feeding interval and development rate, leading to an extension of vector habitats. Climate stress lowers animal immunity and ecosystem structure and function are altered.

24. Aquatic animals are rather vulnerable to climate change as water is their life-support medium and their ecosystems are fragile. Climate change impacts may include changes in pathogen virulence and transmission, local extirpations and introductions. Rising temperatures caused by El Nino may compromise host resistance and increase the occurrence of opportunistic diseases. Increase in frequency and/or intensity of storms may lead to the introduction of disease or predators into aquaculture facilities during flooding episodes.

25. One of the remarkable climate change impacts on fishery is Harmful Algal Blooms (HABs), that happen when tiny algae or marine plants rapidly multiply resulting in depleted oxygen in the water or the production of natural toxins. These toxins could kill fish and make shellfish dangerous to eat, in what is commonly known as "red tide" because the overgrowth of algae usually turns the seawater red. It is seriously affecting some countries in the NENA region for example, Kuwait, Oman and the United Arab Emirates.

V. Interventions by FAO and member countries to address transboundary plant, animal, and fish pests and diseases

26. At the global level, FAO established the Food Chain Crisis Management Framework (FCC), an integrated approach combining prevention, early warning, preparedness, and response to emergencies affecting the food chain to address the challenge of increasing outbreaks of transboundary plant and animal pests and diseases, including forest pests and aquatic diseases, food safety and radiation events. The FCC enables the utilization of the relevant technical and operational capacities and expertise of FAO under one governance to address transboundary threats, and to strengthen capacities of countries to prevent food chain crises. This includes support to adequate surveillance, monitoring and forecasting of threats, early warning, risk analysis, early detection, preventive and risk mitigating practices, better preparedness and response, communication, coordination, and the adoption of adequate policies. In addition, FAO developed an AMR strategy, assisting countries in their efforts to stop the overuse of antibiotics, create awareness, tighten control in animal production and through the food chain, and foster close collaboration with the human health sector.

27. Based on member countries' contributions, FAO has been successfully leading several regional and interregional programmes/initiatives to control different transboundary/migratory pests. One of

these important plant disease control programmes is the ongoing programme against wheat rusts. The programme has been coordinated by FAO through its Wheat Rust Disease Global Programme (WRDGP) since 2008. This programme provides policy and technical support to the concerned countries, in the context of the Borlaug Global Rust Initiative (BGRI). It can be considered as a good example to follow for combating many diseases threatening the NENA region.

28. Historically, one of the most important cases of successful transboundary plant pest combat is that against the Desert Locust (DL), which is well managed by FAO and member countries via the Desert Locust Control Committee (DLCC). This Committee coordinates three FAO regional commissions for controlling the DL: (i) the Commission for Controlling the Desert Locust in the Western Region (CLCPRO); (ii) the Commission for Controlling the Desert Locust in the Central Region (CRC); and (iii) the Commission for Controlling the Desert Locust in South-West Asia (SWAC).

29. The Desert Locust Commissions were established as a collaborative programme in which affected countries, regional organizations, donors, and FAO participate in the development of improved preventive control strategies. One of the core elements of the risk prevention approach adopted by the Commissions is harmonizing national, regional and international DL early warning systems and information management tools to allow permanent monitoring of the DL developments to enhance decision-making in rapid response management, programming, prioritization and targeting. The impact of better DL risk management, investments in early warning systems, capacity building and contingency planning as part of the preparedness efforts became evident to the CRC in terms of cost, area infested and treated, and crop damage during the DL crisis in 2003–2005 and beyond. The cost of the campaigns amounted to just USD 7 million compared with over USD 400 million in Northwest Africa in a case of absence of prevention systems.

30. For facilitation of the regional cooperation to combat plant and animal pests and diseases that are capable of striking across national boundaries, the Emergency Prevention System (EMPRES) for transboundary animal and plant pests and diseases was established in 1994. The DL component of EMPRES in the central and western regions can be considered as an important success model. It supported enhanced collaboration, increased resilience and reduced threats of DL to livelihoods.

31. EMPRES also plays a major role in the control of TADs, for example HPAI, through surveillance, strengthening of veterinary services and diagnostics, risk analysis, awareness building and strong collaboration with the human health sector for zoonotic diseases. The global eradication of rinderpest achieved in 2011, in which FAO provided technical support to the countries, in strong collaboration with the international community, is seen as a milestone in the eradication of TADs. The Emergency Centre for Transboundary Animal Diseases (ECTAD) is FAO's corporate centre for the planning and delivery of veterinary backstopping for member countries in responding to the threat of transboundary animal health crises.

32. In 2016, FAO and the World Organisation for Animal Health (OIE) launched a global eradication campaign for PPR, which counts on a multisectoral effort at national, regional and international level to eradicate the disease by 2030.

33. Through the Progressive Control Pathway for Foot and Mouth Disease (PCP-FMD), a tool developed by FAO, NENA member countries receive FAO/OIE assistance to progressively reduce FMD occurrence. The PCP-FMD is the backbone of the Global FAO/OIE FMD Control strategy.

34. With the support of some NENA countries, the Regional Commission for Fisheries (RECOFI) was established to promote the development, conservation, rational management and best utilization of living marine resources, as well as the sustainable development of aquaculture, including addressing the fishery industry threats such transboundary fish diseases. The current RECOFI member countries are Bahrain, Iran (Islamic Republic of), Iraq, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates.

35. Member countries in NENA exert significant efforts to address transboundary plant, animal, and fish pests and diseases in their respective countries. FAO supports these efforts through various mechanisms including Technical Cooperation Programme (TCP) projects, the Regional Initiative on Building Resilience for Food Security and Nutrition (RI-FSN) and projects funded by extrabudgetary resources. FAO's support focuses on contributing to national policies, building capacities, strengthening early warning systems, raising awareness, managing knowledge and promoting regional cooperation and collective actions.

VI. Towards effective regional cooperation to address transboundary pests and diseases in NENA

36. Climate change has created new ecological niches for the establishment and spread of dangerous plant, animal and fish pests and diseases. The introduction and unexpected spread of these pests and diseases will further jeopardize food security, nutrition and livelihoods, limit international trade and force each NENA country to allocate more resources for their management, without guaranteed success.

37. Countries in the NENA region are facing significant challenges in implementing the wide range of diversified measures to address transboundary plant, animal and fish pests and diseases including prevention, early warning and early response. Insufficient national capacities and the lack of proper regional cooperation programmes are contributing to these challenges and limiting surveillance, border controls and inspections, risk assessments, proper diagnosis and effective timely response.

38. Plant, animal and fish health are considered as International Public Goods. The transboundary nature of some plant, animal and fish pests and diseases makes it impossible for a single country to adequately address them alone. Therefore, regional cooperation among NENA countries becomes vital to create synergy in order to analyse threats, exchange useful information, coordinate response actions and establish standards in harmony with the standards of the International Plant Protection Convention (IPPC) and OIE.

39. The establishment of the proposed regional cooperation programme should build on the successes and lessons learned from different intra and interregional programmes/initiatives, such as the initiatives to combat the DL and wheat rusts, with an emphasis on South-South Cooperation. FAO may consider the establishment of an account as a funding mechanism to financially support the proposed sustainable pest and disease management mechanism. This account should be financed by NENA member countries and donor organizations, and managed by a regional Steering Body composed of representatives from NENA member countries and development partners. The Steering Body would govern a programme that organizes and coordinates the cooperation between NENA countries in terms of transboundary plant, animal and fish pests and diseases, and future climate change influences.

40. This undertaking for a better future of the NENA region will require adequate funding with significant contributions from the member countries and donor organizations. FAO could act as a host to administer fund governance and management. This proposal for a NENA Regional Cooperation Programme includes several key aspects described below.

A. Improved preparedness

41. Socioeconomic studies will be conducted at national and regional levels to determine priorities for intervention to control plant, animal and fish pests and diseases.

42. To support efficient and effective responses, networks of surveillance and early warning based on risk evaluation in the NENA countries will be established.

43. For better prediction, prevention, and management of pests and diseases, capacity building activities related to plant and animal health services, including extension services, diagnostic laboratories and research institutions will be implemented.

B. Facing transboundary threats

44. Considering the high threat of transboundary pests and diseases, existing national programmes will be harmonized with a coordinated regional strategy.

45. For transboundary animal diseases, in particular, region wide sound contingency plans, standard operating procedures (SOPs) and coordinated prevention programmes based on active surveillance and appropriate control measures will be established, and national and regional reference laboratory networks will be enhanced.

C. Preparedness for climate change

46. In order to face the influences of climate change, more efforts must be made towards:

- 1) conducting predictive modelling studies to map areas where threatening pests and diseases may spread more or less actively;
- 2) using advanced up-to-date technologies to forecast climatic events;
- 3) conducting studies to predict natural climatic conditions and develop mechanisms of appropriate early response to prevent negative consequences on crops and animals.

D. Integrated and interdisciplinary approaches (the One Health approach)

47. In the framework of the One Health concept, national committees will be established bringing together human, fish, animal and plant health professionals to develop a common strategy.

48. At the producer level, the most appropriate prevention and efficient integrated pest management (IPM) techniques will be developed and provided to the producers.

E. Appropriate regulations

49. To optimize the quality and effectiveness of the prevention and control systems for pests and diseases, legislations and regulations will be developed, where appropriate, taking current international standards into account.

50. For harmonized cooperation at the regional level, common standards for the regulation and control of transboundary pests and diseases will be developed in accordance with the FAO-IPPC and OIE standards.

51. Capitalizing on the capacity building activities of the regional and subregional commissions of the League of Arab States and Arab Maghreb Union and the network of NEPPO for better coordination among countries.

VII. Conclusions

52. NENA countries are struggling to keep transboundary plant, animal and fish pests and diseases under control. The efforts to improve livelihoods, resilience and food security of human populations in the region are continuously threatened by the emergence and spread of pests and diseases.

53. Sustainable food production in the NENA region requires specific solutions, policies and investments. Ensuring higher levels of efficiency, early warning and reaction to threats to food systems requires sound planning, while taking into account the following facts:

- 1) Many countries in the world (including the NENA countries) are not adequately prepared to effectively respond to new and emerging transboundary plant, animal and fish pests and diseases.

Activities of prevention, early warning, control, eradication and containment are not conducted to the fullest extent possible.

2) Human resources and logistical capabilities of NENA countries are generally not at a level sufficient to face large and urgent plant or animal health issues.

3) Given the international dimension of plant, animal and fish health issues, they are considered as International Public Goods.