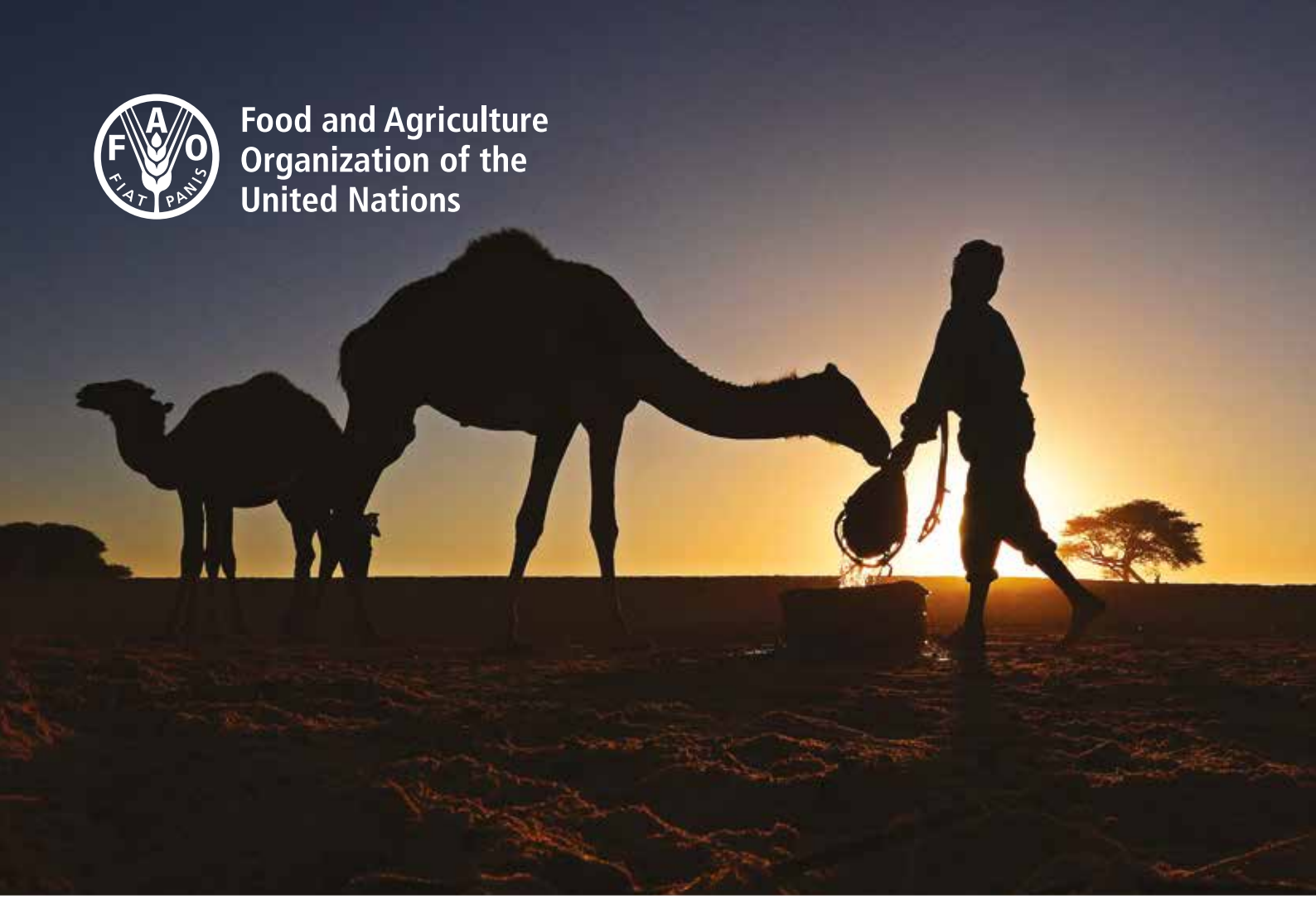
Food and Agriculture Organization of the United Nations



AVERTING RISKS TO THE FOOD CHAIN

A compendium of proven emergency prevention methods and tools

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A compendium of proven emergency prevention methods and tools

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

Rome, 2017

COVER PHOTOS:

© FAO/Carl de Souza
Chad - A camel herder getting water for his camels.

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Khiloli - A veterinarian administering a vaccine by eye drop to a goat during a vaccination campaign against brucellosis, an infectious disease commonly found in farm animals that can be transferred by their milk to humans.

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Afghanistan - Farmers working in a wheat field.

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Thailand - A street vendor selling cooked food from a mobile stall on the streets of Bangkok. All over Thailand people eat from stalls where food is cooked in the open air where standards of hygiene are generally excellent.

INSIDE COVER PHOTOS:

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apples
apples
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FOREWORD

Every year 1 in 10 people falls ill from eating contaminated food, and 420 000 people die as a result. A third of global crop production is lost annually to insects and plant diseases that can spread to multiple countries. With more people, plants and animals travelling internationally, there are more pathogens moving with them. Pests plaguing plants and trees, diseases passing from animals to humans, pollutants compromising waters and soils, climate patterns undergoing drastic change, the threats to our food supply know no borders. Nor does our determination to overcome these global challenges.

The 2030 Agenda for Sustainable Development sets out a plan to end poverty and hunger, safeguard the environment and ensure progress in harmony with nature. Like the interconnected world in which we live, this plan consists of integrated goals to continue our economic endeavours into the future.

Along that same path runs the Food Chain Crisis - Emergency Prevention System, known as FCC-EMPRES, to prevent, provide early warning and respond to transboundary threats that may hit any step of the food chain. The FCC is the Food and Agriculture Organization's response to the increasing number of food chain emergencies, which bring unprecedented challenges to food security, livelihoods, human health, and local, national and global economies.

Controlling transboundary animal and plant pests and diseases and food safety incidents contributes to several Sustainable Development Goals (SDGs), including: ending poverty; eradicating hunger, achieving food security and improved nutrition and promoting sustainable agriculture; ensuring healthy lives; empowering women and girls; promoting sustainable economic growth and halting biodiversity loss. FCC-EMPRES also contributes to all FAO's Strategic Objectives, in particular, making livelihoods more resilient to threats and crises.

This publication promises to help experts, policy makers, national institutions, and development workers in our joint pursuit of a world without hunger. *"Averting risks to the food chain"* demonstrates that a coordinated response of everyone involved in producing, processing, marketing and consuming food is essential. The 23 FCC-EMPRES practices illustrated here show how better coordination makes a difference in people's lives and livelihoods. The multidisciplinary, collaborative and integrated approach encouraged by FCC-EMPRES ensures that information about threats to our food arrives to all people concerned from farm to table before the threats can spread and cross borders.

Adhering to the One Health approach, FCC-EMPRES tackles the drivers of transboundary threats to terrestrial and aquatic animals, plants, forests and food – essentially preventing in addition to containing outbreaks. We invite readers to join our emergency prevention efforts and help build awareness to transboundary food chain threats and combat them through integrated approaches. This compendium of methods and tools provides a running start in averting risks to the food chain.

Ren Wang
Assistant Director-General

FAO AGRICULTURE AND CONSUMER PROTECTION DEPARTMENT

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Thanks also to Ludovica Mei, who coordinated the publication production and to Mona Chaya, who oversaw the process.

EXECUTIVE SUMMARY

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. The Food Chain Crisis - Emergency Prevention System, known as FCC-EMPRES, is FAO's approach to pursuing just that.

Established in 2008 to address risks to the food chain in an integrated and interdisciplinary way, FCC sees the collaboration of experts in animal and aquatic health, food safety, plant, and forest protection, nuclear techniques applied to agriculture, emergency response, and communication, at global, regional and country levels. Surveillance, early detection, early warning, risk analysis, intelligence and timely response combined with capacity development, coordination and advocacy are key components of the integrated approach FCC has adopted to prevent animal diseases (including aquatic diseases), plant pests and diseases (including those affecting forests) and food safety incidents.

This publication, based on 23 FCC-EMPRES information sheets published on a monthly basis by the FCC Intelligence and Coordination Unit of the FAO Agriculture and Consumer Protection Department, showcases 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.

The compendium shows how FCC-EMPRES has made a difference in the four areas of animal health, plant protection, food safety and coordination and intelligence through improving information services, strengthening global and regional coordination, establishing regional commissions, building networks and partnerships, implementing effective response campaigns, utilizing environmentally sound control technologies, coordinating global programmes, conducting training, developing innovative tools and approaches using new technologies, carrying out intelligence, advocacy and communication. The emergency prevention methods and tools used have proven to be effective in defeating threats to the food chain.

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 States 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.

FOOD CHAIN CRISIS EMERGENCY PREVENTION SYSTEM

to protect food security, livelihoods and human health

THE CHALLENGE

transboundary threats threaten the food chain continuously

AVIAN INFLUENZA
PESTE DES PETITS RUMINANTS
AFRICAN SWINE FEVER
RIFT VALLEY FEVER
FOOT-AND-MOUTH DISEASE
EPIZOOTIC ULCERATIVE SYNDROME
WHITE SPOT DISEASE
FRUIT FLIES
LOCUSTS
AFLATOXIN
RED GUM LERP PSYLLID
CASSAVA DISEASES
RADIONUCLIDES IN FOODS
BLUE GUM CHALCID
BANANA DISEASES
SALMONELLOSIS
E. COLI
ARMYWORM

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

7349
MILLION IN 2015 [1]

[1] UN, 2015

URBANIZATION

70%
OF THE WORLD'S POPULATION
WILL LIVE IN CITIES BY 2050 [2]

[2] FAO, 2016

INCIDENCE AND LOSSES

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

PLANT PESTS AND DISEASES ACCOUNT FOR AN ESTIMATED **30%** OF GLOBAL CROP PRODUCTION LOSSES ACROSS THE WORLD

ESTIMATE OF GLOBAL **LOSSES** DUE TO SHRIMP DISEASES IS MORE THAN **US$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

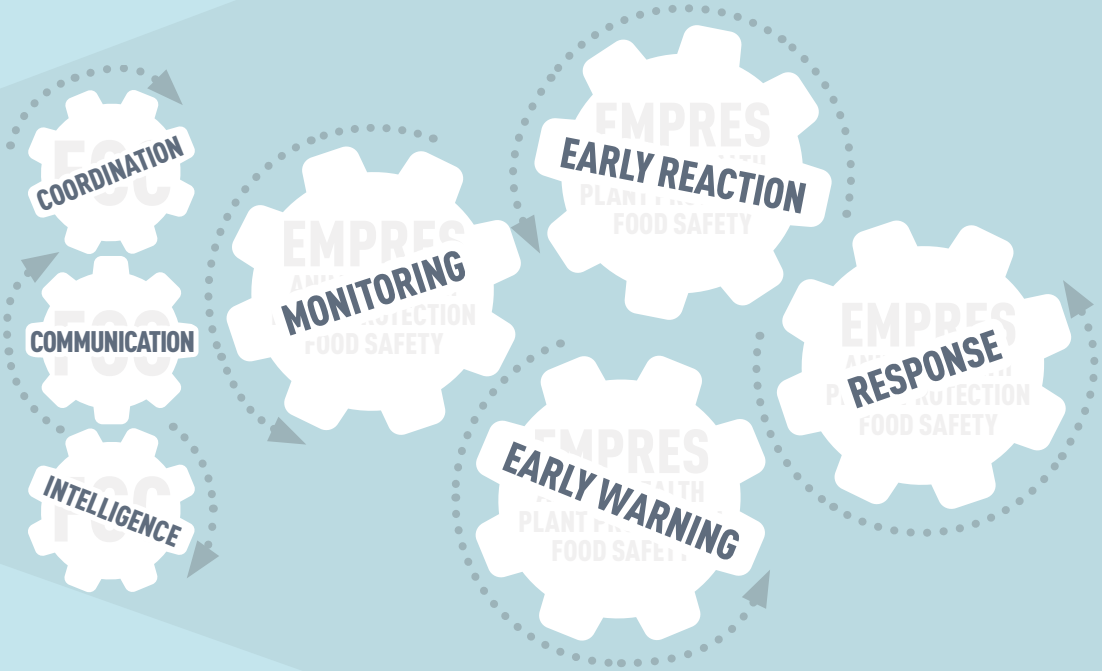
CLOSE TO **1.6 BILLION** **PEOPLE** RELY ON FOREST RESOURCES FOR THEIR LIVELIHOODS

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

FCC-EMPRES TO PREVENT TRANSBOUNDARY ANIMAL AND PLANT PESTS AND DISEASES AND FOOD SAFETY INCIDENTS

FAO RESPONSE

FOOD CHAIN CRISIS



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

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
- **eLocust3** for recording and transmitting locust field observations during survey and control operations
- **Risk modelling tool** to predict diseases
- **EMA-i** application mobile for real-time disease reporting
- **Wheat rust mobile surveillance system** to transmit data to database

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

FCC-EMPRES UTILIZES ALL FAO TECHNICAL AND OPERATIONAL CAPACITIES IN AN INTEGRATED WAY, EMBRACES THE ONE HEALTH APPROACH AND CONTRIBUTES TO SEVERAL SUSTAINABLE DEVELOPMENT GOALS

KEY MESSAGES

1

Facing the **INCREASING LIKELIHOOD OF VIRULENT TRANSBOUNDARY ANIMAL DISEASES, PLANT PESTS** and **DISEASES**, and **FOOD SAFETY INCIDENTS** emerging and spreading farther and faster due to intensifying agricultural food production systems, changing agro-ecological conditions, expanding global trade, and climate change, requires global concerted efforts

2

An **INTEGRATED APPROACH**, covering prevention, preparedness, early warning and timely response, is 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

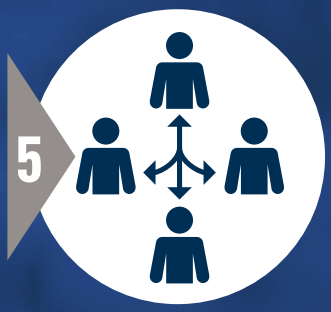
3

MONITORING threats and trends, **REPORTING** events, **EARLY WARNING** and **EARLY REACTION**, **ENHANCING CAPABILITIES** of specialized units and laboratories within ministries, and **DEVELOPING NEW TOOLS** and **ENVIRONMENTALLY SOUND CONTROL TECHNOLOGIES** are at the heart of Emergency Prevention Systems

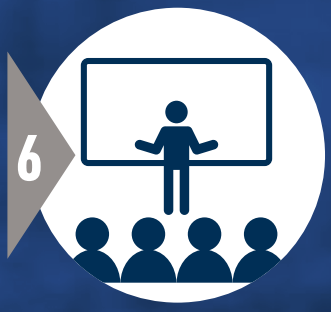
4

PARTNERSHIPS with national authorities, international and regional organizations, and research institutions and communication with all stakeholders are essential to manage transboundary threats

FOOD CHAIN CRISIS EMERGENCY PREVENTION SYSTEM



COORDINATION at **INTERNATIONAl**, **REGIONAL**, and **LOCAL LEVELS** is required to control transboundary threats. There is a need to promote the harmonization of global and regional approaches for early warning, rapid detection and timely response to transboundary threats of international, regional and national concern



CAPACITY DEVELOPMENT 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

PROTECTION against animal and plant pests and diseases, including forest pests and aquatic diseases, food safety threats and preventing their spread, is one of the keys to **FIGHTING HUNGER**, **MALNUTRITION** and **POVERTY**

It is more **COST EFFECTIVE** and **PROTECTIVE OF LIVELIHOODS** and the **ENVIRONMENT** to **INVEST IN PREVENTING** transboundary animal diseases, plant pests and diseases, including forest pests and aquatic diseases, and food safety threats, than to respond to fully developed food crises

01

FOOD CHAIN CRISIS MANAGEMENT FRAMEWORK:

FAO'S APPROACH TO ADDRESS TRANSBOUNDARY THREATS AFFECTING FOOD SAFETY, ANIMAL AND PLANT HEALTH

OUTBREAKS OF TRANSBOUNDARY animal and plant pests and diseases, including forest pests and aquatic diseases, food safety and radiation events has been increasing over the past years, impacting people's access to quality food, and putting their livelihoods and health at risk.

To address this challenge, FAO established the **Food Chain Crisis Management Framework (FCC)**, an approach combining prevention, preparedness, and response to emergencies affecting the food chain and caused by transboundary animal and plant pests and diseases (including aquatic and forests pests and diseases), food safety and radiological threats.

FCC enables the utilization of the relevant technical and operational capacities and expertise of FAO under one governance to face transboundary, high impact threats to production, health and environment, and to support countries in the fight against these threats. This approach also contributes to one of FAO's key priorities: "increasing the resilience of people's livelihoods to threats and crises".

FCC AT A GLANCE

The FCC is FAO's primary tool for action in support of countries in the global governance of threats to the human food chain at all stages from production to consumption. Two committees in FAO, the Policy Advisory Committee and Oversight Committee, support governance efforts to stop and contain these threats and crises. FCC strengthens the capacities of countries to prevent food chain crises. This includes support to adequate surveillance of threats, early warning, preventive and risk mitigating practices, better preparedness and response, and the adoption of adequate policies.

FCC comprises three areas of action dealing comprehensively with the whole cycle of a food chain crisis: coordination and intelligence, prevention and early warning, and response. Coordination and intelligence supports FCC governance, multi-threat forecasting, information sharing, communication, and advocacy.

Emergency prevention and early warning functions are provided by the three specialized units of EMPRES for animal diseases (including aquatic diseases), plant pests (including

forest pests), and food safety threats. They all promote approaches for prevention, early warning, rapid detection and timely response.

EMPRES Animal Health focuses on transboundary animal diseases (TADs), including zoonoses such as African swine fever, avian influenza, ebola, foot-and-mouth disease, Middle East Respiratory Syndrome coronavirus, *Peste des Petit Ruminants, Rift Valley fever*, and others.

EMPRES Plant Protection focuses on Desert Locust, and other locusts in the Caucasus and Central Asia and Africa, other transboundary insects such as armyworms and fruit fl es, and crop diseases such as rust diseases of wheat and coffee, wilt diseases of banana and cassava, and maize diseases.

EMPRES Food Safety focuses on foodborne pathogens (e.g. salmonella and *Enterohaemorrhagic Escherichia coli*) and chemical contamination (e.g. mycotoxins, marine biotoxins).

Response is supported by a specialized global FCC response unit supporting a timely and adequate country and regional response using EMPRES technical capacities.

FCC-EMPRES ACHIEVEMENTS

FCC-EMPRES enhanced capacities of governments and stakeholders in prevention of food chain crises in many countries. A selection of achievements is shown here-below.

Threat monitoring systems at national, regional and global levels have been supported through successful information systems such as:

- The Desert Locust Information Service operating a global early warning system and providing forecasts and analysis for 50 countries.
- The FAO Global Early Warning System (GLEWS) regularly monitoring the animal disease situation.

Other monitoring activities:

- Forecasting of threats to animal and plant health and food safety through the quarterly multi- threat early warning bulletin, and other Early Warning Bulletins (Desert Locust Bulletin; Global Animal Disease Intelligence Report, and others).
- Rapid event reporting in a number of countries through development and implementation of mobile devices and touchpad applications for fi ld threat reporting (EMA-i; e-Locust).
- Risk modelling tools to monitor animal diseases and zoonoses such as Rift Valley fever.

Capacity Development at regional and national levels has been enhanced through the development of manuals, guidelines, tools and regular delivery of trainings such as:

- Regional training on locust monitoring and information management for Caucasian countries and Desert Locust affected countries.
- Regional and national trainings to improve veterinary epidemiology capacity, animal diseases surveillance and risk analysis of TADs.
- A new training package and handbook on early warning capacity building for food safety being rolled-out for regions and countries.
- A training on risk of introduction or transfer of live aquatic animals.

Knowledge, skills and information sharing has been supported for the enhancement of preparedness, early warning, response and monitoring capacities of countries by setting up and reinforcing regional networks and platforms such as the three Commissions for Desert Locust, the epidemiology and veterinary laboratories networks in Asia and Africa, and many other networks.

Special Programmes are being implemented such as the avian influenza multi-year programme which is supporting countries since 2004 in designing and implementing emergency national control strategies. Also, the locust control campaign in Madagascar has successfully halted the plague through the "Three-year emergency programme".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KEY FACTS

FOOD CHAIN CRISIS

ADDRESSES THREATS TO THE FOOD CHAIN OF TRANSBOUNDARY ANIMAL AND PLANT PEST AND DISEASES (INCLUDING AQUATIC AND FORESTS), AND FOOD SAFETY AND RADIOLOGICAL THREATS

INTEGRATES PREVENTION, EARLY WARNING, PREPAREDNESS AND RESPONSE TO AN EMERGENCY AT ALL STAGES OF THE FOOD CHAIN

GOVERNS THREATS OF TRANSBOUNDARY NATURE THROUGH THE FCC POLICY ADVISORY COMMITTEE AND FCC OVERSIGHT COMMITTEE IN FAO

IMPROVES SURVEILLANCE, RISK ANALYSIS, EARLY DETECTION, EARLY WARNING, AND COMMUNICATION

SUPPORTS THREATS FORECASTING THROUGH THE MULTI-THREAT QUARTERLY EARLY WARNING BULLETIN

SHOWCASES FCC-EMPRES SUCCESSFUL ACTIVITIES THROUGH MONTHLY FCC INFORMATION SHEETS AND SUPPORTS INFORMATION SHARING THROUGH FCC WEBSITE

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02

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PREDICTING THE OCCURRENCE OF TRANSBOUNDARY THREATS TO THE FOOD CHAIN

TRANSBOUNDARY ANIMAL DISEASES (terrestrial and aquatic), **PLANT PESTS AND DISEASES** (agriculture and forest plants) and **FOOD SAFETY HAZARDS**, are raising public awareness for their potential impact on food and nutrition security, human health, livelihoods, and trade.

The changing agro-ecological conditions, intensifying food production systems, and the expanding global trade increase the likelihood of these transboundary threats emerging and spreading further and faster than ever before.

The growing number of outbreaks caused by existing and new emerging threats to the food chain have increased the need to predict the threats in a comprehensive and integrated manner, oriented at the whole food chain. These **Food Chain Crisis threats (FCC threats)** are transboundary animal and plant pests and diseases, including forest pests and aquatic diseases, and food safety threats.

The ability to predict FCC threats through a forecasting process is imperative for Governments to act quickly by taking necessary measures to prevent these threats, limit their geographic spread and minimize their impact.

To address this challenge, FAO Food Chain Crisis-Intelligence and Coordination Unit (FCC-ICU) developed an **Integrated Forecasting Approach** to predict FCC threats having a high impact on food and nutrition security and livelihoods.

FCC INTEGRATED FORECASTING APPROACH

FCC-ICU has addressed the risks to the food chain by applying a multidisciplinary integrated forecasting approach to predict FCC threats for the three months ahead. This forecasting approach was developed through a consultative process with FAO experts from animal health, plant health, and food safety areas in order to assess the likelihood of occurrence of a threat to the food chain through a common approach.

The **likelihood of occurrence** of a threat is the probability of a FCC threat happening in a country in the upcoming three months. It is

defined according to the result of the assessment of two main epidemiological parameters:

- **PARAMETER 1**: the **likelihood of introduction** of the threat from another country and its **further spread** within the country (the calculation is made according to a crossing table of likelihood of introduction and likelihood of spread), and
- **PARAMETER 2**: the **likelihood of its re-emergence** (amplification) within the country, in case a threat is already present in the country.

Based on a conservative approach, the likelihood of occurrence of the threat will be considered equal to the higher level of the two parameters. The likelihood of occurrence, introduction, spread, and re-emergence of a FCC threat can be rated as Nil, Low, Moderate, or High. Forecasts are made by collecting FAO official and unofficial qualitative data on FCC threats and using FAO experts' knowledge on spatial and temporal patterns of threats.

The existing FAO early warning systems informing on these areas, such as the Desert Locust Information Service (DLIS), the locust programmes in Caucasus and Central Asia and in Madagascar, the Global Early Warning System (GLEWS), and the International Food Safety Authorities Network (INFOSAN) are primary sources of information.

Through this multi-disciplinary approach, data are collected, analyzed, and threats forecasted at country and regional levels by technical experts from various areas.

FCC EARLY WARNING BULLETIN AND WEB MAPPING TOOL

Forecast events are disseminated through the **FAO quarterly FCC Early Warning Bulletin** and displayed on the **FCC threats web mapping tool**. **FCC Early Warning Bulletin** is a quarterly publication developed and coordinated by FCC-ICU. The purpose of the bulletin is to provide forecast of threats to animal and plant health and food safety for the three months ahead at country, regional and global levels.

FCC-ICU has also recently released a **FCC threats dynamic web map**, a complementary tool to the bulletin. The map shows the global distribution of FCC threats forecasted for the next coming three months.

Each forecast event is visually represented by an icon and five different shapes - one shape for each category (animal and zoonotic, aquatic diseases, forest pests and diseases, locusts, plant pests and diseases) - as a visual clue to help users identify content.

The likelihood of occurrence of a threat is represented by different colours (red, yellow, green and grey) according to the FCC likelihood scale (High, Moderate, Low, and Nil).Filters include searching by country, threat categories and level of likelihood.

WHAT NEXT

The development of an integrated approach to forecast threats to the food chain and the ability to access the forecasts through regular FCC Early Warning Bulletins and FCC web mapping tool are essential to provide, in a simple way, multi-disciplinary technical information to decision makers. This will assist them in carrying out targeted actions for prevention and early response to FCC threats.

This tool will be further developed to become a web-based system to improve data collection, facilitate the use of the integrated forecasting approach and enable a better analysis of trends of the threats at national, regional and global levels.


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KEY FACTS

FOOD CHAIN CRISIS FORECASTING APPROACH

A NEW INTEGRATED APPROACH TO FORECAST FCC THREATS, DEVELOPED AND PILOTED BY FAO FOOD CHAIN CRISIS INTELLIGENCE AND COORDINATION UNIT

A POWERFUL TOOL FOR GOVERNMENTS TO PREVENT AND RESPOND TO OUTBREAKS IN A TIMELY MANNER

FORECASTS MADE BY COLLECTING FAO DATA AND USING FAO EXPERTS' KNOWLEDGE ON DISEASE PATTERNS

FORECASTS DISSEMINATED IN THE FORM OF QUARTERLY EARLY WARNING BULLETINS FOR THE THREE MONTHS AHEAD

FORECASTS PRESENTED IN THE FORM OF A DYNAMIC MAP SHOWING THEIR GLOBAL DISTRIBUTION

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03

FAO AND OIE TO ERADICATE THE SMALL RUMINANTS PLAGUE: PESTE DES PETITS RUMINANTS

PESTE DES PETITS RUMINANTS (PPR) is a destructive, fast spreading viral disease that kills sheep and goats (small ruminants) and devastates livelihoods throughout most of Africa, the Middle East, West, Central and South Asia, and most recently East Asia. The PPR situation is dynamic and threatening. In 2016, the disease was reported for the first time in Georgia and Mongolia.

Sheep and goats (2.1 billion heads worldwide) are the primary livestock resource of many low-income, food-insecure rural families worldwide. They are reared within a variety of production systems and provide milk, meat, wool, fibre, and skins. They also support the livelihoods of traders, processors, wholesalers, and retailers involved in local, national, regional and international trade of live animals, meat, milk, wool, fibre (cashmere and angora) and skins.

The annual global losses due to PPR have been estimated at between US$1.4 billion to US$2.1 billion, but the costs are not simply monetary. PPR's impact on sheep and goat populations adversely affects livelihoods, food security, and employment, including women's and youth's. It entrenches and exacerbates poverty and malnutrition. Loss of livestock due to PPR causes pastoralists and farmers to migrate away from their lands and cultures in search of alternative livelihoods.

In a recent benefit-cost analysis of global PPR eradication, the ratio is estimated at 33.8. However, no benefit-cost can truly capture that benefits will multiply continuously over time and across generations from global eradication.

PPR GLOBAL ERADICATION PROGRAMME

FAO and OIE, in consultation with key stakeholders, developed a five-year Global Eradication Programme 2017-2021. Based on the experience of the successful eradication of Rinderpest in 2011, it is clear that the global eradication of PPR is also readily achievable if sufficient political, financial and technical investment are provided. Like rinderpest, PPR is readily diagnosed and there is a reliable, inexpensive vaccine available that confers life long immunity in vaccinated animals. In addition, there are no latent carrier states or wildlife reservoirs for PPR.

Reflecting this strong case, the 39th Session of the FAO Conference (June 2015) endorsed the establishment of the *Peste des Petits Ruminants* Global Eradication Programme (PPR-GEP) with the vision for global freedom by 2030 to be implemented by FAO and the OIE in line with the PPR Global Control and Eradication World Organisation for Animal Healt (OIE) Strategy, adopted during the PPR International conference held in Cote d'Ivoire (April 2015).

The FAO/OIE PPR Secretariat, established in Rome in April 2016, coordinated the development of the first five years of the PPR-GEP through a consultative process involving key stakeholders.

The objectives for the first five-year phase are to:

- Lay the foundation for and commence the eradication of PPR by reducing its prevalence in currently infected countries. The 62 countries (as of September 2016) that report infection with PPR and the 14 suspected of being infected or at risk will be the major focus.
- Develop capacity for non-infected countries to demonstrate the absence of PPR virus as a basis for official recognition of PPR free status by the OIE.
- Strengthen national Veterinary Services and their systems as the key players in the successful implementation of the PPR-GEP.
- Where appropriate support activities to reduce the prevalence of other priority small ruminant diseases.

WHAT WILL PPR-GEP DO?

- *Programme approach*: the approach comprises a multi-country, multi-stage process involving assessment, control, eradication and maintenance (of PPR virus freedom) stages.
- *Promotion of enabling environment and reinforcement of veterinary capacities*: building an enabling environment for PPR-GEP implementation requires a logical and structured framework, full support and involvement of farmers, the adaptation of the legal framework, and the strengthening of Veterinary Services using the OIE Performance of Veterinary Services (PVS) Pathway.
- *Support to the diagnostic and surveillance systems*: support efforts to better understand the presence (or absence) of PPR in a country or region, its distribution among the different farming systems, the patterns of spread and, ultimately, to establish a decisive control plan. This requires both an assessment of the epidemiological situation and establishment of a functional surveillance system.
- *Implement measures toward PPR eradication*: various measures will be combined namely vaccination, improved biosecurity, animal identification, movement control, quarantine, and stamping out. The total number of animals to be vaccinated is estimated at around 1.5 billion. The 79 countries historically free from PPR will be assisted to apply for OIE PPR free status on a historical basis.
- *Coordination and management*: under the FAO/OIE PPR Secretariat, functional coordination mechanisms established at global, regional and country levels will ensure successful implementation of the programme.

The estimated budget for the five year programme is **US$996.4 million**.

PPR-GEP will contribute to the 2030 Agenda for Sustainable Development, supporting the achievement of many of the Sustainable Development Goals.

KEY FACTS

PPR GLOBAL ERADICATION PROGRAMME

THE PPR GLOBAL ERADICATION PROGRAMME 2017-2021 CONTRIBUTES TO FOOD SECURITY, POVERTY REDUCTION AND RESILIENCE

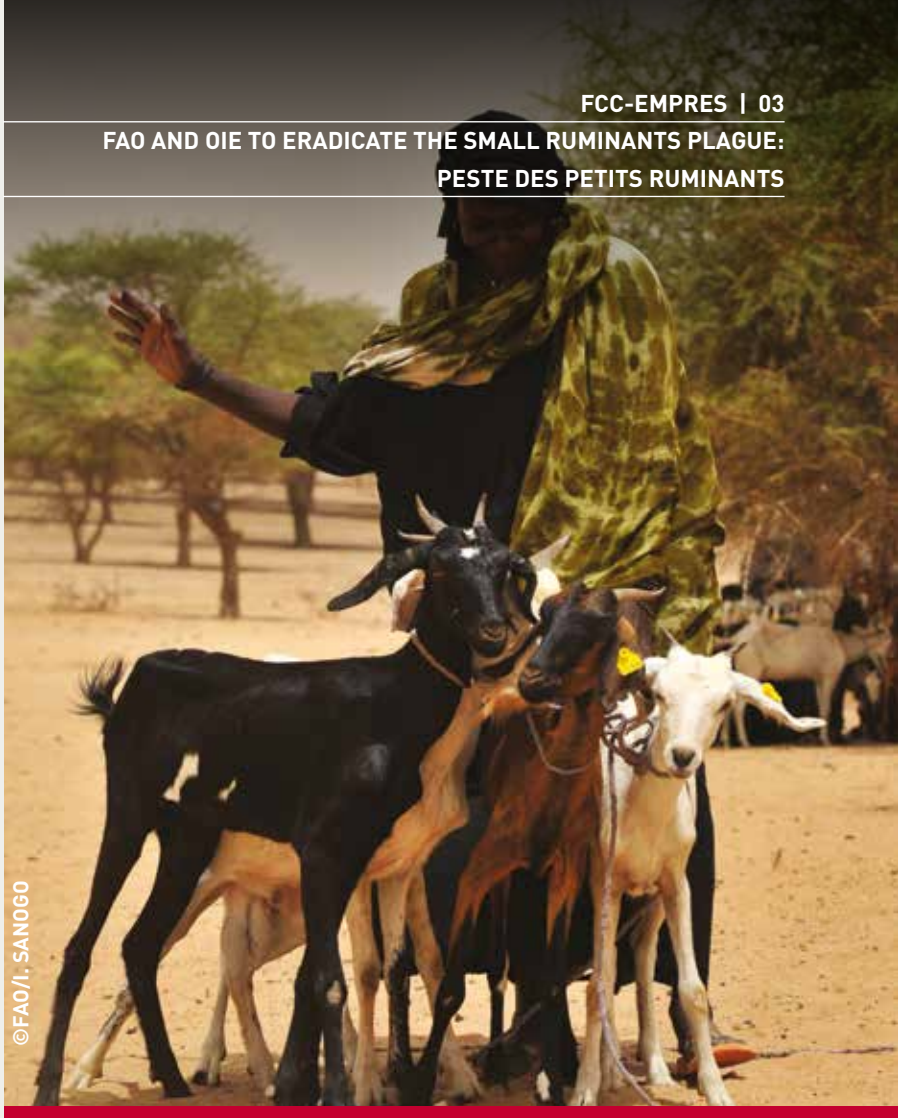
PPR IS READILY DIAGNOSED AND THERE IS A RELIABLE, INEXPENSIVE VACCINE AVAILABLE THAT CONFERS LIFE LONG IMMUNITY IN VACCINATED ANIMALS

THE LIVELIHOODS AND STABILITY OF OVER 300 MILLION RURAL FAMILIES IN AFFECTED COUNTRIES WILL DIRECTLY BENEFIT FROM PPR ERADICATION

CONSUMPTION OF SMALL RUMINANT MEAT AND DAIRY PRODUCTS IS FORECAST TO INCREASE BY 1.7 MILLION METRIC TONNES AND 1.8 MILLION METRIC TONNES PER YEAR RESPECTIVELY

PPR ERADICATION WILL CONTRIBUTE TO SMALL RUMINANT PRODUCTION FOR A GROWING WORLD POPULATION, ESTIMATED TO BE 9.7 BILLION BY 2050

COMBINED MEASURES FOR PPR ERADICATION INCLUDE VACCINATION, IMPROVED BIOSECURITY, ANIMAL IDENTIFICATION, MOVEMENT CONTROL, QUARANTINE, AND STAMPING OUT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EMPRES-i: A POWERFUL GLOBAL TOOL FOR CONTROLLING MAJOR ANIMAL DISEASES

THE INCREASE IN EMERGENCE of new pathogens and spread of transboundary animal diseases (TADs) in countries around the world poses a serious and continuing menace to livestock production, food security and the entire food chain.

TADs can have significant negative impact on the economy, trade, food security and food safety of countries. They cause high rates of death and disease in animals, and have in many cases public health consequences, knowing that approximately 70 percent of diseases affecting humans have animal origins. Prevention and control of TADs require timely and reliable disease information.

Timely and reliable disease information enhances early warning and response to TADs and emergent zoonoses (animal diseases that can be transmitted to humans). It supports prevention, improved management and progressive approach to control.

To address the challenge, FAO's Emergency Prevention System (EMPRES) designed and developed a web-based secure information system to support country level veterinary services by facilitating regional and global disease information: EMPRES Global Animal Disease Information System (EMPRES-i).

This application contributes to the joint FAO/OIE/WHO Global Early Warning and Response System (GLEWS) for major transboundary animal diseases, including zoonoses.

EMPRES-i: A RESPONSE TO A GLOBAL CONCERN

EMPRES-i was first released in 2004 with the worldwide flare-up of H5N1 highly pathogenic avian influenza (HPAI) and made publicly available in 2009. It was created in response to the growing demand from users for global animal health information systems, using a system approach to disease information gathering and sharing.

The platform consolidates disease events worldwide using information that EMPRES receives from a wide range of sources. Partners and FAO networks share and feed EMPRES-i with disease information on a regular basis. For validation and verification, EMPRES

uses not only official, but also unofficial sources of information. The verification process of disease events and unconfirmed reports is done also in coordination with OIE and WHO, under the GLEWS.

EMPRES-i collects information on outbreaks, vaccination and surveillance efforts and supports two main global strategies for control and eradication of two major diseases: foot-and-mouth disease and *Peste des Petits Ruminants (PPR)*.

EMPRES-i hosts data originated from active surveillance implemented through several projects executed by FAO. This data complements countries' efforts to know exactly the situation of animal disease pathogens and its distribution in livestock production systems or along the food chain.

WHAT DOES EMPRES-i DO?

EMPRES-i speeds up national, regional and global disease information sharing; supports the risk assessment process for existing and emergent animal diseases; facilitates epidemiological analysis on specific disease events at regional and global levels and planning surveillance.

EMPRES-i generates and disseminates early warning messages on global animal disease distribution, disease risks and current threats at the national, regional and global level for priority animal diseases.

Data sharing and interoperability is crucial to integrate data and information for analysis. EMPRES-i provides access to data integrated from other information systems in FAO and external databases:

- livestock population/density (GLiPHA/FAO)
- environmental (Geonetwork/FAO)
- genetic information (Openflu database)

Through specific official agreements with key partners, FAO is further linking and integrating other systems, including the FMD BioPortal, the World Reference Laboratory for Foot-and-Mouth Disease, the Swiss Institute of Bioinformatics (SIB) and FAO Reference Centres, into EMPRES-i.

EMPRES-i also supplies analytical and automated tools to better inform risk analysis processes and early warning activities including descriptive analysis (graphics and advanced mapping component).

KEY FIGURES AND ADVANCES

Today EMPRES-i is a global reference database for animal diseases including zoonosis. EMPRES-i stores over 60 000 outbreak records of which more than 20 000 records of animal influenza from 2004 to 2014. It hosts information on disease monitoring and tracking for early warning activities. To date, over 4 000 events have been tracked. The system has a historical database on almost 950 records on rinderpest outbreak information (1827-2003). The global eradication of rinderpest was officially declared in June 2011; still EMPRES-i monitors and verifies suspected syndromic cases compatible with rinderpest cases.

EMPRES-i hosts and maintains a database on Rift Valley fever outbreaks, including animal and human cases, developed in collaboration with Oxford University. The system is under continuous development and new features may be added in the future.

In 2012, EMPRES-i developed a genetic module to link epidemiological and genetic influenza information and enable combined analysis. This tool links avian influenza events and outbreaks for the following subtypes: H5N1, H5N8, H5N6, H1N1, H9N2, H7N9, H7N2, H10N8. This module will be further developed to host genetic information on disease pathogens such as foot-and-mouth disease, Rift Valley fever and African swine fever. In 2013, a new Android mobile application - Event Mobile Application (EMA-i) - was developed and implemented in 10 Ugandan districts in collaboration with the National Veterinary Services and the Ministry of Agriculture.

EMA-i allows veterinarians to enter key epidemiological data into a global database directly from the field using their smartphones. EMPRES-i is undoubtedly proving useful in facing the big challenge of the emergence of new diseases and enhancing rapid disease reporting and early warning activities of countries and regions.

KEY FACTS

EMPRES-i

DISEASE EVENT DATABASE ENABLING USERS TO EASILY ACCESS AND RETRIEVE INFORMATION ON WILD OR DOMESTIC ANIMAL DISEASE OUTBREAKS/ CASES WORLDWIDE

DISEASE MAPPING/ GRAPHING TOOLS ENABLING USERS TO SELECT OUTBREAKS/ CASES FROM THE DATABASE AND REPRESENT THEM GRAPHICALLY AS CHARTS OR ON A MAP

LIBRARY PROVIDING ACCESS TO FAO TECHNICAL PUBLICATIONS

MY EMPRES-i ENABLING USERS TO LOG IN AND ACCESS A PERSONALIZED PAGE DISPLAYING DISEASE EVENTS OF INTEREST AND SELECTING FROM THE DIRECTORY OR LABORATORY SECTIONS

DIRECTORY PROVIDING CONTACT DETAILS OF THE CHIEF VETERINARY OFFICERS (CVO S) FOR EACH COUNTRY

LABORATORIES PROVIDING CONTACT INFORMATION OF FAO /OIE REFERENCE LABORATORIES AND REGIONAL LABORATORY NETWORKS

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STRENGTHENING REGIONAL VETERINARY LABORATORY NETWORKS IN AFRICA AND ASIA

TRANSBOUNDARY ANIMAL DISEASES (TADs) including some high impact zoonoses are highly contagious diseases that can spread rapidly, irrespective of national borders and can negatively impact public health, livelihoods and safe trade.

Controlling infectious diseases of animals, and minimizing their impact on countries' economies and livelihoods of people is crucial for food security.

Veterinary laboratories play a critical role in the early detection and characterization of known, new, or re-emerging epidemic diseases, as well as in the control of endemic diseases. They also contribute to addressing complex issues at the human-animal-environment interface.

A strategic imperative for efficiently managing TADs and zoonotic diseases is building national technical capacities of laboratories in competency and a critical mass of laboratory specialists belonging to global, regional, and national networks.

REGIONAL VETERINARY LABORATORY NETWORKS TO COMBAT TRANSBOUNDARY ANIMAL DISEASES

FAO's experience in networking has shown that regional networks are an effective framework for combating TADs. The FAO EMPRES-Emergency Centre for Transboundary Animal Diseases, enhanced by the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, has been working for many years with national laboratory focal points and international partners to provide coordination, capacity development, and support to regional laboratory networks in Africa, Middle East and Asia.

FAO supported the establishment and development of several regional laboratory networks. In 23 West and Central African countries, two major active networks, the Regional Laboratory Network (RESOLAB) and the Regional Epidemiosurveillance Network (RESEPI), initiated and assisted by FAO, cover diagnostic and epidemiological surveillance activities for Avian Influenza and other TADs. Two similar regional networks, the Eastern Africa Region Epidemiology Network (EAREN) and the Eastern Africa Region Laboratory Network (EARLN), provide support to these activities in 11 countries in East Africa. In West Eurasia, two networks, the West Eurasia Laboratory Network (WELNET) and the

Epidemiology Network (EPINET), have been established in support of foot-and-mouth disease progressive control pathway. In the Mediterranean region, six countries are covered by the Mediterranean Network for Animal Health (REMESA). In Asia, the Association of Southeast Asian Nations (ASEAN) and the South Asian Association for Regional Cooperation (SAARC) networks allow laboratory networking to ten South East Asian countries and eight South Asian countries, respectively.

Resource laboratories, known as "support" or "leading diagnostic" laboratories have been selected in sub-Saharan Africa and Southeast Asia, to provide services in disease confirmation, production of standardized reagents, validation of protocols, and capacity building.

FAO provides support to ensure and guide their regional responsibilities. Regional networks enable the coordination of a multiplicity of actions including the application of standardized protocols and tools, sharing of expertise, experiences and training opportunities, the use of standardized diagnostic reagents, breaking the isolation of national teams in developing countries, organization of regional proficiency tests and more transparent disease reporting, as well as building trust across borders and professionals. They are also useful platforms allowing the development of regional programs on common issues, such as the Regional Quality Assurance Program developed by FAO, or the Regional Biosafety Program for national veterinary laboratories in South and Southeast Asia.

FAO assists also in linking countries and regional laboratory networks with global networks such as the joint World Organization for Animal Health (OIE)-FAO OFFLU network for influenza and those of international partners such as the World Health Organization (WHO) and OIE, Reference Centres for independent technical and scientific advice.

SOME FAO GLOBAL INITIATIVES AND TOOLS IN SUPPORT TO VETERINARY LABORATORIES

Adequate veterinary laboratory policy and legislation are key to maintain accessible, efficient and cost effective veterinary laboratory services. In 2013, FAO initiated the development of an approach to strengthen veterinary laboratory policy. This novel approach is currently piloted in Kenya.

Understanding national and regional needs and resources by using standardized tools to assess and monitor laboratories' capacities and functionality is essential to identify diagnostic laboratory's gaps. FAO developed the Laboratory Mapping Tool in order to standardize data collection on the competencies and gap identification in laboratory functionality, including the required personnel profiles.

This tool has been applied in various countries and the outputs can be used to generate a "map" of a laboratory's strengths and weaknesses to better understand national and regional expertise, and to target areas for support. The FAO Laboratory Mapping Tool will be soon expanded through specific modules, including that of antimicrobial resistance, and will be available on smartphones and tablets.

FAO provides guiding tools and supports the implementation of Laboratory Information Management System (LIMS) in national laboratories for standardization of laboratory diagnostic processes and better sample tracking. Inter-operability between the LIMS and the national Livestock Identification and Traceability System is also established in some countries. FAO supported Indonesia in building a national database for real-time information sharing of laboratory results within the country.

FAO developed the influenza genetic module which is a component of EMPRES-i database (the FAO Global Animal Disease Information System). The influenza genetic module is a tool to integrate pathogen-related data into EMPRES-i.

FAO will continue supporting member countries in preventing, detecting, and responding to threats of animal origin by strengthening capacities of national and regional epidemiology and laboratory systems through continuous staff training, provision of tools and standardized methodology.

KEY FACTS

REGIONAL VETERINARY LABORATORY NETWORK

PROVIDING SUPPORT TO PREVENT AND CONTROL TRANSBOUNDARY ANIMAL DISEASES, AND FACILITATE REGULAR, TRANSPARENT, AND RAPID EXCHANGE OF INFORMATION

SERVING AS PLATFORMS ALLOWING THE DEVELOPMENT OF REGIONAL PROGRAMS ON COMMON ISSUES, SUCH AS THE REGIONAL QUALITY ASSURANCE PROGRAM

ENABLING THE APPLICATION OF STANDARDIZED PROTOCOLS AND TOOLS, SHARING OF EXPERTISE, EXPERIENCES AND TRAINING OPPORTUNITIES

ENABLING THE USE OF STANDARDIZED DIAGNOSTIC REAGENTS, THE ORGANIZATION OF REGIONAL PROFICIENCY TESTS, AND BUILDING TRUST ACROSS BORDERS AND PROFESSIONALS

REGIONAL SPECIALIZED NETWORKS FOR DIAGNOSTIC AND EPIDEMIOLOGICAL SURVEILLANCE: WEST AND CENTRAL AFRICA - RESOLAB AND RESEPI; EASTERN AFRICA - EARLN AND EAREN; SOUTH EAST ASIA – ASEAN; SOUTH ASIA - SAARC; MEDITERRANEAN REGION – REMESA; WEST EURASIA – WELNET AND EPINET

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BUILDING VETERINARY LABORATORY DIAGNOSTIC CAPACITY IN AFRICA: THE VETLAB NETWORK

TRANSBOUNDARY ANIMAL DISEASES and those animal diseases that affect human health have a strong impact on public health, community livelihoods, and trade.

They also pose a major challenge to the value chain of food of animal origin, causing serious production losses and food safety problems.

Additionally, the globalization of trade with increased movement of people facilitates the rapid spread of infectious diseases across countries and between continents.

The early and rapid diagnosis and progressive control and eventually eradication of these diseases require concerted interdisciplinary actions at national and international levels.

In this context, the veterinary diagnostic laboratory network (VETLAB Network) offers a unique opportunity for countries facing similar challenges to work together and better coordinate activities, including training, information dissemination, expertise and experience exchange, and the design of common disease control strategies.

The VETLAB network carries out research and development, training and activities in support of member countries.

WHAT VETLAB NETWORK DOES

The VETLAB network was initially developed and supported by the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture in close cooperation with FAO's Animal Production and Health Division to support the global rinderpest eradication campaign through the development, evaluation, validation, and transfer of selected diagnostic technologies. Rinderpest has been a dreaded cattle disease for millennia, causing massive losses to livestock and wildlife on three continents.

The formation of the laboratory network in Africa was essential to rinderpest eradication and outbreak management campaigns and this network continues today for the prevention, control and eradication of transboundary animal and zoonotic diseases.

The VETLAB network is also a forum to

introduce and apply Quality Assurance systems to ensure international acceptance of test results.

In addition, the VETLAB Network improves regional and national laboratory diagnostic capacity; supports coordination and harmonization of regional approaches for early and efficient detection and readiness to disease alerts during disease surveillance; enhances regional capacity and cross boundary collaborations to enable more effective responses to transboundary animal and zoonotic diseases; builds trust through enhanced transparency and mutual confidence in support of EMPRES-i disease information; facilitates a dynamic approach for interaction between countries and enhances information sharing between national veterinary laboratories in the region.

SUPPORTING VETERINARY DISEASE DIAGNOSTICS IN AFRICA

The sub-Saharan African branch of the VETLAB Network is composed of 32 African countries with four leading institutes providing regional support. The leading institutes are in Côte d'Ivoire (West Africa), Cameroon (Central Africa), Ethiopia (East Africa) and Botswana (Southern Africa).

Through FAO and IAEA support, several laboratories in Africa have strengthened their diagnostic capacity, upgraded their facilities, become more technically sound and improved test reliability.

A striking example of this is the National Veterinary Institute in Ethiopia, which received ISO 17025 accreditation in 2014, an international standard certifying that the laboratory is technically competent and able to produce accurate tests.

This is also shown by the National Animal Health Diagnostic and Investigation Centre in Ethiopia, which has increased the number of accredited assays during the last two years.

Furthermore, the Botswana National Veterinary Laboratory and the Cameroun Laboratoire National Vétérinaire have proven their capacity to contribute as centres of excellence. In fact, they have organized and hosted training courses on disease diagnosis funded by both FAO and IAEA.

In Botswana, the laboratory is currently providing external quality assessment for contagious bovine pleuropneumonia to Southern African Development Community (SADC) countries while the laboratory in Cameroon is providing diagnostic services for African swine fever to Chad. Both are excellent examples of country-to-country support.

As a result of the improved capacity attained through the help of the Joint FAO/IAEA Division and collaboration with national and international laboratories, the laboratory in Botswana was granted the status of a World Organisation for Animal Health (OIE) reference laboratory for contagious bovine pleuropneumonia in May 2012.

The joint FAO/IAEA Animal Production and Health Laboratory runs annual proficiency tests with laboratories affiliated to the VETLAB Network on foot-and-mouth disease (FMD) and *Peste des Petit Ruminants* (PPR) and will add further relevant diseases to these exercises in the near future.

Participation in these proficiency testing exercises gives confidence to the successful laboratories – and alerts and highlights shortcomings to the less successful ones.

The VETLAB Network will continue supporting collaboration and harmonization between the veterinary laboratories in Africa, aiming to increase the overall laboratory proficiency, performance and preparedness to respond to animal and zoonotic disease challenges.


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KEY FACTS

VETLAB NETWORK

32 AFRICAN AND 17 ASIAN NATIONAL ANIMAL DISEASE DIAGNOSTIC LABORATORIES SHARING EXPERIENCES AND INFORMATION

SUPPORTING HARMONIZATION OF REGIONAL APPROACHES FOR EARLY, RAPID AND CONFIRMATORY DETECTION OF TRANSBOUNDARY ANIMAL AND ZOONOTIC DISEASES

IMPROVING REGIONAL AND NATIONAL LABORATORY DIAGNOSTIC CAPACITY

PROVIDING TECHNICAL ADVICE, TRAINING ON SEROLOGICAL AND MOLECULAR TECHNIQUES FOR DISEASE DIAGNOSIS AND A QUALITY ASSURANCE PROGRAMME ON THE DIAGNOSIS OF MAJOR DISEASES

PROMOTING CONSISTENCY AND RIGOR IN METHODOLOGY

LABORATORY ACCREDITATION; COUNTRY-TO-COUNTRY TECHNICAL SUPPORT; PROFICIENCY TESTING EXERCISES


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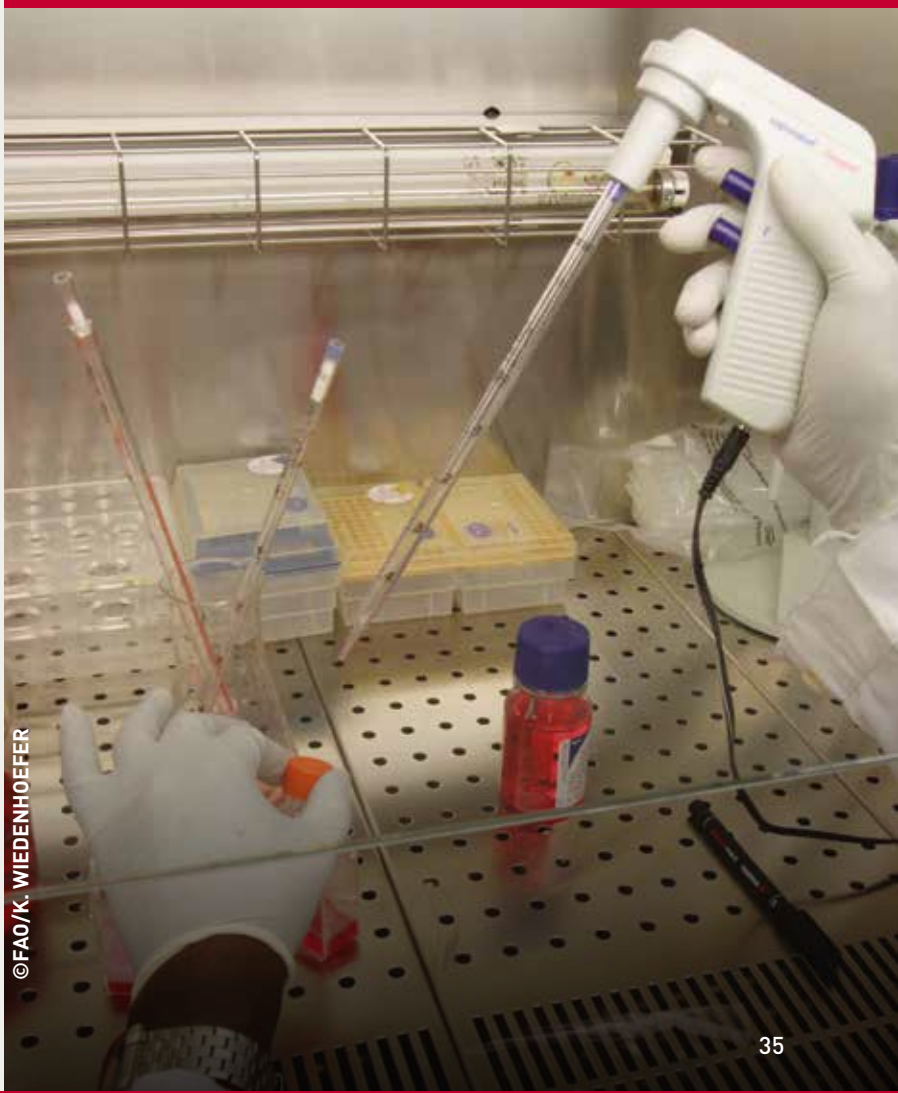
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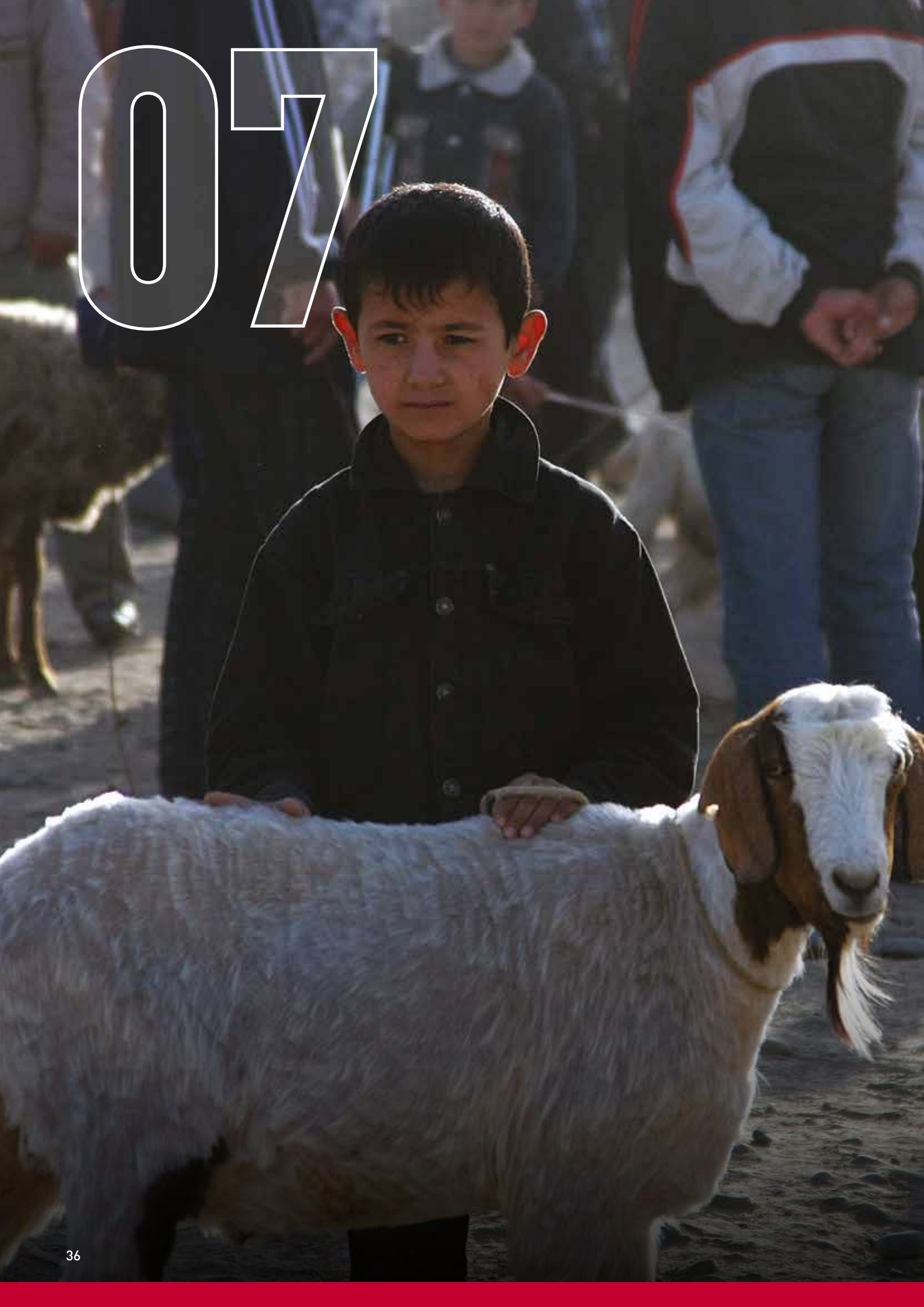

STRENGTHENING VETERINARY DIAGNOSTIC CAPACITIES: THE FAO LABORATORY MAPPING TOOL

The ABILITY of DIAGNOSTIC LABORATORIES to detect and characterize infectious agents, and therefore to support the prevention and management of health threats, is frequently constrained by lack of skilled personnel, accurate and consistent laboratory methods and quick data exchange systems.

Deficiencies in the capacities and capabilities of laboratories may lead to inadequate responses to disease emergencies at the animal–human interface.

To address these gaps, FAO, in 2010, developed the Laboratory Mapping Tool (LMT) to aid laboratory assessment, and in particular to assess the functionality and capacities of veterinary laboratories.

The semi-quantitative assessment of laboratory functionality and capacities is conducted via a detailed and standardized questionnaire which can be applied by an external assessor or via self-assessment. A laboratory profile or "map" will be generated by the tool based on automatic calculations of the determined scores.

The LMT was originally developed in the context of the five-year IDENTIFY project, aimed at strengthening laboratory capacity for early detection and diagnosis of diseases, enabling rapid response to emerging issues, part of the USAID-funded Emerging Pandemic Threat (EPT) Program. It has been applied yearly in more than 30 countries. With the new EPT-2 program, it will be applied also yearly in all EPT-2 supported laboratories.

The core LMT assesses five areas of the laboratory: i) general profile; ii) infrastructure, equipment and supplies; iii) performance; iv) quality assurance, biosafety and biosecurity; and v) collaboration and networking. Within these five areas, 17 categories and 108 subcategories (four scores to each subcategory) have been defined.

This profile of laboratory functionality can be monitored over time, for instance on a yearly basis. An improved version of the tool has been produced thanks to users' feedback and application in many laboratories.The tool has been made public in 2014 and may be used by any veterinary laboratory in any region or by any development partners working on veterinary

laboratory capacity building, to assess a given laboratory functionality and identify priorities and gaps.

Other modules of the LMT are currently being developed to assess more specifically some specific areas, such as the laboratory safety, capacity for testing for anti-microbial resistance (AMR) and testing for specific diseases.

The safety module will soon be finalized and released to the public after being piloted in six African laboratories and nine Asian laboratories.

It includes almost 100 subcategories, 20 categories and four areas: administration, operational aspects, engineering, personal protective equipment. It is referenced in the latest version of the World Organisation for Animal Health manual, biosafety chapter.

The LMT and its modules can be applied as simple Excel files or using a mobile application. They are available in English and French and other languages upon request. When shared with FAO by the assessors, LMT data are recorded and can be compiled on a recently developed platform that allows for further statistical analysis by FAO.

National portals for management of LMT data for the whole national veterinary laboratory system will be shortly available. Through such portal, laboratories or countries will also be able to compare their status on an anonymous basis with others at national, regional and global levels.

The first national inception workshop and training on the use of the core LMT and its safety module took place in Thailand in February 2016 with participation from the national network of Thai veterinary laboratories (ten regional laboratories as well as the National Institute of Animal Health and the foot-and-mouth disease regional reference laboratory). The core LMT and the biological safety module have been translated into Thai language.

During the training, participants have been introduced to the tool and two staff from each laboratory have been invited to apply it in real laboratory facilities and compare their results. Each participant will then be able to independently self-assess their own laboratory.

Other trainings will be organized in other countries or regions upon need and request.

The LMT can be a pertinent tool in evidencing and understanding where diagnostic laboratory gaps are and emphasizing capacity building needs. It can assist to develop strategic plans that will match with individual, national and regional laboratory needs.

The tool also serves to establish a baseline for laboratory status prior to intervention, allowing for an accurate measurement of progress and impact post-intervention.

This tool has already shown to be useful to countries and regions as well as their technical and financial partners by measuring evolution of the laboratory profile and by monitoring national and regional laboratory capacities for identification of priorities for intervention.


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KEY FACTS

LABORATORY MAPPING TOOL

LMT IS A STANDARDIZED TOOL TO ASSESS THE FUNCTIONALITY OF VETERINARY LABORATORIES AND IMPROVE THEIR STANDARDS

LMT MAY BE USED BY ANY VETERINARY LABORATORY IN ANY REGION OR BY ANY DEVELOPMENT PARTNERS WORKING ON VETERINARY LABORATORY CAPACITY BUILDING

THE CORE LMT WAS RELEASED PUBLICLY IN MAY 2014

THE CORE LMT HAS BEEN ALREADY APPLIED FOR SEVERAL CONSECUTIVE YEARS IN MORE THAN 30 COUNTRIES

LMT MODULES ARE BEING DEVELOPED. FIRST MODULE TO BE AVAILABLE: THE LMT- SAFETY MODULE

A FREE MOBILE APPLICATION OF THE LMT WILL BE AVAILABLE IN PLAY STORE AND APPLE STORE (MULTI-PLATFORM ANDROID PHONES AND TABLETS FIRST AND APPLE IOS IN A SECOND STEP)

A PLATFORM FOR LMT DATA RECORDING AND MANAGEMENT IS AVAILABLE

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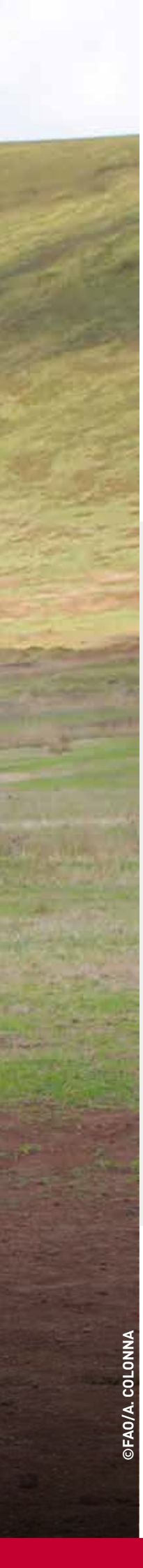

EMA-i: A MOBILE APP FOR TIMELY ANIMAL DISEASE FIELD REPORTING TO ENHANCE SURVEILLANCE

SURVEILLANCE AND EARLY WARNING of animal disease outbreaks, including zoonotic diseases, with potential public health impact enables national authorities to advise at-risk populations.

However, early detection and timely reporting of animal diseases from the field are a challenge in developing countries, where weak infrastructure, human resources, capacities and lack of adequate incentives have an impact to effectively implement adequate disease surveillance and reporting.

Good-quality disease information and reporting is needed in order to understand the disease situation, support decision-making, prevent potential disease incursion and respond quickly.

Thus, it is crucial to apply a system at national level to enhance veterinary services capacities in disease reporting from the field to decision makers and information-sharing among stakeholders.

For this reason, FAO has developed EMA-i (Event Mobile Application) for data collection and to facilitate real-time disease reporting to support veterinary services capacities in disease surveillance implemented in the field.

The rationale for the app is that in some developing countries access to the Internet can be difficult, especially away from urban centres, while telephone networks have good signal coverage over wider areas with rapid connection form the field.

HOW EMA-i WORKS

Using smartphones, animal disease information is collected with EMA-i app from the field. These data, which are geo-referenced, are entered into the app. The app generates a report that is sent in real-time to the Global Animal Disease Information System (EMPRES-i) database where the information is safely stored. The data are verified and validated, and the submitter of the information can be contacted if necessary.

All reports are also accessible through a mapping component of EMA-i which permits

to visualize the location and epidemiological details of a disease event from the field ("near me"). In addition, EMPRES-i platform developed by FAO can serve as a tool for data analysis through charts, tables and maps. An early warning e-mail notification system is also in place for informing decision makers on a disease event.

Crucially, the application allows for confidentiality of sensitive information. Only registered participants have access to their national data.

Another important advantage of this approach is that EMPRES-i can provide a stable and reliable platform for data storage, analysis and management, which is often not available for less developed countries with scarce financial and infrastructure resources.

EMA-i IN THE FIELD

EMA-i was first tested in Uganda in 2013 under a One Health project supported by the Government of Ireland. A pilot activity included the testing and use of EMA-i in 10 out of 112 districts in Uganda. For this purpose, EMA-i was customized for the use of the national authorities and FAO delivered internet-enabled smartphones to the Chief Veterinary Officer, epidemiologists of the National Animal Disease Diagnostics and Epidemiology Center (NADDEC) and District Veterinary Officers. Computers and power back-up were also distributed to the NADDEC offices.

A workflow of report communication was also established according to the existing reporting procedure from the field to the decision makers.

The use of EMA-i app in Uganda has demonstrated major improvements in disease reporting and communication between districts and central level (i.e. from monthly to real-time) and increased the number of animal disease reports received from targeted districts. For instance from July to December 2013, 126 livestock disease reports were submitted in real-time to NADDEC. This compares to 45 and 56 monthly reports NADDEC received through the regular reporting system in 2012 and 2011, respectively. In addition, a wider range of diseases is reported using EMA-i.

Interaction and communication between the field and decision-makers was also significantly improved. For this reason, the Ministry of Agriculture, Animal Industry and Fisheries has expressed a strong interest in expanding EMA-i to all districts.

In early 2015, a new project was launched in Mali. Working in collaboration with FAO Mali and the Emergency Centre for Transboundary Animal Diseases (ECTAD) in Bamako, FAO implemented the first phase of the project by interviewing the veterinary services in Mali to carry out an assessment of needs and gaps in disease information and reporting and with purchasing some of the equipment.

Furthermore, a "training of trainers" session was held at FAO headquarters in Rome, Italy, in December 2014 for FAO officers, one officer from FAO Mali and another from FAO Bamako. The training session was an opportunity to learn about the EMA-i app and EMPRES-i, and to become actively involved in the implementation of the application in Mali. Two pilots program are also planned in Latin America for 2016.

Through EMA-i app, a rapid, real time, efficient and highly confidential communication channel is guaranteed, allowing for an effective and more immediate action during the occurrence of a disease outbreak from detection, reporting and response. This is why FAO is planning to extend the use of this tool to other regions and countries to enhance global capacities in disease reporting, surveillance and early warning.


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KEY FACTS

EVENT MOBILE APPLICATION

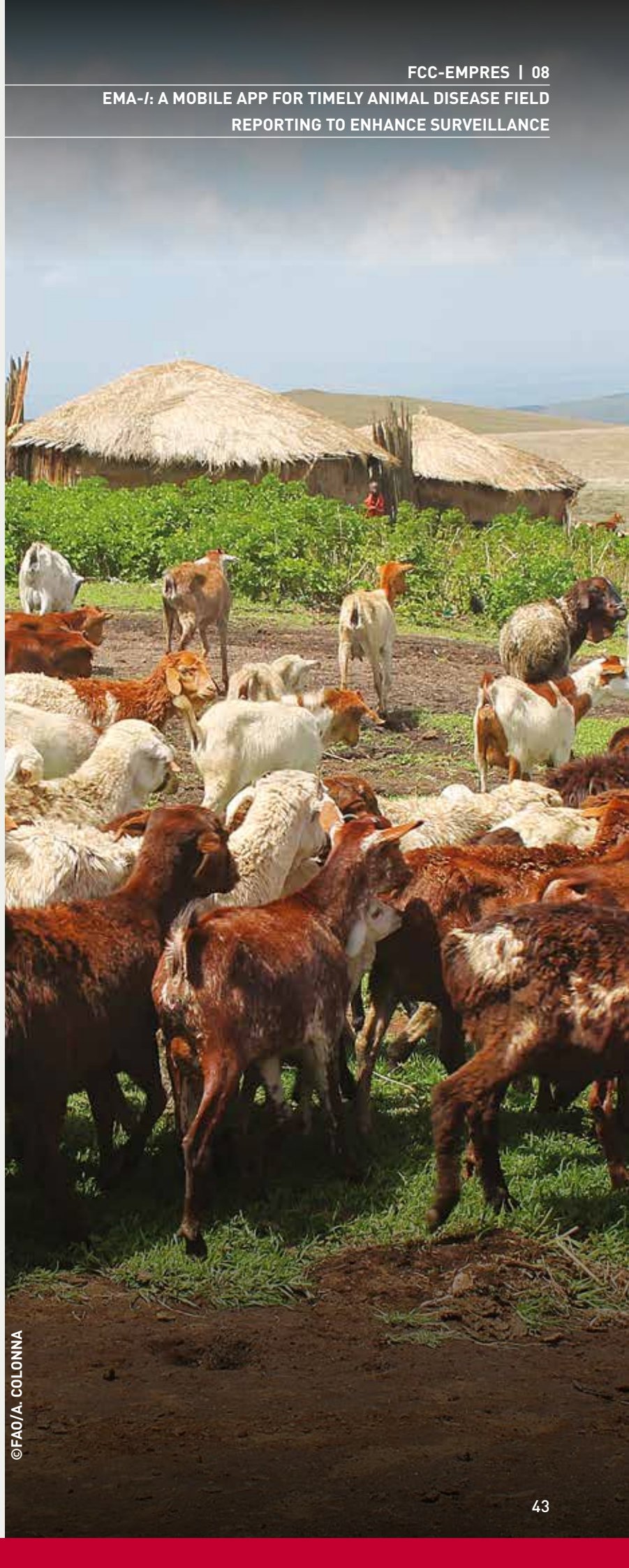
FACILITATING THE EXCHANGE OF INFORMATION ON ANIMAL DISEASE REPORTING BETWEEN ALL ACTORS, FROM FARMERS TO CHIEF VETERINARY OFFICERS

COLLECTING DATA AND REAL-TIME REPORTING FROM THE FIELD

DELIVERING DISEASE INFORMATION DIRECTLY TO THE EMPRES-i DATABASE

ALLOWING DIRECT ACCESS TO THE DATABASE THROUGH A "NEAR ME" MAPPING FUNCTION, WHICH PROVIDES A MAP ON OUTBREAKS REPORTED IN THE NEARBY

EMPRES-i ACTING AS A DATA REPOSITORY FOR SPECIFIC ANALYSIS WHERE ALL SENSITIVE INFORMATION AND DATA REPORTED IS SAFELY STORED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FAO HELPS COUNTRIES PREVENT AND CONTROL RIFT VALLEY FEVER

RIFT VALLEY FEVER (RVF) is a zoonotic, viral, vector-borne disease representing a threat to human health, animal health and livestock production in Sub-Saharan Africa, the Near East and potentially Europe and the rest of the world.

The virus can be transmitted from infectious ruminants to humans through several mosquito species and by contact with infectious animal material. Most human cases develop a mild influenza-like illness while some patients develop much more severe symptoms. In ruminants, it may be associated with high mortality in neonates and young animals as well as high levels of abortion. The impact of the disease on people's livelihoods (socio-economic) and on trade (restrictions) can be high.

Climatic factors are important drivers of RVF viral activity as they drive vector abundance and population dynamics, thus influencing the risk of disease emergence, transmission and spread. A climate- affecting phenomenon such as El Niño can have high impact on RVF.

CLIMATE-BASED FORECASTING MODELS AND EARLY WARNING SYSTEMS

Risk modelling tools, based on near-real-time satellite climate data, monitor the first signals of a possible increase in vector abundance and RVF risk and provide information for prevention and risk mitigation.

The National Aeronautics and Space Administration (NASA), FAO and the World Health Organization (WHO) have been monitoring climatic conditions to predict the risk of RVF vector amplification in East Africa for the past several years using a modelling approach developed by the NASA Goddard Space Flight Center team. In 2006-2007, this climate-based model predicted the risk of RVF occurrence in the Horn of Africa several weeks before the first signs of the disease were recorded in livestock and humans.

In this approach, climate data are used to identify and map areas with persistent, heavy, above-average rains and vegetation anomalies over the last three consecutive months.

Results are then interpreted and assessed in relation to El Niño and Sea Surface Temperature indicators as well as precipitation forecasts and compared with historical data.

Every month, the risk of RVF epizootic is assessed by FAO through the monitoring of the three climatic parameters: precipitation, El Niño Southern Oscillation (ENSO), and cumulative Normalized Difference Vegetation Index (NDVI) anomalies.

For East African region, FAO produced 190 RVF risk maps covering the period 1998-2014.

Following on the work conducted in East Africa, FAO is leading activities on disease modelling and risk mapping to improve early warning and surveillance strategies for northern Africa and Senegal. In particular, FAO is working to calibrate risk modelling tools in West Africa, specifically in Senegal and Mauritania.

Innovative methods are being explored to optimize the RVF prediction in northern and western Africa based on environmental and climatic variables in order to produce risk maps regularly.

These activities are carried out in the framework of the Vmerge project on "Emerging, Viral Vector-Borne Diseases", a research consortium funded by the European Commission.

CAPACITY BUILDING AND DATA DISSEMINATION

Building countries' capacities and providing training to fill any technical gaps is a crucial part of FAO's work in Africa. For this, a training programme on RVF preparedness (surveillance for early detection and contingency plans) took place in Tunisia in October 2015. It brought together 16 focal points of the Mediterranean Animal Health Network, one representative from the veterinary services of Senegal, and three representatives from the World Organisation for Animal Health (OIE).

A FAO manual on RVF surveillance is under development, which will complement this training in addressing the need for awareness and capacity building on RVF preparedness in the region.

Another important component of FAO's activities is assisting countries in formulating RVF preparedness and response plans in East Africa. Two RVF task forces, one in Tanzania and another in Kenya, have been established to provide countries with the best possible advice on the implementation of strategic RVF work plan for containing expected RVF outbreaks at source. FAO also supported awareness creation in Kenya by using local FM radios in high risk areas, especially in the northeast.

FAO continues also its effort to increase the use and understanding of molecular epidemiology by developing the RVF genetic module. The module being developed together with the Swiss Institute of Bioinformatics aims to enhance the linking of genomic sequence information - in centralized sequence database - with outbreak information available at FAO's Global Animal Disease Information System epidemiological database (EMPRES-i). This tool will enable understanding the distribution of viral strains, whether a virus has been recently introduced or was already present, the possible origins of an outbreak, the spread routes, etc.

In addition, FAO produced manuals on RVF prevention, control and elimination and guidelines to prepare national RVF contingency plan.

On a wider scale, FAO disseminates regular RVF updates, and produces RVF early warning messages (EMPRES Watch) in collaboration with OIE and WHO.


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KEY FACTS

RIFT VALLEY FEVER

MONITORING CLIMATE AND VEGETATION PATTERNS AND ANOMALIES IN AFRICA, PARTICULARLY IN EAST AFRICA, AND THE MIDDLE EAST

CALIBRATING AND MODELLING RVF RISK MODEL IN WEST AFRICA (SENEGAL AND MAURITANIA)

GENERATING RVF RISK MAPS AND CONDUCTING RISK ASSESSMENT OF RVF

PROVIDING TRAINING AND CAPACITY BUILDING TO FILL ANY GAPS ON PREVENTION AND CONTROL OF RVF

INCREASING THE USE AND UNDERSTANDING OF MOLECULAR EPIDEMIOLOGY BY DEVELOPING THE RVF GENETIC MODULE

DISSEMINATING RVF DATA, RISK ASSESSMENTS, UPDATES, AND EARLY WARNING MESSAGES


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RISK ANALYSIS TO MANAGE AND CONTROL TRANSBOUNDARY AQUATIC ANIMAL DISEASES

TRANSBOUNDARY AQUATIC ANIMAL DISEASES (TAADS) are a primary constraint to sustainable aquaculture production, and have a significant socio-economic and environmental impacts in several aquaculture countries and regions of the world. The impacts of TAADs are particularly hard-felt by small-scale farmers, who represent the backbone of many rural communities in developing as well as developed countries.

Like other farming sectors, the likelihood of major disease occurrence increases as aquaculture activities diversify, intensify and expand, based heavily on movements of fish and fishery products (broodstock, post-larvae, fingerlings, fry, and feed).

Several factors contribute to the current disease problems faced by the aquaculture sector, such as increased globalization of trade and markets; intensification of fish-farming practices; introduction of new species for aquaculture development; expansion of ornamental fish trade; enhancement of marine and coastal areas through stocking of aquatic animals raised in hatcheries; unanticipated interactions between cultured and wild populations of aquatic animals; poor or lack of effective biosecurity measures; slow awareness on emerging diseases; misunderstanding and misuse of specific pathogen free stocks; climate change; other human-mediated movements of aquaculture commodities.

RISK ANALYSIS FOR AQUATIC ANIMAL MOVEMENT

The ability of aquaculture managers to identify risks and decide on mitigation or management strategies to deal with risks can be improved through the risk analysis process. Research, databases and other vital sources of information and knowledge are needed for risk analysis application, so that biosecurity assessments, surveillance, diagnostics, early warning, emergency preparedness and contingency planning can be effectively supported.

To use the structured step-wise risk analysis process, it is important to first identify the hazards followed by an analysis of the individual steps and critical events leading to an introduction; assessing the risk pathways in terms of release, exposure and consequence; estimating the level of risk; and finally drawing up effective risk mitigation measures with a scope for option evaluation, implementation, monitoring and review. Communicating the

risk clearly, carefully and rapidly is an essential step of critical importance.

FAO, the Network of Aquaculture Centers in Asia and the Pacific (NACA) and the Asia Pacific Economic Cooperation (APEC) started collaborative work in 2000, a product of which was the development of a pioneering manual on risk analysis for aquatic animal movement. Capacity building for Asian and Latin American and the Caribbean countries commenced.

As aquaculture is very diverse in terms of species, environment, systems and practices, the range of hazards and the perceived risks are complex. In 2007, FAO initiated a study to better understand the biosecurity concerns that pose risks and hazards to aquaculture development and management and to the aquatic environment and society. Seven risk sectors were identified: pathogen, food safety, genetic, environmental, ecological, social and economic risks.

For close to 20 years now, FAO has been assisting its Member States in developing risk analysis capacity for safe and responsible movement of live aquatic animals particularly focusing on pathogen risk analysis. Numerous training workshops have been conducted at regional and national levels in various parts of the world.

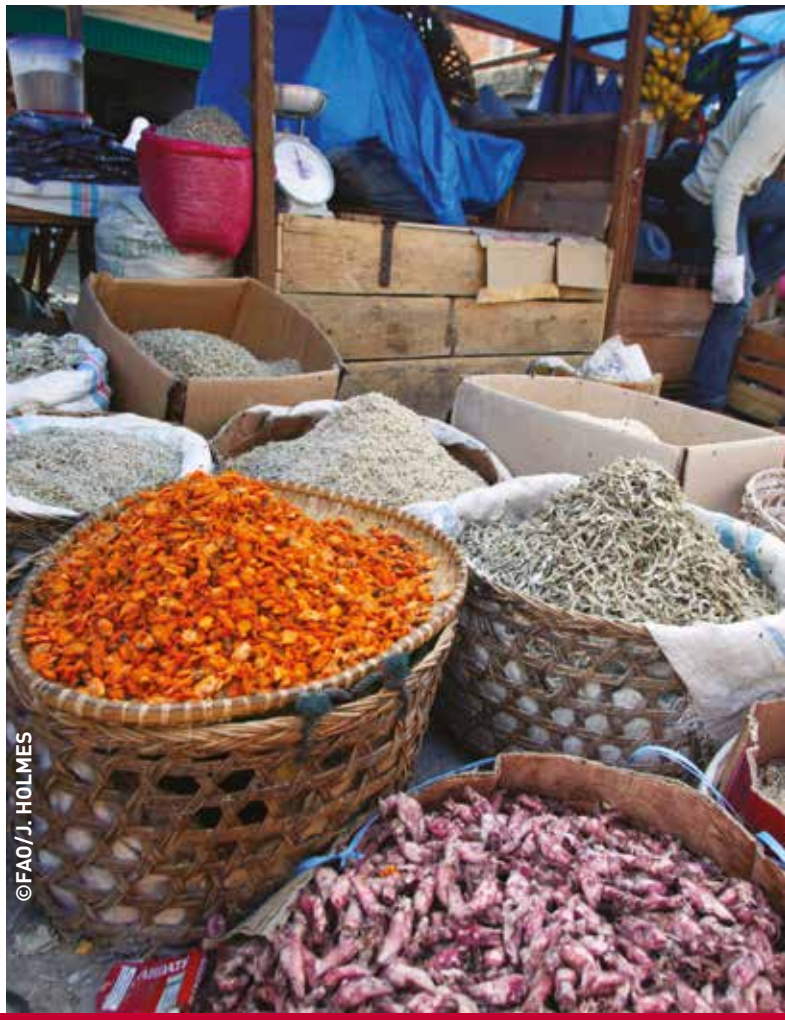
In 2012, FAO published the manual "**An Introductory Training Course: Risk Analysis for Movements of Live Aquatic Animals**". This is now used as a basic reference presented in a format that can be easily adapted for use in short courses by regional and national experts charged with preparing risk analysis training course for local participants.

Using this tool and the recommended supplementary materials, managers will be able to train staff in the planning and supervision of risk analysis. As risk analysis is a complex subject best learnt by experience, translocation scenarios are used to develop case studies used as course materials.

During the last few years, FAO conducted this introductory course for several countries and regions, e.g.: Federated States of Micronesia, Suriname and Tonga; in Africa (Botswana, Ghana, Kenya, Malawi, Mozambique, Namibia, South Africa, Uganda, Zambia, and Zimbabwe); and more recently in the Western Balkan region (Bosnia and Herzegovina, Croatia, Macedonia, Montenegro and Serbia).

Providing this basic knowledge on the risk analysis process and how it can be applied, has led to raising awareness. A better understanding on the application of risk analysis to aquaculture production prevails now among government policy-makers, managers, technical officers, and private sector.

FAO has also developed regionally- oriented guidelines, e.g. the Asia Regional Technical Guidelines on Health Management for the Responsible Movement of Live Aquatic Animals and the Beijing Consensus and Implementation Strategy in collaboration with NACA. A regionally adopted health management programme is considered a practical approach because of similarities in social, economic, industrial, environmental, agro-ecological and geographical.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KEY FACTS

FISHERIES AND AQUACULTURE

FISH AND FISHERY PRODUCTS PLAY A CRITICAL ROLE IN GLOBAL FOOD SECURITY AND NUTRITIONAL NEEDS OF PEOPLE IN DEVELOPING AND DEVELOPED COUNTRIES

THEY ARE AMONG THE MOST WIDELY TRADED COMMODITIES WITH SOME 40 PERCENT OF PRODUCTION ENTERING THE INTERNATIONAL MARKET

GLOBAL FISH PRODUCTION HAS GROWN STEADILY IN THE LAST FIVE DECADES, WITH FOOD FISH SUPPLY INCREASING AT AN AVERAGE ANNUAL RATE OF 3.2 PERCENT

NEW AQUATIC ANIMAL DISEASES ARE EMERGING AND SEVERELY AFFECTING AQUACULTURE - THE WORLD'S FASTEST GROWING FOOD PRODUCING SECTOR. ACUTE HEPATOPANCREATIC NECROSIS DISEASE IS AN EXAMPLE

IRRESPONSIBLE MOVEMENT OF LIVE AQUATIC ANIMALS IS A MAJOR PATHWAY FOR THE TRANSFER AND SPREAD OF TRANSBOUNDARY AQUATIC ANIMAL DISEASES

SERIOUS PATHOGENS SUCH AS WHITE SPOT DISEASE (WSD) AFFECTING CRUSTACEANS AND EPIZOOTIC ULCERATIVE SYNDROME (EUS) AFFECTING FINFISH ARE CLASSIC EXAMPLES

GLOBAL FISH PRODUCTION HAS GROWN STEADILY IN THE LAST FIVE DECADES, WITH FOOD FISH SUPPLY INCREASING AT AN AVERAGE ANNUAL RATE OF 3.2 PERCENT

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FAO DESERT LOCUST INFORMATION SERVICE (DLIS) HELPS COUNTRIES TO CONTROL DESERT LOCUST

THE DESERT LOCUST (*Schistocerca gregaria*) is considered the most dangerous of all migratory pest species in the world. It threatens people's livelihoods, food security, the environment and economic development.

It can easily affect more than 65 of the world's poorest countries. It can reproduce rapidly, migrate long distances and devastate crops and pasture. The Desert Locust has the ability to change its behaviour and appearance, under particular environmental conditions (unusually heavy rains), and transform itself from a harmless individual to part of a collective mass of insects that form a swarm, which can cross continents and seas, and quickly destroy a farmer's field and his entire livelihood in a single morning.

A Desert Locust adult can consume roughly its own weight in fresh food per day that is about two grams every day. A 1 km size swarm contains about 40 million locusts, which eat the same amount of food in one day as about 35,000 people, 20 camels or 6 elephants.

During quiet periods (known as recessions), solitarious locusts are found in low numbers scattered throughout the deserts of North Africa, the Middle East and Southwest Asia. This arid area is some 16 million km in size, and includes about 30 countries. It is called the recession area. During a plague, swarms can also invade other countries and a greater amount of land equivalent to about 20% of Earth's land can be affected (invasion area).

DLIS: FROM MAP READING TO GPS

The first records of Desert Locust plagues date from Pharonic Egypt and have been documented throughout history. During the first 60 years in the 20th century, there were five major plagues, lasting up to 14 years.

Since 1963, there has been a dramatic decline in the frequency and duration of plagues, and now plagues occur perhaps only once every 10 to 15 years and rarely last more than three years.

Today, locust-affected countries' ability to detect, respond to and contain Desert Locust outbreaks has improved as a result of advances in technologies related to geo-positioning, spatial analysis, remote sensing and early warning.

The reduction in the frequency, severity and duration of Desert Locust plagues and their associated food losses has been possible thanks to the adoption of a preventive control strategy relying on early warning and early reaction by locust-affected countries and FAO.

FAO DESERT LOCUST INFORMATION SERVICE

FAO Desert Locust Information Service (FAO DLIS) is the key monitoring and early warning tool in preventing Desert Locust plagues from devastating farmers' fields in Africa and Asia.

Since 1978, FAO DLIS operates an early warning system that monitors weather, ecological conditions, and locust infestations in the potentially affected area on a daily basis.

After 75 years of systematic Desert Locust monitoring and collaboration between locust-affected countries and DLIS, today's FAO DLIS has revolutionized the process.

In the past three decades, the system has shifted from camels to four-wheel drive vehicles, from telex to email, from map reading to GPS, from narratives to handheld data loggers, from manual plotting to GIS, and from weather station reports to satellite-based rainfall estimates and greenness maps.

GPS, RAMSES (Reconnaissance and Management System of the Environment of Schistocerca) and SWARMS (Schistocerca Warning and Management System) GIS, the Internet and eLocust3 (Android-based tablet) have replaced the traditional tools of paper, coloured pencils, maps and telephone.

PEOPLE AT THE CENTRE OF DLIS

DLIS manages an internet-based group of some 25 national locust information officers, a simple mechanism to keep national officers in contact with each other and share information every day.

The primary and most important source of information are survey and control reports from affected countries. Each key country has a Locust Information Officer who is responsible for collating, analysing and transmitting this data to DLIS by email. DLIS, in turn, analyses the data and keeps countries informed of the current situation and expected developments.

DLIS issues a monthly bulletin in three languages (English, French and Arabic) to locust-affected countries, the international donor community, researchers, institutes, and other interested parties that summarizes the current situation and provides a six-week forecast on a per-country basis. During periods of increased locust activity, the bulletins are supplemented by updates, warnings and alerts.

DLIS spends considerable efforts to strengthen the capacities of nationally designated locust information officers.

New tools are developed to facilitate the collection, transmission, management and analysis of data. Annual workshops are held for English and French speaking information officers as a forum for informal discussions on the use, problem-solving and improvement of various tools (eLocust3, eLocust2 Mapper, RAMSES, remote sensing, social media) used by the officers.

This global early warning system, based on new advances in technologies, can be a model for other migratory pest early warning systems throughout the world.


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KEY FACTS

DESERT LOCUST INFORMATION SERVICE

ACTING AS A FOCAL POINT AND COORDINATOR OF A GLOBAL LOCUST INFORMATION NETWORK

MONITORING WEATHER, ECOLOGICAL CONDITIONS AND LOCUST INFESTATIONS IN AFRICA, NEAR EAST AND ASIA ON 24/7 BASIS

USING GIS TO ANALYSE THE CURRENT LOCUST CONDITION IN EACH COUNTRY

PRODUCING INFORMATION ON A DAILY BASIS FOR ABOUT 30 COUNTRIES IN THE AFFECTED REGION

WORKING WITH NATIONAL LOCUST INFORMATION OFFICERS

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FAO ADVANCED TOOLS AND TECHNOLOGIES FOR LOCUST MONITORING AND EARLY WARNING

MONITORING, providing **EARLY WARNING**, and acting promptly to control outbreaks of locust and other migratory pests are crucial to ensure that timely and appropriate action can be taken when an emergency arises.

The Desert Locust Information Service (DLIS) at FAO Headquarters continuously monitors global weather, ecological conditions and the locust situation.

Geo-referenced data in the field are collected and analysed on a daily basis. This analysis, carried out by the national control locust centres and by FAO DLIS, relies on a range of computer-based software tools which were developed by FAO and several partners for early warning purposes.

The handheld device called eLocust is a striking example of these tools. These components constitute the oldest migratory pest monitoring and early warning system in the world.

Some other new important tools are briefly described in the following sections.

TOOLS TO MONITOR DESERT LOCUST

In 2014, FAO DLIS released the updated **eLocust3** system that allows national survey and control officers in locust- affected countries to record and transmit data from the field to their national locust centres in real time via satellite. This data is the basis of the preventive control strategy adopted by FAO and locust-affected countries. The data are used to assess the current situation, forecast its developments and warn locust-affected countries and the international donor community of locust invasions and plagues.

The eLocust3 system operates on Panasonic Toughpads, rugged Android tablets designed specifically for field use. The eLocust3 system is linked to two separate applications, Adobe Reader and eLocust3 3D. The first application is used for accessing a digital reference library in three languages. The second one is a remote sensing mapping application that guides users to specific areas where vegetation may be green. This innovative application has been internationally recognized and has won awards because it runs in the field without the need for

an Internet connection. To date, FAO DLIS configured nearly 400 eLocust3 kits and dispatched them to nearly two-dozen Desert Locust frontline countries.

FAO has also provided extensive training through a series of workshops to designated Master Trainers who are responsible for training field officers in their own country.

Another notable tool is **RAMSESv4** (Reconnaissance and Management System of the Environment of *Schistocerca*). This is an open-source, platform-independent, license-free, geographic information system (GIS) and spatial database software developed for national Desert Locust information officers in locust-affected countries.

This custom software application is used in all frontline countries on a daily basis to manage and analyse remote sensing imagery and ecological, weather and locust data, including survey and control results, in order to assess the current locust situation and determine the need for survey and control operations. The first operational version of RAMSESv4 was released in January 2015 in English, French and Arabic. This was a basic version and further data management and analytical functionalities are being distributed in the form of regular updates according to user needs.

An additional tool in the existing arsenal used to identify potential areas where locusts may be present, increasing in number and perhaps require control is the greenness map. The **greenness map** is a dynamic product that provides the location of green vegetation areas at 250m resolution on a 10-day basis. This information is used to guide survey teams and make operational decisions. It is also incorporated into decadal and monthly locust bulletins prepared by national locust centres and FAO DLIS. FAO has made significant efforts in training national locust information officers in affected countries in the use and interpretation of the new greenness maps.

Finally, FAO DLIS uses **seasonal forecasts** from the World Climate Service (WCS) that predicts rainfall and temperature six months in advance in all Desert Locust areas. The predictions are incorporated into the locust forecasts that appear in the monthly FAO Desert Locust Bulletin, updates and other advice provided by FAO DLIS to locust- affected countries and the international community.

WORKS IN PROGRESS

New tools for Desert Locust monitoring, forecasting and early warning are constantly being developed by FAO DLIS in collaboration with a variety of universities and other partner institutes.

For example, FAO DLIS is currently investigating how to adopt **drones** for locust early warning and preventive control to make surveys more efficient and control more safe. FAO DLIS is developing a 10-day **dynamic dryness map** that shows how long each area has been dry to help countries determine the best time to withdraw survey teams from the field at the end of a rainy season when locusts have finished breeding.

FAO DLIS is also developing a **soil moisture map** to assist field teams in identifying areas that are potentially favourable for locust breeding. These maps will be used in combination with existing rainfall estimate and greenness maps.

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KEY FACTS

DESERT LOCUST INFORMATION SERVICE

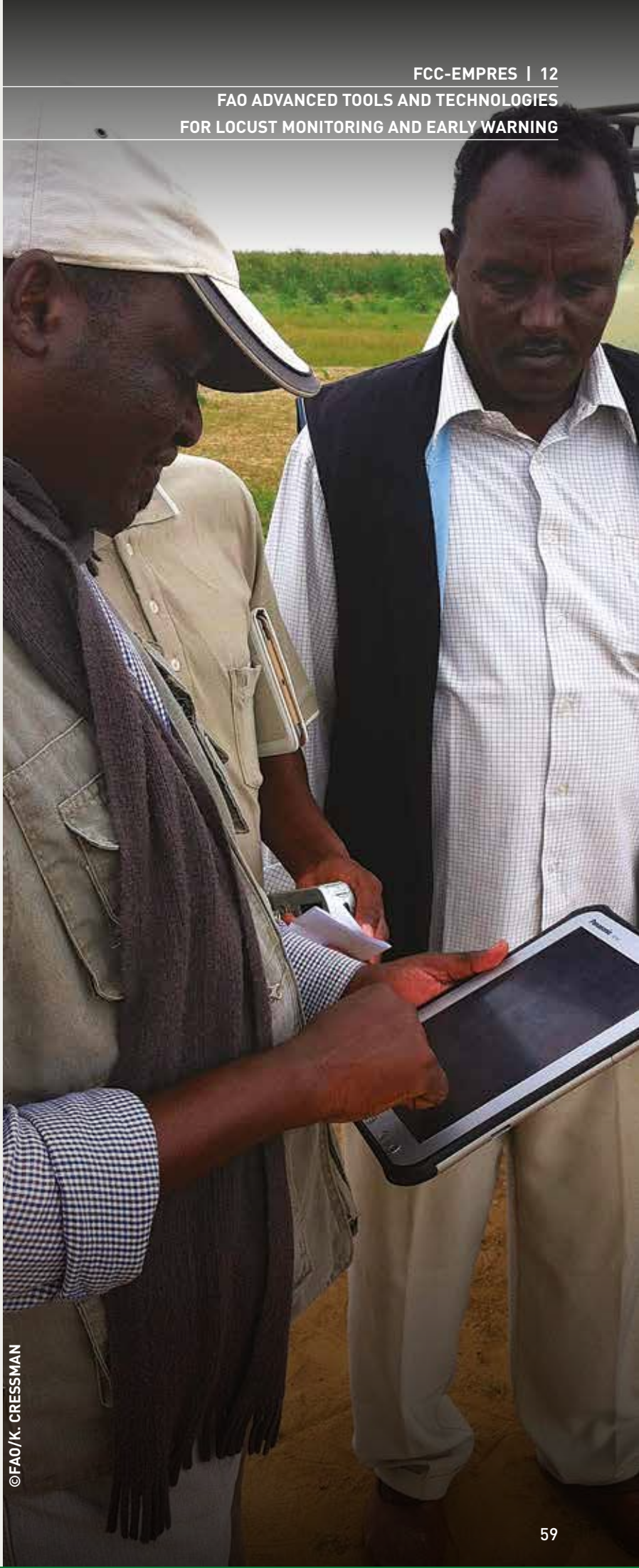
RECORDING AND TRANSMITTING DATA IN REAL TIME VIA SATELLITE FROM THE FIELD TO THE NATIONAL LOCUST CONTROL CENTRES THROUGH ELOCUST3

MANAGING AND ANALYSING FIELD DATA THROUGH RAMSESV4 TO ASSESS THE CURRENT LOCUST SITUATION AND PLAN OPERATIONS

PRODUCING A 10-DAY GREENNESS MAP THAT PROVIDES THE LOCATION OF GREEN VEGETATION AREAS AT 250M RESOLUTION

PROVIDING FORECASTS AND WARNING LOCUST-AFFECTED COUNTRIES AND THE INTERNATIONAL DONOR COMMUNITY

TRAINING NATIONAL LOCUST INFORMATION OFFICERS IN AFFECTED COUNTRIES IN THE USE OF NEW TOOLS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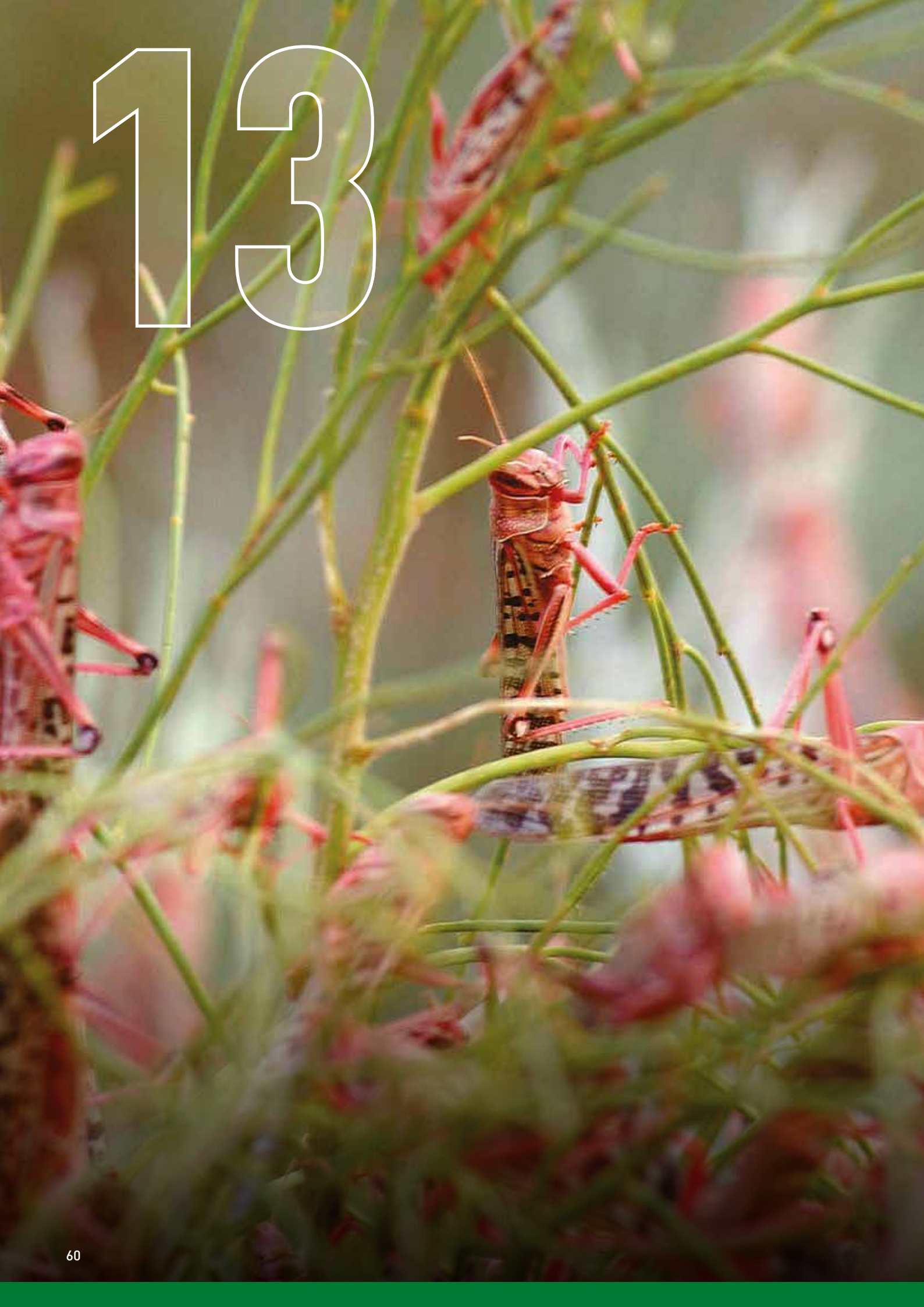

FAO'S COMMISSION ENSURES SUSTAINABILITY OF DESERT LOCUST PREVENTIVE CONTROL IN WEST AND NORTHWEST AFRICA

The FAO COMMISSION for controlling the Desert Locust in the Western Region (CLCPRO) strengthens national capacities of locust- affected countries in West and Northwest Africa in planning, training, research and effective and timely response to Desert Locust invasions in order to prevent upsurges and plagues.

The Commission contributes significantly to food and livelihoods security in northern Africa through its regional approach in preventing serious damage that locusts can inflict on pastures and agricultural production in the concerned member countries.

The Commission fosters sustainable Desert Locust management by implementing harmonized tools and processes for locust monitoring and control that is fully supported by each member country's national budget.

MECHANISMS FOR PREVENTIVE CONTROL STRATEGY OF DESERT LOCUST

The Commission has successfully put mechanisms into place that ensure the long-term sustainability of the preventive control strategy in the Western Region.

First, Commission member countries have developed a strong sense of ownership that resulted in tripling the amount of annual contributions to the Commission's Trust Fund from US$227 000 to US$639 000 starting from 2011. This represents a very good example of country-led development.

Second, a new sustainable financing system for Desert Locust preventive control in the Western Region was adopted by the ten member countries.

This mechanism is composed of eight instruments that are aligned with the four periods of Desert Locust activity (recession, outbreak, upsurge, plague) and includes two new funds.

The key features of the system are:

- the various financing sources at the national, regional and international level complement each other to ensure continuous financing of control operations,
- contingency plans are the cornerstone of the entire system, and
- financing instruments calling for the

participation of international donors are matched with regular dialogue with these donors.

This system aims at reinforcing national funding, regional solidarity, South-South cooperation and regional institution support.

The third mechanism put in place for the durability of the preventive approach is the organization of periodical ministerial meetings that bring together all members of CLCPRO in order to check and review the Commission's track record and determine strategic orientations.

Finally, to develop the preventive control strategy, which is the most efficient, affordable and environmentally sound instrument available for Desert Locust management, special attention is paid to "frontline countries" where autonomous National Locust Control Units were established by national parliaments. These well-equipped and organized units are the pillars of regional and international Desert Locust early warning and control both in frontline and invasion countries.

For this reason, it remains critical that such units have access to sufficient national budgetary resources every year.

ADVANTAGE OF DESERT LOCUST PREVENTIVE CONTROL STRATEGY

The cost of the last Desert Locust invasion in the Western Region in 2003 - 2005 was estimated at US$570 million. The damage to agro-pastoral resources in the Sahel ranged from 30 percent to 100 percent, depending on the type of crop.

Its control required spraying 13 million litres of pesticides with associated risks to human health and the environment that were already vulnerable due to drought and climate change.

CLCPRO estimates that the curative costs of US$570 million was equal to 170 years of preventive control in the ten member countries without using substantial amounts of pesticides.

RESULTS ACHIEVED AND THE WAY FORWARD

Five Desert Locust outbreaks have been contained since 2006 of which some could have evolved into a serious upsurge. Compared to the 2003-2005 upsurge, the response to the 2012-2013 crisis in the Sahel was faster and more efficient, which brought the situation under control and prevented an upsurge.

Several important lessons were learned from managing this emergency: (i) resources were mobilized in 1-2 months, (ii) the lead time for releasing Technical Cooperation Programme funds varied from country to country, showing the need to have country requests prepared at the earliest stages of the threat to accelerate processing, (iii) the procurement and delivery of equipment took much longer than expected, (iv) cooperation between countries facilitated by FAO allowed to meet requirements without having to purchase additional pesticides, and (v) more advocacy is needed to support faster donor involvement.

Overall, the rapid and organized response led to a lower use of pesticides over a much smaller area, causing less adverse impact on the environment than in 2003-2005.

Sustainability of the preventive control strategy is on track, but countries are facing critical challenges especially due to the increasing insecurity in the Western Region that could jeopardize results obtained so far.

New approaches are being investigated in close collaboration with the Desert Locust Information Service in order to get timely locust and habitat information, essential for early warning and rapid response.


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KEY FACTS

FAO COMMISSION FOR CONTROLLING DESERT LOCUST IN THE WESTERN REGION

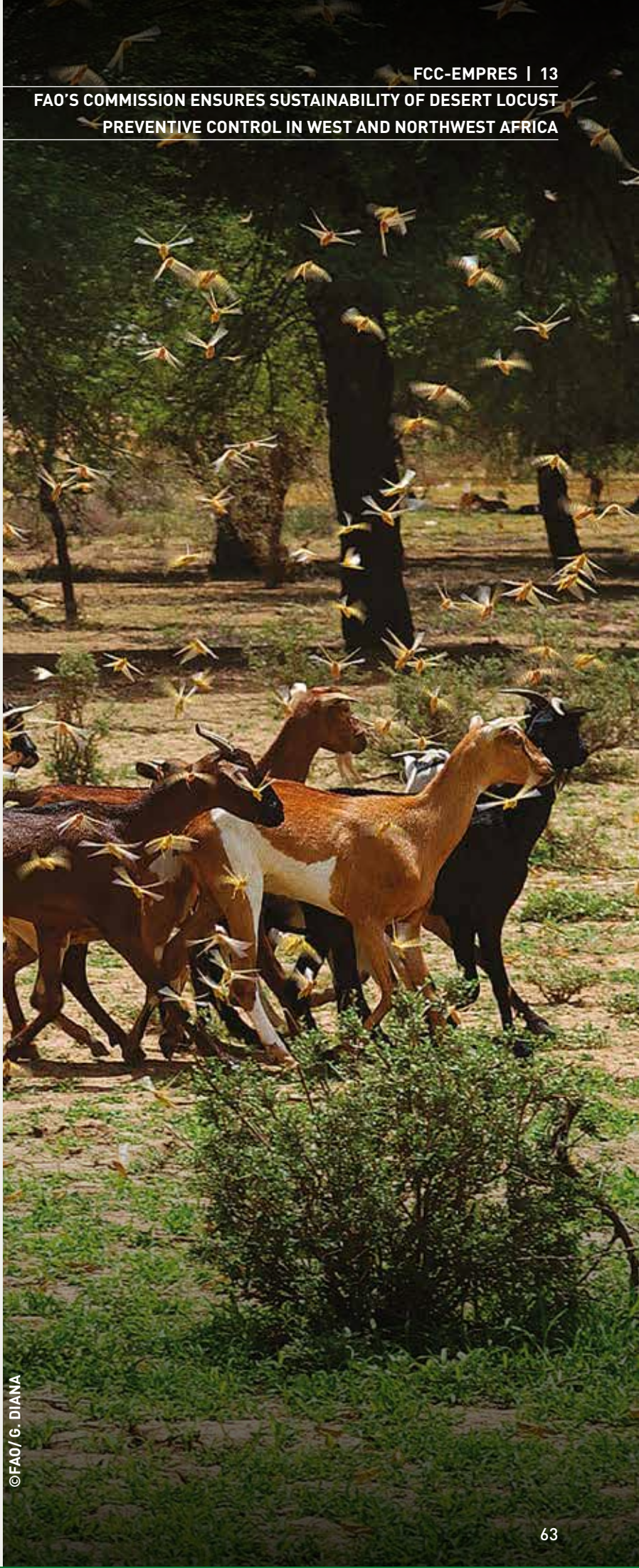
TEN MEMBER COUNTRIES: ALGERIA, BURKINA FASO, CHAD, LIBYA, MALI, MAURITANIA, MOROCCO, NIGER, SENEGAL AND TUNISIA

NEW MECHANISMS TO ENSURE THE LONG- TERM SUSTAINABILITY OF THE DESERT LOCUST PREVENTIVE CONTROL STRATEGY

PREVENTIVE CONTROL STRATEGY IS MORE EFFICIENT, LESS COSTLY AND ENVIRONMENTALLY SOUND

MEMBER COUNTRIES ANNUAL CONTRIBUTIONS TO THE COMMISSION'S TRUST FUND TRIPLED SINCE 2011

NATIONAL LOCUST CONTROL UNITS AND THE CLCPRO SECRETARIAT HAVE ACHIEVED OPERATIONAL SUSTAINABILITY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FAO COMMISSION FOR CONTROLLING THE DESERT LOCUST IN THE CENTRAL REGION (CRC) **FIFTY YEARS FIGHTING DESERT LOCUST**

In July 1965, the 44th session of the Council of the Food and Agriculture Organization (FAO) approved the establishment of the COMMISSION FOR CONTROLLING THE DESERT LOCUST IN THE CENTRAL REGION (CRC) based on recommendations by the 11th FAO Conference session (1961) and a Special Conference held in Beirut (1965). The agreement came into force on 21 February 1967.

The CRC covers Northeast Africa and the Near East and comprises 16 member countries: Bahrain, Djibouti, Egypt, Eritrea, Ethiopia, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Sudan, Syria, United Arab Emirates and Yemen.

MISSION

The role of the Commission is to assist member countries to manage and prevent Desert Locust, and to prepare for and respond to emergencies caused by it.

The CRC concentrates on integrated approaches that:

- support the development, sharing and adaptation of preventive control strategies, explore approaches for assessing impact, vulnerability, adaptation and planning, and focus on economic, institutional and financing issues;
- create enabling frameworks for economically and environmentally sound control products that embody resource- use efficiency, diversification, accessibility and mitigation of the negative impacts of conventional insecticides.

ACTIVITIES

Since its establishment 50 years ago, the Commission has strengthened the national capacities of member countries and assisted in their battle against the Desert Locust through a variety of activities that:

- promote enhanced regional interaction and cooperation between the affected countries through Commission sessions, executive and ad-hoc meetings;
- adopt improved early detection tools and early warning systems;
- build capacity through provision of equipment;
- strengthen expertise through national, regional, inter-regional and international short-term and long-term courses and workshops, including graduate-level fellowships;
- support the introduction of economic and

environmentally safer control technologies as well as demand-driven research;

- develop contingency planning tools and rapid deployment plans;
- provide bilateral and multilateral assistance during emergencies.

CRC activities focus on the needs of the National Locust Control Units (NLCUs). In 2012, the *Environmental and Health Standards of the Desert Locust Operations Programme in the Central Region (EHS-CR)* was adopted by member countries.

The standards define the requirements that a Desert Locust control campaign should meet in order to minimize environmental and human health effects of insecticide use.

One important aspect of EHS-CR is monitoring exposure to pesticides by routinely measuring blood cholinesterase levels of workers involved in locust control operations and pesticide handling. By 2016, most of the CRC member countries have undertaken the initial steps to implement EHS-CR at the national level.

In 2014, CRC continued its efforts in improving contingency planning for Desert Locust emergencies by updating the *Desert Locust Contingency Planning Assistant (DeLCoPA)* that was developed by FAO. This tool helps NLCUs to prepare their national contingency plans by identifying strengths and weaknesses in the national locust programme that should be addressed in order to effectively manage a locust crisis in its early, critical stages. CRC also contributes to updating the *Locust Emergency Preparedness Toolkit (eLERT)* used to provide timely emergency response.

In 2015, the Commission introduced in its Region the *Pesticide Stock Management System (PSMS)* developed by FAO. This system records pesticide stocks, tracks their movement inside and outside the country, whether for control operations, internal redistribution, or triangulation between countries, and manages the disposal of empty pesticide containers.

CRC member countries have adopted the preventive control strategy that relies on early warning and detection, rapid response and contingency planning. It is far less costly and safer to prevent Desert Locust upsurges and plagues than to undertake emergency control operations. Preventive control relies on established national locust units that are well equipped, have sufficiently trained staff and are funded by the government. The Commission works closely with each member country to achieve and maintain this requirement. Since the 1960s, preventive control has had a major impact in reducing the frequency, duration and intensity of Desert Locust plagues, which used to last up to 14 years but now are rarely more than two years in length.

ENHANCED COLLABORATION - A SUCCESS STORY

In 2013-2014, four outbreaks developed along both sides of the Red Sea in Sudan, Eritrea, Saudi Arabia and Yemen. The Commission was able to quickly mobilize US$3.6 million from its Trust Fund, FAO emergency funds, Saudi Arabia, the Islamic Development Bank, and USAID. This and a strong collaborative effort between FAO, donors and affected countries contained the outbreaks and prevented swarms from invading other countries and the development of an upsurge.

CRC continues to work closely with its member countries, the Desert Locust Information Service (DLIS) at FAO Headquarters, the other two FAO regional Desert Locust commissions (Commission for Controlling the Desert Locust in the Western Region (CLCPRO) and the South-West Asia Commission (SWAC)), FAO Representations in each country, the Desert Locust Control Organization for Eastern Africa (DLCO-EA) and the international donor community in order to mitigate the Desert Locust threat and contribute to food security and the fight against hunger and poverty.

KEY FACTS

FAO COMMISSION FOR CONTROLLING DESERT LOCUST IN THE CENTRAL REGION

CRC CELEBRATES FIFTY YEARS OF LOCUST MANAGEMENT

BIGGEST COMMISSION FOR CONTROLLING DESERT LOCUST WITHIN 16 MEMBER COUNTRIES IN THE MIDDLE EAST, ARAB PENINSULA AND HORN OF AFRICA

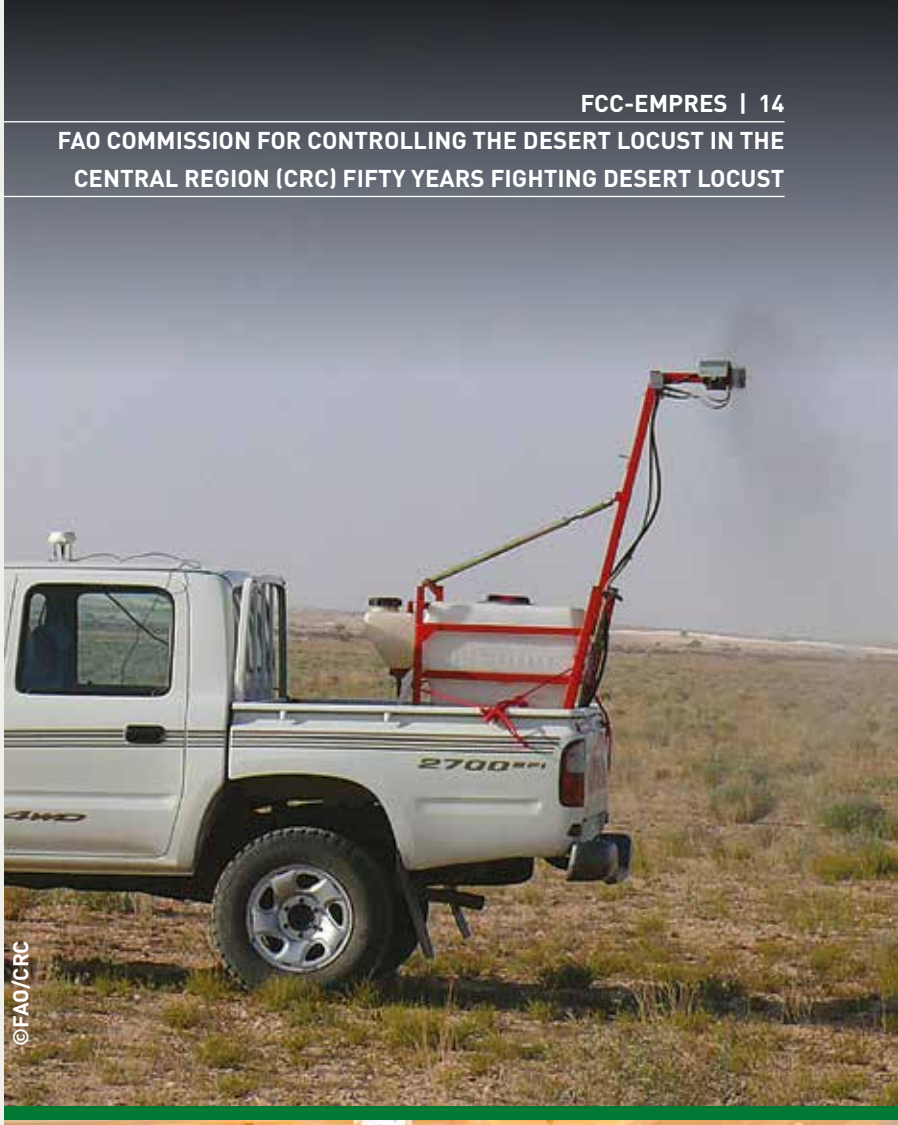
CRC COVERS 30 PERCENT OF THE DESERT LOCUST DISTRIBUTION AREA

ENVIRONMENTAL AND HEALTH STANDARDS OF THE DESERT LOCUST OPERATIONS PROGRAMME IN THE CENTRAL REGION WERE ADOPTED BY MEMBER COUNTRIES IN 2012

PREVENTIVE CONTROL HAS SUCCESSFULLY REDUCED LOCUST PLAGUES

THANKS TO QUICK MOBILIZATION OF FUNDS BY THE COMMISSION DURING 2013-2014, FOUR OUTBREAKS WERE CONTAINED AND SWARMS PREVENTED FROM INVADING OTHER COUNTRIES

ENHANCED COLLABORATION INCREASES RESILIENCE AND REDUCES DISASTER THREATS TO LIVELIHOODS



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IMPROVING NATIONAL AND REGIONAL LOCUST MANAGEMENT IN CAUCASUS AND CENTRAL ASIA


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LOCUSTS AND GRASSHOPPERS pose a serious threat to agriculture in Caucasus and Central Asia.

During outbreaks, the three main locust pests (Italian, Moroccan and Migratory Locusts) attack all types of crops and plants.

More than 25 million hectares of cultivated areas can be affected and locusts can jeopardize food security and livelihoods of more than 20 million people, including the most vulnerable communities living in rural areas.

As locusts are a migratory and transboundary pest that can fly up to 100 km per day and since political boundaries in Caucasus and Central Asia often fall within traditional locust habitats, locust infestations and movements can be a source of tensions between countries.

Locusts are becoming even more dangerous with exceptional weather events associated to climate change, due to their capacity to take advantage of new situations.

In October 2011, FAO initiated the "Programme to improve national and regional locust management in Caucasus and Central Asia (CCA)" to safeguard food security and the livelihood of rural populations through reduction of locust outbreaks and upsurges.

The Programme supports the locust preventive control strategy, which relies on appropriate monitoring, early warning and early reaction. If properly implemented, crises could be avoided, with no, or limited damage on crops and rangelands, less impact on human health and the environment, and low financial costs.

To that end, FAO contributes to develop regional cooperation and strengthen national capacities.


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DEVELOPING REGIONAL COOPERATION

Encouraging cooperation among countries is one of the most important aspects of the Programme and a number of joint activities and trainings are organized such as annual joint and cross-border surveys.

For example, three cross-border surveys were carried out between Kyrgyzstan-Tajikistan, Kyrgyzstan-Uzbekistan, and Tajikistan-Uzbekistan in May 2015.

A joint survey was also conducted in Kakheti, Georgia, involving Armenia, Azerbaijan, Georgia and Russia.

A total of 42 locust experts from seven countries participated. While these surveys allow locust experts to jointly collect data and evaluate the locust situation in border areas, one of their major breakthroughs is a significant reduction in tension between countries regarding the sources of locust invasions.

Those benefits have been fully recognized by countries.

SUPPORTING EARLY WARNING IN CCA

Information collection and exchange is the cornerstone of any preventive approach. Nine out of the ten CCA countries, i.e. a total of almost 100 locust experts, have benefitted from training on improved locust monitoring and data management since the start of the Programme.

Every year, national bulletins on locust situations and their actual management are prepared and issued as monthly regional bulletins that are shared amongst all countries during the locust campaign in CCA.

A Geographic Information System (GIS) is under development for locusts in CCA that will be used both at the national and regional levels. It will allow storing, sharing and analysis of the standardized, geo-referenced locust data, which are collected during field surveys by the observers and scouts from the national plant protection services.

A complementary tool was developed in 2013, the Automated System for Data Collection (ASDC), which will be linked to the GIS. Two pilot countries, Georgia and Uzbekistan, whose experts were trained, were designated to test the system from 2014; Russia has also decided to join as a pilot country from 2015. The ASDC will be improved on this basis and then shared with all countries, together with the GIS.

MITIGATING AND MONITORING THE IMPACT OF LOCUST CONTROL ON HUMAN HEALTH AND THE ENVIRONMENT

A critical aspect in locust control is the adverse effects that pesticides may have; therefore, major efforts are done to mitigate and monitor them.

National capacities are being enhanced to improve spraying techniques, including promotion of the Ultra-Low Volume technology, recognized throughout the world as the most efficient means of locust control. A total of 65 locust experts (from seven countries so far) have also been trained to better monitor and mitigate the impact of locust control operations on human health and the environment.

A pilot activity was conducted in 2014 in Tajikistan to develop an integral system for monitoring locust control operations. As a result, for the first time ever in CCA, a Human Health and Environmental Monitoring Team was set up during the 2015 locust control campaign. A similar system is being developed in Kyrgyzstan in 2015.

Since its launch, highly positive results have been obtained by the Programme in terms of strengthening national and regional locust management in CCA. This is an ongoing process and more is envisaged, such as training-of-trainers so that each country will be able to train a large number of national experts.


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KEY FACTS

LOCUST PROGRAMME IN CAUCASUS AND CENTRAL ASIA

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

EFFECTIVE REGIONAL COOPERATION, INCLUDING CROSS-BORDER SURVEYS, FOR TRANSBOUNDARY LOCUST PEST MANAGEMENT

ENHANCED LOCUST MONITORING, EARLY WARNING & EARLY REACTION

DEVELOPMENT OF A LOCUST GEOGRAPHIC INFORMATION SYSTEM (GIS) FOR CAUCASUS AND CENTRAL ASIA

IMPROVED RESPONSE TO LOCUST OUTBREAKS

RISK REDUCTION OF CONTROL OPERATIONS ON HUMAN HEALTH AND THE ENVIRONMENT


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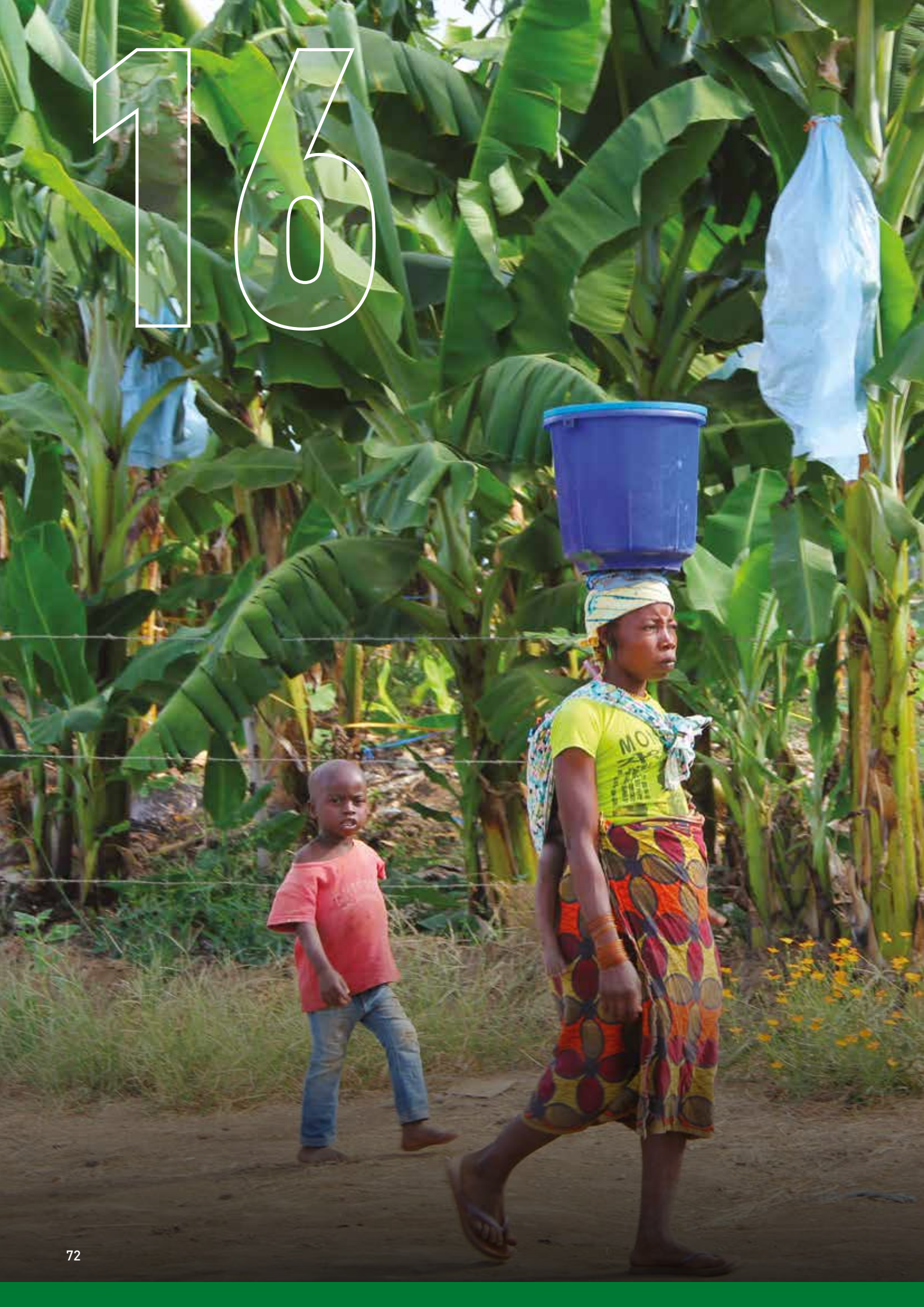

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COMBATTING FUSARIUM WILT DISEASE OF BANANA

FUSARIUM WILT DISEASE is caused by the soil-borne fungus *Fusarium oxysporum f.sp. cubense* and is one of the most destructive diseases of banana worldwide. Its new race Tropical Race 4 (Foc TR4) has been causing serious losses in Southeast Asia and severely affecting livelihoods of small producers. It has recently spread to Africa (Mozambique) and some countries of the Middle East. This is raising concerns that it might also spread to the Indian Sub-continent and Latin America.

Banana, together with plantains, is the most exported fruit in the world and the fifth most produced food crop in least-developed countries.

TR4 poses a serious threat to production and trade of this popular crop, with serious repercussions on livelihoods of small holder producers, workers and banana value chain.

The disease can spread through infected plant materials and spores and infested soil particles attached to farm tools, shoes, vehicles and any other means. Irrigation and drainage water and particularly floods play critical roles in spread.

WHAT IS TROPICAL RACE 4?

TR4 was discovered about 20 years ago in Southeast Asia and has been affecting banana production severely.ì TR4 affects particularly Cavendish variety, the popular banana found largely in markets today. Many other varieties cultivated by smallholder farmers are also susceptible to this race.

TR4 produces characteristic Fusarium wilt symptoms. The first external symptom is usually the yellowing of the older leaves. As the disease progresses, the leaves collapse, forming a skirt of dead leaves around the lower part of the plant. Once established in a plantation, it can easily spread and can remain viable in the soil for decades. The global concern of TR4 is that so far there are no effective eradication solutions.

GENETIC DIVERSITY NEEDED FOR LONG TERM RESILIENCE

The spread of TR4 has raised fears of a repetition of the disastrous outbreak of the

disease in the 1900's, when a different race of the fungus (race 1) spread across Latin America, nearly decimating the global banana industry.

The world's export banana was saved only by switching from the Gros Michel banana to the Cavendish banana.

However, TR4 is now threatening the sustainable production of Cavendish variety and many other varieties.

Thus, the industry, scientific and international communities are in search of possible solutions.

Developing new banana varieties is not an easy task as it propagates vegetatively. Developing varieties which are appropriate for the value chain and disease resistant at the same time is challenging. Promising genetic materials showing certain levels of resistance, including somaclones, can be considered in disease management when there is no other option.

The long term solution lies not only in developing new resistant varieties, but also in making the banana production systems more resilient by promoting more multi-crop based and genetically diverse systems.

HOW TO PREVENT SPREAD OF TR4?

Prevention is the most effective way of combatting the disease. Implementation of appropriate regulations and phytosanitary measures, along with guidelines provided by the International Plant Protection Convention (IPPC) is essential to stop entrance of the fungus into a country or region.

Specific actions needed to prevent the spread include use of certified disease free tissue culture planting material, avoiding sharing of farm equipment, border controls, regular surveys, early detection and containment.

In case of outbreaks, infested areas should be fenced in promptly, infected plants destroyed and quarantine measures employed.

FAO'S ROLE

FAO promotes international collaboration, communication and advocacy globally. FAO has been raising awareness through news releases and several activities globally, and particularly in Latin America and Caribbean, Africa and the Near East. A multi-stakeholder task force was established under the World Banana Forum to promote collaboration and advocacy.

Workshops on surveillance methodology, advocacy and capacity building were organized. Policy and technical guides were produced to assist concerned countries in prevention, and diagnostics of Foc TR4, and in identifying risk pathways for its containment and preventing its spread. An emergency project has been implemented to contain the disease in Nampula province of Mozambique. As the challenge persists, a national strategy document has been prepared for the government.
An expert consultation on prevention of the disease was organized at FAO Headquarters in Rome, resulting in the development of a global programme for prevention of Fusarium wilt disease of banana.

The global programme aims to promote preventive approaches and support efforts for improved preparedness and disease management. It addresses awareness raising, policy support, surveillance, contingency planning, risk and impact assessments, regulatory aspects, best agronomic practices, research efforts, capacity development and response actions.
It foresees strong partnerships and collaboration with CGIAR centers, international institutions, regional organizations and networks, universities and national institutions as well as private sector and NGOs.
Concerted effort and international collaboration is crucial to combat TR4 fungal disease.


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KEY FACTS

BANANA FUSARIUM WILT DISEASE FOC TR4

FUSARIUM WILT DISEASE OF BANANA CAUSED BY TR4 RACE IS AMONG THE MOST DESTRUCTIVE DISEASES OF BANANA WORLDWIDE

TR4 AFFECTS PARTICULARLY CAVENDISH BANANAS REPRESENTING AROUND HALF OF GLOBAL BANANA PRODUCTION

EFFECTIVE ERADICATION OF THE DISEASE IS CURRENTLY NOT POSSIBLE. ONCE ESTABLISHED, IT REMAINS VIABLE FOR DECADES IN SOIL

PREVENTION AND STRICT IMPLEMENTATION OF PHYTOSANITARY MEASURES ARE THE MOST EFFECTIVE WAY OF COMBATTING THE DISEASE

CROP DIVERSIFICATION AND BETTER USE OF AVAILABLE GENETIC RESOURCES IS KEY TO BUILDING RESILIENCE TO THE DISEASE IN THE LONG TERM


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CONTINGENCY PLANNING MAKES COUNTRIES MORE RESILIENT TO LOCUST THREATS AND CRISES

LOCUSTS are a serious threat to agro-pastoral resources, food security and livelihoods in Africa and Asia where they can have major economic, social and environmental impacts. For example, the cost of control operations during the last major Desert Locust upsurge in 2003-2005 was nearly US$600 million, and almost 13 million litres of chemical pesticides were sprayed. Damage to crops and pastures in some Sahelian countries ranged from 30 to 100 percent.

Effective early response to locust infestations and their management relies on having well established and tested contingency plans before a locust emergency develops.

Following the multilateral evaluation of response to the Desert Locust upsurge in 2003-2005, FAO has supported the establishment of contingency plans in locust-affected countries within the framework of its regional Desert Locust commissions in the Western Region (CLCPRO), the Central Region (CRC) and South-West Asia (SWAC), the Locust Programme in Caucasus and Central Asia, and the Three-year Programme in response to the locust plague in Madagascar.

METHODOLOGY AND PRINCIPLES

A contingency plan is a plan that deals with rare events that occur irregularly and often unpredictably and whose nature is roughly known.

National locust contingency plans are an integrated tool to help countries respond effectively and on time to locust emergencies in order to mitigate the impact of outbreaks, upsurges and plagues on food security and livelihoods.

The plans are based on the structure of the country's locust programme and available resources.

The core principle of a locust contingency plan is that different locust situations require certain actions known in advance. It takes into account the nature of the locust threat and its potential to develop from a recession (calm situation) into an outbreak, to the critical situation of an upsurge and finally into a plague.

Better threats forecasting facilitates the implementation of a specific plan. Regular monitoring undertaken by national teams enhances forecasting (prediction of timing and

likelihood of a threat). Threat forecasts are regularly issued by national authorities at country level, and by FAO's Desert Locust Information Service at global level.

The potential scale of the threat can be estimated from experience and historical data. The likely response capacity can be determined from available resources and those that can be quickly mobilized.

Although contingency plans may vary from country to country, every plan has similar components such as resources, advanced warning, scenarios, triggers, responsibilities, procedures, testing and updating.

Contingency plans help to ensure a better coordinated response to locust threats. Lessons learnt from locust contingency planning can be applied to other transboundary plant pests and diseases.

ACHIEVEMENTS

West and North-West Africa
(*Algeria, Burkina Faso, Chad, Libya, Mali, Mauritania, Morocco, Niger, Senegal, Tunisia*).
Since 2008, eight out of ten member countries of the CLCPRO have developed their national contingency plan based on lessons learnt from actual locust situations and simulation exercises organized in Mali and Senegal.

Locust emergency response involves all ministries, and a National Coordination Body defines responsibilities for evaluation, anticipation, operations, logistics, transmissions, communication, human health and environment.

Furthermore, National Locust Control Units in frontline countries (countries hosting Desert Locust permanent habitat and breeding areas) have normative work plans to implement the preventive strategy, and CLCPRO has a regional contingency plan for coordinating control operations and providing technical and financial support when needed.

South-South assistance is a long tradition in the Western Region, enhanced through CLCPRO. A "Regional Desert Locust Contingency Fund" was established in 2016 to cope with the beginning of an upsurge, which is a critical period that could evolve into a crisis situation if not properly managed.

Northeast Africa and Near East
(Bahrain, Djibouti, Egypt, Eritrea, Ethiopia, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Sudan, Syria, United Arab Emirates, Yemen).
Since 2009, regional workshops have been conducted to develop a common sense among stakeholders on the need of contingency arrangements. As a result, member countries of the CRC are better prepared to respond more effectively to locust emergencies. CRC has updated the Desert Locust Contingency Planning Assistant, a tool used by countries to identify gaps in organizational structure and operations to help strengthen their national locust programme. In case preventive control measures are not fully successful, CRC provides support to affected countries during locust emergencies as well as encourages countries to help each other within the region. In the near future, CRC will be focusing on developing contingency plans in the non-frontline countries.

South-West Asia
(Afghanistan, India, Iran, Pakistan).
Contingency planning was introduced to the region in 2013 and each country has developed a preliminary plan for invasion and outbreak scenarios. In the coming years, the plans will be updated and expanded to address upsurges and plagues as well as human health and environment issues and use cloud technology.

Madagascar
The contingency plan was officially approved in September 2013.

Now that the 2013-2016 plague has ended, a normative work plan to implement the preventive strategy is being finalized by the Government.


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KEY FACTS

CONTINGENCY PLANS

CONTINGENCY PLANS IMPROVE PREPAREDNESS AND RESPONSE TO LOCUST EMERGENCIES

SPECIFIC CONTINGENCY PLANS ARE IMPLEMENTED DURING LOCUST OUTBREAKS, UPSURGES AND PLAGUES

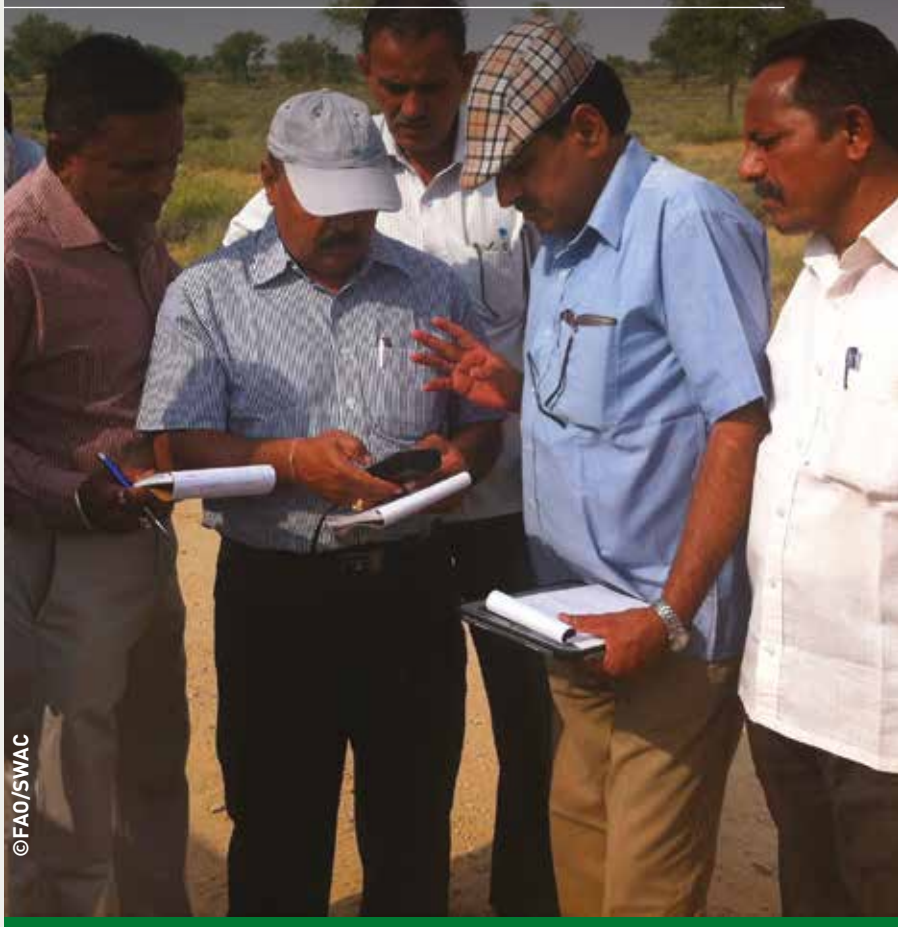
ALL CONTINGENCY PLANS HAVE SIMILAR COMPONENTS SUCH AS RESOURCES, ADVANCED WARNING, SCENARIOS, TRIGGERS, RESPONSIBILITIES, PROCEDURES, TESTING AND UPDATING

CLCPRO REGIONAL CONTINGENCY PLAN COORDINATES CONTROL OPERATIONS AND PROVIDES TECHNICAL AND FINANCIAL SUPPORT WHEN NEEDED

CLCPRO AND CRC ESTABLISHED A REGIONAL EMERGENCY FUND FOR DESERT LOCUST EMERGENCIES

MADAGASCAR APPROVED ITS EMERGENCY CONTINGENCY PLAN IN SEPTEMBER 2013

CONTINGENCY PLANNING INTRODUCED TO 10 CAUCASIAN AND CENTRAL ASIAN COUNTRIES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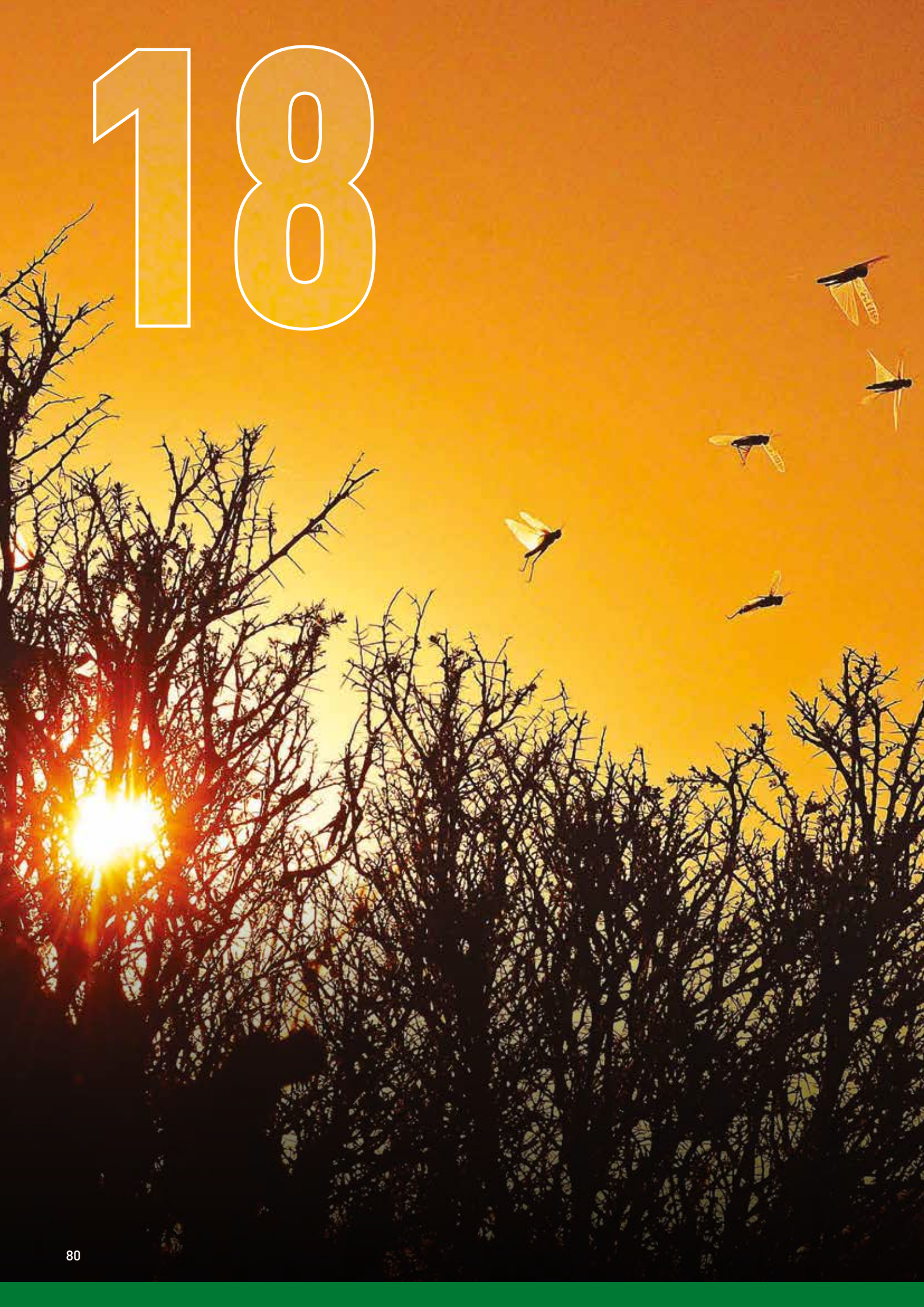

BASELINE ENVIRONMENTAL REQUIREMENTS HELP REDUCE PESTICIDE USE IN WEST AND NORTH-WEST AFRICA

Many of the pesticides used in DESERT LOCUST CONTROL pose a risk to the environment and to human health, even if they are used judiciously.

To minimize the impact of pesticides use on human health and the environment, member countries of the FAO Commission for Controlling the Desert Locust in the Western Region (CLCPRO) established baseline environmental requirements that locust campaigns should comply with.

The endorsement of the Human and Environment Standards by eight countries of the CLCPRO has allowed a better management of pesticide stocks, the mapping of sensitive areas and the use of biopesticides in the region covered by the Commission.

Mali and Mauritania were among the first countries to meet the two most important requirements: developing their Pesticide Stock Management System (PSMS) and mapping of ecologically sensitive areas.

PEST CONTROL SYSTEM HELPS DATA COLLECTION AND SHARING

Obsolete pesticides contaminating the environment pose a risk to the health of local people.

In order to facilitate the collection and sharing of information on pesticide stocks movements and registration status of products in stocks, FAO developed the Pesticide Stock Management System (PSMS).

The Pesticide Stock Management System is a country-level inventory of usable and unusable pesticides to be adopted by countries, particularly those affected by locusts.

In this respect, Mauritania is one of the first countries to have successfully implemented the web-based application which ensures the sound management and disposal of stocks and reduces over-supply of pesticides.

Pesticide Stock Management System provides information on the quantity of pesticide stocks available in the country (by region, product type, production batch, active ingredients, quantity, quality, manufacturers, etc.), pesticides use (amount sprayed, target, location (geographical

coordinates) of treatment, rates of application, processing equipment used, etc.) and empty pesticide containers. It incorporates a simplified and automated management based on barcode labels placed on packages.

The Pesticide Stock Management System facilitates the prioritization of pesticide stocks movement from countries having an excess of pesticides to countries that have an immediate need for them. Examples include transfers from Mauritania to Yemen and from Mali to Malawi and Mozambique. It also prioritizes pesticide usage by classifying the products into three categories (good, expiring, expired).

The database displays the certificates of conformity issued by laboratories which can transfer stocks to other countries and continents (triangulation or bilateral donation). It also warns about the expiration date six months in advance to let countries arrange for a compliance check.

By using the system, countries have been able to: (i) ensure traceability of their stock from purchase to the return and disposal of empty pesticide containers, (ii) be informed on the availability of pesticide stocks, their locations and compliance with FAO/WHO standards, and (iii) recover almost all empty containers at the end of locust campaigns.

MAPPING OF ECOLOGICALLY SENSITIVE AREAS IN MALI

Pesticide treatments used in Desert Locust control operations can pollute the environment and harm large numbers of vulnerable animal or plant species. The identification and mapping of areas particularly sensitive to pesticide contamination is important to ensure minimal environmental damage and impact on human health of such control operations.

To this end, the National Locust Unit of Mali has successfully achieved the mapping of ecologically sensitive areas - human settlements, wetlands, oases, protected areas, areas with a concentration of migratory birds and areas with a high or unique biodiversity - in 2012.

Mali developed a tool for the mapping of ecologically sensitive areas and included it in the national environmental action plan. This plan restricts the use of pesticides in areas identified as sensitive to pesticide contamination.

The validation of this mapping tool in Mali was used as an example for other CLCPRO member countries to build their mapping systems.

The mapping tool was also recently integrated into the *Reconnaissance and Management System of the Environment of Schistocerca* (RAMSES), a geographical information system used by national locust information officers to manage and analyze ecological, weather and locust data. This will allow locust units to avoid the treatment of sensitive areas during locust control operations and implement risk reduction measures.

This is the first time that such an important environmental and ecological aspect is taken into consideration by Locust Units.


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KEY FACTS

FAO COMMISSION FOR CONTROLLING DESERT LOCUST IN THE WESTERN REGION

COMPOSED OF TEN MEMBER COUNTRIES: ALGERIA, BURKINA FASO, CHAD, LIBYA, MALI, MAURITANIA, MOROCCO, NIGER, SENEGAL AND TUNISIA

WORKING FOR FARMERS IN WEST AND NORTH-WEST AFRICA INVOLVED IN INTERVENTIONS AGAINST LOCUSTS

WORKING WITH COUNTRIES AT RISK FROM DESERT LOCUST INFESTATIONS

WORKING TO MINIMIZE HUMAN HEALTH AND ENVIRONMENTAL EFFECTS OF INSECTICIDE USE IN LOCUST CONTROL OPERATIONS

IMPLEMENTING THE PESTICIDE STOCK MANAGEMENT SYSTEM (PSMS), A COUNTRY-LEVEL INVENTORY OF USABLE AND UNUSABLE PESTICIDES

MAPPING OF ECOLOGICALLY SENSITIVE AREAS PARTICULARLY SENSITIVE TO PESTICIDE CONTAMINATION


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CONTROLLING FRUIT FLY PEST BY RELEASING STERILE MALE INSECTS

The larvae of FRUIT FLY PESTS damage plant tissues before their harvest. Fruit flies belong to the Tephritidae family.

Several species of Tephritidae have a greater impact on global agricultural horticulture trade than almost any other pest; their introduction poses a major risk to horticulture in affected countries.

Socioeconomic consequences are so severe that countries free of key fruit fly pests (such as Chile, Japan, New Zealand and USA) prohibit the import of fresh produce from countries where these pests are endemic or have been introduced.

Unfortunately, the spread of fruit flies does not stop at country borders. Globalization of trade favours the dispersal of these pests to countries and regions free of the pest. Furthermore, introduced pests are increasingly surviving in previously inhospitable areas due to a warming climate.

The Joint FAO/IAEA[1] Division of Nuclear Techniques in Food and Agriculture helps Member States control invasive pest fruit flies by providing technical and scientific support and transferring nuclear and related technologies to reduce losses in fruit and vegetable production, minimize insecticide use, preserve biological diversity. This results in facilitation of international trade, increase farmers' income and enhance food security.

1 - International Atomic Energy Agency

BIRTH CONTROL FOR INSECTS: THE STERILE INSECT TECHNIQUE

Fruit flies attack many important fruit crops, including citrus, mango, apples, peaches, apricots as well as some vegetables (especially cucurbits), seed crops and also many wild plants.

The economic implications are not only reduced production and increased control costs, but also loss of export markets and/or the cost of establishing and maintaining phytosanitary measures. One efficient and cost-effective pest control technology is the Sterile Insect

Technique (SIT). The SIT is a biologically-based pest control method in use since the late 1950's that, unlike chemical control tactics, is friendly to the environment and does not pose any health concerns.

The SIT involves the mass-rearing and subsequent sterilization of large numbers of male insects of the target pest. The sterilized male insects are then released repeatedly over the infested areas, where they mate with the fertile wild females that consequently produce no offspring. The wild pest population can be effectively suppressed if the sterile males outnumber the wild males.

In special situations of isolation, and if the pest population is treated systematically on an area-wide basis with sterile males, complete eradication can be achieved as sterile males will invariably seek out and mate with any remaining females of the target pest population, a feat that is difficult to achieve using insecticides.

Thus, the SIT is also suited to help eliminate outbreaks of invasive, newly introduced pest populations before they spread and become fully established.

In addition, the SIT is species-specific. As such, it has no negative impact on natural enemies and pollinators, meeting the increasing public demand for safe and environmentally friendly pest control.

CONTROL STRATEGIES AND SIT APPLICATIONS

The SIT is effectively used as part of an integrated approach and in emergency situations is also effective to eliminate outbreaks of invasive pests.

With assistance of the Joint FAO/IAEA Programme, the SIT has been used successfully to suppress (Argentina, Israel, South Africa, Spain), contain (Australia, Guatemala), prevent establishment (California and Florida, USA), or even eradicate (Argentina, Chile, Peru, Mexico) the Mediterranean fruit fly from entire areas or countries.

In addition, it has been applied to prevent incursions of the Mexican fruit fly (*Anastrepha ludens*) into Texas, USA, and to eradicate the Mexican fruit fly and the West Indian fruit fly (*A. obliqua*) from northern Mexico. The SIT is also utilized against the South American fruit fly (*A. fraterculus*) in South America.

Thanks to the application of the SIT component in area-wide integrated pest management programmes, the melon fly (*Bactrocera cucurbitae*) was eradicated from the Okinawa archipelago in Japan. In Thailand, the Oriental fruit fly (*B. dorsalis*) and the Guava fruit fly (*B. correcta*), and in the Philippines the Oriental fruit fly, are being suppressed in pilot areas to reduce losses in mango. In the Mediterranean region, the interest in the use of SIT against olive fruit fly (*B. oleae*) is growing. The recent introductions and spread of several *Bactrocera* species into Africa and other regions serve as a warning about the invasiveness of these exotic species.

At present, the Insect Pest Control Subprogramme of the Joint FAO/IAEA Programme is supporting regional (Africa, Asia and Europe) and national field projects for controlling fruit flies. Research and development, training, and expert services and equipment are provided.

The SIT is proving to be one of the most successful and environment-friendly insect pest control methods ever developed.


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KEY FACTS

FRUIT FLY PEST STERILE INSECT TECHNIQUE

FRUIT FLIES HAVE A GREATER IMPACT ON GLOBAL AGRICULTURAL FRUIT TRADE THAN ALMOST ANY OTHER PEST

ABOUT 70 SPECIES OF TEPHRITID FRUIT FLIES ARE KEY PESTS OF FRUITS AND VEGETABLES, CAUSING HIGH LOSSES EVERY YEAR[2]

THE MEDITERRANEAN FRUIT FLY (*CERATITIS CAPITATA*) ATTACKS OVER 250 SPECIES OF FRUITS AND VEGETABLES

STERILE INSECT TECHINIQUE INVOLVES THE MASS-REARING AND SUBSEQUENT STERILIZATION OF LARGE NUMBERS OF MALE INSECTS OF THE TARGET PEST

STERILE INSECTS ARE NOT SELF-REPLICATING AND THEREFORE CANNOT BECOME ESTABLISHED IN THE ENVIRONMENT

STERILE INSECT TECHNIQUE HAS BEEN APPLIED TO ERADICATE FRUIT FLY PEST POPULATIONS FROM WHOLE AREAS OR COUNTRIES

2 - J. Appl. Entomol. 137 (Suppl. 1) (2013), © 2013 Blackwell Verlag GmbH

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STRENGTHENING MADAGASCAR'S CAPACITIES FOR BETTER LOCUST MANAGEMENT

AN ONGOING LOCUST PLAGUE is threatening the livelihoods and food security of 13 million people in Madagascar.

The current Malagasy Migratory Locust plague started in April 2012, following a two-year upsurge that was not successfully addressed because of insufficient financial resources.

The locust emergency began in a context where food insecurity and malnutrition rates were high. In fact, more than three-quarters of Malagasy families rely on agriculture for their living, but frequent natural disasters – drought, floods, cyclones, locust crises – push families into poverty and hunger.

Rice and other cereal crops are at risk of considerable damage due to the locust plague, which can have a wider impact on domestic supply and cereal prices.

To address this major issue, the Ministry of Agriculture of Madagascar and FAO developed a "Three-year emergency Programme in response to the locust plague" comprising three successive locust campaigns (2013–2016).

The Programme aims at safeguarding the food security of the most vulnerable rural populations by halting the plague and allowing a return to recession.

STRATEGY TO CONTROL THE MALAGASY MIGRATORY LOCUST PLAGUE

FAO coordinates and implements the locust campaigns, which sought to identify hotspots of locust populations; permanently monitors the dynamics of the locust populations to produce the most accurate forecasts; and carries out targeted control measures in accordance with good agricultural practices and respecting of human health and the environment.

The strategy adopted includes large-scale aerial survey and control operations and the use of conventional chemical pesticides for full cover treatments against adults and late instar hopper bands, insect growth regulators for barrier treatments to rapidly protect large areas infested by hopper bands and biopesticides in

locations near or within environmentally sensitive areas. Those pesticides are mostly sprayed by air due to the huge infested areas and their remote locations.

FIRST CAMPAIGN'S RESULTS

The first locust campaign (September 2013-August 2014) was successfully implemented: the locust plague was halted while crops and pastures were protected, thus preventing the country from a serious food crisis. The locust populations were controlled on an area exceeding 1.2 million hectares, without any incident affecting human health or the environment and without significant damage to the major rice baskets.

These results were obtained thanks to the implementation of large-scale aerial survey and control operations, which were executed from three aerial bases, redeployed as needed in accordance with the evolving locust situation. Without these treatments, crops would have been destroyed by locusts. In addition, the 2013/2014 campaign significantly contributed to the building up of national capacities.

PREVENTING A LOCUST EMERGENCY IS MUCH BETTER THAN CONTROLLING A PLAGUE

The current fight against the locust plague in Madagascar shows again how managing a major locust emergency is expensive at all levels and very complex.

Implementing a locust preventive control strategy is more economical and potentially less damaging to public health and the environment as compared to large-scale control operations. In order to prevent future emergencies, a locust preventive control strategy will have to be implemented in Madagascar upon return to a recession situation. Such an approach is the only way to adequately and sustainably address locust issues. The locust preventive control strategy consists of appropriate monitoring of locust populations in their traditional habitats to allow early warning and early reaction with well-targeted control operations, using updated techniques, while reducing risks for human health and the environment.

In view of future implementation of the preventive strategy, an institutional and technical study on locust management in Madagascar was prepared. The study identified the main constraints encountered by the National Anti-Locust Center for effective prevention and formulated recommendations to that end. Moreover, a number of actions have been taken during the implementation of the Three-year Programme to strengthen national capacities in the medium/long-term.

First, the Progamme has strengthened human capacities in data collection and analysis and information management, by setting up the Locust Watch Unit in Madagascar composed of young Malagasy professionals. The Locust Watch Unit is currently able to document the weather and ecological conditions, the locust developments and the survey and control operations; monitor the use of the main inputs such as pesticides and flying hours; provide forecasts on locust development and produce thematic maps using a customized Geographical Information System and related updated databases.

Second, a number of training sessions on survey, control operations, and field base management have been delivered. On-the-job training was also provided during field operations. Finally, the Human Health and Environmental Management Plan was developed, to be implemented during the emergency programme and beyond. Prevention and early action are key to properly managing locusts in Madagascar.


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KEY FACTS

MAJOR LOCUST EMERGENCY

LOCUST PLAGUE SINCE APRIL 2012

LOCUST INVASION AREA: ALMOST THE WHOLE ISLAND

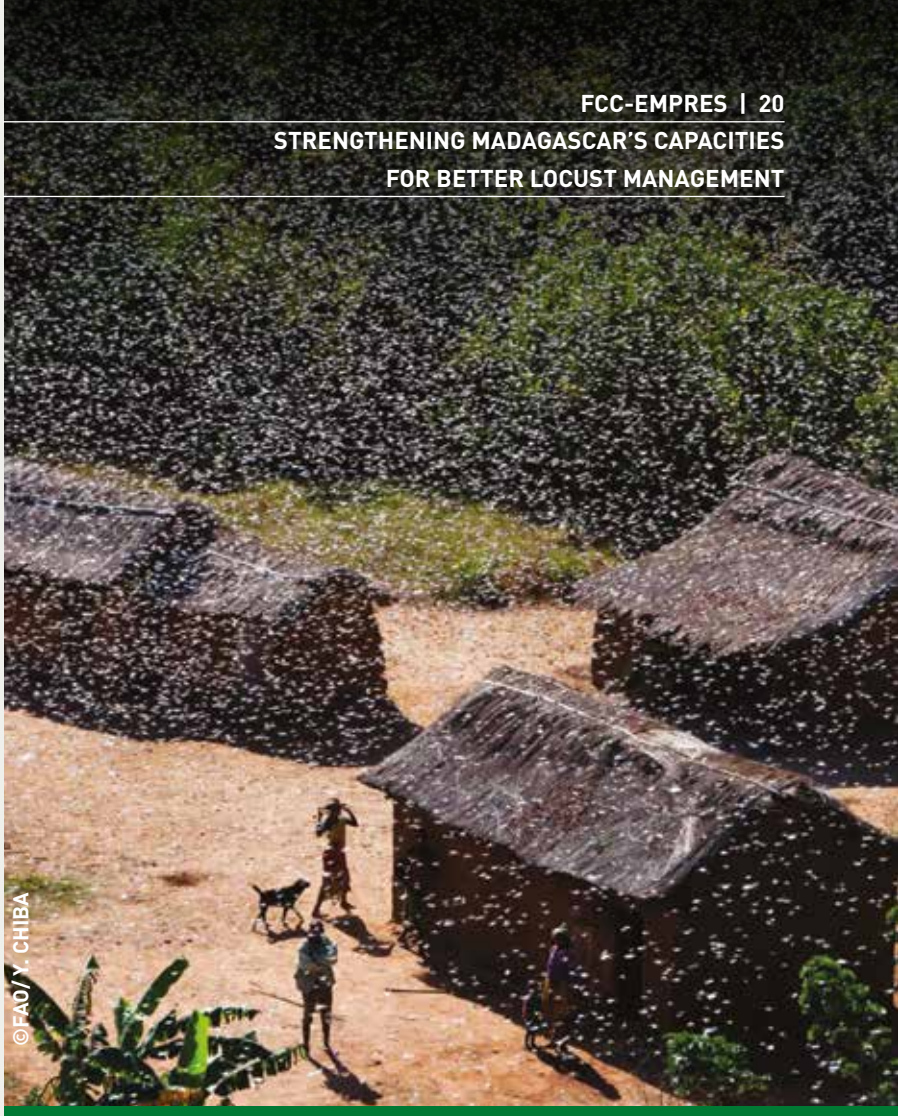
LIVELIHOODS AND FOOD AND NUTRITION SECURITY OF 13 MILLION PEOPLE THREATENED

THREE CONSECUTIVE LOCUST CONTROL CAMPAIGNS ARE NEEDED TO REACH A LOCUST RECESSION SITUATION

MORE THAN 1.4 MILLION HECTARES TREATED FROM OCTOBER 2013 TO FEBRUARY 2015

HUMAN HEALTH AND ENVIRONMENTAL PLAN IMPLEMENTED

LOCUST WATCH UNIT IN MADAGASCAR ESTABLISHED IN FEBRUARY 2013 AND TECHNICALLY SUPPORTED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INTEGRATED PEST MANAGEMENT FOR EUCALYPTUS PLANTATIONS: THE CASE OF ZIMBABWE

INVASIVE ALIEN SPECIES (IAS) have become a serious threat to the productivity of forest plantations in many parts of the world. These are any species of plants, animals, pathogens or insects that are non-native to a particular ecosystem and having a tendency to spread to a degree that could cause environmental, economic, socio-cultural or human health damages.

Globalisation of trade, and increased movement of people from one part of the world to the other have largely facilitated the rapid transmission and spread of IAS.

In Zimbabwe, there are three new invasive insects species on *Eucalyptus plantations* - bronze bug, blue gum chalcid, and red gum lerp psyllid - that are presently causing devastating damages to the *Eucalyptus* trees in the country.

In order to control invasive alien insect species of *Eucalyptus* and prevent current and future pest incursions, FAO provides technical assistance to the country for the implementation of integrated forest pest management practices.

INVASIVE ALIEN SPECIES IN *EUCALYPTUS* WOODLOTS AND PLANTATIONS IN ZIMBABWE

Eucalyptus plantations have become a viable livelihood option for many people. The fast-growing tree of Australian origin has numerous purposes including timber production, honey production, fuel wood and production of fencing and roofing poles. The majority of the rural population use indigenous tree species as a source of energy (domestic requirements and tobacco curing).

The incidence of pest outbreaks dates back many years in the history of plantation forestry in Zimbabwe. However, the country started experiencing serious problems with IAS of *Eucalyptus* between 2007 and 2008 with two forest insect pests originating from Australia: the bronze bug (*Thaumastocoris peregrinus*) causing enormous defoliation damage, and the blue gum chalcid (*Leptocybe invasa*) causing galls on leaves, stems and branches leading to stunted growth. In 2014, another more devastating *Eucalyptus* pest, the red gum lerp psyllid (*Glycaspis brimblecombei*) was first recorded in the country.

The unprecedented decimation of *Eucalyptus*

plantations, increases pressure on indigenous forests as communities revert to their increased use, resulting in land degradation.

RESPONSE: INTEGRATED PEST MANAGEMENT

Conventional methods of pest management (chemical use), cannot be used sustainably neither in small scale nor in commercial forest plantations as they are expensive and pose a danger to the ecosystem and the environment in general.

Through FAO projects, Integrated Pest Management (IPM) technologies were introduced in Zimbabwe, contributing to the effective management and control of the two forest pests of *Eucalyptus* (bronze bug and blue gum chalcid), thus arresting the decline of forests and land degradation.

An intensive awareness campaign and training programme were implemented to build capacities on integrated control methods with emphasis on biological control and implementation of phytosanitary measures.

In 2014, as part of efforts to combat *Leptocybe invasa* (blue gum chalcid), FAO funded the importation of its natural enemy (*Seletrichodes neseri*) to act as a biological control agent for the pest. The biological control agent was multiplied at the Forestry Commission of Zimbabwe laboratory and later released in the field.

The monitoring of affected *Eucalyptus* plantations revealed that the biological control agent is already showing promising results in some of the areas it was released.

In terms of capacity development, a total of 431 stakeholders received training through farmer field schools to build capacity in managing *Leptocybe invasa* using IPM which include use of biological control agent.

Furthermore, the Forestry Commission of Zimbabwe, the state authority responsible for forest management, was trained to develop and implement control programmes for the *Eucalyptus* pest in Zimbabwe. Knowledge and skills gained are expected to benefit control of future pests of *Eucalyptus* as well as other tree species.

In June 2016, through a regional project being implemented in the SADC region, an integrated pest management training workshop was held on management of IAS affecting *Eucalyptus* species in Zimbabwe. The primary objective was to capacitate extension officers and targeted beneficiaries to be able to identify and report on IAS and to equip participants with basic integrated pest management techniques.

Lastly, FAO produced brochures, training manuals, field guides, and implemented e-learning materials on good practices in forest health.

WAY FORWARD

Following the successful implementation of the classical biological control programme against *Leptocybe invasa* and the initial release of the biological control agent in some areas of the country, there is a need to roll out the programme in other affected areas and develop a monitoring programme, which includes communities to assess the establishment of this agent as well as its effectiveness in reducing pest populations.

The introduction of another pest of *Eucalyptus*, the red gum lerp psyllid, is another challenge to be dealt with in the short term. An action plan towards broadening the scope of the biological control programme to include the red gum lerp psyllid has to be developed.

Overall, there is a lack of information on forest invasive species at country and regional level. Information sharing is necessary in the planning and implementation of any regional strategy for the management of invasive alien species.


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KEY FACTS

FAO INTEGRATED PEST MANAGEMENT

THREE NEW INVASIVE INSECTS ATTACKING *EUCALYPTUS* PLANTATIONS IN ZIMBABWE

INTEGRATED PEST MANAGEMENT (IPM) TECHNOLOGIES HAVE CONTRIBUTED TO THE EFFECTIVE MANAGEMENT AND CONTROL OF TWO INVASIVE PESTS OF *EUCALYPTUS* IN ZIMBABWE

THE IMPORTATION, REARING AND RELEASE OF THE BIOLOGICAL CONTROL AGENT OF BLUE GUM CHALCID INTO *EUCALYPTUS* PLANTATIONS SHOWED PROMISING RESULTS IN CONTROLLING THE INSECT PEST

TRAINING OF STAKEHOLDERS THROUGH FARMER FIELD SCHOOLS ON BLUE GUM CHALCID MANAGEMENT

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ENHANCING FOOD SAFETY EARLY WARNING SYSTEMS IN EAST AFRICA

UNSAFE FOOD causes considerable morbidity and mortality. More than 200 diseases are spread through food contaminated with bacteria, viruses, parasites, natural toxins, pesticides, and chemical or radioactive substances. Exposure to these contaminants can lead to infectious diseases, acute toxicities, cancers and developmental defects.

Millions of people fall ill every year and many die as a result of eating unsafe food or drinking contaminated water. For example, diarrheal diseases alone kill an estimated 1.5 million children annually (WHO, 2015. 10 facts on food safety).

FAO has estimated that at least 25 percent of the world's food crops are contaminated with mycotoxins, which are fungal toxins in crops (FAO, 2002). There is strong evidence of a link between exposure to aflatoxins - a foodborne mycotoxin - and liver cancer (WHO, 2003).

Food safety hazards can also spread through distribution of unsafely produced, processed or handled food and result in food chain incidents. Such events can easily occur in two or more countries and sometimes result in regional or global food safety emergencies.

Food safety incidents, beyond direct public health consequences, can have significant food security and economic impacts both in developed and developing countries. This is due to agri-food trade disruptions, losses of food and incomes, and health care and productivity costs. It is crucial to detect and prevent spread of food safety hazards early.

This is why FAO is supporting East African countries to strengthen their food safety early warning systems.

A NEW TRAINING PACKAGE ON EARLY WARNING CAPACITY BUILDING FOR FOOD SAFETY

An early warning system is an integral element of a food control system, working together with other elements such as food inspection, laboratory networks, surveillance programmes and risk assessment capacities.

To strengthen food safety early warning systems, FAO EMPRES Food Safety is:

- developing surveillance and intelligence tools for prevention of food safety incidents;
- guiding and facilitating development of early warning systems in food safety, including rapid alert and communication networks;
- supporting food safety emergency prevention, preparedness and response capacity building;
- promoting inter-sectorial and trans-disciplinary partnerships and collaborations among key food safety stakeholders at all levels of the food chain, using the principles of a One Health approach.

A new training package has been developed through which the above objectives can be accomplished.

The training package includes a new, comprehensive handbook, which explains how to identify, assess and prevent future threats to the food chain before they become emergencies and cause adverse events and illness.

The handbook illustrates key early warning concepts using:

- a new tool for identifying gaps and needs in existing early warning systems for food safety;
- foresight techniques that can help identify food safety knowledge and research gaps and opportunities, to inform future surveillance and monitoring practices, or to assess the vulnerability of a food system;
- a horizon-scanning tool, which uses a structured approach of gathering data from diverse sources to provide organizations, countries or regions with intelligence to support medium- to long-term thinking (5-10-20 years ahead) about food safety issues.

The handbook includes a checklist that guides countries and regions through an evaluation of their needs, where to find support, planning an early warning system as part of overall food control system, and ensuring sustainability.

The training package can be tailored to the specific needs and contexts of different countries and regions worldwide.

FAO'S WORK IN AFRICA

Two workshops, in Kigali (2012) and Addis Ababa (2013), identified many food safety challenges in Africa. Two initiatives were planned: 1) the creation of an African Union (AU) Food Safety Authority and 2) the development of an AU-Rapid Alert System for Feed and Food Safety.

Through a regional collaboration with the African Union-Inter-African Bureau for Animal Resources (AU-IBAR), FAO EMPRES Food Safety held a Regional Workshop on Enhancing East African's Early Warning Systems for Food Safety (Nairobi, 2014) to help East Africa develop proposals for building or improving existing food safety early warning systems.

All actions on early warning systems are done in partnership with regional bodies such as the AU-IBAR in Africa, and international partners and collaborators, and globally through WHO/FAO INFOSAN network.

KEY FACTS

EMPRES FOOD SAFETY

FOOD CONTAMINATED WITH HARMFUL BACTERIA, VIRUSES, PARASITES, CHEMICALS OR POISONOUS METALS, CAN CAUSE AROUND 200 DIFFERENT DISEASES

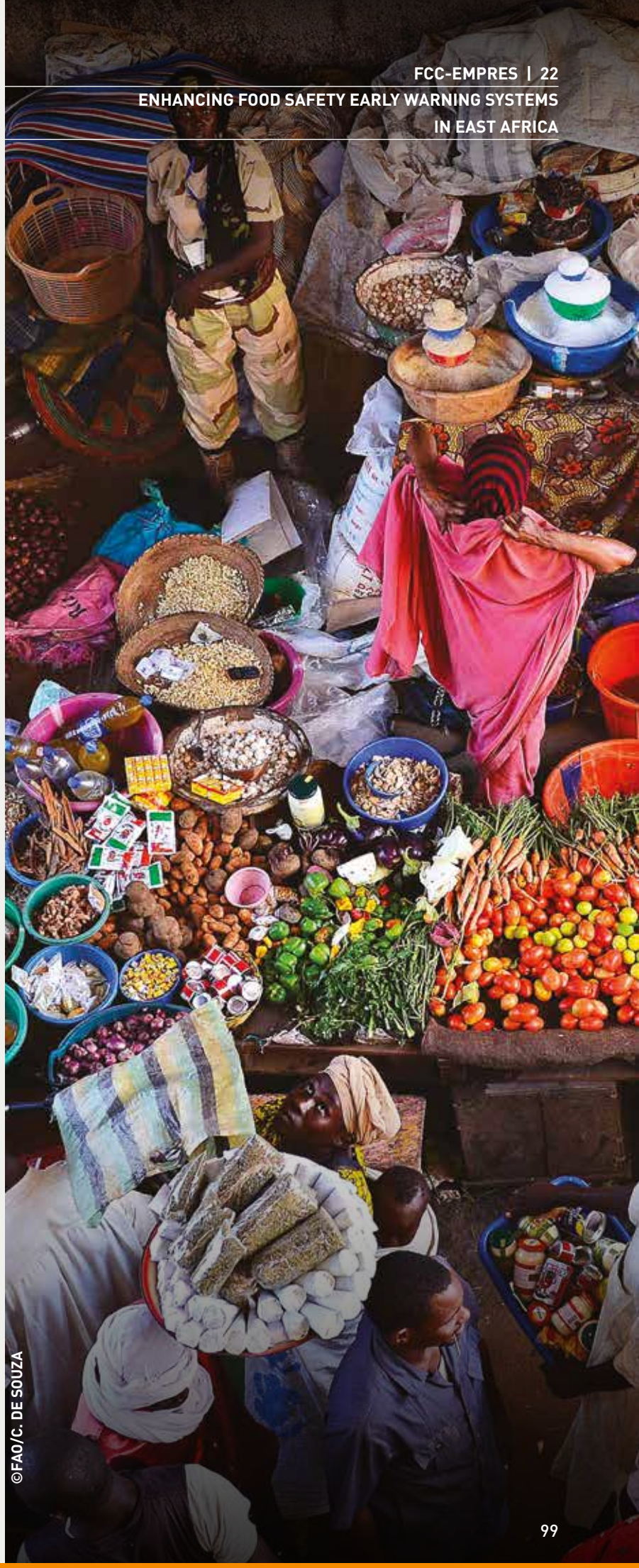
FOODBORNE PATHOGENS (*E.G. SALMONELLA, CAMPYLOBACTER, AND ENTEROHAEMORRHAGIC ESCHERICHIA COLI*) CAN CAUSE SEVERE DIARRHOEA

CHEMICAL CONTAMINATION (E.G. MYCOTOXINS, MARINE BIOTOXINS, AND TOXINS) CAN CAUSE SEVERE POISONING AND LONG-TERM DISEASES, SUCH AS CANCER

APPLYING A NEW INTELLIGENCE TOOL "TO MAP OUT" COUNTRIES' AND REGIONS' GAPS AND NEEDS IN THEIR EARLY WARNING SYSTEMS FOR FOOD SAFETY

PROMOTING USE OF HORIZON-SCANNING TOOLS THAT GATHER DATA FROM DIVERSE SOURCES IN COUNTRIES AND REGIONS TO SUPPORT THEIR MEDIUM- TO LONGTERM THINKING ABOUT FOOD SAFETY ISSUES

A SIMPLE CHECKLIST FOR ASSESSING AND DESIGNING EFF ECTIVE AND EFF ICIENT EARLY WARNING SYSTEMS FOR FOOD SAFETY



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PREPARING FOR AND RESPONDING TO A NUCLEAR OR RADIOLOGICAL EMERGENCY

ACCIDENTAL OR MALICIOUS RELEASES OF RADIOACTIVE MATERIAL have the potential to threaten health and disrupt life. Experience has shown that communities, agricultural production and food trade can be affected by major accidents. Such events may have international or even global consequences, therefore, it is important to prepare and make arrangements for dealing with them.

There are two conventions governing notification and assistance to nuclear or radiological emergencies on which the international emergency preparedness and response framework is based: the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.

FAO is a full party to these Conventions both adopted in 1986, following the accident at the Chernobyl nuclear power plant.

The Convention on Early Notification of a Nuclear Accident governs notification. This establishes a system to facilitate the provision of relevant information about nuclear accidents as early as possible in order to minimize transboundary radiological consequences. In the event of a nuclear accident, State Parties to the convention that could be directly affected and the International Atomic Energy Agency (IAEA) are notified promptly. The IAEA in turn informs other States Parties, countries and international organizations and provides further information on request.

The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency facilitates the provision of assistance and support. If help is requested, the IAEA serves as the focal point for such cooperation by channelling information, supporting efforts and providing its services.

RADIATION EMERGENCY MANAGEMENT PLAN: THE FUKUSHIMA ACCIDENT

In the Fukushima accident, information was provided in accordance with the Early Notification Convention. Within one hour of the Fukushima accident notification, the international procedures were initiated, including the Joint Radiation Emergency Management Plan (JPLAN) of the International Organizations. The JPLAN describes the arrangements between key international organizations, including FAO. Currently being revised for 2016, the new edition will be jointly sponsored by 18 international organizations.

Under the JPLAN, the Joint FAO/IAEA Division is the FAO focal point and has assigned liaison officers to staff the IAEA Incident and Emergency Centre. This has ensured coordination and dissemination of information between FAO and the IAEA.

Other appropriate international organizations were also represented at the IAEA and international coordination was maintained through regular video- and teleconference meetings of the Inter-Agency Committee on Radiological and Nuclear Emergencies.

Japan requested support from FAO and a joint IAEA/FAO Food Safety Assessment Team (FSAT) visited Japan within two weeks of the emergency. The FSAT provided advice and assistance to the Japanese authorities, including local government, on technical issues related to food safety and agricultural countermeasures, including sampling and analytical strategies and interpretation of monitoring data to ensure that reliable and continuous updates could be provided on the extent of food contamination in the affected areas.

These data were used for the development of possible mitigation and remediation strategies to be shared with authorities at local and national levels in Japan.

During and after the Fukushima accident, data on radioactivity were processed in accordance with the FAO mandate to collect, analyse, interpret and disseminate information relating to food and agriculture.

These data were received directly from Japan through the International Food Safety Authorities Network (INFOSAN). An authoritative database of monitoring data was compiled by the Joint FAO/IAEA Division.

Not only did this database support information exchange, it was also fundamental to FAO input into international assessments and reports, such as the report on the Fukushima Daiichi Accident lately published by IAEA in 2015.

CURRENT ACTIVITIES

The Joint FAO/IAEA Division has initiated an international research project to develop and assess systems of innovative data collection, management and visualization.

An international network of institutions from ten different countries are collaborating to develop and implement protocols for sampling, mapping and decision support to optimize emergency response and the implementation of urgent actions such as food and commodity restrictions and food safety communication strategies.

This project has developed an integrated electronic system that can be used as an application on smartphones and other portable devices and link with existing data exchange platforms.

Currently being tested and refined, a feature is that it can be used in routine monitoring as well as in an emergency.

Promoting the routine use of such a system ensures that it will be maintained and developed in line with best practices and that users will not require specialist training should they be faced with an emergency – the system could be implemented at a moment's notice.

Although developed in relation to radionuclide contamination, in principle this electronic system could be used for any emergency or situation where large volumes of sampling data needs to be shared, managed, mapped and used as the basis for decision making and to provide data for public information.

KEY FACTS

THE RESPONSE OF AGRICULTURE AND FOOD AUTHORITIES TO RADIATION EMERGENCIES NEEDS TO BE BASED ON RADIATION SAFETY PRINCIPLES

PLANNING AND USING ESTABLISHED RADIATION SAFETY PRINCIPLES ARE ESSENTIAL TO AVOID MISCONCEPTIONS CONCERNING RADIATION AND RADIOACTIVITY

PEOPLE CAN BE EXPOSED TO RADIOACTIVITY BY EATING AND DRINKING FOOD AND WATER CONTAMINATED WITH RADIOACTIVE MATERIALS; BY INHALING RADIOACTIVE MATERIALS OR BY DIRECT RADIATION EXPOSURE

THE INTERNATIONAL NUCLEAR AND RADIOLOGICAL EVENT SCALE (INES) IS A CLASSIFICATION SYSTEM USED TO SUCCINCTLY COMMUNICATE THE SAFETY SIGNIFICANCE OF NUCLEAR AND RADIOLOGICAL ACCIDENTS

2016 MARKS THE 5TH ANNIVERSARY OF FUKUSHIMA ACCIDENT AND THE 30TH ANNIVERSARY OF CHERNOBYL ACCIDENT; BOTH CLASSIFIED AS MAJOR ACCIDENTS (INES 7)

GUIDELINE LEVELS FOR RADIONUCLIDES IN FOOD IN INTERNATIONAL TRADE FOLLOWING A NUCLEAR OR RADIOLOGICAL EMERGENCY ARE CONTAINED IN CODEX STANDARDS

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