Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

AVERTING RISKS TO THE FOOD CHAIN

A compendium of proven emergency prevention methods and tools

SECOND EDITION

FOOD CHAIN CRISIS | EMERGENCY PREVENTION SYSTEM

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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FOREWORD

As the number of transboundary pest and animal and foodborne disease outbreaks rises, so does the number of people who are chronically hungry due to these and other factors. The correlation can be explained by the link between our health and that of the planet. We rely on land and sea for the production of safe and quality foods for our daily nourishment. Pests and disease epidemics negatively impact the quality, quantity and safety of our food sources, and cripple economic growth and efficiencies in production. Furthermore, the epidemic and endemic levels of the pathogens and disease vectors can be difficult to control. This is why FAO stresses and promotes the special efforts required for cost-effective preventive measures rather than the more expensive control, disinfestation, treatment and disposal measures. When preventive measures are late or difficult, preparedness and contingency plans must be in place to enable rapid response. Early warning systems, based on close monitoring, surveillance, and timely reporting are fundamental to warn and empower communities to safeguard their livelihoods and assets by enhancing disease and pest prevention measures and for government services to take immediate measures to protect communities and national economies.

To illustrate this point, take, for instance, the Fall armyworm (FAW). When the caterpillar-like insect spread from the tropical and subtropical regions of the Americas, where generations of farmers have coped with it, to West and central western Africa in early 2016, FAW immediately started depriving local populations of their maize and other crops. Its voracious appetite for a wide range of crops (up to 80), combined with an ability to fly up to 100 km per night in moth stage, allowed FAW to expand southward and spread beyond continental Africa, threatening livelihoods particularly in sub-Saharan Africa, North Africa, Near East and South Asia. Clearly, this transboundary threat to the food chain calls for urgent and coordinated international action.

In response, FAO is leading the global coordinated response and provides countries with support, starting with recommendations on pest and pesticide management. FAO has developed tools to build early warning, monitoring and response mechanisms, including farmers' manuals or guides, mobile applications, web platform and conduct risk assessment, risk modelling and mapping. To mitigate the damage, FAO has worked with countries to develop action plans and policies and train farmers and extension workers.

FAW is just one of the destructive transboundary pests distressing precious crops on which FAO has worked in the last two years, the period covered by this Compendium. FAO has also provided technical and policy support to countries facing problems with locusts, bark beetles, red palm weevils and fruit flies as well as plant diseases afflicting banana, cassava, wheat and several more, for which the price has been too high. Some 20 to 40 percent of crop production are lost to pests every year while plant diseases cost the global economy around USD 220 billion annually.

Another disconcerting trend is the upsurge in zoonotic diseases, such as H5N1 Higly Pathogenic Avian Influenza, Avian Influenza A (H7N9) and the pandemic influenza virus H1N1 and Rift Valley fever, which directly cause illness and death in humans. These highly contagious animal diseases can spread rapidly, crossing national borders and causing epidemics. Other livestock diseases are known to jump between regions and crossing borders, such as African swine fever (ASF), Foot-and-mouth disease (FMD) and Peste des petits ruminants (PPR) have direct consequences on livestock, livelihoods of rural communities and smallholders impacting food security and nutrition, though they do not affect public health directly. The economic impact of the disease burdens on livestock farmers and on trade is difficult to ascertain but estimated at over USD 400 billion annually. Livestock contributes a global average of 43 percent to agriculture's GDP – yet livestock services and veterinary care falter in terms of being able to safeguard such investments through improved prevention and effective response.

Through cases such as these, this publication shows the ways the FAO Food Chain Crisis Management Framework (FCC) addresses threats to the food chain in the areas of animal health, plant protection and food safety. Tapping

FOREWORD

on expertise across disciplines and working alongside other international organizations and partners, FAO supports Member Countries in preventing, preparing, detecting, responding to and recovering from the food and agriculture threats and impacts in an integrated way, from food production to consumption. Here, you will see how early warning, prevention and rapid response can make a difference when threats arise.

Efforts to stop the pathogens and pests that cause our crops to fail, animals to fall sick or compromise the safety of our food must be able to count on national and global structures to prevent and mitigate their impact. As the factsheets comprising this Compendium were being produced, the international community was advocating for better awareness and concerted action. Thanks to these efforts, which met with the approval of the United Nations General Assembly, we will celebrate World Food Safety Day every 7 June and the International Year of Plant Health in 2020.

With globalization and climate change altering the presence and distribution patterns of pathogens, the challenges ahead are daunting. Knowing how to face animal and plant diseases and pests and food safety threats is critical in the fight against hunger, malnutrition and poverty. Together we must strive to maintain the balance and sustainability of natural resources in the planet so it continues to allow us to produce the food we need, assured biodiversity, and economic growth for generations to come. This is all about global sustainable development!

Bukar Tijani
Assistant Director-General

FAO AGRICULTURE AND CONSUMER PROTECTION DEPARTMENT

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EXECUTIVE SUMMARY

The importance of prevention cannot be overestimated. In this environment of climate change and global marketing of agricultural products, transboundary diseases, pests and threats to the food chain are increasing, so that every effort must be made to prevent them from being introduced and spreading to new environments. Prevention can save lives, save livelihoods and save money.

The purpose of this second edition of the Compendium of monthly FCC-EMPRES information sheets is to share lessons learned over the last two years on the prevention and control of high-impact animal and aquatic diseases, plant and forest pests and diseases and food safety incidents.

The Compendium outlines what FCC-EMPRES teams did, what they grasped, and what the challenges to managing transboundary threats are, so that other initiatives may benefit and build upon the knowledge and best practices shared in the stories. Antimicrobial resistance, Fall armyworm (FAW), and African swine fever (ASF) are some of more widely known topics covered in this volume that are currently posing threats to public health, food safety and security, as well as to livelihoods, animal production and economic and agricultural development.

The intensification of agricultural production has led to a rise in the use of antimicrobials – which could more than double by 2030. To remain effective in the treatment of animal and plant diseases, antimicrobials must be used responsibly and only when needed. FAO supports governments, producers, traders and other stakeholders to move towards the responsible use of antimicrobials in agriculture, thus helping reduce antimicrobial resistance in agricultural systems. FAO supports related regional, national and local efforts through capacity building, technology transfer and knowledge-sharing, as well as working in partnership at global level with the World Health Organization (WHO) and the World Organisation for Animal Health (OIE). The three Organizations, known as the Tripartite, focus on developing the capacities of lower-income countries to stop the proliferation of antimicrobial resistant bacteria.

Fall armyworm has spread to across sub-Saharan Africa, except two countries, and is now present in Asia as well. The pest becomes more destructive as it feeds on more crops and different parts of crops, increasingly growing an appetite for sorghum and millet, in addition to maize. The tens of millions of small-scale maize farmers in sub-Saharan Africa have been most affected by Fall armyworm.

From the outset, FAO has promoted a coordinated response to FAW. For instance, it took the lead in the development and establishment of the FAW monitoring and early warning system and utilized the specific expertise of other institutes. A mobile phone application, FAMEWS (Fall Armyworm Monitoring & Early Warning System), has been developed in English and French to help farmers and field scouts by collecting data from pheromone traps set to monitor outbreaks in the fields. Currently, innovative technologies are being considered to monitor FAW and diagnose damage using drones, remote sensing, artificial intelligence learning, and Google Earth Engine.

Preventive and preparatory measures have proved useful. A recent example can be found in China, a major pork-producing country. With approximately half of the swine in the world (approximately 500 million in number) being located in China, the swine value chain involves a wide range of producers from small family holdings to large-scale commercial operators.

Given the importance of the sector, China and FAO had anticipated that African swine fever (ASF) could one day arrive in the country. While the disease poses no direct threat to human health, outbreaks can be devastating with the most virulent forms lethal in 100 percent of infected animals. And there is no effective vaccine to protect swine from the disease.

EXECUTIVE SUMMARY

So when ASF was detected in China in August 2018, protocols and detection plans had already been developed. Thanks to work carried out over a period of several years, veterinary authorities and others have been able to respond quickly and isolate areas where ASF detections have occurred. However, its detection in areas more than one thousand kilometres apart within the country could mean the deadly pig virus may spread to other Asian countries anytime.

These are some examples of cases where FAO is making a major contribution to assist Member Countries in preventing and controlling transboundary threats to the food chain.

This publication, based on 22 FCC-EMPRES information sheets published on a monthly basis by the FCC Intelligence and Coordination Unit of the FAO Agriculture and Consumer Protection Department, highlights some of the best practices currently in use. The easy-to-use Compendium is structured by area:

- FCC Intelligence and Coordination in blue,
- EMPRES Animal Health in red,
- EMPRES Plant Protection in green, and
- EMPRES Food Safety in orange.

While the stories cannot reflect the full complexity of the work or activities undertaken by FCC-EMPRES teams, they provide a snapshot of some current challenges and recent successes.

Readers will gain an understanding of how information systems, early warning mechanisms, tools, manuals and guidelines can facilitate monitoring, detecting and assessing threats to animal and plant health and food safety, as well as assist Member Countries in developing policies, strengthening preparedness, and communicating to allow for timely actions.

We invite readers to scan through the table of contents to identify the methods and tools that are most suitable to their local needs. The knowledge gained in various parts of the world on an array of topics contained herein should help others save lives, livelihoods and money.

FOOD CHAIN CRISIS EMERGENCY PREVENTION SYSTEM

to protect food security, livelihoods and human health

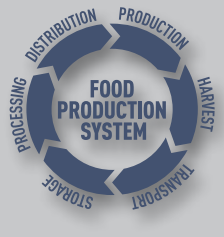
THE CHALLENGE

TRANSBOUNDARY THREATS THREATEN THE FOOD CHAIN CONTINUOUSLY

CAUSES OF INCREASED FOOD CHAIN EMERGENCIES

GLOBALIZATION

INTENSIVE FOOD PRODUCTION SYSTEMS



CLIMATE CHANGE

- rising temperatures
- extreme weather conditions
- droughts and floods
- changes in precipitation patterns

DEMOGRAPHIC GROWTH

7.6
BILLION IN 2017 [1]

[1] UN, 2017

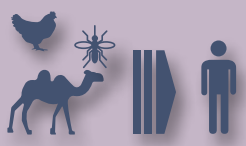
URBANIZATION

68%
OF THE WORLD'S POPULATION WILL LIVE IN CITIES BY 2050 [2]

[2] UN, 2018

INCIDENCE AND LOSSES

APPROXIMATELY **70%** OF DISEASES AFFECTING PEOPLE HAVE ANIMAL ORIGINS



SOME **20% TO 40%** OF GLOBAL CROP YIELDS ARE LOST EACH YEAR TO PLANT PESTS AND DISEASES

ESTIMATE OF GLOBAL LOSSES DUE TO SHRIMP DISEASES IS MORE THAN **USD 3 BILLION** [3]

[3] FAO, 2009

FOREST INSECT PESTS AFFECT MORE THAN **85 MILLION HECTARES** [4]

[4] FAO, 2015

MORE THAN **200 DISEASES** ARE SPREAD THROUGH FOOD [5]

[5] WHO, 2016

IMPACT ON LIVELIHOODS

NEARLY **1 BILLION** OF THE WORLD'S POOREST PEOPLE DEPEND ON LIVESTOCK FOR THEIR LIVELIHOODS [6]

[6] FAO, 2009

10-12% OF THE WORLD'S POPULATION DEPENDS ON FISHERIES AND AQUACULTURE FOR THEIR LIVELIHOODS

CROP PRODUCTION PROVIDES ABOUT **84%** OF GLOBAL FOOD, FEED AND FIBRE NEEDS

CLOSE TO **1.6 BILLION** PEOPLE RELY ON FOREST RESOURCES FOR THEIR LIVELIHOODS

CONTAMINATED FOOD ADVERSELY IMPACTS NATIONAL ECONOMIES AND LIVELIHOODS THROUGH REDUCED AVAILABILITY OF FOOD FOR CONSUMPTION

FCC-EMPRES TO PREVENT TRANSBOUNDARY THREATS TO THE FOOD CHAIN

MONITORING TRANSBOUNDARY THREATS

- **Desert Locust Information Service (DLIS)** to collect and send information from remote locations to decision-makers in good time
- **FAO Global Early Warning System (GLEWS)** to inform prevention and control measures, through the rapid detection and risk assessment of health threats and events
- **FCC forecasting approach** to predict FCC threats having a high impact on food and nutrition security and livelihoods
- **EMPRES-i Global Animal Disease Information System** to provide timely and reliable information on global animal disease distribution and current threats at national, regional and global level
- **FAMEWS global platform** to provide a real-time situation overview with maps and analytics of Fall armyworm infestations at global, country and sub-country levels

NEW TECHNOLOGIES FOR COMBATTING TRANSBOUNDARY THREATS

- **Geographic Information System (GIS)** to combine and cross-analyse a large amount of visual and numerical data and produce predictions of disease spread
- **Risk modelling tool** to predict diseases
- **EMA-i** application mobile for real-time disease reporting
- **FAMEWS** application mobile for collecting, recording and transmitting data on Fall armyworm
- **eLocust3** for recording and transmitting locust field observations during survey and control operations

MANAGING TRANSBOUNDARY THREATS

- **Contingency plans:** training and simulation exercises
- **Control methods for prevention:** quarantine, vaccination, hygiene measures, burning plant residues and ploughing the soil
- **Control methods to slow down epidemics:** zoning and information on regional movements of products/animals/plants
- **Integrated Pest Management:** environmentally sound control technologies, use of cultivars and tree breeding for resistance

CAPACITY DEVELOPMENT

- **Training**
- **Technical consultation guidelines and handbooks**
- **Information systems**
- **Standard operational procedures**
- **Letter of agreement**
- **Policy and technical support**
- **Partnership**

KEY MESSAGES

EVERY YEAR ALMOST 1 PERSON IN 10 AROUND THE WORLD FALLS ILL FROM EATING CONTAMINATED FOOD, and it is estimated that around 420 000 people die as a result. The burden of foodborne diseases is borne by individuals of all ages, but particularly by children under 5 years of age, and by persons living in low-income subregions of the world.[1]

ABOUT 60 PERCENT OF ALL HUMAN DISEASES AND OVER 70 PERCENT OF NEW DISEASES OF HUMANS HAVE ANIMAL ORIGIN, with the potential of becoming major public health threats. Transboundary animal diseases may have a significant detrimental effect on national economy systems, social systems, production systems and food systems.

GLOBALLY, ANNUAL CROP LOSSES TO PLANT PESTS ARE ESTIMATED TO BE BETWEEN 20 TO 40 PERCENT OF PRODUCTION[2]. In terms of economic value, plant diseases alone cost the global economy around USD 220 billion annually[3] and invasive insects around USD 70 billion[4].

INSECT PESTS AFFECT MORE THAN 85 MILLION HECTARES OF FOREST, of which a major part is in temperate North America.[5] However, the global area damaged by insect pests, diseases and severe weather events overall is expected to be higher than that reported.[6]

PESTS AND PATHOGENS ARE TRAVELLING FASTER AND FURTHER AND BECOMING MORE VIRULENT due to several factors such as globalized trade, intensive farming, deforestation, overgrazing, climate change, population and livestock movement due to conflicts and crises.

PREVENTING ANIMAL DISEASE AND PLANT PEST OUTBREAKS AND FOOD SAFETY INCIDENTS before they occur is essential to protecting the food chain. Most food chain crises are preventable with timely actions and the right investments.

INVESTING IN PREVENTION of transboundary animal diseases, plant pests and diseases, including forest pests and aquatic diseases, and food safety threats, is more cost-effective and protective of people's livelihoods and the environment than to respond to fully developed food crises.

1 WHO website, 2015. https://www.who.int/foodsafety/publications/foodborne_disease/fergreport/en/
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3 Agrios, G.N. (2005). Plant pathology. Fifth edition. Elsevier Academic Press.
4 Bradshaw, C.J.A., Leroy, B., Bellard, C., Roiz, D., Albert, C., Fournir, A., Barbet-Massin, M., Salles, J.M., Simard, F. & Courchamp, F. 2016. Massive yet grossly underestimated global costs of invasive insects. Nature Communications, 7(12986): 1–8.
5 FAO Global Forest Resources Assessment, 2015.
6 Changes in Global Forest Resources from 1990 to 2015. Volume 352, 7 September 2015, pp. 78-88.

KEY MESSAGES

FAO ADDRESSES FOOD CHAIN CRISES using an integrated approach, covering prevention, preparedness, early warning and timely response, needed to face food chain crises caused by transboundary animal diseases and plant pests and diseases, including forest pests and aquatic diseases, food safety threats and radiological emergencies.

FAO ADDRESSES THE RISING NUMBER OF TRANSBOUNDARY ANIMAL AND PLANT PESTS AND DISEASES AND FOOD SAFETY THREATS, through a set of emergency prevention methods and tools proving that prevention, early warning, preparedness and good food chain crisis management can improve food security, save lives and livelihoods.

SURVEILLANCE, EARLY DETECTION, EARLY WARNING, AND TIMELY RESPONSE combined with capacity development, coordination, and communication are key components of the integrated approach FAO has adopted to prevent animal diseases (including aquatic diseases), plant pests and diseases (including those affecting forests) and food safety incidents.

CARRYING OUT INTELLIGENCE, monitoring threats and trends, reporting events, developing and utilizing innovative tools and environmentally sound control technologies, are at the heart of Emergency Prevention Systems.

DEVELOPING CAPACITY at the international, regional, national and local levels increases the resilience of people, communities or systems to transboundary threats and ensures that methods and tools are operational and adapted to the needs on the ground.

STRENGTHENING GLOBAL AND REGIONAL COORDINATION, building networks and partnerships, enhancing advocacy and communication, implementing effective response campaigns, improving information services, and conducting training are among numerous effective emergency preventive methods and tools to defeat threats to the food chain.

CONTROLLING TRANSBOUNDARY ANIMAL AND PLANT PESTS AND DISEASES AND FOOD SAFETY INCIDENTS contributes to achieving multiple goals and targets set by the 2030 Agenda: ending poverty, eradicating hunger, achieving food security and improved nutrition, promoting sustainable agriculture, ensuring healthy lives, empowering women and girls, promoting sustainable economic growth and halting biodiversity loss.

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FOOD CHAIN CRISIS EMERGENCY PREVENTION SYSTEM

An integrated programme to prevent, prepare and respond to transboundary high-impact animal and plant pests, diseases and food safety events

Transboundary and high-impact animal and plant pests and diseases (including fish and forests), food safety, and radiological emergencies, are all major threats to the food chain and have a great impact on people's food security, livelihoods and health, as well as on the global economy.

Without appropriate measures dedicated to preventing, alerting, preparing for and responding to such food chain crises, transboundary threats have an increasingly disastrous impact on the lives and livelihoods of vulnerable families and on global food supply safety and availability.

FAO addresses these threats in an integrated and interdisciplinary manner through the mechanism of the Food Chain Crisis Management Framework – Emergency Prevention System (FCC-EMPRES). This mechanism is unique in that it integrates, under one roof, activities aiming to prevent and assure preparedness to food chain crises; risk analysis; risk communication; early warning; and rapid medium- and longer-term response to potential or verified emergencies threatening the food chain.

The FCC-EMPRES operates through the three Emergency Prevention Systems for early warning (EMPRES Animal Health; EMPRES Plant Protection; EMPRES Food Safety), the Emergency and Resilience Division (PSE) for emergency response, and the Coordination Unit (ICU) for intelligence and coordination.

The **Food Chain Crisis – Intelligence and Coordination Unit** (FCC-ICU) performs – as its name suggests – roles of coordination, advocacy and communication, as well as long-term risk analysis. The impetus for its creation in 2007 was to establish a single unit to coordinate the work of the three EMPRESes, to ensure the development of synergies between them.

The FCC-ICU has a key strategic function in anticipating short- and medium-term multi-threats to the food chain and coordinating the FCC's monitoring, event identification, risk assessment, early warning and prevention efforts across the food chain, anticipating crises and developing risk scenarios to strengthen FAO's preventative actions and efforts to support to preparedness at country and regional levels. Its core business contributes to overall country and community resilience. The main areas of work of the FCC-ICU are:

- substantive and procedural coordination of the FCC at policy, technical and operational levels, among the EMPRES;
- coordination and support for food chain threats by providing integrated early warning, including monitoring and risk assessment;
- provision of information on the food chain threat's contribution to the multi-threats analysis for the purposes of food security early warnings, and formulation of food chain multi-threats risk analyses on crop, animal production, fisheries, forestry and food trade, including anthropogenic drivers, globalization and climate change;
- supporting the provision of intelligence on food chain threats, and foresight in facilitating expert consultations on emerging food chain threats, including within the context of shocks such as natural disasters and protracted crises;
- supporting networking, strategic partnerships and resource mobilization relating to activities food chain threats;

FOOD CHAIN CRISIS EMERGENCY PREVENTION SYSTEM

- supporting integrated and coordinated technical communication efforts on food chain threats and related early warning efforts.

The EMPRES for Transboundary Animal and Plant Pests and Diseases is a global public good established in 1994 with the goal of enhancing world food security and fighting transboundary animal and plant pests and diseases. To contribute to the efforts to reduce the adverse impact of food safety emergencies regarding global food security and public health, EMPRES Food Safety was established in 2009 to complement the two previously established EMPRES systems (in animal health and plant protection).

FCC-EMPRES contributes to increasing the resilience of livelihoods to threats and crises, addressing policies and the institutionalization of strategies, early warning systems, risk and vulnerability reduction, and preparedness and response to disasters.

The main results achieved by FCC-EMPRES are: improved surveillance of threats to the food chain; risk analysis, including threat risk analysis; early detection, early warning and early reaction to threats; contingency planning for better preparedness; coordination with partners; communication of risks; promotion of environmentally sound control technologies; and closer collaboration and partnership with affected countries, with national and international agricultural research centres, and other international institutions.

The main objective of these results is to prevent food chain crises, and to respond to them on an effective and timely basis if they occur.

FCC-EMPRES conducts ongoing work at global, regional and country levels, and mechanisms for implementation are already in place. It is necessary to enhance, expand and support these mechanisms to strengthen countries' capacities to face food chain threats. Solid partnerships with international and regional organizations, research institutions and national authorities are also in place. Key partners include the World Organisation for Animal Health (OIE), the World Health Organization (WHO), the African Union – Interafrican Bureau for Animal Resources (AU-IBAR), International Agricultural Centres (CG Centres), and the National Agricultural Research System (NARS).

Investing in FCC-EMPRES is advantageous in the long term, because the prevention of food chain crises saves lives, saves livelihoods and saves financial resources.

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ANTIMICROBIAL RESISTANCE IN FOOD AND AGRICULTURE

Antimicrobial Resistance (AMR) occurs when micro-organisms – bacteria, fungi, viruses, and parasites – evolve to become resistant to antimicrobial substances, such as antibiotics and antifungals.

This occurs naturally, through adaptation to the environment, or through selective pressure, when micro-organisms come into contact with antimicrobials.

The process is accelerated when inappropriate or excessive use of antimicrobials occurs.

As a result, medicines that were once effective treatments for disease in people and animals become less effective or wholly ineffective, leading to a reduced ability to successfully treat infections.

This in turn leads to more severe or prolonged illnesses, increased mortality, production losses in agriculture and reduced livelihoods and food security.

AMR IN THE FOOD AND AGRICULTURE SECTORS

Antimicrobials play a critical role in the treatment of terrestrial and aquatic food-producing animals and plants, helping to assure food safety and quality, animal health and welfare and farmer livelihoods.

In food animal production, antimicrobials can be used to treat sick animals, prevent diseases from spreading or promote faster animal growth by applying low concentrations of antimicrobials to animal feed. This third use is increasingly discouraged, but still practiced in several countries.

While the majority of antimicrobial use in agriculture tends to occur in food animal production, antimicrobials such as antibiotics and fungicides are also applied to agricultural crops and are used in the agro-industries, for instance in the production of biofuel by-products.

A growing world population is resulting in an increased demand for food. This, in turn, is placing pressure on food supply chains and systems.

Global antimicrobial use in the agricultural sector is difficult to estimate because of the lack of regulations and poor data collection in many countries. However, it is estimated to reach over 60 000 tonnes annually.

This total volume is expected to rise over time as the demand for food and for products of animal origin increases.

Following administration, up to 90 percent of antimicrobials may be excreted unmetabolized in

water and animal waste, with subsequent spread into the environment. This, in turn, may increase the development of AMR micro-organisms through exposure to antimicrobial residues, as well as further spread of resistance through the transfer of resistance genes to other micro-organisms. Various practices can be implemented to reduce the use of antimicrobials in agriculture.

Among others, adequate animal vaccination, good hygiene and husbandry practices and better animal welfare would lead to healthier animals or crops and a decreased need for antimicrobials, as well as the use of feed ingredients or additives that enhance gut health and the efficiency of feed conversion.

A legal framework should be in place in each country to ensure the quality and efficacy of the antimicrobials being used, and to guarantee their prudent use.

KEY PLAYERS AND PARTNERS

FAO is uniquely positioned to contribute to the international efforts to address AMR, given its expertise in a variety of disciplines (aquatic and terrestrial animal health and production, animal welfare, food and feed safety, plant production and protection, the environment, and legislation) to provide scientific and technical advice and to conduct capacity development projects.

FAO works closely with the World Health Organization (WHO) and the World Organisation for Animal Health (OIE) to promote a One Health approach to reducing AMR globally.

Furthermore, FAO supports the work of the Codex Alimentarius, which sets a range of standards related to preventing and minimizing AMR in the food chain. The Codex Alimentarius also provides scientific advice and support to countries on the implementation of its own standards.

FAO ACTION PLAN AND TOOLS FOR COMBATING AMR

FAO has developed an Action Plan on AMR, which focuses on:

- raising awareness on AMR and related threats;
- developing capacities for surveillance and monitoring of AMR and antimicrobial use in food and agriculture;
- strengthening governance related to antimicrobial use and AMR in food and agriculture; and
- promoting good practices in food and agriculture systems and the prudent use of antimicrobials.

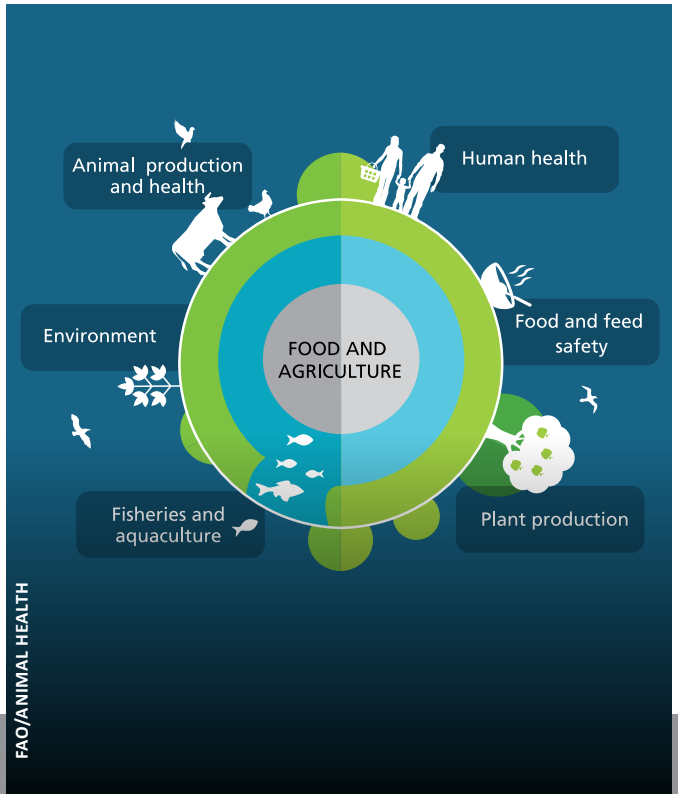
FAO is developing tools to assist countries in their efforts to manage the risks associated with AMR.

The Progressive Management Pathway for AMR is a tool that offers a stage-wise progression to guide activities and interventions on AMR for each of the food and agriculture sectors in the four focus areas of the Action Plan.

The Assessment Tool for Laboratory and AMR Surveillance Systems (ATLASS) assesses laboratory capacities for detecting AMR, as well as the structure and operation of the overall surveillance system.

FAO PROJECTS TO SUPPORT MEMBER COUNTRIES IN PREVENTING AND CONTROLLING AMR

FAO has projects in Southeast Asia, sub-Saharan Africa, Latin America and the Caribbean (2016), and Eastern Europe and Central Asia (2017), focused on ensuring that multisectoral National Action Plans on AMR are in place and aligned with global recommendations and standards, enhancing awareness, strengthening regulatory frameworks, building surveillance capacities, and promoting good practices that reduce the need for antimicrobials.



KEY FACTS

ANTIMICROBIAL RESISTANCE

EFFECTIVE ANTIMICROBIALS ARE CRITICAL FOR THE TREATMENT OF DISEASES IN PEOPLE AND ANIMALS, HELPING TO ENSURE FOOD SAFETY AND SECURITY, AND THUS NEED TO BE PRESERVED

AMR IS A MAJOR GLOBAL THREAT OF INCREASING CONCERN TO HUMAN AND ANIMAL HEALTH, EXACERBATED BY THE EXCESSIVE USE AND MISUSE OF ANTIMICROBIALS

ANTIMICROBIAL USE IS EXPECTED TO RISE WITH THE INCREASE IN DEMAND FOR FOOD; MINIMIZING THE USE OF ANTIMICROBIALS IS CRITICAL TO REDUCE DEVELOPMENT OF AMR

FAO IS UNIQUELY POSITIONED TO CONTRIBUTE TO INTERNATIONAL EFFORTS TO ADDRESS AMR, HAVING EXPERTISE IN A VARIETY OF DISCIPLINES

THE FAO ACTION PLAN AND ONGOING PROJECTS FOCUS ON RAISING AWARENESS, DEVELOPING CAPACITIES FOR SURVEILLANCE, STRENGTHENING GOVERNANCE AND PROMOTING GOOD PRACTICES IN FOOD AND AGRICULTURAL SYSTEMS

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02

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FAO'S GLOBAL ANIMAL DISEASES SURVEILLANCE AND EARLY WARNING SYSTEM

In all regions of the world, livelihoods are sustained partially or entirely by the livestock sector. Livestock contribute approximately 40 percent of the global value of agricultural output and support the livelihoods and food security of almost 1.3 billion people.

The greater concentration and intensification of animal production; the globalized trade of animals and their products; rapidly changing animal health systems and climate dynamics; and greater urbanization are all increasing the risk of animal health threats. Over 70 percent of new diseases affecting humans are of animal origin and have the potential to become local and major public health threats.

It is crucial to support efforts to reduce the risk of these threats to animal and public health.

Global disease intelligence and early warning, supported by science-based risk assessments, are key to informing decisions, actions, and timely communication between agencies and sectors responsible for human health, animal health, wildlife, and food safety. This better guides policies and strategies to prevent, detect and respond to animal and public health risks.

FAO's contribution to the Global Surveillance and Early Warning System (GLEWS) is to perform global surveillance of and provide intelligence on health threats, as well as to help regions and countries to enhance their capacities of surveillance, risk assessment, prevention and risk management of animal diseases (including zoonoses), and support to rapid response mechanisms in partnership with the World Health Organization (WHO) and the World Organisation for Animal Health (OIE).

ANIMAL DISEASE SURVEILLANCE AND INTELLIGENCE

FAO/GLEWS performs disease event-based surveillance by the hour and provides intelligence globally on a daily or weekly basis. It invests in data collection and verification, as well as in integrating expertise and local knowledge and providing analysed information for decision-makers. FAO/GLEWS provides global information through early-warning, foresighting and forecasting activities. It routinely monitors information on priority and emerging animal diseases from different sources (epidemiological networks, regional projects, field missions, NGOs, cooperating institutions, ministries, FAO in-country representations and other United Nations agencies, public domains, the media and web-based health surveillance system).

RISK ASSESSMENT

Conducting risk assessment at the human-animal-environment interface for emergency response or longer-term strategic planning for prevention and control is crucial to mitigating potential impacts. This support to countries is essential to preparing

contingency plans, strengthening quarantine procedures and laboratory diagnostic capabilities, planning training courses for veterinary staff and farmers, determining needs for vaccines, and identifying areas for targeted surveillance.

FAO/GLEWS regularly assesses the likelihood and potential consequences of significant threats and distributes alert messages to regions and countries at risk.

HEALTH INFORMATION SYSTEMS AND NEW TOOLS

FAO/GLEWS supports member countries by designing, developing and managing disease information systems and digital tools to support early warning activities at global, regional and national level.

The Global Animal Disease Information System (EMPRES-i) – a reference database for disease events – makes data on animal disease outbreaks and surveillance available to stakeholders. This system stores outbreak disease records, and tracks and monitors disease events to provide alerts and promote awareness of health threats.

Recognizing the multisectoral nature of disease and health information systems, and the need for real-time data exchange and analysis, FAO/GLEWS promotes open-source technologies and the development and interoperability with other information systems at national, regional and global level. Through official agreements with partners, FAO collaborates with digital disease surveillance organizations (such as ProMED and HealthMap) to improve data quality. The successful linkage of epidemiological data from EMPRES-i with a database for human and animal influenza viruses (such as OpenfluDB) enables further investigation and accurate surveillance of the virus.

Digital technologies, such as the Event Mobile Application (EMA-i), are being developed and implemented at country level, allowing for field epidemiological data collection and reporting. EMA-i has been been implemented in target districts in Uganda (since 2013), Mali (2015), and Zanzibar, United Republic of Tanzania (2016). In these locations, it has been clearly demonstrated to bring about major improvements in disease reporting and communication (that is, from a monthly to a real-time basis) in select districts.

CAPACITY BUILDING

Effective and sustained surveillance capacity is necessary to ensure the rapid forecast, identification and prevention of transboundary threats and to enable sustainable responses. Weaknesses in veterinary services makes disease prevention, control and risk mitigation difficult.

FAO/GLEWS has developed and implemented several capacity development projects within the One Health approach, through the provision of technical expertise and training to strengthen veterinary systems and other stakeholder capacities, in particular on:

- early warning and surveillance;
- risk assessment and risk modelling;
- epidemiological networks; and
- management of risks related to the interfaces between humans, animals, the environment and the food chain.

Field epidemiology training for veterinarians (FETPV) is actively promoted and implemented by FAO to enhance the long-term and sustainable capacities of veterinary services for surveillance, risk assessment and epidemiological analysis. This approach is endorsed and supported by multiple international partners and donors.

A FRUITFUL COLLABORATION

FAO's GLEWS unit, in collaboration with the OIE and the WHO, provides a unique One Health and cross-sectoral mechanism for disease verification, data sharing, and robust and timely joint risk assessments aimed at formulating risk management options for health events at the human-animal-ecosystems interface (Joint FAO–OIE–WHO GLEWS+).


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KEY FACTS

FAO GLEWS

PERFORMING GLOBAL ANIMAL DISEASES SURVEILLANCE, RISK ASSESSMENT AND DISEASE INTELLIGENCE THROUGH A MULTIDISCIPLINARY APPROACH

ASSISTING COUNTRIES IN THE RISK ASSESSMENT AND RISK MODELLING OF ANIMAL DISEASES

COMBINING NEW TECHNOLOGICAL TOOLS TO SUPPORT DISEASE INTELLIGENCE

DISSEMINATING TECHNICAL BULLETINS, UPDATES, DESCRIPTIVE AND ANALYTICAL REPORTS, AWARENESS AND EARLY WARNING

ENHANCING COUNTRIES' CAPACITIES IN SURVEILLANCE, EPIDEMIOLOGICAL NETWORKS, EARLY WARNING AND AWARENESS, AND IN MANAGEMENT OF RISKS AT THE HUMAN-ANIMAL INTERFACE

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03


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GOOD EMERGENCY MANAGEMENT PRACTICE
HELPING COUNTRIES TO PREPARE FOR ANIMAL DISEASE EMERGENCY RESPONSE

The human food chain is under continued threat from an alarming increase in the number of outbreaks of transboundary animal diseases (TADs).

Avian influenza, foot-and-mouth disease and Rift Valley fever are examples of threats to the human food chain that may have detrimental effects on food security, human health, livelihoods, national economies and global markets.

Considering the resurgence of certain animal diseases and the persistent threats posed by TADs, it is necessary to continue FAO's efforts towards building country capacities for preparedness for animal disease emergencies. Planning for emergency disease eradication and control programmes better equips regions and national veterinary services to cope with emergencies and achieve rapid and cost-efficient control.

Building capacity in emergency management helps regions and countries to prepare for and manage effective responses to animal disease disasters and crises.

THE GOOD EMERGENCY MANAGEMENT PRACTICE: THE ESSENTIALS MANUAL

Created by FAO to better prepare its member countries, the Good Emergency Management Practice (GEMP) is an overall approach to ensuring preparedness for and appropriate response to animal health emergencies, supporting veterinary services in increasing preparedness to animal disease outbreaks, and decreasing the time required to respond to crises.

GEMP is a collection of organized procedures, structures and resource management tools that help emergency managers to detect diseases at an early stage in an animal population, predict and limit its spread, target control measures and eliminate the disease, with subsequent re-establishment of verifiable freedom from infection. Specifically, GEMP guides national animal health services in preparing an emergency preparedness plan, a contingency plan, an operations manual and a recovery plan.

The FAO manual entitled "Good Emergency Management Practice: The Essentials" systematically sets out the elements required to achieve preparedness planning for any animal disease emergency. The GEMP manual guides veterinary services in better preparing and responding in a timely manner when faced with disease emergencies. Many of the principles described in the GEMP manual may also be helpful in preparing for zoonotic and even non-infectious disease emergencies.

The GEMP manual is available in English, Spanish, French, Arabic, Chinese and Russian. Each version can be downloaded from the FAO website.

THE GOOD EMERGENCY MANAGEMENT PRACTICE: THE ESSENTIALS (GEMP) WORKSHOPS

To reach a wide audience of animal health professionals and expose them to emergency management tools, the FAO Crisis Management Centre for Animal Health (CMC-AH), in close collaboration with the relevant FAO offices at regional, subregional and country level, organizes various GEMP trainings in countries and regions. The multiday interactive workshops bring professionals together to learn best practices and exchange experiences in dealing with animal disease emergencies.

The GEMP workshops serve as hubs of knowledge to help countries assess their level of preparedness, including command structures, risk analysis methods, contingency planning, funding mechanisms, information systems and compensation plans.

The concept also fully embraces a One Health approach, requiring multiple disciplines to fully address issues affecting human and animal health, food security and food safety.

Some examples of successes resulting from GEMP training are the following:

- South Africa created the "GEMP working group", with the mandate to work on the finalization of the national avian influenza contingency plan;
- Kenya applied the GEMP principles during the spread of Rift Valley fever throughout the implementation of the contingency plan in the four high-risk clusters in the country (2015); and
- Côte d'Ivoire applied the knowledge acquired on GEMP principles to respond to the African Swine Fever outbreaks of 2014.

In the United Republic of Tanzania (2017), a workshop was jointly organized by FAO and the Tanzania Department of Veterinary Services – Ministry of Agriculture, Livestock and Fisheries. Experts participated from multiple sectors, including animal health, public health, One Health and other specializations. Contingency plans for avian and pandemic influenza and Rift Valley fever were reviewed, an action plan was developed, and a Tanzania GEMP working group was formed to encourage and track continued progress on the actions.

In Africa, Asia, Latin America and the Middle East, more than 55 countries have already benefited from GEMP workshops.

GOOD EMERGENCY MANAGEMENT PRACTICE: FUTURE TOOLS

FAO member countries have identified needs beyond the GEMP Essentials to increase their resilience to existing or probable threats to animal health.

Delving more deeply into the emergency management practices using a GEMP "Plus" (GEMP+) approach will help countries build their capacities to prevent, prepare for, respond to and recover from animal health emergency incidents. GEMP+ will strive to refine contingency planning templates, develop SOP guidance, support review of technical plans, build and deliver training and simulation exercise materials, support resource mobilization, mentor GEMP trainers and provide other capacity-building activities that increase the resilience of agricultural livelihoods to threats and crises and enhance their ability to respond when they occur.

Animal health preparedness planning goes hand-in-hand with threat reduction by addressing potential pathogens at their source.

Successful emergency management preparedness will help to sustain animal health, human health, food security and community resilience.


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KEY FACTS

GOOD EMERGENCY MANAGEMENT PRACTICE

PROVIDING A TOOL GATHERING FAO'S ACCUMULATED KNOWLEDGE ON BEST PRACTICES FOR MANAGING ANIMAL HEALTH EMERGENCIES

HELPING COUNTRIES TO PREPARE AN EMERGENCY PREPAREDNESS PLAN, A CONTINGENCY PLAN, AN OPERATIONS MANUAL, AND A RECOVERY PLAN

SHARING, WITH COUNTRIES, PROCEDURES, STRUCTURES AND RESOURCE MANAGEMENT THAT LEAD TO EARLY DETECTION OF A DISEASE, ENABLING PREDICTION OF ITS SPREAD, PROMPT LIMITATION, TARGETED CONTROL AND ELIMINATION

THE GEMP MANUAL PROVIDES GUIDANCE ON BETTER PREPARING AND RESPONDING IN A TIMELY MANNER WHEN FACED WITH ANIMAL DISEASE EMERGENCIES

GEMP WORKSHOPS BRING PROFESSIONALS TOGETHER TO LEARN BEST PRACTICES AND EXCHANGE EXPERIENCES IN DEALING WITH ANIMAL DISEASE EMERGENCIES

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04

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DROMEDARY CAMELS AND MERS-CoV: FILLING KNOWLEDGE GAPS

The Middle East Respiratory Syndrome Coronavirus (MERS-CoV) is an emerging threat for public health globally and can be a cause of severe respiratory infection in humans, especially those who suffer from other ailments.

The disease is new to humans and was first reported in 2012 in Saudi Arabia.

Dromedary camels are thought to be a natural reservoir of MERS-CoV and can be a source of infection for humans. Camels are widely spread throughout the world, mainly in arid areas, and serve important economic, livelihood, nutritional and social purposes.

MERS-CoV is transmitted from person to person through close contact, especially in healthcare settings.

However, there is currently no evidence of sustained person-to-person spread.

Additionally, no vaccine or specific treatment is currently available to prevent MERS-CoV transmission.

To date, 27 countries have reported human cases of MERS-CoV in the Middle East, Africa, Europe, Asia and North America.

Nevertheless, the majority of cases to date have occurred in Saudi Arabia where – according to some studies – MERS-CoV has been circulating in camels since at least 1992.

All cases and outbreaks outside of this region can be traced back to a person who travelled from the Middle East.

TOWARDS A BETTER UNDERSTANDING OF MERS-CoV

MERS-CoV has been found in dromedary camels in several countries in the Middle East and Africa.

Camels become infected with very mild or no clinical signs. MERS-CoV is mainly acquired by dromedaries when they are less than one year of age.

They can be a source of infection to humans, although how the virus is transmitted from camels to humans is currently not known.

Because the role that camels and other animals play in the epidemiology of MERS-CoV and the route of transmission to humans remain unclear, science-grounded decisions and risk management measures are based on precautionary measures and good hygiene practices.

Scientific studies to better understand the dynamics of MERS-CoV in the camel population and the mode of transmission between camels and humans is critical to developing appropriate measures for reducing the risks to public and animal health.

Coronaviruses are a large family of viruses that can cause mild to severe illness, usually gastrointestinal or respiratory. Severe Acute Respiratory Syndrome (SARS) is another example of a coronavirus that can be transmitted from animals to humans and cause severe diseases.

It is thought that MERS-CoV originally evolved from a bat coronavirus and jumped to dromedary camels some time ago.

Dromedaries are considered the natural host for MERS-CoV, although the virus has also been found in alpacas living in close proximity to infected camels.

The challenges posed by MERS-CoV at the human-animal interface can only be met by using a One Health approach involving multisectoral collaboration, communication and cooperation.

FAO AND MERS-CoV

FAO plays a coordinating role in reducing the risk of MERS-CoV at the human-animal interface by working with global partners such as the World Organisation for Animal Health (OIE) and the World Health Organization (WHO).

The three organizations convene joint technical and expert meetings to advance knowledge and guide policy.

At national level, FAO provides technical expertise to improve capacities for surveillance, laboratory diagnostics, camel value chain analysis, behavioral studies, food safety, and risk mapping and analysis.

In addition, FAO provides guidance and promotes good practices and biosecurity measures to prevent human transmission or consumer protection.

FAO also regularly monitors the MERS-CoV situation in humans and animals, issues monthly updates, publishes qualitative risk assessments and provides access to information and knowledge. It also promotes research development with relevant institutions to address knowledge gaps in the transmission of MERS-CoV in animals and from animals to humans.

Furthermore, FAO assists countries in developing communication strategies to ensure that appropriate information reaches the public on MERS-CoV and to avoid possible negative impacts on the livestock industry.

FAO is currently implementing several projects on MERS-CoV in Africa and the Middle East. Cross-sectional and longitudinal surveillance studies are being conducted regularly in four countries – Egypt, Ethiopia, Jordan and Kenya – at different nodes along the camel value chain, including breeding herds, live camel markets, quarantine stations and slaughterhouses.

Camel value chain analyses are also being carried out to characterize the sector.

Approximately 75 laboratory staff in three national veterinary laboratories have been trained on MERS-CoV diagnostic testing, while 50 field personnel have received training in sample collection and transportation, clinical examinations and data collection.

In implementing the MERS-CoV projects, FAO works closely with funding partners (such as the U.S. Agency for International Development – USAID), national governments, academic institutions, collaborating centres and producer associations.

FUTURE PROSPECTS

Further studies are planned to better understand the routes of transmission to humans, seasonality factors and potential animal host species, including wildlife. In addition, the collation of data that captures the distribution of virus circulation in countries with high camel population densities may provide opportunities to understand human 'spillover' events. Information from these studies would also be important in the identification and evaluation of the socio-economic factors that are associated with the risk of MERS-CoV infection in camel populations.


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KEY FACTS

MERS-CoV

MERS-CoV IS A NEW PUBLIC HEALTH THREAT THAT CAN CAUSE SEVERE RESPIRATORY INFECTIONS IN HUMANS

DROMEDARY CAMELS ARE THOUGHT TO BE A NATURAL RESERVOIR AND CAN BE A SOURCE OF INFECTION FOR HUMANS

THERE IS CURRENTLY NO HUMAN OR ANIMAL VACCINE, NOR SPECIFIC TREATMENT

CRITICAL GAPS REMAIN IN OUR UNDERSTANDING OF CAMEL-HUMAN TRANSMISSION

UNDERSTANDING MERS-CoV AT THE HUMAN-ANIMAL INTERFACE REQUIRES A ONE HEALTH APPROACH INVOLVING HUMAN AND ANIMAL HEALTH SECTORS

AS A BRIDGE BETWEEN RESEARCH AND NATIONAL PARTNERS, FAO IS WELL POSITIONED TO CONTRIBUTE TO EFFORTS TO BETTER UNDERSTAND THIS PUBLIC HEALTH THREAT ASSOCIATED WITH THE DROMEDARY CAMEL SECTOR

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05

MAINTAINING GLOBAL FREEDOM FROM RINDERPEST

Rinderpest is a highly contagious disease that, throughout history, has resulted in the mortality of hundreds of millions of livestock and has caused significant disruption and damage to agricultural supply chains throughout the world.

FAO, the World Organisation for Animal Health (OIE) and regional partners implemented the Global Rinderpest Eradication Programme, which brought an end to the disease in 2011. Rinderpest is the first animal disease to be eradicated worldwide. FAO estimates that its successful eradication has avoided losses of USD 920 million every year in Africa alone.

To coordinate a post-eradication strategy and to keep the world free of the disease, the FAO-OIE Rinderpest Secretariat and the FAO-OIE Rinderpest Joint Advisory Committee (JAC) were established in succession in 2012, sharing the core responsibility of securing rinderpest virus-containing material (RVCM) in a minimum number of designated rinderpest holding facilities (RHF) for limited and controlled use.

CHALLENGES

Although rinderpest has been eradicated from the natural environment, stores of RVCM remain in a number of laboratories around the world.

The results of a FAO questionnaire administered in 2010–2011 revealed that RVCM were stored in over 40 facilities in over 36 countries. The majority of these facilities are located in Asia and Europe, with a small number in Africa and North America. Over a dozen countries that had eradicated the disease decades before did not submit responses to the questionnaire.

Countries may not report on their RVCM stocks because they choose to keep the virus as national security for diagnostics and vaccine production in case of an emergency.

Some facilities that continue to store RVCM have not taken adequate biosecurity measures to prevent accidental or non-accidental release of the rinderpest virus. The risk of a re-introduction of the virus into the natural environment can most effectively be reduced by substantially limiting the number of laboratories that store RVCM worldwide.

ACHIEVEMENTS AND ONGOING ACTIVITIES

The Rinderpest Secretariat encourages transparency with regard to RVCM stores and for countries to take action on them. For example, the options offered by FAO are to request assistance in destroying the virus and decontaminating the facility, transferring of the virus to a FAO-OIE RHF or applying to become an RHF. Five high-biocontainment facilities have been designated as FAO-OIE RHFs either for the storage of (1) RVCM, excluding vaccine and vaccine virus seeds or (2) rinderpest vaccine virus seeds and/or manufactured vaccines. The JAC reviews

applications submitted to the Rinderpest Secretariat from countries applying to host RHFs and proposals for conducting research using RVCM.

As a result of the ongoing regional and international meetings for countries storing RVCM and their neighbours, the number of countries storing RVCM has declined by more than 50 percent since 2011. The Rinderpest Secretariat is available for assistance in the investigation of RVCM stocks and in the safe destruction or transfer of stocks.

The Global Rinderpest Action Plan (GRAP) is being developed by FAO in collaboration with the OIE, with the aim of providing a framework for recognizing, reporting and rapidly suppressing a rinderpest re-emergence and to offer decision-making pathways leading to full implementation of rinderpest emergency management measures.

In parallel, FAO and the OIE are undertaking post-eradication communication and advocacy campaigns in several countries to enable governments and farmers to recognize and report any signs of re-emergence. Awareness-raising campaigns have been conducted in Egypt, Ethiopia, Kenya, Nigeria, and Senegal, targeting farmers and communities. The campaigns will be extended to Pakistan, South Africa and Viet Nam in 2018.

Communication materials will also be developed for veterinarians, laboratory personnel and academia, with a special focus on the delivery of e-learning modules through 2019.

THE WAY FORWARD

Several measures are necessary to further minimize the risk of, and to respond to, the possible (though improbable) re-emergence of rinderpest, including:

- establishing a bank of reference vaccine strains available for vaccine production in case of an emergency;
- expanding the number of vaccine reserves available to high-risk regions;
- preparing countries and regions for rapid action and notification of a rinderpest re-emergence;
- increasing the accuracy of current reports on RVCM stores;
- continuing the provision of support to the virus sequence and destroy initiative; and
- developing virus-free serological and molecular diagnostic tests to be deployed in case of emergency.

Through collaboration among countries, regions and international partners, the risk of rinderpest re-emergence can be minimized, and cattle can continue to be free of the deadly disease.

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KEY FACTS

RINDERPEST ERADICATION

GLOBAL FREEDOM FROM RINDERPEST WAS DECLARED IN 2011 THANKS TO CONCERTED EFFORTS BY COUNTRIES, WITH SUPPORT FROM INTERNATIONAL AND REGIONAL ORGANIZATIONS

THE RISK OF RE-EMERGENCE EXISTS DUE TO THE RINDERPEST VIRUS-CONTAINING MATERIAL HELD IN A NUMBER OF FACILITIES AROUND THE WORLD

THROUGH ADVOCACY AND IN-COUNTRY EXPERT MISSIONS, THE NUMBER OF LABORATORIES CONTINUING TO HOLD SAMPLES OF THE RINDERPEST VIRUS HAS BEEN REDUCED BY MORE THAN 50 PERCENT SINCE 2011

FIVE BIOCONTAINMENT RHFS ON THREE CONTINENTS HAVE BEEN OFFICIALLY DESIGNATED BY FAO AND THE OIE AS SAFE TO STORE RVCM

COMMUNICATION CAMPAIGNS FOR DISEASE RECOGNITION AND REPORTING AMONG STAKEHOLDERS ARE BEING IMPLEMENTED BY FAO AND THE OIE IN HIGH-RISK COUNTRIES

THE GLOBAL RINDERPEST ACTION PLAN IS IN ITS FINAL STAGES OF DEVELOPMENT AND IS BEING HARMONIZED WITH REGIONAL AND NATIONAL CONTINGENCY PLANS

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06

MONGOLIA ENHANCES CONTROL OF CROSS-BORDER ANIMAL DISEASES THROUGH INNOVATIVE APPROACHES

The livestock sector in Mongolia is the main pillar of the rural economy, contributing 16 percent of the national GDP and providing livelihoods for 30 percent of its population.

However, over the decades, the livestock industry has been confronted with occasional flare-ups of transboundary animal diseases (TADs).

The nomadic lifestyle of Mongolian herders further exacerbates the risk of spread. Nomadic people move, on average, four times per year to ensure that their animals have sufficient pasture for grazing.

Animal diseases such as Foot-and-mouth disease (FMD), *Peste des petits ruminants* (PPR) and Brucellosis are transmitted to livestock through direct contact, air, foodstuffs and contaminated objects. The link between these diseases and infected meat and animal products has led many countries to impose trade restrictions on Mongolia to minimize the risk of disease importation.

Through their Joint Division, FAO and the International Atomic Energy Agency (IAEA) have enabled Mongolia to strengthen capacities in controlling animal diseases, especially TADs, by boosting research on safe nuclear and nuclear-derived techniques for diagnosis and quicker detection of the disease, by training personnel on these techniques, and by providing equipment and expert services.

EFFECTIVE FOOT-AND-MOUTH DISEASE CONTROL IN MONGOLIA

The frequent outbreaks of FMD have constituted a major animal health problem in Mongolia, particularly in the eastern provinces. The genetic differences between the FMD virus strains responsible for these outbreaks have made it difficult and time-consuming for inexperienced laboratories to accurately characterize field virus strains and to match them to the most appropriate FMD vaccine for controlling the disease. As a result, when FMD first emerged in Mongolia, the spread of the virus and the damage to the farming economy were much more destructive than in other countries equipped with better diagnostic facilities.

With the assistance of the Joint FAO/IAEA Division, Mongolia's capacities in the diagnosis of animal diseases, especially transboundary diseases, were strengthened.

Mongolia's Biosecurity Level 3 Laboratory was renovated. Additionally, its staff was trained, standard operating procedures were validated, and guidelines and laboratory protocols were adopted.

Furthermore, Biocombinat, a Mongolian public enterprise, received technical support to develop vaccine reconstitution technology for addressing FMD outbreak emergencies in the country.

The improved research and diagnostic capacities that use nuclear and nuclear-derived techniques enabled the Veterinary Service of Mongolia to successfully contain FMD outbreaks in 2013 and 2014.

NUCLEAR TECHNOLOGIES TO MINIMIZE THE SPREAD OF HIGHLY CONTAGIOUS ANIMAL DISEASES

Since 1987, the Joint FAO/IAEA Division has provided technical support to the animal production research group at the Mongolian State University of Agriculture, the animal health group at the Institute of Veterinary Medicine (IVM), and the State Central Veterinary Laboratory (SCVL).

This support has included capacity building on animal production and health research, training of personnel, and provision of equipment and expert services to the IVM and SCVL on the diagnosis of animal diseases, especially TADs.

Individual and group training has been conducted, and more than 100 participants have been trained on the use of nuclear-derived and molecular techniques for animal disease diagnosis, surveillance of TADs, and quality control in veterinary diagnostic laboratories.

The training has also included essential aspects on how to correctly collect samples and manage potentially infected livestock, to ensure the early, rapid and accurate analysis of biological field samples.

An irradiation unit was delivered to Mongolia to evaluate the protective capacity of irradiated vaccines against various bacterial and viral diseases. As a first step, a research protocol was devised for a *Mycoplasma agalactiae* vaccine and experimental work was initiated.

Before PPR was reported in Mongolia, the risk was already high because of its prevalence in neighbouring countries. Preparatory research was therefore initiated at the IVM and the SCVL in 2014 to validate the diagnostic techniques for yaks and camels and to increase surveillance.

Thanks to the increased capacity, awareness and monitoring, PPR was reported in 2016 in small domestic ruminants as well as in wildlife. Since then, three regional veterinary laboratories in PPR-affected areas have been equipped with diagnostic instruments for disease surveillance.

FAO and the IAEA continue to assist Mongolia with training, equipment, consumables and reagents for laboratory diagnosis of TADs.

SCVL staff were trained on the use of the one-step multiplex assay, developed by the Joint FAO/IAEA Division, for the detection of bacterial and viral pathogens such as the PPR virus and the *Capripoxvirus* from small ruminants, as well as on its panpox assay for detection and genotyping of the eight poxviruses.

More recently, IVM staff were trained on the analysis of whole-genome sequencing data of the influenza virus, using free software.

MONGOLIA IS ON TRACK TO MANAGE ANIMAL DISEASES

These dedicated efforts place Mongolia in a good position to control TADs and to use these tools as a springboard towards re-establishing the country's position in export markets as a source of high-quality meat.

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KEY FACTS

JOINT FAO-IAEA PROGRAMME

THE LOSS OF FARMERS' ANIMALS CAUSED BY TADS HAS BEEN REDUCED BY THE IMPROVED RESEARCH AND DIAGNOSTIC CAPACITIES OF MONGOLIAN LABORATORIES AND VETERINARIANS USING SAFE NUCLEAR AND NUCLEAR-DERIVED TECHNIQUES

THE MONGOLIAN GOVERNMENT IS NOW ABLE TO EFFECTIVELY IMPLEMENT APPROPRIATE AND TIMELY RESPONSE MEASURES TO DEAL WITH ANIMAL DISEASE OUTBREAKS

NUCLEAR TECHNIQUES FOR CONTROLLING ANIMAL DISEASES INVOLVING DIAGNOSIS, SURVEILLANCE AND QUALITY ASSURANCE AT VETERINARY DIAGNOSTIC LABORATORIES HAVE BEEN SUCCESSFULLY APPLIED

THE RECENT QUICK CONTAINMENT OF FMD OUTBREAKS AND THE DETECTION OF PPR EMERGENCE IN THE COUNTRY DEMONSTRATE THE EFFECTIVENESS OF INSTITUTIONAL CAPACITIES TO CONTROL ANIMAL DISEASES

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07


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A NEGLECTED ZOONOTIC DISEASE
DOG-MEDIATED RABIES
ELIMINATING HUMAN DEATHS BY 2030

Rabies is a preventable and fatal viral disease that kills an estimated 59 000 people every year. The virus is transmitted to people and other animals by exposure to the saliva of infected animals through bites and scratches. Most deaths occur in children in poor and rural communities living in Asia and Africa, where awareness about the disease and access to human and dog vaccines is limited.

Over 99 percent of human deaths are caused by exposure to dogs that are infected with the rabies virus, despite the existence of safe, effective and affordable dog rabies vaccines.

The rabies virus also kills livestock, which causes households to lose important food sources as well as assets for farming and transportation. When rabies is present, communities may be disrupted by the menace of rabid animals, which may keep farmers from tending their fields, traders from taking their goods to markets, and children from going to school.

WHAT ARE THE CHALLENGES?

Rabies is a Neglected Zoonotic Disease, and while countries almost always identify rabies as a top priority, political commitment and funding for control of rabies remains insufficient. Inadequate awareness of the disease and its transmission, coupled with limited access to vaccines, impede control efforts. As a result, dog-mediated rabies is still present in over 150 countries, and its true burden is much higher than what is reported as many cases are not recognized or recorded. This underreporting of rabies cases in animals and humans remains the main reason for the lack of reliable data on the number of rabies cases and their impact on communities and society as a whole.

In 2015, the world called for action by setting a goal of zero human deaths from dog-mediated rabies by 2030 (Zero by 30).

HOW FAO AND KEY PARTNERS ARE RESPONDING

FAO has partnered with the World Health Organization (WHO), the World Organisation for Animal Health (OIE) and the Global Alliance for Rabies

Control (GARC) to form "*United Against Rabies*", a collaboration to end human deaths from dog-mediated rabies by 2030. The United Against Rabies collaboration will leverage existing tools and expertise in a coordinated way to empower, engage and enable countries to save human and animal lives from this fully preventable disease. Efforts will focus on three objectives:

- to effectively use vaccines, medicines, tools and technologies;
- to generate, innovate, and measure impact; and
- to sustain commitment and resources.

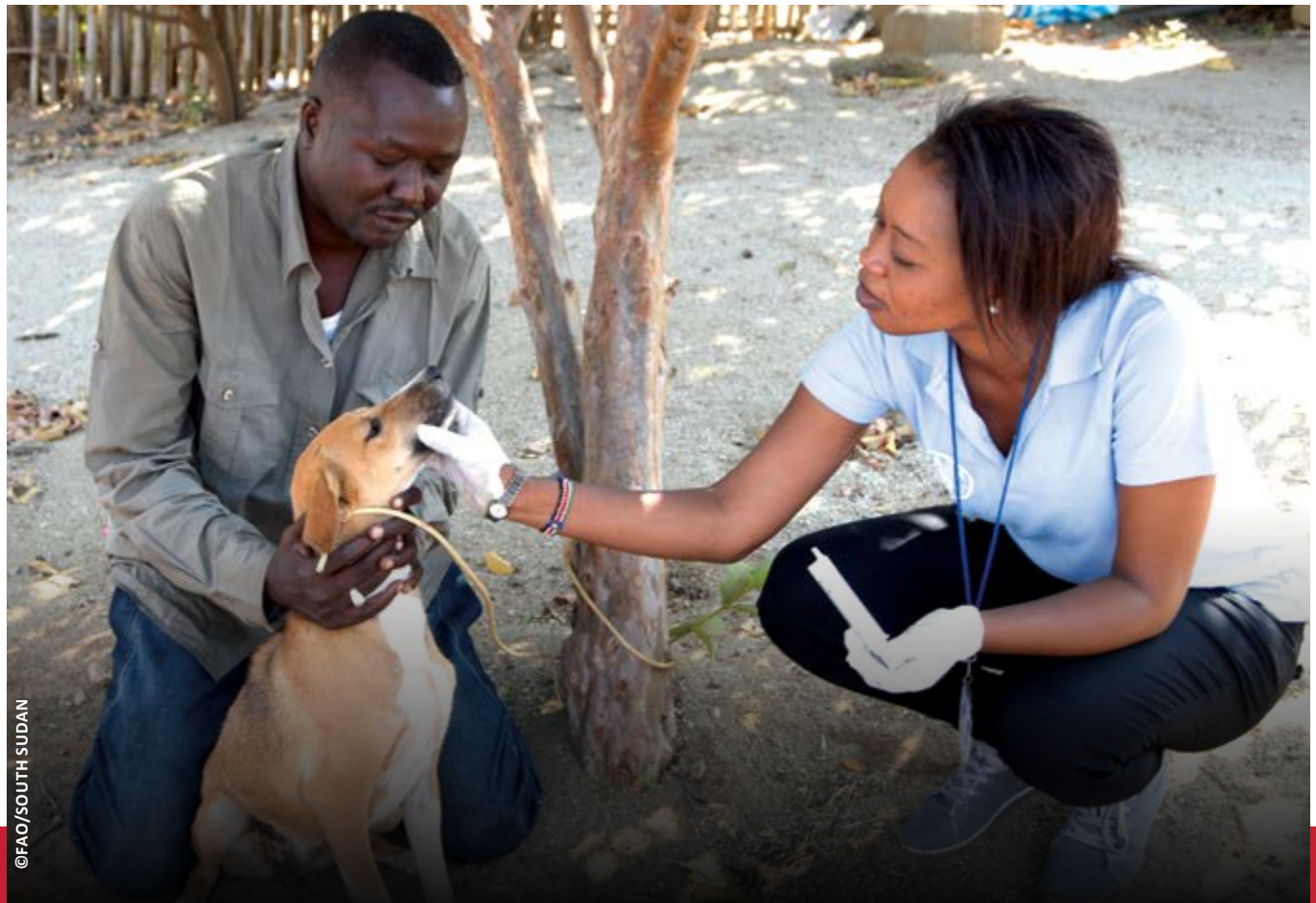
Moreover, FAO contributed to the development of the *Stepwise Approach for Rabies Elimination* (SARE) tool, which is a practical planning, monitoring and evaluation tool to guide, develop and refine national rabies control programmes. The risk management tool outlines achievable step-by-step guidance to make controlling dog-mediated rabies easier for countries. The tool is being used in many countries and will be used in the United Against Rabies collaboration to support countries in reaching the goal of Zero by 2030.

FAO is also supporting countries in developing and implementing control programmes for rabies. FAO provides a variety of expertise on the development of communications and education material, vaccination and dog population management strategies, integrated dog-bite case management, and trainings for field teams engaged in capturing and vaccinating free-ranging dogs. FAO is also supporting countries in strengthening their disease surveillance and control systems by providing laboratory diagnostic training and proficiency testing programmes, and by organizing stakeholder consultations for SARE implementation.

Since the establishment of World Rabies Day in 2007, FAO has actively contributed to the commemoration of this day at global, regional, national and local level by raising awareness on the rabies issue. World Rabies Day plays an important role in advocating for the prevention and control of this disease among leaders and policy-makers, especially in countries where rabies is still neglected despite the severe impact it has on human health and wellbeing.

WAY FORWARD

A coordinated One Health effort is needed to ensure zero human deaths from dog-mediated rabies by 2030, and FAO, as part of United Against Rabies, will continue to collaborate with countries and communities to reach this goal.



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KEY FACTS

DOG-MEDIATED RABIES

RABIES CAUSES AN ESTIMATED 59 000 DEATHS IN PEOPLE EVERY YEAR, YET IT IS PREVENTABLE THROUGH DOG VACCINATIONS

RABIES ALSO KILLS LIVESTOCK, CAUSING THE LOSS OF IMPORTANT FOOD SOURCES AS WELL AS ANIMALS USED FOR FARMING AND TRANSPORTATION

IN 2015, A GOAL WAS SET TO END HUMAN DEATHS FROM DOG-MEDIATED RABIES BY 2030

FAO IS PARTNERING WITH THE WHO, THE OIE AND THE GARC TO FORM THE UNITED AGAINST RABIES COLLABORATION, THAT WILL SUPPORT COUNTRIES IN REACHING THE GOAL OF ZERO HUMAN DEATHS BY 2030

FAO IS PROVIDING SUPPORT TO COUNTRIES THROUGH THE DEVELOPMENT OF TOOLS SUCH AS THE STEPWISE APPROACH FOR RABIES ELIMINATION AND CAPACITY DEVELOPMENT FOR LABORATORY AND FIELD WORKERS

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THE GLOBAL FOOT-AND-MOUTH DISEASE CONTROL STRATEGY

Foot-and-mouth disease (FMD) is one of the most contagious transboundary animal diseases (TADs). Livestock movements and trade play a key role in the spread of the disease.

FMD is still widespread throughout the world. It occurs in large parts of Africa, the Middle East and Asia, and the countries that are free of FMD today remain under constant threat of an incursion.

The disease is well known for its ability to severely affect and indeed disrupt regional and international trade in animals and animal products. It is also notorious for the enormous financial damage it can cause in FMD-free countries that are hit by an outbreak.

However, the burden of FMD on developing countries, involving the loss of animals and biological diversity and the decrease of production efficiency, is generally much less well known or is underestimated.

In FMD-endemic countries, usually developing countries, the disease threatens food security and the livelihoods of smallholders and prevents animal husbandry sectors from developing their economic potential.

With a fast-moving infection, surveillance is essential and building up national and regional epidemio-surveillance capacities is a priority activity.

FAO and the World Organisation for Animal Health (OIE) developed a 15-year global control strategy in 2012 to reduce the burden of FMD in endemic countries and maintain the status of FMD-free countries.

THE ECONOMIC IMPACT OF FMD

In regions where FMD is endemic (that is, most parts of Asia, West Eurasia, the Middle East and Africa), the presence of the disease undermines not only food security but also economic development at all levels of the production system, from village smallholders to more organized livestock production systems.

The direct economic impact of the disease results from a drop in milk production, abortions and deaths (mainly of young livestock); the indirect effects include loss of draught power for crop production and transportation, and the costs of implementing FMD control measures.

In other parts of the world, FMD has either been eradicated (Oceania, Western Europe and North and Central America), or has been controlled (South America). In FMD-free countries, the cost of the incursion of FMD is estimated to be significantly high (because of the implementation of control measures and restrictions or bans on trade in agricultural products), which justifies the use of strong

measures to prevent the introduction of the FMD virus and to control the disease at source.

FMD outbreaks in countries where the disease had previously been eradicated cause losses of approximately USD 1.5 billion per year. Although more difficult to estimate, the cost burden in endemic regions is estimated to exceed USD 6.5 billion a year.

Thus, reducing FMD in endemic countries by means of a coordinated control strategy at the global and regional level is of shared interest and should be considered a global public good.

THE GLOBAL FMD CONTROL STRATEGY

The control strategy was developed based on a biodefence approach aimed at strengthening mechanisms for detecting and reporting outbreaks internationally in real-time, ensuring harmonized control measures across borders, managing risks in virus spread and preventing its escape from laboratories. Countries where the disease is endemic or sporadic are subdivided into seven regional pools following genetic and antigenic analyses of the FMD virus.

The specific goal of this strategy is not only to reduce the impact of FMD on animal production in developing countries, but also to maintain the official FMD-free status of countries that have already eradicated the disease.

The strategy includes three components:

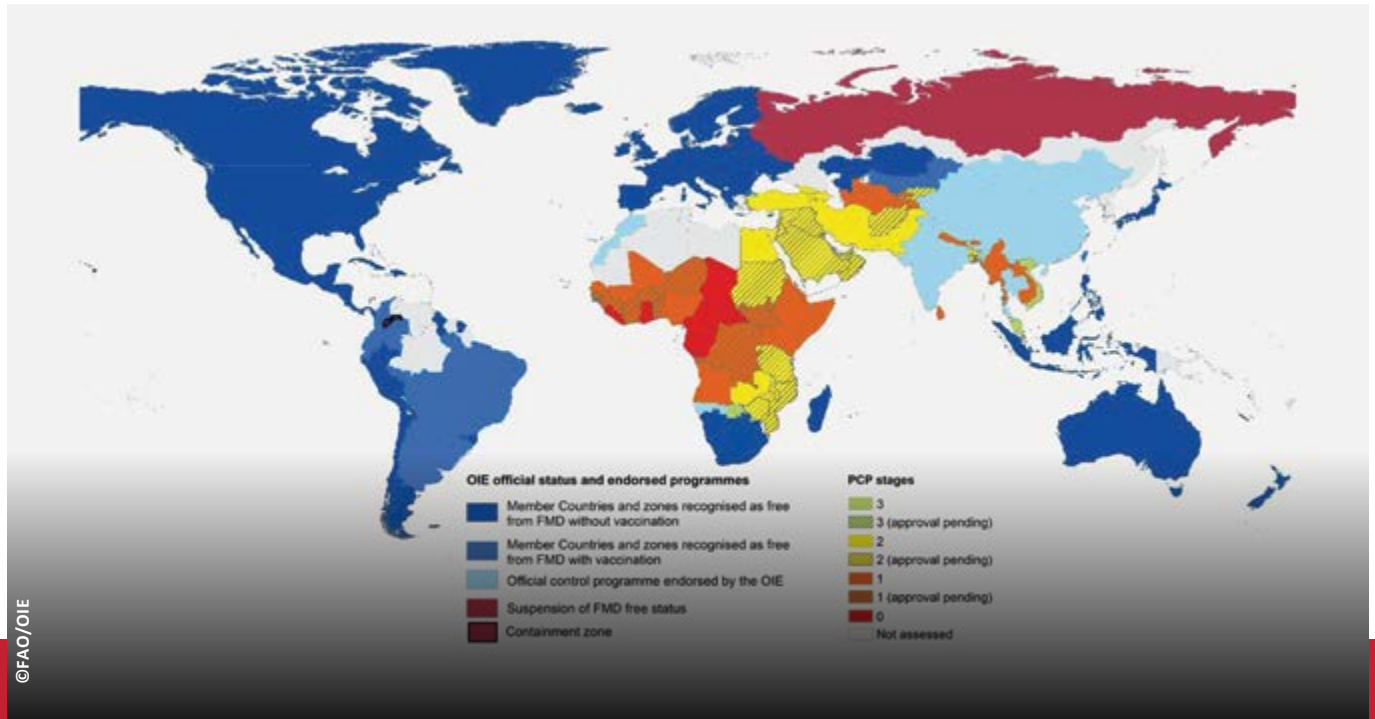
- improving global FMD control;
- strengthening veterinary services; and
- controlling other TADs.

Strengthening veterinary services is an important component of the global FMD control strategy and serves as a link with the other two components. Strong veterinary services will improve the effective implementation of the strategy and represent an opportunity to enhance their capacity to fight other high-impact livestock diseases. Based on the result of national, regional and international efforts, FMD control has progressed following the implementation of the global FMD control strategy.

To date, the strategy has been successfully implemented in 72 of 79 affected countries. In the majority of cases, countries advanced in the Progressive Control Pathway (a structured five-stage approach) from stages 1 and 2, and some few countries to stage 3 and beyond 5 (official recognition of FMD-free status without vaccination by the OIE). Limited countries remained at stage 0 during the first five years of the strategy. The added value consists in the fact that these monitoring programs assist with generating the regional and global surveillance results needed to inform biothreat assessment.

CONCLUSION

Controlling FMD and reducing its impact would have a hugely positive economic impact on both FMD-infected and FMD-free countries. However, this achievement demands that global, regional and national partners work closely together and that the appropriate resources be mobilized.



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KEY FACTS

FOOT-AND-MOUTH DISEASE

FMD HAS A HIGH BIOTHREAT POTENTIAL BECAUSE OF ITS EXCEPTIONAL INFECTIVITY, THE POTENTIAL FOR DELIBERATE INTRODUCTION, AND THE DAMAGING CONSEQUENCES OF INTRODUCTION TO FREE COUNTRIES

SINCE 2012, THE FAO/OIE GLOBAL FMD CONTROL STRATEGY HAS BEEN ENGAGING COUNTRIES IN PROGRESSIVE FMD CONTROL TO REDUCE THE RISK AT SOURCE

IN THE PAST FIVE YEARS, MULTIPLE UNEXPLAINED JUMPS OF FMDV INFECTION HAVE OCCURRED, RESULTING IN REGIONAL EPIDEMICS AFFECTING MILLIONS OF ANIMALS

MITIGATION MEASURES HAVE LARGELY FOCUSED ON PREVENTION OF VIRUS ENTRY INTO COUNTRIES THROUGH TRADE

AS OF JANUARY 2017, THE OIE HAS OFFICIALLY RECOGNIZED 68 MEMBER COUNTRIES AS BEING FREE FROM FMD, AND 15 OTHER COUNTRIES AS HAVING FMD-FREE ZONES

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AFRICAN SWINE FEVER
A TRANSBOUNDARY THREAT THAT REQUIRES REGIONAL AND INTERNATIONAL COOPERATION

African swine fever (ASF) is a contagious viral disease that causes a haemorrhagic fever in domestic pigs and wild boar. It is characterized by high fever, internal haemorrhage and multiple organ failure, with a lethality that approaches 100 percent. As a result, the backyard sector, with its low biosecurity, is particularly vulnerable. This not only threatens food security and the livelihoods of pig producers and other actors along the supply chain, but can also have major repercussions on international trade.

The swine sector plays a key role as a source of animal protein. Pigs have become a crucial food source due to their fast growth, efficient feed conversion, quick turnover, and high reproduction rate.

ASF is currently widespread in sub-Saharan Africa, Eastern Europe, the Caucasus, the Russian Federation and the Italian island of Sardinia. Its arrival in the Caucasus in 2007 and its progressive advance through the Russian Federation into Eastern Europe, where it now seems to be established, demonstrated the high potential for transboundary spread of ASF. In August 2018, China reported the occurrence of ASF for the very first time.

AFRICAN SWINE FEVER NEW TO ASIA

The recent developments in Asia indicate that a further geographic expansion of ASF is likely to occur.

In this region, ASF was first detected at a pig farm in the Siberian region of the Russian Federation in March 2017.

In China, the virus was discovered in the country's northeast at the beginning of August 2018. With China relying heavily on the pork industry and owning almost half of the world's domestic pigs, the ASF incursion could have a catastrophic impact on trade and pig production, with serious implications for global food security.

FAO began working with China's Ministry of Agriculture and Rural Affairs a few years ago to establish an ASF contingency plan and develop diagnostic capacity. A Field Epidemiology Training Programme for Veterinarians was also developed to strengthen epidemiological investigation, disease situation tracking, risk assessment and emergency preparedness.

HOW TO PREVENT AND CONTAIN ASF

ASF is one of the more difficult transboundary animal diseases to control as no successful vaccine has yet been developed. The ASF virus has several wildlife reservoirs in Africa and can be transmitted via soft ticks (*Ornithodoros spp.*) in endemic areas of the region.

Direct contact with infectious pigs and wild boars or their excrements or secretions, as well as consumption of contaminated feed, are the main transmission routes of the ASF virus to domestic pigs. The ASF virus can survive for long periods in contaminated environments or cured pork products.

In the absence of any effective vaccine or treatment, the best strategy against ASF is for veterinary systems to set up an early detection plan, coupled with an early response mechanism for outbreaks. Improved biosecurity, quick control of outbreaks though movement restrictions and stamping-out policies are essential for infected and endemic countries. The awareness and training of veterinary professionals and others who find themselves on the front line is crucial for effective control of ASF. Prevention starts with stringent measures at borders, biosecurity and awareness-raising among all swine producers and allied industries involved.

FAO'S RESPONSE AND ACTION

FAO has developed a methodology to empower local communities to better prevent and respond to ASF in a sustainable and realistic manner, in particular when veterinary services have serious constraints on the support they are able to provide farmers at the local level.

The development of the strategies should be based on the collection of quantifiable and detailed information on the different aspects of the pig sector and the marketing chain.

At regional level, FAO, in collaboration with the African Union's Interafrican Bureau for Animal Resources, the United Nations and the International Livestock Research Institute, developed an Africa-wide strategy for the prevention and control of ASF.

FAO has also established a database in EMPRES-i (the EMPRES Global Animal Disease Information System) on host densities and disease outbreak information reported by national authorities. This data will facilitate situation analyses and risk modelling for ASF spread and persistence.

Transboundary animal diseases are most effectively controlled through international and regional networks that are capable of coordinating the activities of relevant stakeholders and providing a platform for knowledge exchange that leads to the development of common approaches towards sustainable control. Information-sharing and coordinated action are essential to strengthen cooperation in ASF prevention and control.

In addition, FAO has developed manuals on ASF detection, diagnosis, preparation of contingency plans, and good practices for the swine sector, and has conducted risk assessment and studies as well as trainings on ASF.

Following the outbreak of ASF in China, an Emergency Regional Consultation on African Swine Fever on Risk Reduction and Preparedness (Bangkok, September 2018) was organized by FAO to review approaches to risk reduction and preparedness at both regional and country level.

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KEY FACTS

AFRICAN SWINE FEVER

ASF IS A VIRAL HAEMORRHAGIC DISEASE OF SWINE CHARACTERIZED BY LOW TO MODERATE MORBIDITY AND HIGH FATALITY

ASF IS ENDEMIC IN SUB-SAHARAN AFRICA, THE ITALIAN MEDITERRANEAN ISLAND OF SARDINIA, AND PARTS OF THE CAUCASUS AND EASTERN EUROPE

THERE IS CURRENTLY NO EFFECTIVE VACCINE OR TREATMENT

PREVENTING THE ENTRY OF THE VIRUS THROUGH IMPROVED BORDER CONTROL OF SWINE AND PORK PRODUCTS, AWARENESS-RAISING, AND BIOSECURITY FORM THE BEST STRATEGY AGAINST ASF TO ACHIEVE DISEASE-FREE COUNTRIES AND ZONES

AWARENESS, IMPROVED BIOSECURITY, QUICK CONTROL OF OUTBREAKS THOUGH MOVEMENT RESTRICTIONS AND STAMPING-OUT POLICIES ARE ESSENTIAL FOR INFECTED COUNTRIES

MULTILATERAL AND INTERGOVERNMENTAL EFFORTS ARE KEY TO PREVENT AND RESPOND TO OUTBREAKS OF ASF

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ENHANCING THE CAPACITIES OF NATIONAL VETERINARY SERVICES THROUGH THE FAO SURVEILLANCE EVALUATION TOOL

In recent years, outbreaks of animal diseases such as Foot-and-mouth disease (FMD), African swine fever (ASF) and *Peste des petits ruminants* (PPR) have had a devastating impact on communities' livelihoods and food security. In addition, many animal diseases can spread to humans (known as zoonoses), sometimes with lethal outcomes, as seen with rabies, Avian influenza and Rift Valley fever.

To reduce the risk posed by these pathogens, it is necessary to establish a strong animal disease surveillance system that is capable of timely exchange of information with other sectors, such as public health and the environment. However, in many countries, the animal health systems are underdeveloped and underfunded, a factor that places these nations at a disadvantage when they are required to prepare for animal diseases, including zoonoses.

Strengthening the capacities of national veterinary services is therefore crucial to fill this gap and ensure that:

1. **The impact of economically important livestock diseases such as FMD, ASF, PPR and Avian influenza is reduced;**
2. **Countries are able to maintain disease-free status through efficient surveillance activities;**
3. **Zoonoses are detected in animals prior to their spillover to humans.**

FAO'S ROLE IN MEETING THE CHALLENGE

A methodology to assess the quality of national disease surveillance systems and to determine critical gaps was identified. The United States Agency for International Development (USAID), under a project agreement, has been a key partner in developing SET, based on the Surveillance System Analysis Tool (OASIS) of the French National Agency for Food Safety, Environment and Labour (ANSES).

The goals of SET are twofold:

- Provide countries with a comprehensive and reproducible evaluation methodology to assess national animal disease surveillance systems;
- Produce a locally relevant action plan for improvement using specific, measurable, attainable, relevant and time-bound (SMART) recommendations.

SET is currently used by countries for the targeted planning of activities to enhance the capacity of national veterinary surveillance systems. In addition, follow-up assessments measure the progress and impact of the interventions implemented.

THE SET TOOLKIT AND METHODOLOGY

SET consists of a scoring grid that assesses surveillance systems against 90 indicators, which are grouped into 19 categories and seven major areas. For each indicator, the evaluation team enters a score ranging from 1 to 4 along with a justification qualifying the score. Once all indicators have been scored, the toolkit automatically provides visual outputs depicting the strengths and weaknesses of the surveillance system.

In-country missions last 10–12 days, when the team interviews various actors and stakeholders of the surveillance system to gather the information required to complete the toolkit. Care is taken to conduct interviews at all levels of the surveillance system (central, intermediate and field). In addition, the SET methodology includes a strong One Health component, and representatives of ministries of health and the environment provide information on inter-sectoral collaboration.

Using the information collected during interviews, each indicator is scored. Once the visual outputs have been generated, a strengths, weaknesses, opportunities and threats (SWOT) analysis is conducted and SMART recommendations are developed. The results of the evaluation and a preliminary action plan are presented to the key decision-makers, who provide their initial feedback and agreement.

Finally, a comprehensive report describing the mission, its findings and the finalized action plan is drafted and posted online.

PARTNERS INVOLVED

SET evaluation missions are held in close collaboration with in-country FAO teams, which are instrumental in coordinating mission logistics, organizing interviews and acting as intermediaries with the central government. In addition, national focal points from the country's veterinary services or laboratory network are key members of the evaluation team throughout the duration of the mission. These actors provide invaluable background information on the surveillance system and coordinate meetings with stakeholders at the intermediary and field level.

RESULTS ACHIEVED AND NEXT STEPS

During 2017–2018, a total of 13 missions were conducted in selected African countries and the mission evaluation reports are being posted online.

Action plans developed by SET teams have been implemented in several countries. For example, Liberia created an epidemiology unit within their directory of veterinary services that will lead the development of standardized disease reporting tools – as highlighted in the SET recommendations. The United Republic of Tanzania is implementing a technical-scientific committee for surveillance activities, a gap identified during the evaluation in the country.

SET is much more than an evaluation, as a major part of its activities involves measuring the impact of recommendations implemented. In the future, regular meetings with technical and financial partners will ensure that recommendations are implemented, while follow-up evaluation will track countries' progress towards an efficient and sustainable animal disease surveillance system.

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KEY FACTS

FAO SURVEILLANCE EVALUATION TOOL

RECENT OUTBREAKS OF ANIMAL DISEASES HAVE HAD A DEVASTATING IMPACT ON LIVELIHOODS

THE FAO SURVEILLANCE EVALUATION TOOL (SET) PROVIDES SUPPORT FOR PLANNING AND MONITORING THE PROGRESS OF ANIMAL DISEASE SURVEILLANCE CAPACITY IN COUNTRIES

SURVEILLANCE OF ANIMAL DISEASES PROTECTS COMMUNITIES FROM ZOONOTIC DISEASES, WHICH CAN SPREAD TO HUMANS

SET WAS IMPLEMENTED IN 13 COUNTRIES IN AFRICA, RESULTING IN THE DEVELOPMENT OF LOCALLY RELEVANT ACTION PLANS FOR THE TARGETED IMPROVEMENT OF ANIMAL DISEASE SURVEILLANCE SYSTEMS

REGULAR FOLLOW-UP WITH COUNTRIES' FINANCIAL AND TECHNICAL PARTNERS ENSURES THAT SET RECOMMENDATIONS ARE IMPLEMENTED

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COMBATING WHEAT RUST DISEASES: STRENGTHENING NATIONAL CAPACITIES AND INTERNATIONAL COLLABORATION

Wheat is the most widely grown crop globally and a source of food and livelihood for over 1 billion people in many developing countries.

Rust diseases are, historically, the most damaging diseases affecting wheat.

Their frequency, extent and impact has increased significantly in the last two decades, causing global concerns. Their high capacity to develop new races makes most wheat varieties vulnerable to infection.

Wheat rusts are caused by fungal pathogens belonging to the Puccinia species. The three major rusts are yellow rust (*P. striiformis* f. sp. *tritici*), stem rust (*P. graminis* f. sp. *tritici)* and leaf rust (*P. triticina*). They are airborne fungi with spores that can spread rapidly over large distances by wind.

These fungi infect the leaves, stems or ears of plants, resulting in shrivelled grains and yield losses of up to 80 percent or more, depending on local conditions.

Rusts affect almost all wheat-producing regions. However, Eastern and North Africa, the Near East, West, Central and South Asia, which together account for more than 37 percent of global wheat production areas, are more vulnerable to wheat rust epidemics.

Considering these challenges, FAO continuously reinforces its collaboration with partners, to enhance countries' capacities in prevention and preparedness to rust diseases.

NEW RUST RACES ARE EMERGING AND SPREADING

Wheat rust fungi frequently produce new races, which can spread quickly across borders into new environments and affect large areas.

Since the 1990s, stem rust has posed an important challenge because of the new races of the disease that devastated wheats in several countries in Eastern Africa. The stem rust – Ug99 race is now present in 13 countries, as well as the Digalu race. Similarly, the aggressive Yr27 virulent strain of yellow rust has been causing severe outbreaks and losses in many countries in a wide geographical area, from North Africa to South Asia, in the last decade.

In 2016, new races of both yellow and stem rusts have emerged in various regions. The detection of the TTTTF race of stem rust in Sicily, Italy, where stem rust was not previously problematic, raises concerns for the Mediterranean basin. Similarly, while the yellow rust "Warrior" race was spreading from Europe towards West Asia, in 2016, another race detected in Afghanistan was also found in Ethiopia.

INTEGRATED DISEASE MANAGEMENT, CAPACITY BUILDING AND INTERNATIONAL COLLABORATION

To combat wheat rust diseases effectively, integrated management approaches are essential because of the complex nature of the pathogen. For long-term prevention, individual control methods are not adequate; rather, integrated strategies and practices are required.

Using resistant varieties is the primary tool for disease prevention; however, contingency plans should also be developed to control possible outbreaks with the proper use of fungicides. Other agronomic measures – such as removing green bridges between crop cycles, mixed varieties, appropriate irrigation and fertilization – should also be considered.

Since 2008, FAO has been running a global wheat rust programme to provide policy and technical support to concerned countries, in collaboration with its national and international partners including the International Center for Agricultural Research in the Dry Areas (ICARDA), the International Maize and Wheat Improvement Center (CIMMYT), the International Fund for Agricultural Development (IFAD), Cornell University and Aarhus University in the context of the Borlaug Global Rust Initiative (BGRI).

Targeting 40 countries in Africa, the Near East and Asia, the programme focuses on supporting national surveillance and disease management, and on facilitating regional and international collaboration and information sharing. The programme provides technical assistance to strengthen national capacities in seed multiplication, distribution of quality seeds of resistant varieties, farmer training through Farmer Field Schools, as well as to improve research facilities in certain countries such as Ethiopia, Egypt, Iran and Turkey.

Special efforts are also made to support countries in Eastern Africa, such as Ethiopia and Eritrea, in surveillance, rapid seed production, farmer training and rapid response, where new strains of stem and yellow rusts threaten wheats.

GLOBAL MONITORING AND EARLY DETECTION

The frequent evolution of new rust races requires continuous global monitoring and national surveillance. The Global Rust Monitoring System, coordinated by CIMMYT and supported by FAO and other partners, promotes international collaboration and information-sharing. The collaboration between FAO, ICARDA, CIMMYT, the BGRI and Aarhus University facilitated the detection of new stem and yellow rust races in 2016. National experts on training at the Regional Cereal Rust Research Center, Turkey, surveyed wheat fields. Samples were sent to Aarhus University for analysis and races were identified.

PROSPECTS FOR IMPROVED PREVENTION

The risks posed to wheat production by the emerging rust races capable of spreading quickly over continents necessitate intensified international collaboration and coordination. Strengthening national capacities is particularly critical to enabling countries to develop and effectively implement their contingency plans for preventing rust outbreaks. The global wheat rust programme will refocus on reinforcing national capacities and international collaboration for improved prevention and rapid response. These national and international efforts need adequate resources to be effective.


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KEY FACTS

WHEAT RUST DISEASES

RUST DISEASES THREATEN WHEAT PRODUCTION AROUND THE WORLD, PARTICULARLY IN AFRICA, THE NEAR EAST AND ASIA

UP TO 80 PERCENT OR MORE OF A FARMER'S YIELD CAN BE LOST TO RUST

THE CAUSAL FUNGI ARE AIRBORNE AND THEIR SPORES CAN SPREAD ACROSS LONG DISTANCES RAPIDLY BY WIND

IN RECENT YEARS, YELLOW AND STEM RUSTS HAVE PRODUCED NEW RACES, CAUSING SIGNIFICANT LOSSES PARTICULARLY IN EASTERN AFRICA AND THE NEAR EAST

THE GLOBAL WHEAT RUST PROGRAMME TARGETS 40 COUNTRIES IN AFRICA, THE NEAR EAST, EASTERN EUROPE AND ASIA

FAO SUPPORTS THE GLOBAL RUST MONITORING SYSTEM AND COUNTRIES TO IMPROVE THEIR CAPACITIES IN SURVEILLANCE, CONTINGENCY PLANNING AND DISEASE MANAGEMENT

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DESERT LOCUST CONTROL COMMITTEE: A GLOBAL COORDINATING BODY FOR LOCUST EARLY WARNING AND PREVENTIVE CONTROL

The desert locust, *Schistocerca gregaria* (Forskål, 1775), is the world's most dangerous migratory pest, with a voracious appetite unmatched in the insect world.

Within the desert locust's distribution area, which is equivalent to 20 percent of the Earth's land surface and stretches from Northwest Africa to the Indian subcontinent, the insects can rapidly reproduce, concentrate and then form swarms able to move up to 150 kilometres per day in search of food. These swarms can even cross continents and oceans. A single desert locust swarm the size of Brussels could consume Belgium's entire food supply in a single day.

Desert locust swarms pose a constant threat to food supplies in some of the world's poorest and driest countries.

Established in 1955 by FAO, when the world was in the midst of a 12-year-long desert locust plague, the Desert Locust Control Committee (DLCC) is the primary forum that brings together locust-affected countries, donors and other agencies to discuss desert locust management under the FAO umbrella. The DLCC is also the primary advisory body to the Director-General of FAO on all desert locust issues, and has met 40 times since its establishment until 2012.

The three working languages of the DLCC are Arabic, English and French.

The DLCC defines global desert locust prevention strategies and common management approaches that are implemented at the regional and national level.

The activities of the DLCC are those that benefit each member country affected by the desert locust, specifically:

- publishing a monthly FAO Desert Locust Bulletin with six-week forecasts, supplemented by updates and warnings;
- providing 11-month trainings of national locust information officers at FAO headquarters;
- issuing technical publications such as the FAO Desert Locust Guidelines;
- providing fellowships;
- overseeing the Pesticide Referee Group for the independent evaluation of effective locust control products and their potential impact on human health and the environment;

- supporting the development of new technologies and tools for locust early warning and preventive control;
- reproducing and distributing locust-related technical papers;
- managing the Locust Watch – Desert Locust website;
- providing emergency contingency funds; and
- organizing the biannual forum for the discussion of all issues related to desert locusts.

INTERNATIONAL TRUST FUND

The functioning of the DLCC depends on the resources from the Trust Fund established in 1966. Thus, the DLCC relies solely on annual contributions from member countries to carry out its activities. These contributions are extremely modest compared to the benefits that it provides to its members.

The current total amount of annual contributions is USD 207 780.

Out of 64 DLCC members, 35 should contribute to the DLCC Trust Fund every year: Afghanistan, Algeria, Bahrain, Burkina Faso, Cameroon, Chad, Djibouti, Egypt, Eritrea, Ethiopia, Gambia, Ghana, India, the Islamic Republic of Iran, Iraq, Jordan, Kenya, Kuwait, Lebanon, Libya, Mali, Mauritania, Morocco, Niger, Pakistan, Qatar, Saudi Arabia, Senegal, Somalia, Sudan, Syria, Tunisia, Uganda, the United Arab Emirates and Yemen.

HOW DOES THE DLCC DIFFER FROM REGIONAL DESERT LOCUST COMMISSIONS?

The DLCC maintains a global perspective and forum on desert locust early warning, control and emergencies, and provides guidance to the three FAO regional desert locust commissions – the Commission for Controlling the Desert Locust in the Western region (CLCPRO), in the Central Region (CRC) and in Southwest Asia (SWAC).

These three commissions focus on developing a preventive control strategy by promoting the establishment of autonomous national desert locust units and strengthening their member countries' national capacities in surveying, controlling, reporting, providing training, research, planning and ensuring safety.

The DLCC and the regional commissions complement each other, to implement a complete global preventive control strategy that reduces the frequency, duration and intensity of desert locust plagues while ensuring food security and protecting livelihoods.

To fully benefit from this approach, it is important that all countries affected by the desert locust are members of the DLCC and the appropriate commission within their region.

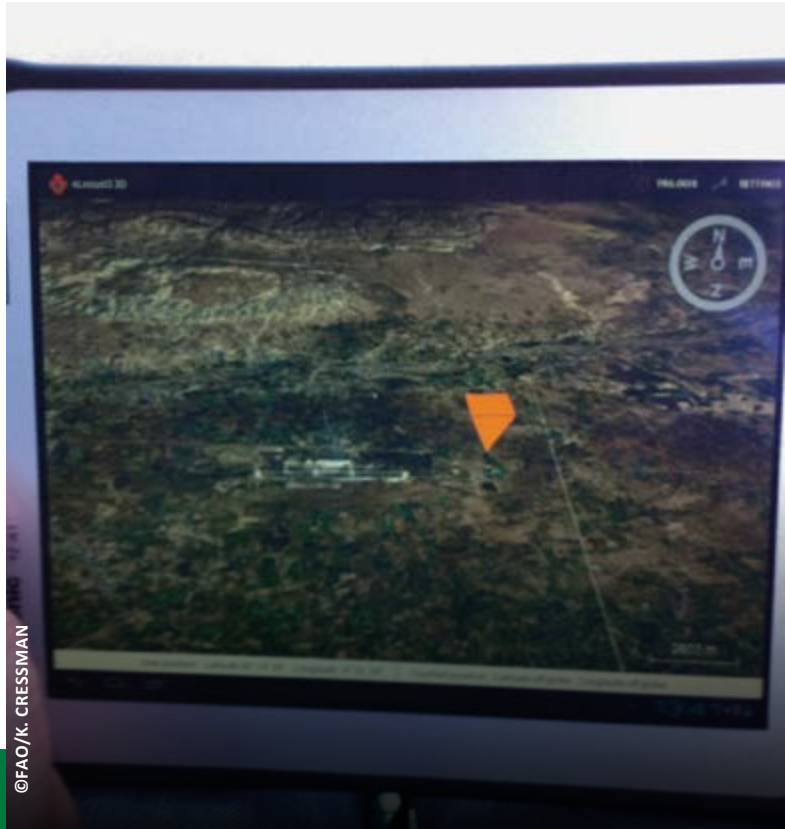
IMPACT OF THE DLCC ON DESERT LOCUST CONTROL

Since the last DLCC in 2012, 12 desert locust outbreaks occurred in Yemen, Mauritania, Sudan, Eritrea, Saudi Arabia, and Somalia.

All of these outbreaks were brought under control thanks to intensive survey and control operations carried out by the national locust units in the affected countries, supported by the FAO Commissions for Controlling the Desert Locust and with technical advice from the Desert Locust Information Service (DLIS) at FAO headquarters.

Consequently, the situation did not deteriorate further and swarms were prevented from migrating to other countries and regions; thus, upsurges were avoided.

These efforts are a good example of the successful implementation of early warning and preventive control strategies.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KEY FACTS

THE FAO DESERT LOCUST CONTROL COMMITTEE

THE PRIMARY GLOBAL FORUM GATHERING DESERT-LOCUST-AFFECTED COUNTRIES, DONORS AND OTHER AGENCIES TO DISCUSS DESERT LOCUST MANAGEMENT UNDER THE FAO UMBRELLA

DEFINES COMMON DESERT LOCUST PREVENTION STRATEGIES AND MANAGEMENT APPROACHES GLOBALLY

PROVIDES GUIDANCE TO THE THREE REGIONAL FAO DESERT LOCUST COMMISSIONS: CLCPRO IN THE WESTERN REGION, CRC IN THE CENTRAL REGION AND SWAC IN SOUTHWEST ASIA

RELIES SOLELY ON ANNUAL CONTRIBUTIONS OF MEMBER COUNTRIES TO A TRUST FUND ESTABLISHED IN 1966 AND MANAGED BY FAO TO CARRY OUT DLCC ACTIVITIES

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FAO PROTECTING CHESTNUT FORESTS IN TURKEY USING CLASSICAL BIOLOGICAL CONTROL METHODS

Chestnuts (*Castanea* species) are trees providing crucial resources for livelihoods in many parts of the world, with a wide range of economic, social and environmental benefits.

The Asian chestnut gall wasp (ACGW), *Dryocosmus kuriphilus Yasumatsu* (Hymenoptera: Cynipidae), is considered one of the most harmful insect pests of chestnut varieties in the world and can cause serious damage. However, protecting forest health from ACGW is possible using Integrated Pest Management (IPM) principles, including classical biological control methods.

THE ASIAN CHESTNUT GALL WASP IN TURKEY

Chestnut has been a staple food in Turkey for millennia. Today, the country is one of the biggest chestnut producers in the world. In all of its chestnut-growing regions, chestnut fruits are an important source of income for the rural population. Besides fruits, chestnut honey is another important product that may be obtained from these forests.

Chestnut trees are also used for wood production. The ACGW was first reported in Turkey in 2014. The ACGW appears to have entered Turkey through plant material transportation. In 2014, the pest was observed in a few chestnut groves and forest areas covering approximately 2 000 ha in Yalova and Bursa provinces, Marmara Region.

During the first surveys, it was observed that 80 percent of the branches of many trees had formed galls and that nut production had almost ceased in Gacik, Yalova.

CONTROL METHODS AGAINST THE ASIAN CHESTNUT GALL WASP

Pest control methods are required for the ACGW, unlike for other gall wasps, the gall-makers of which develop an equilibrium with host plants. However, pest management is challenging in Turkey because of its features and diversity, and the abundance of tree species that vary significantly within the country. Several control methods have been used against the ACGW. However, classical biological control methods have been the most successful. To date, only the *Torymus sinensis* parasitoid, used as a biocontrol agent, has successfully controlled the ACGW's invasive populations.

Other measures applied against the ACGW using IPM principles are:

- **Phytosanitary measures**. The ACGW is on the quarantine list of the EPPO (European and Mediterranean Plant Protection Organization).
- **Early detection**. Young affected plants must be destroyed immediately.
- **Plant odours.** The ACGW follows kairomones pervading from branches and leaves; the majority of these chemicals can be produced synthetically and used as ACGW attractants with almost no effect on the environment. This is a recommended approach that is being tested.
- **Mechanical and physical control**. Positive results can be obtained in chestnut nurseries by covering young plants with nets for two or three months in the summer during the adult flight period, to avoid oviposition in buds.
- **Cultural control**. Pruning may help to reduce ACGW impact and improve the growth of weakened trees; however, commercial growers cannot rely on this method because of the high costs it entails.
- **Use of resistant varieties**. This work is in progress.
- **Chemical control**. The use of chemicals may have serious side-effects on the environment and thus is not recommended. Furthermore, the ACGW spends most of its life cycle within the galls, where it is well protected from chemicals.

FAO'S TECHNICAL ASSISTANCE IN CLASSICAL BIOLOGICAL CONTROL: A SUCCESS STORY

In 2015, the General Directorate of Forestry of the Ministry of Forestry and Water Affairs of the Republic of Turkey requested FAO's technical assistance to manage the ACGW population in the Marmara region.

In late 2015, FAO started the project entitled *"Control of Chestnut Gall Wasp in Chestnut Forests of Turkey"* with the Directorate. In April 2016 and November 2016, FAO led two field missions to investigate the biology of the ACGW, establishing a laboratory for rearing and releasing the *Torymus sinensis* biological control agent imported from Italy by the Directorate, and providing theoretical and practical training activities for stakeholders (technical staff, foresters and chestnut growers) on handling, rearing, introducing and establishing the biological control agent and other silvicultural practices to control the pest.

FAO also provided technical guidance to all stakeholders on identifying the indigenous natural enemies, and developed practical guidelines describing the process and procedures for management of the ACGW using classical biological control in Turkey.

In April 2017, the Government Directorate of Forestry of Turkey announced the successful establishment of the natural enemy of the ACGW in the Yalova region.

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KEY FACTS

THE ASIAN CHESTNUT GALL WASP

THE ACGW IS COMMONLY RECOGNIZED AS THE MOST SERIOUS INSECT PEST OF CHESTNUT SPECIES WORLDWIDE

ATTACKS BY THE ACGW MAY GREATLY AFFECT THE GROWTH OF CHESTNUT TREES, HAVING A NEGATIVE IMPACT ON FRUIT AND WOOD PRODUCTION

ONCE IN A NEW AREA, THE ACGW SUCCESSFULLY ESTABLISHES ITSELF BECAUSE OF ITS OVERWINTERING CAPACITY WHEREVER CHESTNUT SPECIES ARE PRESENT

SEVERAL CONTROL METHODS HAVE BEEN USED AGAINST THE ACGW, BUT TO DATE, ONLY THE *TORYMUS SINENSIS* PARASITOID, A BIOCONTROL AGENT, HAS SUCCESSFULLY CONTROLLED ITS INVASIVE POPULATIONS

FAO ASSISTED IN ESTABLISHING A LABORATORY FOR REARING AND RELEASING THE *TORYMUS SINENSIS* BIOLOGICAL CONTROL AGENT

FAO ASSISTED IN DEVELOPING PRACTICAL GUIDELINES DESCRIBING THE PROCESS AND PROCEDURES TO MANAGE ACGW USING CLASSICAL BIOLOGICAL CONTROL IN TURKEY

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REDUCING LOCUST OUTBREAKS IN CAUCASUS AND CENTRAL ASIA TO BOOST FOOD SECURITY AND LIVELIHOODS

Locusts and grasshoppers pose a serious threat to agriculture, including pastures and rangelands, in Caucasus and Central Asia, concerning an area of more than 25 million hectares. During outbreaks, the three main locust pests – the Italian locust, the Moroccan locust and the migratory locust – attack all kinds of crops and plants and jeopardize food security and livelihoods, placing at least 20 million people at risk. The most affected populations live in rural areas, where human health and the environment may suffer from the negative impact of locust control operations that use conventional pesticides.

Locusts are migrant pests that are capable of flying up to 100 km per day and settling in new areas. Both in Caucasus and Central Asia, national borders are situated on traditional locust habitats and breeding areas. This means that locusts frequently cross territorial boundaries.

To reduce the occurrence and intensity of locust outbreaks in Caucasus and Central Asia, since 2011, FAO has been implementing a regional *"Programme to improve national and regional locust management in Caucasus and Central Asia (CCA)"*.

THE LOCUST PREVENTIVE CONTROL STRATEGY IN CCA

The Programme incorporates the key concepts of the locust preventive control strategy. Preventive control consists of monitoring locust habitats to detect early changes in locust numbers, density, behaviour and appearance, thus allowing for adequate early warning and early reaction.

This strategy offers the following comparative advantages:

- reduced damage to crops and rangelands, and therefore preservation of the food security and livelihoods of highly vulnerable rural communities;
- reduced negative impact on human health and the environment of control operations using chemicals; and
- reduced financial costs.

This approach is the result of applied research carried out since the beginning of the twentieth century, with a solid scientific basis and extensive field practice. Its value has been demonstrated by FAO's experience in other geographical areas within the framework of the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES) – Desert Locust Component.

MAJOR ACHIEVEMENTS IN LOCUST MANAGEMENT

From 2011 to 2016, the following goals have been achieved:

- A technical network on locusts and effective regional cooperation has been established in CCA. This includes regular information exchange through monthly bulletins on locust situations, experience-sharing during annual workshops and intraregional assistance.
- Eighteen joint or cross-border surveys have been conducted, involving 182 locust experts from the ten countries, to collect data and evaluate the locust situation in border areas.
- National capacities have been strengthened, with a total of 478 experts trained on a wide range of locust-related topics through nine internships on locust management and 33 regional and national training sessions.
- Monitoring and analysis tools have been developed to establish a common system of collection, storage and sharing of standardized chrono-, geo- and taxo-referenced locust data in CCA countries: the Automated System for Data Collection, available in ten languages for use on tablets, smartphones and computers, and the locust Geographical Information System in CCA, entitled "Caucasus and Central Asia Locust Management System" (currently being tested).
- Updated control methods and spraying techniques have been introduced and developed, in particular the Ultra-Low Volume (ULV) technology, which is now used by most CCA countries together with emulsifiable concentrate formulations; less harmful pesticides and alternatives to conventional pesticides were also promoted.
- National integral systems for the environmental and health monitoring of locust control have been developed in two pilot countries, Tajikistan (2014) and Kyrgyzstan (2015), resulting in the establishment of Human Health and Environmental Monitoring Teams. Other activities to reduce risks to human health and the environment have also been undertaken.
- Operational capacities have been strengthened through the delivery of equipment, mainly for demonstration or training purposes, including survey, positioning, and communication equipment, ULV sprayers, conventional pesticides in ULV formulation, Personal Protective Equipment, human health and environmental monitoring material.

THE WAY FORWARD

CCA countries and FAO have agreed on a common vision, objectives, results and activities for the coming years. Newly introduced or pursued activities should be carried out over an additional five-year period, focusing on the following:

- sustainability of existing regional cooperation, which is a crucial aspect of CCA locust management;
- implementation of an effective preventive locust control strategy, aiming at annually decreasing infested and treated areas in CCA and thus reducing economic, social and environmental impact; and
- further harmonization and increase of knowledge and best practices.

More partnerships leveraging on the accomplishments of the previous years will be sought, to extend the work and further improve locust management in CCA and thus enhance the food security, livelihoods and health of an even greater number of rural families.

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KEY FACTS

LOCUST MANAGEMENT IN CCA

A MULTIFUNDED PROGRAMME IMPLEMENTED BY FAO SINCE 2011 TO IMPROVE NATIONAL AND REGIONAL LOCUST MANAGEMENT

TEN COUNTRIES INVOLVED: AFGHANISTAN, ARMENIA, AZERBAIJAN, GEORGIA, KAZAKHSTAN, KYRGYZSTAN, THE RUSSIAN FEDERATION, TAJIKISTAN, TURKMENISTAN AND UZBEKISTAN

RESOURCE PARTNERS INCLUDE JAPAN AND THE JAPAN INTERNATIONAL COOPERATION AGENCY (JICA), TURKEY AND THE UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID)

REGIONAL COOPERATION FOR BETTER LOCUST MANAGEMENT DEVELOPED AND NATIONAL CAPACITIES STRENGTHENED

LOCUST MONITORING IMPROVED AND COMMON SYSTEM OF COLLECTION, STORAGE AND SHARING OF STANDARDIZED DATA DEVELOPED AND TESTED

INTRODUCTION AND DEVELOPMENT OF UPDATED CONTROL METHODS AND SPRAYING TECHNIQUES

IMPACT OF LOCUST CONTROL ON HUMAN HEALTH AND THE ENVIRONMENT BETTER MITIGATED AND MONITORED

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INNOVATIVE PARTICIPATORY APPROACH TO CONTROL THE RED PALM WEEVIL ON DATE PALMS IN MAURITANIA

The red palm weevil (RPW), *Rhynchophorus ferrugineus* (Olivier), is the most destructive pest affecting palms, causing widespread damage to several palm species in various agro-ecosystems worldwide. The RPW originates from South and Southeast Asia and is now spreading to almost all countries of the Near East, North Africa, and the Mediterranean. This pest moves from one country to another mainly through infested planting material.

In North Africa, which accounts for 15 percent of global date production, the RPW poses a serious threat to date palm cultivation.

In Mauritania, the RPW was first detected in late December 2015, in the Tidjikja oasis in Tagant Wilaya, which covers almost 20 000 ha with approximately 2.6 million date palm trees. This was the first time the RPW was detected in the Maghreb Region. By March 2016, around 70 infestations had been detected in Tidjikja. Detection is extremely difficult during the early stages of an infestation because of the way the RPW burrows into the palm tree. Usually, the RPW is detected on palms at later stages of infestation, when adults emerge and new infestations and spread of the weevil can be triggered.

INNOVATIVE PARTICIPATORY PEST CONTROL APPROACH

The Government of Mauritania requested FAO's technical assistance to control the RPW outbreak in the country. The technical cooperation project entitled *"Assistance d'urgence pour contrôler le charançon rouge du palmier dans les oasis de la Mauritanie"* was launched in March 2016, to support the government in containing the spread and eradicating the pest. The Integrated Pest Management (IPM) approach, based on extensive preventive measures and collaborative practices, was adopted in the project to control the pest. A participatory pest management action plan was put in place, along with a communication strategy, supported by adequate human and financial resources from FAO, the Ministry of Agriculture, and farmers' organizations.

Well-structured national and local IPM programmes for the RPW were established, with regular inspection of palm trees, pheromone trapping, targeted insecticide treatments, internal quarantine, and public awareness initiatives.

Theoretical and practical trainings were organized, involving the local authorities (the Governor and the Municipality Head), technical department heads (agriculture, environment), farmers' organizations and NGOs. During the training, the risks posed by the pest to the economy and to the oasis itself were highlighted.

THE FARMERS OF TIDJIKJA PROTECT THEIR OASIS

Farmers in Tidjikja, with a special focus on youth, were trained on all IPM activities, including inspection for early detection, treatment techniques, trap management and date palm cleaning.

In early 2016, Tidjikja farmers created the ISOT (*Initiative pour la Sauvegarde de l'Oasis de Tidjikja*) group to mobilize resources, and to start awareness and advocacy campaigns to eradicate the pest and protect their oasis.

A well-coordinated network was established comprising the entire Tidjikja farming community. The network used social media to share up-to-date information on the pest, coordinate their actions and mobilize resources.

The Federation of Farmer Associations in Tidjikja mobilized farmers to engage in the IPM action plan. The Federation also played a leading role in coordinating and communicating with other national and international organizations to deliver technical and financial support to farmers. The Government of Mauritania set up a national steering committee to monitor the RPW programme and report to the Minister of Agriculture. A communication plan was developed and implemented through different media (TV, radio, newsletters, social media, etc.).

SUCCESS OF IPM IN CONTROLLING THE RPW

The immediate and well-structured action initiated by the Government of Mauritania in implementing the IPM programme, with the support of FAO, resulted in containing the pest in the original foci of infestation within one year, with no further spread. The lead, proactive participation, and high level of commitment and cooperation of farmers and farmer cooperatives was key to the success of the action. Also, applying preventive measures, systematic coordination, planning and monitoring among all stakeholders facilitated RPW control in the oasis.

The successful IPM initiative resulted in early pest eradication and the potential declaration of Tidjikja as an RPW-free area.

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KEY FACTS

RED PALM WEEVIL

THE RPW IS ONE OF THE WORLD'S MAJOR INVASIVE PEST SPECIES AND IS THE SINGLE MOST DESTRUCTIVE PEST OF SOME 40 PALM SPECIES WORLDWIDE

THE RPW WAS DETECTED IN THE GULF REGION DURING THE MID-1980S. OVER THE LAST THREE DECADES, THE WEEVIL HAS SPREAD RAPIDLY THROUGHOUT THE MIDDLE EAST AND NORTH AFRICA, AFFECTING ALMOST EVERY COUNTRY IN THE REGION

THE RPW ATTACKS YOUNG, SOFT TREES THAT ARE LESS THAN 20 YEARS OLD. AROUND HALF OF THE 100 MILLION DATE PALM TREES FIT THESE CRITERIA AND ARE THEREFORE VULNERABLE

THE RPW IS VERY DIFFICULT TO DETECT IN THE EARLY STAGES OF INFESTATION BECAUSE OF THE VERY FEW EXTERNALLY VISIBLE SIGNS: AROUND 80 PERCENT OF THE PEST'S LIFE CYCLE TAKES PLACE HIDDEN INSIDE THE TREE

INTEGRATED PEST CONTROL METHODS INCLUDE REMOVAL OF ALL INFESTED PALMS, REDUCED USE OF INSECTICIDES, USE OF BIO-PESTICIDES, LOW-COST AND HIGHLY SENSITIVE MICROPHONES TO DETECT LARVAE FEEDING INSIDE A TREE, PHEROMONE TRAPS, DRONES, REMOTE SENSING AND SNIFFER DOGS

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FALL ARMYWORM THREATENS FOOD SECURITY AND LIVELIHOODS ACROSS AFRICA

Fall Armyworm (*Spodoptera frugiperda*), or FAW, is a transboundary insect pest that feeds on more than 80 crop plants – particularly maize when available – and is capable of travelling over 100 km per night. It can cause significant yield losses if it is not well managed, and has a high potential to negatively affect food security. FAW is native to the tropical and subtropical regions of the Americas; however, it has been recently introduced into Africa, where it has rapidly spread.

In early 2016, FAW was first confirmed in Central and Western Africa. By the end of 2017, it was found in almost all countries of sub-Saharan Africa and could spread further.

By early 2018, tens of millions of hectares of maize in Africa were found to be infested with FAW. The majority of maize farmers in Africa are smallholders, typically growing 1 to 2 ha of maize. These farmers have limited access to pest information, inputs and adequate production prices.

Farmers need significant support to sustainably manage FAW in their cropping systems through Integrated Pest Management (IPM), which is the most appropriate approach to adopt in managing FAW.

To support farmers and countries in responding to the FAW threat, FAO has taken a lead role in providing technical expertise, policy advice, training, coordination and communication on FAW management.

MAIZE FARMERS STRUGGLING AGAINST FAW

Maize is the most widely grown staple food crop in sub-Saharan Africa. More than 300 million people in Africa depend on maize as a source of food and livelihood.

Left uncontrolled, FAW can reduce maize yields by 10 to 20 percent. This reduction, coupled with other factors including drought and social instability, can push smallholder families over the tipping point into food insecurity.

Concern on a new type of damage may cause panic among both farmers and government officials, leading to an overuse of synthetic chemical insecticides that may be highly hazardous to human health.

In Mesoamerica, smallholder farmers have been sustainably managing FAW in maize for centuries. Gathering and analysing experiences and best practices from the Americas, along with local experimentation and testing, will help to design a sustainable FAW management program for smallholders in Africa based on IPM.

FAO'S ACTIONS TO SUPPORT COUNTRIES AGAINST FAW IN AFRICA

FAO took immediate action to help member countries, farmers' organizations and individual farmers to manage FAW. This was accomplished in partnership with other organizations, through FAO's mandate of coordination, convening partners, organizing technical consultation meetings and technical working groups, and providing technical and policy advice.

Immediately, FAO implemented its Technical Cooperation Programme projects on FAW management, which are operational in at least 29 countries.

In 2017, FAO organized several meetings in Africa to provide updates on the situation, share and update knowledge on sustainable FAW management for smallholder family members, and support emergency preparedness and rapid pest management response.

South-South Cooperation and knowledge exchanges between Africa and the Americas were facilitated to share and update the state of knowledge on sustainable FAW management for smallholder family farmers. This included information on biological control, monitoring, economic thresholds, use of bio-insecticides, and the impact of plant biodiversity on FAW ecology.

FAO formulated a Framework for Partnership for the sustainable management of FAW in Africa, endorsed by the African Union and intended as a guide for the development of projects and programmes by the various stakeholders.

It also developed a Programme for Action for Sustainable Management of FAW in Africa that focuses on pesticide use, monitoring and early warning, farmer education, communications, risk mapping and impact assessment.

Field tools developed by FAO, such as a mobile phone app, a centralized database, and a web-based early warning platform, help to monitor FAW throughout Africa. These are supplemented by pheromone traps with ongoing field evaluations of appropriate lures. Innovative technologies such as remote sensing, drones, Google Earth Engine and artificial learning are utilized to improve FAW monitoring and diagnose damage.

FAO facilitated the preparation of a Farmer Field School (FFS) guide on IPM for FAW covering FAW identification, biology and ecology, plant diversity, soil health management, early scouting, mechanical controls, botanical pesticides, biopesticides and biological control agents, pesticide risk reduction, community monitoring, and other topics. Farmers and communities will carry out adaptive research to refine sustainable pest management recommendations.

Special attention is given to technical and policy advice regarding the use of pesticides. Highly hazardous pesticides are avoided and bio-pesticides are tested.

FAO'S KEY NEXT STEPS FOR FAW

One of FAO's key next steps for FAW management in Africa is to support the design and implementation of a sustainable and ecological pest management programme for smallholder farmers in Africa, after examining the experiences of the farmers and researchers from the Americas.

Promising management practices will be tried and adapted in the field, using FFS that involve farmers and farmer organizations across Africa, in collaboration with research and advisory services.

Next steps include upscaling activities across the continent, to help farmers to better respond to the threat.

Significant resources will be mobilized to enable the training of tens of thousands of farmers in sustainable FAW management, the implementation and use of monitoring and early warning systems, the reduction of risk relating to pesticide use, and the execution of careful risk mapping and impact assessments.


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KEY FACTS

FALL ARMYWORM

FARMERS AND GOVERNMENTS SHOULD NOT PANIC: THERE ARE PROVEN, EFFECTIVE MEANS OF MANAGING FAW

A MASSIVE ROLLOUT OF A LEARNING, TRAINING AND COMMUNICATIONS PROGRAMME IS NECESSARY THROUGH VILLAGE MEETINGS, FFSS, NATIONAL EXTENSION PROGRAMMES AND ADVISORY SERVICES

SUSTAINABLE FAW MANAGEMENT METHODS INCLUDE UTILIZING PLANT DIVERSITY, ATTRACTING AND MAINTAINING NATURAL ENEMIES, AND MECHANICAL CONTROL

TARGETED USE OF LOCALLY PRODUCED BOTANICAL INSECTICIDES AND PATHOGENS COLLECTED FROM THE FIELDS ARE OTHER VIABLE OPTIONS TO SUSTAINABLY MANAGE FAW

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FAMEWS: A MOBILE APP FOR MONITORING & EARLY DETECTION OF FALL ARMYWORM

Fall armyworm (*Spodoptera frugiperda*), or FAW, is an insect pest of more than 80 plant species and causes damage to economically important cultivated cereals such as maize, rice and sorghum, as well as to vegetable crops and cotton. The larval stage of the insect causes the damage. FAW reproduces at a rate of several generations per year, and the moth can fly distances of up to 100 km per night.

The insect pest is native to tropical and subtropical regions of the Americas. In the African continent, it was first detected in central and western Africa in early 2016. By early 2018, only 10 of the 54 African states and territories had not reported infestations by the invasive pest.

Maize is now the most infested crop in Africa. As maize is a staple crop, farmers and their families are unlikely to abandon it.

FAO and its partners have been at the forefront of tackling FAW and continue to support prevention, early warning and effective response.

An integral part of FAO's sustainable management programme for FAW in Africa is the FAW Monitoring and Early Warning System (FAMEWS) mobile app. Data from the app provides valuable insight on how the insect populations change over time with ecology, to improve knowledge of its behaviour in Africa and guide best management.

FAW MONITORING AND EARLY WARNING SYSTEM

Given its demonstrated expertise and experience in continent-wide and global early warning systems for agricultural transboundary pests, FAO took the lead in developing and establishing the FAW monitoring and early warning system, utilizing the specialized expertise of other institutions.

The monitoring component of the system is being established within the context of existing community Integrated Pest Management (IPM) programmes, such as Farmer Field Schools (FFSs) and community-based systems.

The system consists of field data, collected at the farm level, that are collated so that they can be shared and analysed at local, national and global level to produce useful information in the form of relevant advice for management and early warning for all stakeholders.

Only farmers in their fields can successfully manage FAW on a sustainable basis. FAO has led the formation of FFSs across sub-Saharan Africa for over 20 years. Thousands of FFSs have successfully worked with hundreds of thousands of smallholder family farmers to sustainably manage their production systems. FAO will bring FAW management to the

thousands of existing field schools and expand into the areas most affected by FAW, based on a unified curriculum linked to monitoring and continuous feedback and improvement.

FAMEWS MOBILE APP: HOW IT WORKS

The FAMEWS mobile app, a critical tool for FAW management, enables the collection, recording and transmission of field data by farmers, either as individuals or organized into communities, such as FFSs and other community-based programmes. The tool is simple, straightforward, intuitive, and easy to maintain and update.

Field data are collected to:

- determine FAW presence at the local, district, national and regional level;
- take immediate action;
- monitor FAW movements and spread;
- identify gaps in monitoring;
- identify potentially threatened or at-risk areas; and
- provide forecasts and early warning.

The app is useful on two fronts: to farmers and agricultural workers engaged in the direct management of their crops to prevent further infestations and reduce damage; and to all actors involved in managing FAW in Africa, by providing vital analysis on risks, spread, and management.

This app should be used whenever a field is scouted or pheromone traps are checked for FAW.

Field scouting consists of inspecting 50 plants in a field and recording relevant data. It may be done by farmers, community focal points, agricultural extension agents or other parties.

Checking pheromone traps involves counting the number of adult male FAW moths that have been caught. Pheromone traps are not a substitute for field scouting.

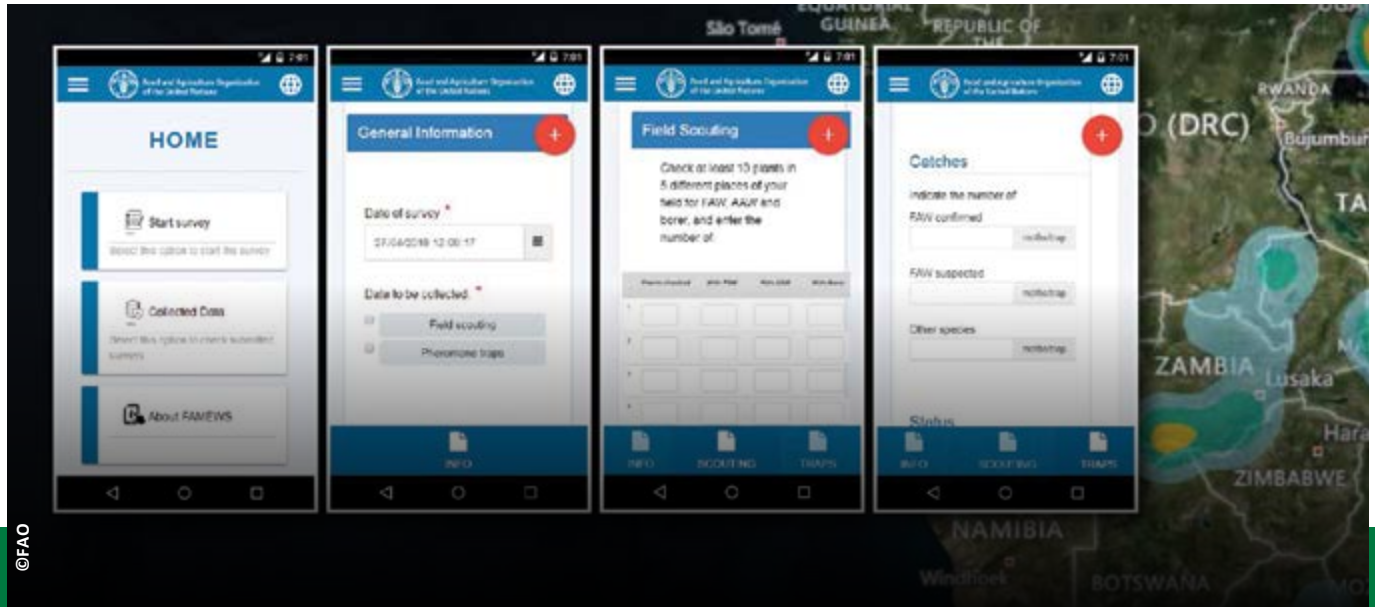
Once farmers and workers have checked their crops for infestations and entered the required data, the app calculates infestation levels so that farmers can take action to better manage the situation.

The data are validated by national FAW focal points in each country and transferred to a global web-based platform. They are then analysed to give a real-time situation overview, with maps of FAW infestations and the measures that are most effective in reducing its impact.

Initially implemented in Madagascar and Zambia, the app is now being rolled out across all countries in sub-Saharan Africa that are affected by the invasive pest through the FAO-supported FFSs, as well as other community-based forums leading the fight against FAW.

WHAT IS NEXT?

Updates to the app will provide additional functionalities, such as an advisory system that informs the user and provides guidance, and a diagnostic tool that uses the cameras of mobile phones to determine the levels of FAW infestation in maize. The app is designed to expand with the evolving needs of farmers, analysts and decision-makers.



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KEY FACTS

FAMEWS

THE FAMEWS SYSTEM CONSISTS OF A MOBILE APP AND A GLOBAL MAPPING PLATFORM THAT SUPPORTS FAW MANAGEMENT, FROM MONITORING AND EARLY WARNING TO RESPONSE AND RISK ASSESSMENT

FAMEWS IMPROVES KNOWLEDGE OF FAW BEHAVIOUR IN AFRICA AND GUIDES BEST RESPONSE

TO USE THE FAMEWS MOBILE APP, THERE IS NO NEED FOR INTERNET OR CELL NETWORK CONNECTION

THE APP ONLY CONNECTS TO THE INTERNET OR CELL SERVICE WHEN IT SENDS DATA; THEREFORE, THE COST IS SIMILAR TO THAT OF A CHAT MESSAGE

THE INFORMATION COLLECTED DURING FIELD SCOUTING AND CHECKING PHEROMONE TRAPS MUST BE CAREFULLY RECORDED IN THE MOBILE APP


XXII CIMF

ERADICATION OF THE MEDITERRANEAN FRUIT FLY FROM THE DOMINICAN REPUBLIC USING NUCLEAR TECHNOLOGY

The Mediterranean fruit fly (or medfly), *Ceratitis capitata* Wied., is considered a major agricultural pest worldwide because of the direct damage it causes to fruit and vegetable production. Countries free of the pest impose restrictions on the commercialization of horticultural commodities. The insect attacks several varieties of fruit and vegetable, and spreads very fast.

The presence of this pest was officially reported in the Dominican Republic in March 2015.

The International Atomic Energy Agency (IAEA), FAO and the United States Department of Agriculture (USDA) immediately joined forces to assist the country in establishing a national monitoring network to delimit the distribution of the outbreak and initiate an eradication campaign, with support from the Moscamed Programme of the United States of America, Guatemala and Mexico, as well as regional organizations such as the International Regional Organization for Plant and Animal Health (OIRSA) and the Inter-American Institute for Cooperation on Agriculture (IICA).

In July 2017, the Caribbean country officially declared that it is free of the invasive pest, only two years after an outbreak led to considerable damage to its agricultural industry.

The Dominican Republic has eradicated the medfly by using an integrated approach that includes the sterile insect technique (SIT) – an environmentally friendly and effective method to suppress or eradicate selected insect populations – and that was applied on an area-wide basis.

EFFECTIVE MEDITERRANEAN FRUIT FLY ERADICATION

An outbreak of the Mediterranean fruit fly was reported for the first time in the Dominican Republic in March 2015, near the tourist city of Punta Cana. The pest rapidly spread over an area of 2 000 km^2 in the east of the country. Investigations indicate that the Mediterranean fruit fly probably entered the country inside a tourist's luggage.

Although some 200 km away from the main horticultural production areas, an immediate import ban was placed by major trading partners on several agricultural products, including avocado, citrus fruits, papaya and peppers, thereby severely affecting agricultural exports, which are the country's main source of income after tourism. The ban resulted in an estimated loss of approximately USD 40 million in fruit and vegetable exports alone in the following nine months of 2015, putting thousands of jobs at risk.

While most flies were initially detected in non-commercial almond trees along the coast, there was a fear that they would also invade commercial fruit and vegetable farms.

NUCLEAR TECHNOLOGIES TO CONTAIN AND ERADICATE THE PEST

As an emergency response, the Government of the Dominican Republic, through its Ministry of Agriculture, established the Moscamed Programme-DR, and made available the financial and operational support required to perform all necessary monitoring and control activities. Local personnel were immediately trained in establishing a surveillance network throughout the country to detect and identify the fly, as well as in complementary pest control methods such as pruning of host trees, destruction of potential fruit hosts and use of selective insecticide bait-sprays.

The IAEA and FAO, in close cooperation with the USDA and the Guatemala-Mexico-USA Moscamed Programme, provided technical assistance to the Dominican Republic to suppress and eradicate this major invasive pest and to implement the SIT as the main eradication tool. The OIRSA and the IICA also participated in this major effort to assist the Dominican Republic.

Through its Technical Cooperation Programme, the IAEA also provided assistance through emergency funds, conducting capacity-building actions and deploying a long-term expert on-site to train staff and implement the SIT to eradicate the pest. A facility in the town of Higuey was adapted as a fly emergence-and-release facility to manage the sterile male flies that were transported weekly as pupae from El Pino, Guatemala. From October 2015 to May 2017, over 4 billion sterile flies were released in the affected areas.

A Technical Advisory Committee of international experts, chaired by the Joint FAO/IAEA Division, was fundamental in providing technical guidance to the Ministry of Agriculture of the Dominican Republic.

DOMINICAN REPUBLIC DECLARED MEDFLY-FREE

As a result of this major effort, the last Mediterranean fruit fly was detected in January 2017 and official eradication was declared six months later, in July 2017. Export markets have since reopened and the net revenues of the rapidly growing horticultural sector have been re-established.

Phytosanitary activities are now carried out by 117 inspectors and include the use of X-ray machines in the Dominican Republic's maritime ports, airports and border points to minimize the risk of entry of the fly and other invasive pests.

The Dominican Republic is now on the list of countries that have successfully eradicated the Mediterranean fruit fly. It has successfully developed the capabilities for area-wide application of the SIT and has become a source of training and technology transfer for other countries in the region that are increasingly exposed to invasive pest incursions because of increased travel and trade. Had this devastating pest been allowed to establish itself, the whole Caribbean Region and all of its trading partners would have been at severe risk of devastating outbreaks and huge losses in export revenue.

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KEY FACTS

MEDITERRANEAN FRUIT FLY

A MEDFLY OUTBREAK IN THE DOMINICAN REPUBLIC RESULTED IN AN EXPORT BAN ON HORTICULTURE PRODUCTS, ENTAILING AN ESTIMATED LOSS OF USD 40 MILLION

THE IAEA AND FAO, IN CLOSE COOPERATION WITH THE USDA, THE MOSCAMED PROGRAMME, OIRSA AND IICA, PROVIDED TECHNICAL ASSISTANCE TO THE GOVERNMENT OF THE DOMINICAN REPUBLIC

THE MEDFLY WAS ERADICATED FROM THE DOMINICAN REPUBLIC USING THE STERILE INSECT TECHNOLOGY

OFFICIAL ERADICATION WAS DECLARED IN JULY 2017. EXPORT MARKETS HAVE SINCE REOPENED AND NET REVENUES RE-ESTABLISHED

THE DOMINICAN REPUBLIC IS NOW ON THE LIST OF COUNTRIES THAT HAVE SUCCESSFULLY ERADICATED THE MEDITERRANEAN FRUIT FLY

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FIGHTING THE THREATS OF BANANA BUNCHY TOP DISEASE IN AFRICA

Banana bunchy top disease (BBTD), caused by the banana bunchy top virus (BBTV), is listed among the world's 100 worst invasive species. The disease is transmitted by the *Pentalonia nigronervosa* banana aphid and through infected propagation materials.

BBTD is endemic in many banana-producing countries in Asia and the Pacific Region and Africa. In sub-Saharan Africa, it was reported to be present in 15 countries: Angola, Benin, Burundi, Cameroon, Central African Republic, Republic of Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Malawi, Mozambique, Nigeria, Rwanda, South Africa and Zambia.

Bananas and plantains are produced in over 135 countries, being the fourth most-cultivated food crop in least developed countries.

Approximately one-quarter of global production takes place in sub-Saharan Africa, where it provides 35 percent of daily calorie intake.

Therefore, banana is crucial to people's food security and livelihoods, and BBTD could potentially have a devastating economic and social impact in the continent.

BBTD is currently a major threat to banana cultivation in sub-Saharan Africa, and a menace for over 100 million people for whom banana is the major staple food.

FAO has been supporting countries in their efforts to control BBTD through awareness-raising, farmer training and capacity building in various areas such as surveillance, diagnosis, prevention and integrated disease management.

HOW TO PREVENT AND CONTROL BBTD

Controlling BBTD is extremely difficult because of the widespread presence of its vectors and the unavailability of effective treatments once the virus is established in an area.

Symptoms of the disease include dark-green discontinuous streaks on leaf lamina and petiole at initial stages, and then rosetting of leaves, chlorosis and drying of leaf margins. Severe stunting and a bunchy appearance of the suckers developing after infection are also common. Consequently, the effects of the disease on production may be detrimental: plants become stunted and produce no or inedible fruits, resulting in a production loss of almost 100 percent within two years of disease occurrence.

In Malawi, BBTD was responsible for the collapse of banana production in the central part of the country and for the decline in production of 30–90 percent in the affected districts. Being extremely

difficult to eradicate, the most effective disease control strategy is prevention of disease spread.

The use of virus-free seedlings in production and the prevention of movement of infected plant materials are key to avoid disease incursions into new areas.

Once the disease is established, the most effective control method is prompt destruction of infected plants and aphids, ideally through injection of herbicides and systemic insecticides directly into the plants. Replanting must be done using certified virus-free planting materials after a banana-free period of at least two months, to kill off aphid vectors and eradicate any residual inoculum.

To prevent the spread of the virus to non-affected areas and countries, strict implementation of phytosanitary measures is necessary. For this purpose, the International Standards for Phytosanitary Measures (ISPM), developed by the International Plant Protection Convention (IPPC), and the Technical Guidelines for the Safe Movement of Musa Germplasm, developed by MusaNet/Bioversity International, provide the necessary guidance.

All these efforts require a programmatic approach and strategic planning at national and international level.

FAO'S RESPONSE TO BBTD IN CENTRAL AFRICA

The disease has been affecting production in some countries in Central and Southern Africa. Recently, it has become an important concern for Gabon, Cameroon and Equatorial Guinea, as well as neighbouring countries. In 2015, FAO implemented a subregional project that helped build national capacities for surveillance, diagnosis and management of BBTD in these three countries.

FAO, in collaboration with the International Institute of Tropical Agriculture (IITA), the African Research Centre on Bananas and Plantains (CARBAP) and national institutions, facilitated the training of 22 technicians, the surveying of 302 farms, the destruction of 5 909 infected plants and the supply of virus-free seedlings by IITA to 75 Cameroonian farmers whose farms were infested by the virus.

Through the project:

- a risk management strategy was designed to monitor the progress of the disease;
- an early warning and rapid eradication action plan was developed;
- quarantine and customs officers, as well as border police, were trained in inspection of plant materials;
- vigilance committees were set up in border villages to control movement of plant materials; and
- producers were trained in the local production of healthy planting materials, particularly via the plant derived from stem fragment technique (PIF), to enable them to rehabilitate their fields.

The project clearly illustrated the importance of raising awareness, using virus-free planting materials, conducting regular field surveys and ensuring prompt destruction of infected plants.

It was also evident that collaboration among countries and international institutions was key to disease management at regional level. This is not only because the disease easily spreads across borders, but also because multidisciplinary approaches are necessary and countries require such support in implementing the appropriate disease management principles.


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KEY FACTS

BANANA
BUNCHY TOP DISEASE

BANANA AND PLANTAIN (MUSA SPP.) ARE AMONG THE MOST IMPORTANT STAPLE CROPS FOR RURAL POPULATIONS IN AFRICA

BANANA BUNCHY TOP DISEASE (BBTD) IS A MAJOR THREAT TO BANANAS WORLDWIDE, AND THE VIRUS IS LISTED AMONG THE WORLD`S WORST 100 INVASIVE SPECIES

AS DISEASE ERADICATION IS CHALLENGING, THE BEST DISEASE CONTROL STRATEGY IS PREVENTION OF MOVEMENT OF INFECTED PLANTS AND USE OF VIRUS-FREE PLANTING MATERIALS

REGULAR SURVEYS AND PROMPT DESTRUCTION OF INFECTED PLANTS AND APHIDS REDUCE THE RISK OF SPREAD

INTERNATIONAL COLLABORATION IS ESSENTIAL FOR EFFECTIVE MANAGEMENT OF THE DISEASE AT REGIONAL AND GLOBAL LEVEL

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HALTING BARK BEETLES THAT CAUSE PINE FORESTS DIEBACK IN BELARUS AND UKRAINE

Pine dieback, caused by bark beetles, is causing severe damage to Scots pine (*Pinus sylvestris*) in Belarus and Ukraine.

Forestry and the wood processing industry of Scots pine is significant in Belarus and Ukraine in economic, social and environmental terms. In recent years, a new threat has attacked pine forests, resulting in an increased proportion of dead trees. Bark beetles bore into the plant tissues, create reproductive galleries, and feed on the living tissue. Native forests and older plantations are currently suffering from dieback and associated outbreaks of bark beetles. These insects usually attack dead or dying trees and serve as primary decomposers.

However, under stressful conditions, such as drought or high tree density, they may attack and destroy healthy trees in large numbers, overcoming tree defences.

To address this situation, FAO is providing technical assistance on combating dieback of pine forests using Integrated Pest Management (IPM) strategies.

FAO is also assisting the Governments of Belarus and of Ukraine to develop and implement an emergency action plan. This plan serves as a guide to find a long-term, coordinated solution to reduce or control the periodic incidence of bark beetle infestations.

THE MAIN CAUSES OF PINE PLANTATIONS DIEBACK

Pine dieback was first detected in Belarus in 2008. The damage to Scots pine is estimated to extend over more than 184 000 ha in 2018, with no sign of decline. The principal bark beetle species in Belarus and Ukraine is *Ips acuminatus* (Coleoptera: Scolytinae). This bark beetle often initiates attacks in the upper part of mature trees and may infest twigs as small as 2 mm in diameter. Other bark beetles species in the genus *Ips*, such as *Ips sexdentatus*, are involved.

Pine trees growing in abundance cause the rapid spread of various bark beetle species, resulting in the dieback of pine forests. These trees present reduced vitality across all age groups. In addition, the extreme weather conditions due to global climatic changes have created a favourable environment for the rapid reproduction rate of the bark beetle.

Controlling pine bark beetle populations alone is unlikely to solve the pine dieback problem that Eastern Europe countries are experiencing if forest stands are not managed to adapt to global climate change.

INTEGRATED PEST MANAGEMENT FOR CONTROL OF THE IPS SPECIES

IPM is a critical component to manage pests sustainably, as it involves strategies that are effective as well as benign to the environment.

Prevention. Dense, pure and overmature stands of Scots pine are likely to be more prone to bark beetle infestations. Hazard rating systems should be developed and include indicators such as pine basal area, stand age and site index. Periodic thinning and harvesting trees before they become overmature reduces the susceptibility to bark beetles within high-risk areas. These high-risk areas should be monitored frequently using pheromone traps and aerial detection flights.

Monitoring/Prediction. Pheromone traps are used to detect first-generation emergence of overwintering beetles and monitor the flight of subsequent generations. The relationship between the number of first-generation beetles and the degree of subsequent damage can be determined to develop a prediction system for better forecasting of outbreaks.

Detection. Aerial detection methods should be used to detect all infestations. In the long term, detection protocols using satellite imagery or drones should be developed.

Evaluation. Infested spots must be examined to estimate the number of infested trees and species of bark beetles present.

Suppression. Sanitation cutting must be carried out as soon as foliage discoloration appears and should be extended to nearby apparently healthy trees. Before the second-generation broods emerge, all infested fallen trees should be harvested, debarked or destroyed.

Chemical control may have adverse effects against bark beetle predators; therefore, it is not recommended as a primary control measure.

FAO'S ACTIONS

In 2018, FAO started a project to identify the primary causes of pine dieback, develop an emergency action plan for combating dieback of pine forests in Belarus and Ukraine (including a training programme on management techniques), and strengthen national capacities to monitor forest pests and diseases.

In April 2018, FAO hosted a Regional Workshop on Combating Dieback of Pine Forests in Minsk, attended by experts from all over the world and forest officers from Belarus and Ukraine.

To improve cooperation and exchange of information, FAO has established a Forest Invasive Species Network for Europe and Central Asia, with the aim of fostering integrated and dynamic forest pest management in the region and providing baseline data for informed decision-making. The role of climate change in the intensified spreading of plant pests and diseases represents one of the main points addressed.

FAO provides technical guidance to the Governments and foresters of Belarus and Ukraine to improve forest resilience against bark beetle infestations and to mitigate the impact of climate change.

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KEY FACTS

PINE DIEBACK

BARK BEETLES OF THE FAMILY SCOLYTIDAE ARE COMMON PESTS OF CONIFERS, SUCH AS PINES, AND REPRODUCE IN THE INNER BARK OF TREES

BARK BEETLES CAUSE PINE DIEBACK IN SCOTS PINE FORESTS IN BELARUS AND UKRAINE

BARK BEETLES TYPICALLY ATTACK STRESSED OR DYING TREES; HOWEVER, THEY MAY INVADE AND KILL HEALTHY TREES

IN BELARUS, IN 2018, THE DAMAGE OF SCOTS PINE IS ESTIMATED TO EXCEED 184 000 HA, WITH NO SIGN OF DECLINE

INTEGRATED PEST MANAGEMENT CONTRIBUTES TO THE EFFECTIVE MANAGEMENT OF PINE DIEBACK

TO IMPROVE COOPERATION AND THE EXCHANGE OF INFORMATION, FAO HAS ESTABLISHED A FOREST INVASIVE SPECIES NETWORK FOR EUROPE AND CENTRAL ASIA

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TOWARDS SUSTAINABLE LOCUST MANAGEMENT IN CAUCASUS AND CENTRAL ASIA

Locusts and grasshoppers pose a serious threat to agriculture, including pastures and rangelands, in Caucasus and Central Asia (CCA), where more than 25 million hectares are concerned.

During outbreaks, the three main locust pests – the Asian migratory locust (*Locusta migratoria migratoria*), the Italian locust (*Calliptamus italicus*) and the Moroccan locust (*Dociostaurus maroccanus*) – attack all kinds of crops and natural vegetation and jeopardize the food security and livelihoods of at least 20 million people. The most affected populations are the most vulnerable rural communities, whose health and environment may moreover suffer from the adverse effects of locust control operations.

Locusts are migrant pests that are capable of flying over up to 100 km per day and settling in new areas, which increases their pest status. In Caucasus and Central Asia, locust traditional habitats and breeding areas are often situated on both sides of borders. This results in frequent movements of hopper bands and swarms across political boundaries. Locusts are also opportunistic insects, and may become more dangerous with global warming and the exceptional weather events boosted by climate change.

To reduce the occurrence and intensity of locust outbreaks, since 2011, FAO has been implementing a multifunded and interregional "Programme to improve national and regional locust management in Caucasus and Central Asia (CCA)".

KEY CHALLENGES AND FUTURE DIRECTIONS

The main achievements of the Programme include the creation of a regional technical network, strengthened national capacities on a wide range of topics related to locust management, and greater attention to human health and environmental aspects.

Building on these achievements and faced with the critical challenge of ensuring the sustainability of national and regional locust management, countries agreed on a shared vision based on three main directions:

- ensuring the sustainability of regional cooperation;
- shifting from reaction to prevention and disaster risk reduction; and
- further strengthening human and operational capacities.

In this context, the Technical Workshop on Locusts in CCA, held in November 2017 in Tajikistan, enabled definition of a roadmap, including expected results and envisaged activities, to be used as a framework for the Programme in the coming years.

TOWARDS LONG-TERM REGIONAL COOPERATION ON LOCUSTS

No successful management of transboundary plant pests can be expected without regional cooperation. The regional network is a significant step forward; however, it is not sufficient, in terms of sustainability. It must be maintained and consolidated. This means pursuing key activities such as regular information exchange (regional monthly bulletins), joint activities (cross-border surveys, training, etc.) and annual meetings at regional level. In addition, countries should agree upon and establish an appropriate long-term mechanism. It is only in this way that regional cooperation can be guaranteed in the long term, beyond the Programme and external funding.

TOWARDS PREVENTION AND RISK DISASTER APPROACHES

The locust preventive control strategy relies on monitoring locust population dynamics, which enables more accurate forecasts and thus early warnings and early reactions. It includes a regular collection of standardized and georeferenced field data at key periods of locust biological cycles and in appropriate areas. These data are quickly transmitted and then analysed together with weather and satellite information.

This strategy has proven to be the only effective and sustainable one in the long term, from socio-economic and environmental perspectives. In fact, if well-designed and implemented, it contributes to:

- anticipating and preventing crises;
- better responding to crises in case they occur; and
- reducing annual infested and treated areas.

This can be translated into:

- reduced damage to crops and rangelands, and therefore better preservation of the food security and livelihoods of vulnerable rural communities;
- reduced negative impact of control operations on human health and the environment; and
- reduced financial costs.

The approach is the result of applied research conducted in the beginning of the twentieth century, with a solid scientific basis and extensive field practice. Its value has been demonstrated by FAO's experience within the EMPRES (Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases) Programme and continues to be supported by the FAO Desert Locust commissions.

While the Locust Programme in CCA relies on this experience, a shift from reaction to prevention and disaster risk reduction is still necessary for the region, where infested areas average 8.7 million hectares annually, resulting in the treatment of 4.9 million hectares.

Such a significant paradigm shift requires strong advocacy as well as in-depth work in several directions:

- improved localization and description of locust hotspots, for better-targeted survey operations;
- more accurate locust surveillance, including the use of the Automated System for Data Collection (ASDC); and
- enhanced analysis and forecast, using modern tools such as the customized Geographical Information System entitled "Caucasus and Central Asia Locust Management System (CCALM)."

FURTHER STRENGTHENING NATIONAL CAPACITIES

Effective implementation of the locust preventive control strategy relies on the further strengthening of national capacities on locust management, primarily to enhance monitoring and related early warning and reaction.


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KEY FACTS

LOCUST MANAGEMENT IN CCA

A MULTIFUNDED PROGRAMME IMPLEMENTED BY FAO SINCE 2011 TO IMPROVE NATIONAL AND REGIONAL LOCUST MANAGEMENT

TEN COUNTRIES INVOLVED: AFGHANISTAN, ARMENIA, AZERBAIJAN, GEORGIA, KAZAKHSTAN, KYRGYZSTAN, THE RUSSIAN FEDERATION, TAJIKISTAN, TURKMENISTAN AND UZBEKISTAN

RESOURCE PARTNERS INCLUDE JAPAN AND THE JAPAN INTERNATIONAL COOPERATION AGENCY (JICA), TURKEY AND THE UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID)

MAIN RESULTS ACHIEVED: EFFECTIVE REGIONAL TECHNICAL NETWORK AND STRENGTHENED NATIONAL CAPACITIES ON LOCUST MANAGEMENT

KEY CHALLENGE: SUSTAINABILITY OF NATIONAL AND REGIONAL LOCUST MANAGEMENT IN CCA

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PREVENTING FOOD SAFETY EMERGENCIES: INFOSAN

FAO/WHO INTERNATIONAL FOOD SAFETY AUTHORITIES NETWORK

Foodborne diseases are common throughout the world, placing a significant burden on public health and often disrupting trade. The rapid globalization of food production and trade, combined with the growing complexity of the food chain, means that risks posed by unsafe foods have the potential to quickly evolve from a local problem to an international incident, in a short period of time. Indeed, an increasing number of food safety events have international ramifications and cannot only be managed at the national level, rather requiring closer linkages among food safety authorities internationally.

To efficiently prevent and control the cross-border spread of unsafe food, it is crucial that information be shared among countries in case of food safety emergencies.

WHAT IS INFOSAN?

INFOSAN is a global voluntary network of officially designated government authorities that are responsible for, or involved in, the prevention, preparedness and/or response to food safety events and emergencies. INFOSAN is technically and strategically managed by FAO and the World Health Organization (WHO) through a joint secretariat, with its main activities being performed in the WHO Department of Food Safety and Zoonoses. The INFOSAN Secretariat's arm at FAO is located in the FAO Food Safety and Quality Unit, specifically in the Emergency Prevention System (EMPRES) – Food Safety programme. INFOSAN has an email account and a secure Community Website where members can exchange confidential information, directly contact the INFOSAN Secretariat, receive updates from the INFOSAN Secretariat, and contribute to discussions on food safety issues of international significance.

PURPOSE OF INFOSAN

INFOSAN's mission is to strengthen countries' capacities for prevention, preparedness and response to food safety events and emergencies by fostering a global community of practice among food safety professionals. The Network promotes the rapid exchange of relevant information during food-safety-related events; facilitates the sharing of information on important food-safety-related issues of global interest; promotes partnerships and collaboration among countries and food-safety-related networks; and helps countries to strengthen their capacities to manage food safety emergencies.

WHO ARE INFOSAN MEMBERS?

Currently, over 500 participants from 188 countries are members of INFOSAN. Each country designates one INFOSAN Emergency Contact Point and one or more INFOSAN Focal Point(s) in various sectors relevant to food safety. Membership is restricted to the government authorities responsible for, or involved in the prevention, preparedness and/or response to food safety events and emergencies in their country.

The INFOSAN Emergency Contact Point responds to requests from the INFOSAN Secretariat in the verification and assessment of events. It is encouraged to report urgent food safety events of potential international significance to the INFOSAN Secretariat, in coordination with relevant national authorities including the International Health Regulations (IHR) national focal point.

The INFOSAN Focal Point provides technical support to the INFOSAN Emergency Contact Point.

INFOSAN ACTIVITIES

INFOSAN's main activities are emergency-related. The INFOSAN Secretariat monitors and obtains information about food safety events through a variety of sources. This information is assessed by FAO/WHO experts to verify the event and determine its potential impact. The information is also verified by the relevant INFOSAN Emergency Contact Point. INFOSAN also engages in communication activities, including the issuance of international alerts.

Other INFOSAN activities include the provision of relevant training, such as technical webinars and simulation exercises, the development of tools and guidance materials, and the dissemination of food safety information of global interest pertaining to new developments or initiatives, as well as lessons learned and best practices.

PREVENTING FOOD SAFETY EMERGENCIES

FAO supports INFOSAN through the EMPRES-Food Safety programme. The capacity development of countries in emergency prevention and early warning are major components of EMPRES-Food Safety and contribute directly to INFOSAN. EMPRES-Food Safety co-organizes and participates in simulation exercises and webinars on food safety emergency preparedness and response, produces guidance documents and provides training in early warning and food safety risk communication, and engages in surveillance activities. For example, in April 2017, INFOSAN organized an online simulation exercise for several African countries, to practice emergency preparedness and response set-ups for food-borne outbreaks using the case of E.coli O157 infections linked to internationally distributed fruit and nut snack mixes.

Furthermore, EMPRES-Food Safety has taken part in training sessions on food safety risk communication during emergencies and crises in Senegal and the Seychelles. Through a food safety project in Senegal, EMPRES-Food Safety supported strengthening the country's food safety early warning and preparedness and the development of a food safety emergency response plan in the country. Its results are to be shared with seven neighbouring countries in a final workshop in Dakar.

INFOSAN regularly organizes webinars on various relevant topics for its members. A recent INFOSAN webinar on the use of Whole Genome Sequencing in foodborne outbreaks investigations has been extended to FAO's Food Safety Technical Network, illustrating the importance of knowledge sharing.

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KEY FACTS

INFOSAN

INFOSAN – THE INTERNATIONAL FOOD SAFETY AUTHORITIES NETWORK – IS A GLOBAL NETWORK JOINTLY MANAGED BY FAO AND THE WHO

INFOSAN FACILITATES THE RAPID EXCHANGE OF RELEVANT INFORMATION DURING FOOD SAFETY EVENTS AND EMERGENCIES

INFOSAN CONTRIBUTES TO STRENGTHENING COUNTRIES' CAPACITIES FOR PREVENTION, PREPAREDNESS AND RESPONSE TO FOOD SAFETY EVENTS OR EMERGENCIES

INFOSAN IS AN IMPORTANT PART OF THE FAO EMERGENCY PREVENTION SYSTEM (EMPRES) FOOD SAFETY PROGRAMME

CURRENTLY, 188 COUNTRIES ARE MEMBERS OF INFOSAN

ONE EMERGENCY CONTACT POINT AND ONE OR MORE FOCAL POINT(S) ARE APPOINTED IN EACH MEMBER COUNTRY TO COORDINATE THE INFOSAN ACTIVITIES FOR THE RESPECTIVE COUNTRY

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