



Food and Agriculture  
Organization of the  
United Nations

# TACKLING **ANTIMICROBIAL RESISTANCE** IN FOOD AND AGRICULTURE





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**Food and Agriculture Organization of the United Nations**

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# ABBREVIATIONS

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<b>ACT</b>	Action to support implementation of Codex AMR Texts
<b>AHI</b>	Animal Health Institute
<b>AMR</b>	antimicrobial resistance
<b>AMU</b>	antimicrobial use
<b>AST</b>	Antimicrobial susceptibility testing
<b>FAO-ATLASS</b>	FAO Assessment Tool for Laboratories and Antimicrobial Resistance Surveillance Systems
<b>CJWZ</b>	Codex Food Standards, Zoonotic Diseases and AMR (FAO Centre)
<b>FAO</b>	Food and Agriculture Organization of the United Nations
<b>FAVA</b>	Federation of Asian Veterinary Associations
<b>IACG</b>	Interagency Coordination Group
<b>InFARM</b>	International FAO AMR Monitoring Platform
<b>IPC</b>	infection prevention and control
<b>IT</b>	information technology
<b>IZSLT</b>	Istituto Zooprofilattico Sperimentale del Lazio e della Toscana
<b>M&amp;E</b>	monitoring and evaluation
<b>MPTF</b>	Multi-Partner Trust Fund
<b>MUL</b>	One Health Multi-Lateral Funding Programme
<b>PMP</b>	Progressive management pathway
<b>PPP</b>	public-private partnership
<b>PTAST</b>	Proficiency Testing for Antimicrobial Susceptibility Testing
<b>RAP</b>	Regional Office for Asia and the Pacific
<b>RLC</b>	Regional Office for Latin America and the Caribbean
<b>ROI</b>	return on investment
<b>TISSA</b>	Tripartite Integrated System for Surveillance on AMR
<b>TrACSS</b>	Tracking AMR Country Self-Assessment Survey
<b>UNEP</b>	United Nations Environment Programme
<b>WAAW</b>	World Antimicrobial Awareness Week
<b>WHO</b>	World Health Organization
<b>WOAH</b>	World Organisation for Animal Health

# FOREWORD BY THE DEPUTY DIRECTOR-GENERAL

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The world continues to face growing challenges that threaten global food security. This underscores the need to make global agrifood systems more resilient, sustainable, and capable of meeting the relevant Sustainable Development Goals (SDGs) FAO's Strategic Framework 2022–2031 and its four betters –better production, better nutrition, a better environment and a better life, leaving no one behind– are guiding our efforts towards that transformation.

Antimicrobials play a critical role in treating diseases in both aquatic and terrestrial food-producing animals, as well as in crops. They contribute to productive and sustainable agrifood systems, supporting the countless livelihoods that depend on them around the world. When overused or misused, however, antimicrobials can contribute to a rise in antimicrobial resistance (AMR).

The “silent” AMR pandemic is one of the global challenges the world is facing that can jeopardize recent human and animal health and welfare gains, the environment, food and nutrition security and safety, economic growth and development. Antimicrobial resistance impacts everyone everywhere, and it was responsible for at least 1.3 million deaths and 5 million associated deaths globally in 2019. It deserves to be better recognised that the all-age death rate attributable to resistance is highest in the developing countries of the global south.

Antimicrobial resistance is therefore not a “first world problem”- it is one the entire membership of FAO must face together. Considering that an estimated 70 percent or more of the antimicrobials sold worldwide are used in food producing animals alone, the crucial contribution that agrifood systems transformation can provide in addressing AMR becomes clear.

The urgency of tackling AMR is growing, and FAO is proud to lead the response within the agrifood sector, in collaboration with our many partners, including the other Quadripartite organizations: the United Nations Environment Programme (UNEP), the World Health Organization (WHO) and the World Organisation for Animal Health (WOAH). We are working together in a multisectoral One Health approach, particularly with regard to supporting countries in developing and implementing their national action plans on AMR.

This first report highlights FAO's many contributions to the AMR response in the food and agricultural sectors, including our work with partners and stakeholders and the dedicated efforts of our staff across the Organization. This report also reflects FAO's commitment to supporting the implementation of the Global Action Plan on AMR.

The report also shows how, by developing innovative tools and delivering technical assistance, we are making a difference in countries as they respond to the multiple challenges of AMR in the food and agriculture sectors. However, it also recognizes that much more needs to be done to generate comprehensive and robust evidence, develop and implement interventions that will reduce the need of antimicrobials, ensure that strong and effective governance is in place and that adequate political leadership and resources are mobilized to enable sustainable action.

FAO remains strongly committed to addressing these challenges, so that the development and spread of AMR are minimized in the years ahead.



Maria Helena Semedo  
Deputy Director-General

# EXECUTIVE SUMMARY

The Food and Agriculture Organization of the United Nations (FAO) leads the global response to antimicrobial resistance (AMR) in the food and agriculture sectors. Its work in response to the many challenges of AMR is currently guided by the FAO Action Plan on Antimicrobial Resistance 2021–2025. This first report on FAO's contribution to the global response to AMR outlines a wide range of activities undertaken by FAO from 2020 to 2022 at global, regional and country level. Although this first report on AMR spans two years, 2021–2022, it was necessary to use some information from the previous year as a reference point.

FAO's work to tackle AMR in the food and agriculture sector is undertaken with key partners, most notably through the Quadripartite collaboration with the United Nations Environment Programme (UNEP), the World Health Organization (WHO) and the World Organisation for Animal Health (WOAH, formerly OIE). Their joint work as the Quadripartite (previously the Tripartite before UNEP formally joined the collaboration in March 2022) is guided by their first formal Strategic Framework, published in 2022 (FAO, WHO, WOAH and UNEP, 2022). This is accompanied by two-year workplans and aligned with the Global AMR Action Plan adopted in 2015 (WHO, 2015).

Major initiatives supported by the Quadripartite include the Multi-Partner Trust Fund (MPTF), which is now fostering action on AMR in 10 countries in addition to several global activities. Global level activities include support to the Global Leaders Group on AMR, comprising political leaders and experts in the field advocating for and advising on the need of a robust global effort to tackle AMR and the AMR Multi-Stakeholder Partnership Platform, a global, voluntary and inclusive coordination mechanism that brings together stakeholders from civil society and the private sector, governments and international and regional organizations, as well as philanthropic donors.

FAO also works on AMR with the United States Agency for International Development (USAID), the Fleming Fund in the United Kingdom of Great Britain and Northern Ireland, the Republic of Korea's ACT (Action to support implementation of Codex AMR Texts) project, the European Union, bilateral partners, academia (notably with the eight FAO Reference Centres on AMR)<sup>1</sup> and professional and civil society organizations.

FAO's contribution to the AMR response is part of FAO's One Health Priority Programme Area and focuses on supporting countries in developing and implementing those components of national action plans on AMR that are relevant to the food and agriculture sectors in the context of a One Health approach. Data from the most recent Tracking AMR Country Self-Assessment Survey (TrACSS) in 2020–2021 indicate that while most countries have now developed national AMR action plans and have multisectoral governance mechanisms in place, few have dedicated own funding or integrated implementation approaches involving all One Health sectors<sup>2</sup>.

<sup>1</sup> At the time of writing, another centre was in the process of being designated.

<sup>2</sup> WHO. 2021. Global Database for Tracking Antimicrobial Resistance (AMR) Country Self-Assessment Survey (TrACSS), 2020–2021. Geneva, Switzerland. <https://amrcountryprogress.org>

Most countries also have at least some forms of legal framework in place to respond to AMR in the food and agriculture sectors, such as laws or regulations on the prescription and sale of antimicrobials for animal use, the marketing of antimicrobials and the prohibition of antimicrobial use for growth promotion. The scope and comprehensiveness of these frameworks vary widely, however, and enforcement mechanisms are weak in many settings. At the same time, many countries continue to lack adequate capacity and infrastructure to undertake effective surveillance, awareness-raising and infection prevention and control in the food and agriculture sector, as well as adequate funding to implement their national action plans.

Recognizing these key challenges, FAO's sector-specific work on AMR also focuses on developing global tools for adaptation and use at regional and country level, as well as providing tailored technical support for the implementation of countries' national AMR action plans. Major tools and initiatives include:

- Twenty-three countries across the regions have used the Progressive Management Pathway for Antimicrobial Resistance (FAO-PMP-AMR) to develop and/or enhance the implementation of national AMR action plans through a stepwise approach to the management of antimicrobials and AMR response in agrifood systems;
- the International FAO AMR Monitoring Platform (InFARM), which aims to support the generation, sharing and analysis of AMR data in the food and agriculture sector and is now being piloted at country level;
- the FAO Assessment Tool for Laboratories and Antimicrobial Resistance Surveillance Systems (FAO-ATLASS), used in 28 countries in 2021 and 2022;
- Implementation of the international standards such as the Codex Alimentarius texts by FAO and WHO related to foodborne AMR;
- the forthcoming Reduce the Need of Antimicrobials in the agrifood systems initiative, is a global effort to reduce the need of antimicrobial use (AMU) and to promote the prudent and responsible use of antimicrobials and good practices in agrifood systems ; and
- AGRIWASH, a tool to assess the implementation of infection prevention and control, including water, hygiene, sanitation and wastewater management.

To date, FAO has directly supported AMR-related activities in the food and agriculture sector in 47 countries in Africa, Asia, Europe, Latin America and the Caribbean. This report presents the highlights of FAO's AMR-related activities at a global, regional and country level under the five pillars of the FAO Action Plan on AMR. It also features eight case studies illustrating FAO's AMR-related work in countries and by thematic area.

The AMR response in the food and agriculture sectors requires more and better evidence, more informed, more widespread interventions to reduce the threat of AMR, greater resources, stronger capacity and more robust governance to ensure effective stakeholder engagement and sustained commitment and action based on the One Health approach to reduce antimicrobial use, particularly at country level.

## The report at a glance

This report:

- describes FAO's role in the global governance of AMR;
- provides an overview of progress on implementing national action plans on AMR in agrifood systems;
- highlights key activities undertaken to implement the FAO Action Plan on AMR 2021–2025; and
- flags key challenges and opportunities related to AMR in the food and agriculture sectors.

## Antimicrobial resistance in food and agriculture

In addition to its direct impact on human and animal health, AMR poses certain risks to food and agricultural systems, food safety, food security, livelihoods and economies. It is estimated that more than 70 percent of all antimicrobials sold worldwide are used on animals raised for food (Van Boeckel *et al.*, 2017).

## FAO's contribution to the response to antimicrobial resistance

At the United Nations General Assembly of September 2016, Member Nations committed to developing and implementing national AMR action plans and called on FAO and other organizations to support them in doing so. The FAO Action Plan on AMR 2021–2025 underpins FAO's response to that call.

To lead the global response to AMR in the food and agriculture sectors, FAO brings expertise, champions multisectoral and multidisciplinary responses to AMR, coordinates action, promotes good production practices and responsible AMU, works with key stakeholders and supports the development of national and regional regulatory frameworks, as well as the implementation of AMR-relevant standards.

FAO coordinates this work through the Joint FAO/WHO Centre for Zoonotic Diseases and AMR (CJWZ), which hosts the AMR Working Group and supports the Quadripartite partnership on One Health and its associated work programme. CJWZ has the task of coordinating this work widely across the Organization's different units, including regional and country offices, to ensure a holistic One Health response to AMR.

## The Quadripartite collaboration

The Quadripartite collaboration between FAO, UNEP, WHO and WOHAI capitalizes on the agencies' respective mandates, resources, programming and political influence to combat AMR. It is assisted by the Quadripartite Joint Secretariat, which also coordinates the Quadripartite's collaboration with the World Bank, other United Nations agencies and international organizations, Members, civil society and the private sector, as well as the work of the AMR MPTF, Global Leaders Group and the AMR Multi-Stakeholder Partnership Platform.

### **Antimicrobial Resistance Multi-Partner Trust Fund**

The [AMR MPTF](#) is a key instrument in funding Quadripartite actions against AMR at country, regional and global level. It has funded 10 country programmes to date and supported four technical areas at global level: i) the environment, ii) monitoring and evaluation of the Global Action Plan on AMR, iii) AMR-related legislation and iv) integrated surveillance.

### **Global Leaders Group on Antimicrobial Resistance**

The [Global Leaders Group on Antimicrobial Resistance](#) was formed to build greater political support for the response to AMR. It is supported by the Quadripartite Joint Secretariat. Its mission is to collaborate globally with governments, agencies, civil society and the private sector and to advocate for political action against AMR.

### **Antimicrobial Resistance Multi-Stakeholder Partnership Platform**

The [AMR Multi-Stakeholder Partnership Platform](#) is a global, voluntary and inclusive mechanism for the coordination of efforts by a wide range of stakeholders to tackle AMR through a One Health response.

### **Progress on implementing national antimicrobial resistance action plans in the food and agricultural sectors**

#### ***Monitoring implementation of the Global Action Plan on Antimicrobial Resistance***

The Quadripartite organizations have co-developed a monitoring and evaluation (M&E) framework for the Global Action Plan that uses a variety of sources, including the annual TrACSS.

### **Key survey data relevant to the food and agriculture sectors**

#### ***National antimicrobial resistance action plans and governance***

Overall, many countries still lack adequate funding for national action plan implementation. Though nearly 90 percent of countries have developed a national action plan on AMR, as of 2020–2021, only 40 percent had a plan that was government approved and budgeted, according to the latest TrACSS survey. Indeed, only 20 percent of countries with funding were implementing the plan in the relevant sectors and had an M&E system in place.

Despite improvements in multisectoral collaboration on the development and implementation of national action plans on AMR over the past five years, only 22 percent of countries said they took an integrated approach to implementing them and drawing on data and lessons from all sectors for adaptation.

Around 28 percent of countries reported engaging all six sectors (human health, animal health, plant health, food production, food safety and the environment) in developing and implementing national action plans on AMR in 2020–2021.

### ***Legal frameworks to support responsible and prudent use of antimicrobials***

Where legal frameworks to tackle AMR exist, their scope and comprehensiveness vary considerably, and relatively few countries have effective enforcement processes in place to ensure compliance.

***Raising awareness and understanding of AMR risks and response:*** Only 40 percent of countries offer targeted, nationwide, government-supported activities to change the behaviour of key stakeholders in the plant health, food production and food safety sectors. In most countries, such programmes are limited or small in scale and not available to all or most key stakeholders. Few countries routinely require courses on AMR as part of training and professional education in the farming (animal and plant), food production, food safety and environmental sectors.

***Surveillance:*** Laboratory capacity, systems and integration remain a challenge for many countries. In 2020–2021, only 17 percent of countries said that all of their laboratories performing antimicrobial susceptibility testing (AST) in the animal health and food safety sectors were integrated into the national surveillance system. According to the 2022-2023 TrACSS survey, the percentage increased slightly to 18 percent.

***Infection prevention and control:*** In the 2022-2023 TrACSS survey, around 40 percent of responding countries reported developing national plans to implement minimum requirements for infection prevention in food animal production. However, only 14 percent of countries had a nationwide implementation of their plans to ensure good production practices in line with international standards and adapted them for implementation at local farm and food production level. The 2022-23 TrACSS responses suggest that approximately 30 percent and 25 percent of responding countries implemented the minimum requirements for infection prevention in terrestrial animal production and aquatic animal production, respectively.

### ***FAO support for reporting countries***

FAO provided support for interventions directly related to AMR in 35 of the 136 countries responding to the TrACSS survey in 2019–2020 and in 43 out of the 163 respondents in 2020–2021.

A comparative analysis of the 2020-2021 TrACSS survey responses suggest that countries in which FAO directly supports AMR-related interventions, particularly low-income countries, are catching up and performing better than countries of similar status where FAO has no direct interventions.

The number of countries with direct FAO support through projects stood at 38 in the 2022-2023 TrACSS season.

## **Supporting Members in strengthening capacities to implement national antimicrobial resistance action plans in agrifood systems.**

FAO's contribution to the AMR response focuses on supporting countries in developing and implementing components of national action plans on AMR that are relevant to the food and agriculture sectors in the context of a One Health approach.

This report presents FAO's tools and activities at global, regional and country level, under each of FAO's five Action Plan areas of work:

1. increasing stakeholder awareness and engagement;
2. strengthening surveillance and research;
3. enabling good practices;
4. promoting responsible use of antimicrobials; and
5. strengthening governance and allocating resources.

### **Challenges and opportunities: the way forward**

Major challenges facing the food and agriculture sectors' response to AMR include the low amount of AMU and AMR data, which are often not harmonized and of poor quality due to limited capacity at country level. There is also a need for greater multisectoral coordination on information technology (IT) and One Health at a global, regional and national level to facilitate data collection and sharing.

Fostering political leadership at all levels for urgency of action is also a persistent challenge, particularly when it comes to resolving the lack of adequate resources to implement national action plans on AMR.

Overall, the future response to AMR in the food and agricultural sectors requires more and better evidence, more informed and more widespread interventions to reduce the need of antimicrobials, more resources, increased capacity and stronger governance to ensure effective stakeholder engagement, and sustained commitment and action based on a One Health approach, particularly at country level.



# SECTION 1.

## ANTIMICROBIAL RESISTANCE IN FOOD AND AGRICULTURE

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This first report on FAO's response to AMR in the food and agriculture sectors for the period 2020 to 2022:

- describes FAO's role in the global governance of AMR, focusing on collaboration among the Quadripartite organizations (FAO, UNEP, WHO and WOA), as well as other key partnerships;
- provides an overview of country progress on the implementation of national action plans on AMR in the food and agriculture sectors, drawing on data from TrACSS;
- highlights key activities undertaken by FAO to implement the FAO Action Plan on AMR 2021–2025 and help implement the Global Action Plan on AMR as it relates to the food and agriculture sectors, as well as key tools used by FAO to assess and build global, regional and national capacities to tackle AMR in those sectors; and
- flags key challenges and opportunities related to AMR in the food and agriculture sectors.
- Development of this report was led by CJWZ, with contributions from the FAO AMR Working Group. Its intended audience includes policymakers in the food and agricultural sectors, FAO Members and international technical and financial partners.

### 1.1 Overview of antimicrobial resistance in the agrifood system

AMR is one of the top 10 global public health challenges, gravely endangering many achievements of the twentieth century, such as the reduction in morbidity and mortality from infectious diseases. AMR occurs when bacteria, viruses, fungi and parasites change over time and no longer respond to medicines such as antibiotics, fungicides and other antimicrobials. As a result, infections are harder to treat and the risks of disease spread, causing the number of illness and death to increase.

The findings of the Global Research on Antimicrobial Resistance study show that drug-resistant bacterial infections led to 1.27 million human deaths in 2019, making AMR a leading cause of death globally (Murray, et al., 2022). Without concerted action to curb the spread of drug-resistant pathogens, the rise of AMR may result in more than a USD 3.4 trillion loss in global annual gross domestic product by the end of this decade (OECD, 2018).

In addition to its direct impact on human and animal health, AMR also poses risks to food and agricultural systems, food safety, food security, livelihoods, economies and environment, including soils and water. These risks are particularly high in countries where legislation, regulatory surveillance and monitoring systems on the use of antimicrobials and the prevention of AMR in agrifood systems are weak or inadequate. Food production and food are also potential media for the development and spread of AMR.

It is estimated that more than 70 percent of all antimicrobials sold worldwide are used on animals raised for food (Van Boeckel et al., 2017). Antimicrobials play a critical role in treating diseases in food-producing, aquatic and terrestrial animals and plants, helping to ensure food security and safety. Antimicrobials are also used prophylactically to prevent likely diseases in populations of animals or plants, especially those being intensively produced. A common practice in the past was to add antimicrobials in low concentrations to animal feed to stimulate growth and production, but this practice has been increasingly discouraged. Antimicrobial substances are also used to treat microbial diseases in plants.

Estimates of the total annual global use of antimicrobials in agriculture vary considerably due to poor controls and a lack of systems to collect accurate animal and plant AMU data in many countries. With demand for animal-sourced food products projected to grow steadily over the coming decades, the demand for AMU in agriculture is also expected to rise unless production practices are modified accordingly.

The use of antimicrobials in animal and plant production is influenced by an interplay of many factors:

- the burden of diseases that are otherwise preventable through the modification of environmental hygiene, nutrition, husbandry and other management practices;
- limited access to animal and plant health experts, as well as limitations in training and support for these experts;
- weak regulation and oversight of the use of antimicrobial drugs;
- limited coordination and siloed approach to AMR governance;
- over-the-counter or internet sales that make antimicrobials readily available;
- limited evidence on the efficiency of alternatives to antimicrobials;
- lack of evidence-based antimicrobial treatment guidelines;
- the availability and use of substandard and falsified antimicrobials;
- lack of awareness of good farming and husbandry practices, leading to excessive or inappropriate AMU;
- lack of data and data analysis to support decision-making;
- the use of antimicrobials as growth and production promoters in animals; and
- anthropological, sociocultural, political and economic factors that pose barriers to good practices.

## 1.2 FAO's contribution to the global response to antimicrobial resistance

In September 2016, the United Nations General Assembly recognized that to address AMR through a One Health approach, multisectoral action across human, animal and plant health and the environment was required. To this end, Member Nations committed to develop and implement AMR national action plans and called on FAO among other organizations to support them in doing so.

FAO leads the global response to AMR in the food and agriculture sectors. FAO Conferences in 2015 and 2019 endorsed the first and second FAO Action Plans on AMR (FAO, 2016; 2021a), which underscored the importance



and urgency of addressing the growing global threat of AMR in all countries through a coordinated, multisectoral, One Health approach.

FAO's current work on AMR is guided by the FAO Action Plan on AMR 2021–2025 (FAO, 2021a). The Action Plan is fully aligned with, and contributes to, key food and agricultural sector indicators of the Global Action Plan on AMR (WHO, 2015), which was approved by the World Health Assembly in 2015 in the context of the 2030 Agenda for Sustainable Development.

FAO brings expertise in aquatic and terrestrial animal health and production, food and feed safety, genetic resources, crop production, natural resource management, risk communication, policy and legislation, and behavioural change to tackle the challenges of AMR in the food and agricultural sectors through a One Health approach (Figure 1). The Organization champions multisectoral and multidisciplinary responses to AMR, coordinated through strong governance and informed by evidence, and promotes good production practices and responsible AMU. It also works with key stakeholders at country level, from national authorities to farmers, providing technical assistance to strengthen their capacity and capability to manage AMR risks in the food and agriculture sectors and food production environments. FAO supports the development of national and regional regulatory frameworks, as well as the implementation of AMR-relevant standards, such as those approved by the FAO-hosted Codex Alimentarius Commission and the International Plant Protection Convention. It also supports target-setting, norm-setting and bottom-up processes of collective action to empower stakeholders to improve their practices.

**Figure 1.** FAO tackles the challenges of antimicrobial resistance in food and agriculture through a One Health approach



Source: Authors' own elaboration

FAO coordinates this work through CJWZ, which hosts the AMR Working Group and supports the Quadripartite partnership on One Health and its associated work programme.

The implementation of the FAO Action Plan on AMR contributes to the AMR indicator of the FAO Strategic Framework 2022–2031, which shows the overall level of implementation of national action plans in countries where FAO provides AMR support in the food and agriculture sectors. Measurement of this indicator is based on self-reporting by Members through the TrACSS survey.

FAO works closely with key partners to support a global, multisectoral response to the threats of AMR, notably through the Quadripartite collaboration with UNEP, WHO and WOAHA.

An evaluation of FAO's role and work on AMR conducted in 2021 (FAO, 2021b) recognized that FAO had a strong mandate and was well positioned to work on AMR in the food and agriculture sectors, and that its technical expertise was a key comparative advantage. It recommended the development of an FAO strategy on AMR and a strong programmatic approach with a central coordination and management structure linked to regional offices. The recommendations were taken into consideration in developing the FAO Action Plan on AMR 2021–2025 and when establishing CJWZ.



## SECTION 2.

# ONE HEALTH COLLABORATIONS

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One Health collaboration has been recognized as pivotal in tackling AMR. The Political Declaration of the United Nations High Level Meeting on Antimicrobial Resistance in September 2016 recognized the need to address AMR within the framework of a One Health approach (United Nations, 2016).

Moreover, it called on WHO, FAO and WOA, regional and multilateral development banks, including the World Bank, relevant United Nations agencies and other intergovernmental organizations, as well as civil society and relevant multisectoral stakeholders, to collaborate in the fight against AMR.

FAO has adhered to and proactively promoted this One Health collaborative approach ever since.

### 2.1 Quadripartite collaboration

The 2015 Global Action Plan on Antimicrobial Resistance, the blueprint for tackling antimicrobial resistance, calls for greater collaboration between WHO, FAO and WOA – the Tripartite – to advance sector-specific and multisectoral One Health approaches on AMR (WHO, 2015).

Furthermore, the 2019 report of the Interagency Coordination Group (IACG) on AMR (IACG, 2019) (Figure 2 ) made several recommendations on global governance that required greater leadership from the Tripartite organizations and greater collaboration between them. These included the creation of a Global Leaders Group on AMR and the establishment of a constituency-based AMR Multi-Stakeholder Partnership Platform with diverse representation, facilitated and managed by the Tripartite, to develop a shared global vision, narrative and targets for the One Health response.

In March 2022, with the formal engagement of UNEP in the light of the growing realization of the importance of the environmental dimensions of AMR, the collaboration became a Quadripartite effort. Each organization is committed through its governing body and individual AMR action plan or strategy to supporting the delivery of the Global Action Plan on AMR by advancing both sector-specific and joint One Health responses.

The comparative advantage of the Quadripartite collaboration lies in its ability to leverage the respective mandates, resources, programming and political influence of the four organizations in support of a One Health response. Together, the four agencies play a key role in fostering this approach and helping countries to adopt it. By focusing on areas where collaboration adds value, the Quadripartite Strategic Framework supports more coherent and coordinated approaches, helps to reduce silos and duplication, enables coordinated engagement with a broader range of partners and constituencies, and allows a more comprehensive understanding of the multiple drivers of AMR, as well as the shared challenges and opportunities in key policy and technical areas (FAO, WHO, WOA and UNEP, 2022). The Quadripartite Strategic Framework is accompanied by two-year workplans. The Tripartite (now Quadripartite) Joint Secretariat was established in 2019.

The Secretariat is hosted by WHO and includes liaison officers from FAO, UNEP and WOAAH. The role of the Secretariat is to coordinate the joint AMR activities of the Quadripartite based on a common workplan; support Quadripartite collaboration with the World Bank, other United Nations and international organizations, Members, civil society and the private sector; and coordinate the work of the AMR MPTF. The Secretariat's terms of reference were updated in June 2022.

The Quadripartite organizations developed their first formal Strategic Framework on AMR in 2022 to guide their collaboration and help align the delivery of their work across the different organizational levels (FAO, WHO, WOAAH and UNEP, 2022)(Figure 2). Given the importance of the environmental dimension of the One Health approach and its ongoing collaboration with the Tripartite, UNEP was engaged in developing the Strategic Framework prior to formally joining the Quadripartite.

The Strategic Framework broadly supports the implementation of the five pillars of the Global Action Plan and strengthening the governance of the AMR response. It introduces a theory of change that includes the Quadripartite goal of preserving antimicrobial efficacy and ensuring sustainable and equitable access to antimicrobials for responsible and prudent use in human, animal and plant health, helping to achieve the SDGs. The desired impact of the collaboration is that countries have the capacity to design and sustainably implement evidence or informed One Health responses to AMR.

The framework's objectives are:

- to optimize the production and use of antimicrobials along the whole lifecycle, from research and development to disposal; and
- to decrease the incidence of infection in humans, animals and plants to reduce the development and spread of AMR.

The Quadripartite organizations have also developed Antimicrobial resistance and the United Nations Sustainable Development Cooperation Framework: Guidance document for United Nations Country Teams to support countries in including AMR-related programming in United Nations Sustainable Development Cooperation Frameworks (WHO, FAO, WOAAH and UNEP, 2021).



**Figure 2.** Key milestones on the road to quadripartite collaboration against AMR



Source: Authors' own elaboration

## 2.2 Antimicrobial Resistance Multi-Partner Trust Fund

The AMR MPTF is a key instrument for funding Quadripartite collaborative action and supporting the scale-up of the One Health approach to AMR at country, regional and global level. The AMR MPTF is governed by a Steering Committee composed of senior-level principal representatives of the Quadripartite organizations and representatives of resource partners. As of December 2022, the resource partners were the Netherlands, Sweden, the UK Fleming Fund, Germany and the European Union. FAO chaired the MPTF Steering Committee in 2021 and 2022. Since its launch in 2019, the MPTF has mobilized more than USD 26 million.

Ten country programmes have been approved by the Steering Committee (Cambodia, Ethiopia, Ghana, Indonesia, Kenya, Morocco, Peru, Tajikistan, Senegal and Zimbabwe) and are now in the implementation phase. Each country has received approximately USD 1 million for a three-year programme. The MPTF supports activities such as catalytic and coordinated policy advice, technical assistance and capacity strengthening, depending on Member requests of the Quadripartite. Examples of activities supported by the MPTF in Cambodia and Morocco are shown in case studies 1 and 2.

### Case study 1: Scaling up efforts to tackle antimicrobial resistance in Cambodia through a One Health approach

Cambodia endorsed its Multi-sectoral Action Plan on AMR 2019–2023 in 2019 (Government of Cambodia, 2019). However, a lack of inter-sectoral coordination jeopardized implementation of the plan. The MPTF is supporting the establishment of the high-level Inter-Ministerial Coordination Committee on AMR (IMCC-AMR) to strengthen coordination and monitor the Multi-sectoral Action Plan. As part of the process, in collaboration with FAO, WHO and WOA, the Government of Cambodia organized a consultation meeting with key stakeholders from across the One Health spectrum in October 2021 to help shape the IMCC-AMR. The outcome of the meeting was a draft terms of reference for the new committee.

A literature review on AMR in the animal health sector and a review of guidelines on the prudent use of antimicrobials are also under way. This will enable policymakers to ensure that policy dialogue and implementation are more comprehensive to optimize the use of antimicrobials in critical sectors and to help improve target groups' understanding of AMR risks and response options.

In addition to assisting countries in their efforts, since 2021, the MPTF has supported a global programme spanning four technical areas:

- **Addressing AMR risk in the environment:** This project, jointly developed by the Quadripartite and led by FAO, to strengthen capacity and actions on environment within AMR National Action, sector policy and global partnership as part of a multi-organization cross-sectoral One Health Approach. To assist in clarifying the roles and responsibilities among the Quadripartite on environmental dimensions of AMR the team drafted the “Inter-organization co-operation on environmental dimensions of AMR” document. A webinar was held in December 2021 on “Unpacking the environmental dimensions of AMR in food and agriculture”. A literature review on the environmental dimensions of AMR has been undertaken to map existing capacity building interventions and inform capacity building activities, alongside ongoing MPTF-country interviews to better understand local and regional priorities. The team has strengthened engagement with the One Health Global Leaders Group on AMR in raising the profile of the environmental dimensions of AMR and provided support to the prioritization of key issues in environmental dimensions of AMR.
- **M&E of the Global Action Plan on AMR:** To measure progress on implementing national action plans on AMR, the Quadripartite has administered TrACSS annually since 2016. Responses from the surveys are published in an [open-access database](#). An M&E framework for the Global Action Plan has been developed, with a harmonized list of indicators at the national and global levels. MPTF funding will allow the Quadripartite to develop guidance for countries on developing national monitoring frameworks for national action plans on AMR through in-country and country desk assessments. A summary of recent TrACSS data on the food and agriculture sectors appears in section 3.



## Case study 2: Establishing the first One Health governance mechanism to tackle antimicrobial resistance in Morocco

AMR MPTF funding is supporting the implementation of a national multisectoral plan for the prevention and control of AMR in Morocco through a One Health approach. The development phase of the project demonstrated the excellent dynamic that already existed between key partners working on One Health in the country. Building on this collaboration between technical teams, FAO, WOAHA and WHO partnered with the Ministries of Health, Agriculture and Environment to raise awareness of AMR and to advocate for a multisectoral partnership at a strategic level.

AMR MPTF funding enabled the establishment of the first One Health governance system for AMR in Morocco, bringing together key stakeholders to address common issues. This mechanism consists of:

- a high-level Steering Committee composed of ministers from the three ministries and representatives of FAO, WOAHA and WHO;

- a technical coordination committee composed of the technical officers of FAO, WOAHA and WHO and the focal points of the three ministries; and

- a national scientific project coordinator, recruited specifically for the project, with the role of bringing all partners together and facilitating implementation.

The official launch event of the project was a crucial step in sensitizing, mobilizing and engaging high-level decision-makers on AMR. The event was attended by the Minister of Health and the Secretaries-General for Agriculture and Environment, as well as representatives of FAO, WHO and WOAHA. In addition, a national workshop on the Progressive Management Pathway to AMR Management (PMP-AMR) was organized with FAO support. The approach comprises the progressive self-assessment of the implementation status of national AMR action plans. While the workshop focused on the food and agriculture sector, it also showed how the methodology and assessment tools can be tailored to other sectors to achieve sustainable use and stewardship of antimicrobials.

Other activities currently under way include the establishment of an integrated AMR surveillance system, regulatory work for the institutionalization of AMR programmes, the strengthening of AMR-relevant legislation, the assessment of laboratory capacity towards an accreditation system and a communication plan to raise awareness on AMR.

- **Legislation related to antimicrobial resistance and use:** FAO has developed a methodology for assessing national legislation in AMR-relevant areas in the food and agriculture sectors, which is described in more detail in section 3. The MPTF is supporting the upgrade of this methodology into a One Health legislative assessment tool for AMR by way of collaboration between FAO, WHO and WOA, with inputs from UNEP.
- **Integrated surveillance of AMR and AMU:** The Tripartite Integrated System for Surveillance on AMR (TISSA) is an initial step towards an integrated system for the surveillance of AMR and AMU across the human, animal and agricultural sectors, incorporating aggregated data from the respective Quadripartite organizations' platforms, including WHO GLASS, WOA ANIMUSE and FAO's InFARM. The aim is for TISSA to serve as a global repository of data on AMR and AMU that will contribute to the understanding of AMR transmission across sectors, the burden of AMR on human and animal health, problematic pathogens for public health, animal health and the agrifood industry. It will also inform human, animal and plant health management policies and measures to control AMR in specific sectors and limit the spread to other sectors. TISSA is further aimed at fostering integrated surveillance at country level.

### 2.3 Global Leaders Group on Antimicrobial Resistance

Further to the 2019 governance recommendations of the IACG to build greater political support for the response to AMR, the Tripartite Joint Secretariat supported the establishment of the Global Leaders Group on AMR in late 2020. FAO is closely engaged in and contributes to its work.

The Global Leaders Group was co-chaired by the Prime Ministers of Bangladesh and Barbados from 2020 to 2022 and its members include the Directors-General of FAO, UNEP, WHO and WOA, as well as ministers, academics and influential figures from the private sector and civil society. Its mission is to collaborate globally with governments, agencies, civil society and the private sector through a One Health approach and to advise on and advocate for political action to mitigate drug-resistant infections through responsible and sustainable access to and use of antimicrobials.

The Global Leaders Group has held five meetings and numerous other technical meetings since early 2021, including to develop an action plan with priorities (Figure 3) in six key areas: i) sustained political action on AMR; ii) transforming human health, animal health, food, plant and environmental ecosystems with a focus on infection prevention and control and responsible use; iii) advocacy for improved surveillance and monitoring of AMU and AMR across sectors; iv) advocacy for the increased mobilization of internal and external financial resources, especially for national action plan implementation in low- and middle-income countries (LMICs); v) advocacy for innovation across sectors to secure a sustainable pipeline of antimicrobials (particularly antibiotics), vaccines, diagnostics, waste management tools, safe and effective alternatives to antimicrobials and equitable access to them; and vi) advocacy for better understanding of the environmental pathways of AMR. FAO is closely engaged in supporting the technical and political work of the Global Leaders Group through the Quadripartite Joint Secretariat. The Global Leaders Group has produced information notes on AMR and



the climate crisis; financing the AMR response; surveillance of AMR and AMU; and animal health and welfare and AMR and AMU. It has also issued statements and calls to action on reducing antimicrobial discharges from food systems, manufacturing facilities and human health systems; AMU in food systems; and a ministerial pocket guide on responding to AMR across sectors.

Since its creation, Global Leaders Group advocacy has led to a number of successful contributions, such as the development of the Codex Alimentarius guidelines on integrated monitoring and surveillance of foodborne AMR (FAO and WHO, 2021). It has also helped to ensure the visibility of AMR on the agendas of the G20 and G7 groups of nations. The Global Leaders Group has advocated for the inclusion of AMR in the Intergovernmental Negotiating Body process to develop the WHO instrument on pandemic preparedness and response and contributed to the decision of the United Nations General Assembly in March 2022 to hold a second High Level Meeting on AMR in 2024.

Furthermore, in 2022, the Global Leaders Group hosted side-events on AMR at the Commonwealth Heads of Government Meeting in Kigali and at the United Nations General Assembly in New York. Most recently, in November 2022, in close collaboration with the Quadripartite Joint Secretariat, Global Leaders Group members participated in the Third Ministerial Meeting on AMR held in Muscat, Oman.

## **2.4 Antimicrobial Resistance Multi-Stakeholder Partnership Platform**

The AMR Multi-Stakeholder Partnership Platform, was established by the quadripartite in November 2022 in line with a recommendation of the IACG report to develop and work towards a shared global vision, goals and coordinated action on AMR. The Coordination team of this platform is hosted by FAO.

The Platform brings together actors from the human, animal, plant and environmental sectors with a view to preserving antimicrobials and ensuring their responsible use through a One Health approach. It is a voluntary, collaborative coordination mechanism (Figure 4) established by the Quadripartite as a global movement for action against AMR. The platform's contribution will be underpinned by:

- the promotion of a shared vision for action to tackle AMR;
- information-sharing and networking; and
- support for concrete actions to boost progress in containing, combating and, ultimately, reversing AMR.

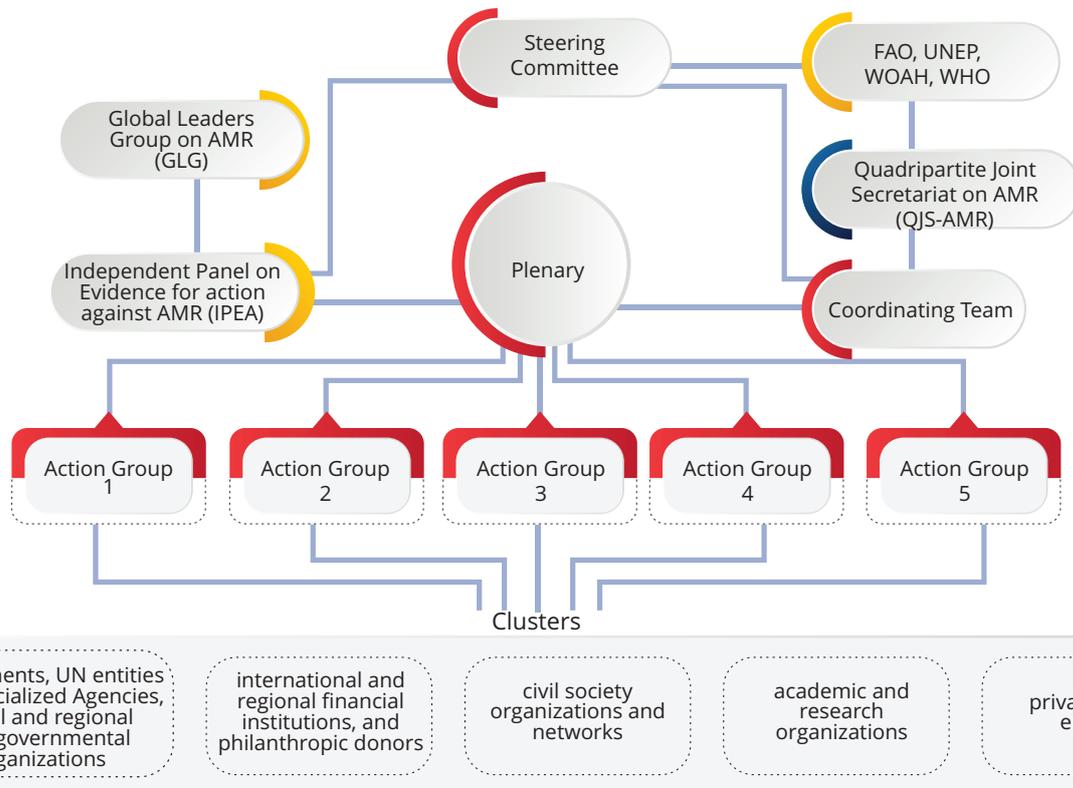
**Figure 3.** Priorities of the Global Leaders Group on Antimicrobial Resistance



Source: Global Leaders Group on AMR. 2023. *Priorities of the Global Leaders Group on AMR*. Geneva. <https://www.amrleaders.org/resources/m/item/priorities-of-the-global-leaders-group-on-amr>



**Figure 4.** Collaborative coordination mechanism of the Partnership Platform



Source: FAO, UNEP, WHO & WOA. 2022. *Antimicrobial Resistance (AMR) Multi-Stakeholder Partnership Platform – Catalyzing a global movement for action against AMR*. Rome. <https://www.fao.org/3/cc3014en/cc3014en.pdf>





# SECTION 3. NATIONAL ACTION PLANS ON ANTIMICROBIAL RESISTANCE: IMPLEMENTATION STATUS IN THE FOOD AND AGRICULTURE SECTORS

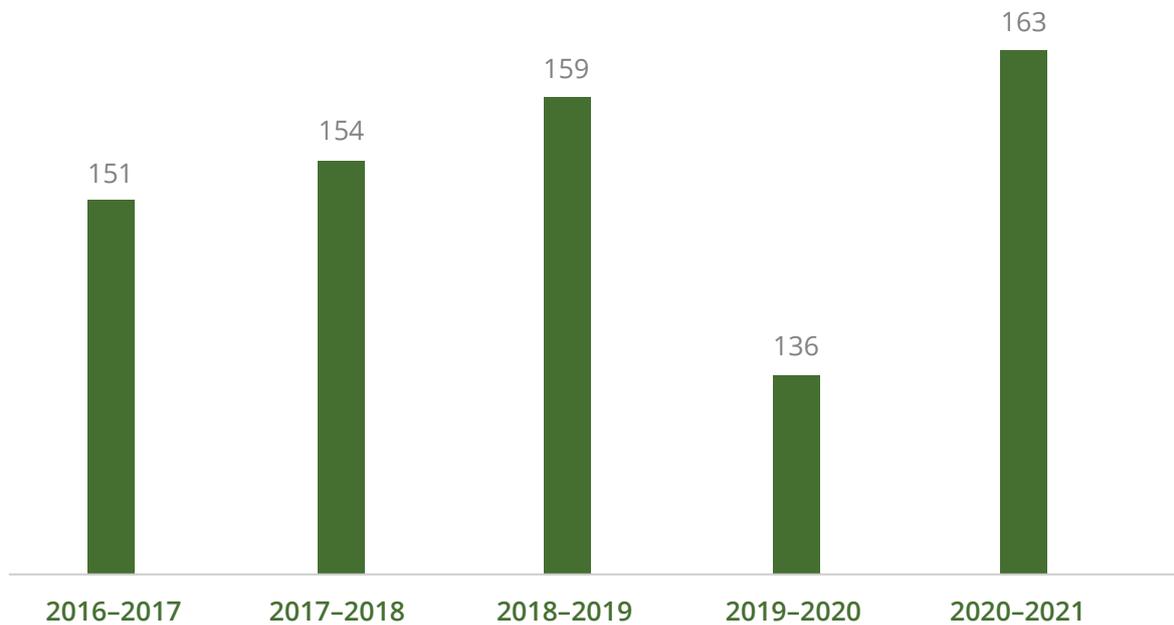
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## 3.1 Monitoring the implementation of the Global Action Plan on Antimicrobial Resistance

The 2015 Global Action Plan on AMR sets out five objectives for tackling AMR and the tasks required to achieve them. It also highlights the roles and responsibilities of governments, national and international partners. To ensure that all stakeholders fulfil their roles and responsibilities, and to assess whether they are collectively effecting the necessary change, the Tripartite organizations co-developed an M&E framework for the Global Action Plan and an annual country self-assessment tool: TrACSS.

The framework uses a variety of sources, including indicators from the Sustainable Development Goal M&E framework and platforms led by the individual Tripartite agencies. Recognizing that action at country level is essential to progress on AMR, the Tripartite (FAO, WOH and WHO) has jointly administered TrACSS since 2016 (Figure 5). TrACSS data also inform the AMR indicator of the FAO Strategic Framework 2022–2031, which measures the overall level of implementation of national action plans on AMR in countries where FAO provides AMR-related support in the food and agriculture sectors. The 2020–2021 survey included 17 specific questions on agrifood systems and received a record number of responses from 163 countries (Figure 5).

The Global Action Plan M&E framework includes measures to assess reductions in levels, slowdowns in development and greater resistance. It aims to measure, among other things, resistance in commensal *E.coli* from key food-producing animals, namely i) the percentage of *E.coli* isolates showing resistance to third-generation cephalosporins (that is, presumptive ESBL-producing *E.coli*) and ii) patterns of resistance in *E.coli* to a defined panel of antimicrobials. FAO will report on these indicators in future, based on data from its InFARM platform, currently in development (see section 4).

**Figure 5.** Number of countries that have responded to the TrACSS survey since 2016

Source: Authors' own elaboration

### 3.2 Key TrACSS data relevant to the food and agriculture sectors

#### ***National antimicrobial resistance action plans and governance***

Responses to the 2019–2020 TrACSS survey showed that nearly 90 percent of countries had developed a national action plan on AMR, while 2020–2021 responses showed that the scope and quality of these plans had improved significantly over the previous five years. However, in 2020–2021, only 40 percent of countries had a plan approved by government, in line with Global Action Plan objectives, including a budgeted operational plan and monitoring arrangements. Only 20 percent had identified funding sources and were implementing the plan in relevant sectors, with a defined M&E process in place.

This scenario improved slightly during the 2022–2023 TrACSS survey (Figure 6), with 93 percent of the responding countries having developed NAPs and 57 percent having government approval, budgeted operational plans and monitoring arrangements. However, the number of countries implementing their NAPs and undertaking M&E dropped to 11 percent in the 2022–2023 TrACSS survey.

Multisectoral collaboration on the development and implementation of national action plans on AMR has also improved significantly over the last five years, with most countries now having some form of multisectoral working group on AMR in place. However, only 22 percent of respondents in 2020–2021 reported using an integrated approach to implement national AMR action plans, incorporating data and lessons from all sectors. Around 28 percent of countries reported the engagement of all six sectors (human health, animal health, plant health, food production, food safety, and the environment) in developing and implementing national action plans on AMR in 2020–2021.

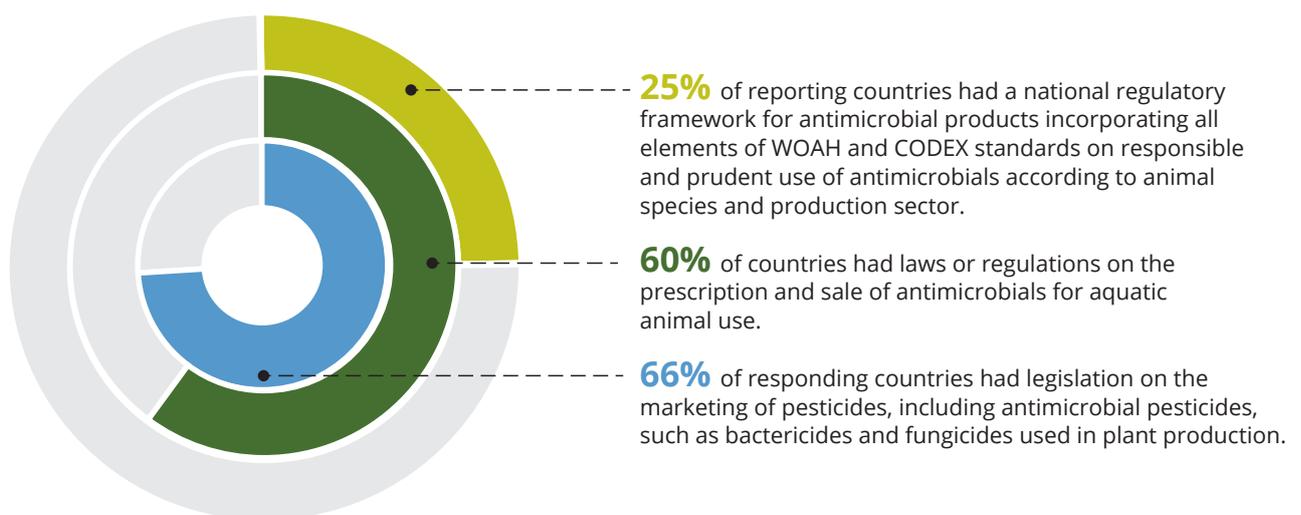


**Figure 6.** National antimicrobial resistance action plans and governance



Source: based on WHO. 2023. Global Database for Tracking Antimicrobial Resistance (AMR) Country Self-Assessment Survey (TrACSS), 2022-2023. Geneva, Switzerland. <https://amrcountryprogress.org>

**Figure 7.** Legal frameworks to support responsible and prudent use



Source: WHO. 2023. Global Database for Tracking Antimicrobial Resistance (AMR) Country Self-Assessment Survey (TrACSS), 2022-2023. Geneva, Switzerland. <https://amrcountryprogress.org>

## Summary of major gaps in national responses to antimicrobial resistance in the food and agriculture sectors

An integrated One Health approach and capacity for implementing and monitoring national action plans with the engagement of all sectors is weak or lacking.

There is inadequate financing for national AMR action plan implementation. Weak regulatory frameworks do not incorporate all elements of WOH and Codex standards on the responsible and prudent use of antimicrobials according to animal species and production sector. There is a lack of and/or inadequate mechanisms and resources to ensure regulatory compliance.

There is a lack of nationwide, government-supported awareness-raising and behavioural change activities on a sufficient scale, targeted across sectors.

AMR is poorly integrated into training and professional education curricula.

There is inadequate collection, analysis and reporting of AMR surveillance data in food-producing, terrestrial and aquatic animals, particularly for priority animal pathogens and zoonotic and commensal bacterial isolates.

There is inadequate laboratory capacity and integration of AMR-related data into national surveillance systems.

There is limited use of data on AMR and AMU to amend national strategies or inform decision-making in the plant health, food production and food safety sectors. The use of infection prevention control measures in food animal production and good production practices is inadequate.

Overall, many countries still lack adequate funding for national action plan implementation and comprehensive One Health approaches, while monitoring frameworks are frequently limited or lacking.

This underscores the need for the continued strengthening of plans and One Health governance in many countries.

### **Legal frameworks to support responsible and prudent use**

Encouragingly, in 2022–2023, nearly 80 percent of countries responding to TrACSS said they had laws or regulations on the prescription and sale of antimicrobials for terrestrial animal use, while 60 percent of countries had laws or regulations on the prescription and sale of antimicrobials for aquatic animal use. Over 60 percent of respondents had legislation on the marketing of pesticides, including antimicrobial pesticides, such as bactericides and fungicides used in plant production (Figure 7). Around 60 percent had laws or regulations prohibiting the use of antibiotics for growth promotion in animals in the absence of risk analysis.

However, for optimizing antimicrobial use in terrestrial animal health, only a quarter of reporting countries had a national regulatory framework for antimicrobial products incorporating all elements of the WOH and Codex standards on responsible and prudent use of antimicrobials according to animal species and production sector (Figure 7). Where relevant legal frameworks to tackle AMR existed, their scope and comprehensiveness varied considerably, and relatively few countries had effective enforcement processes to ensure compliance. This number dropped to 20 percent when optimizing antimicrobial use in aquatic animal health.

### **Raising awareness and understanding of AMR risks and response**

Survey results for 2022–2023 indicated that only 9 percent of countries were providing routine, targeted, nationwide, government-supported activities to change the behaviour of key stakeholders across sectors including human health, terrestrial animal health, aquatic animal health, plant health, food production, food safety and environment. In most countries, such programmes were limited or small-scale and not provided to all or most key stakeholders. Few countries reported having routine courses on AMR as part of training and professional education in farming (animal and plant), food production, food safety and environmental sectors.

### **Surveillance**

In 2022–2023, only 34 percent of countries reporting through TrACSS said they systematically collected and reported AMR surveillance data for food-producing terrestrial animals, aquatic animals, and plants. Fewer than 20 percent had established a national system of AMR surveillance for priority foodborne pathogens and/or relevant indicator bacteria that followed quality assurance processes aligned with intergovernmental standards.

Around 63 percent of countries said they used antimicrobial consumption/use data to amend national strategies or inform decision-making. Moreover, 47 percent, 25 percent, 11 percent, 17 percent and 24 percent of countries, respectively, said they did so for the terrestrial animal health, aquatic animal health, plant health, food production and food safety sectors (Figure 8).

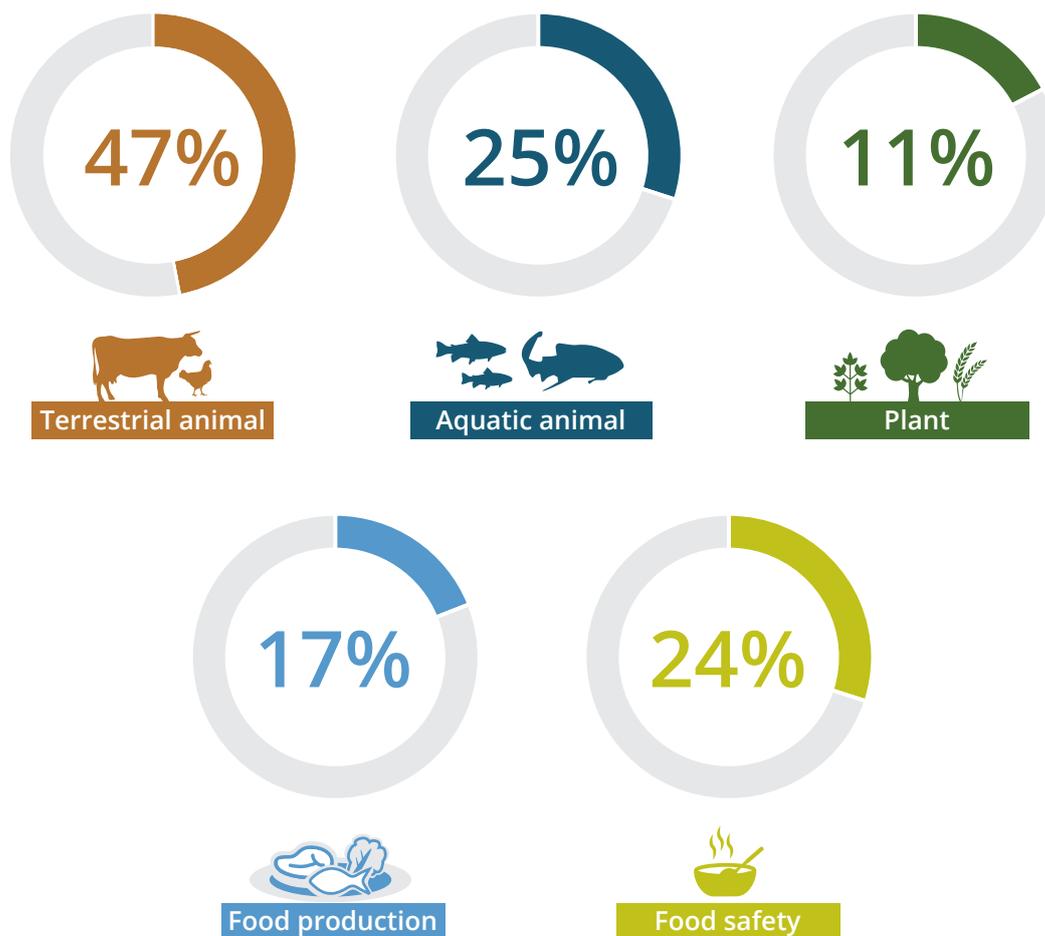


Laboratory capacity, systems and integration remain a challenge for many countries, with only 18 percent of countries surveyed in 2022–2023 saying that all laboratories performing AST in the animal health and food safety sectors were integrated into the national surveillance system.

#### ***Infection prevention and control***

TrACSS results since 2019 suggest that only around 40 percent of responding countries implement minimum requirements for infection prevention in food animal production (such as good animal husbandry practices and biosecurity) in accordance with WOH standards. While most countries had some activities in place to develop and promote good production practices in 2020–2021, only 22 percent had developed a national plan to ensure good production practices in line with international standards and adapted them for implementation at local farm and food production level.

**Figure 8.** Percentage of countries responding to the 2022-2023 TrACSS survey that used data on antimicrobial resistance and/or use to inform decision-making on at least an annual basis, by sector



Source: based on WHO. 2023. Global Database for Tracking Antimicrobial Resistance (AMR) Country Self-Assessment Survey (TrACSS), 2022-2023. Geneva, Switzerland. <https://amrcountryprogress.org>

TrACSS results in the 2022-2023 cycle suggest that only approximately 30 percent and 25 percent of responding countries implement the minimum requirements for infection prevention in terrestrial animal production and aquatic animal production, respectively. These requirements include good animal husbandry practices and biosecurity following WOH and Codex standards. For instance, while most countries had some activities in place to develop and promote good production practices in 2022-2023, only eight out of the 177 countries that responded to the 2022-2023 TrACSS system periodically monitored the implementation of the national plan to reduce the use of antimicrobials and minimize the development and transmission of AMR in terrestrial animal production. In the aquatic animal production sector, this number dropped to five countries.

***FAO support for reporting countries***

TrACSS data should be viewed in light of the fact that FAO provided support for interventions directly related to AMR, mainly in certain LMICs. These included 35 of the 136 countries that responded to the TrACSS survey in 2019–2020 and 43 of the 163 respondents in 2020–2021. The FAO Strategic Framework AMR indicator for 2020–2021 reflects an overall level of implementation of 48.92 percent against 47.89 percent for 2019–2020. Compared with 2019–2020, most responses in the 2020–2021 survey showed that low-income countries in which FAO directly supported AMR-related interventions were catching up and performing better than similar countries where FAO had no direct interventions.



## SECTION 4.

# SUPPORTING MEMBERS IN STRENGTHENING THEIR CAPACITIES TO COMBAT ANTIMICROBIAL RESISTANCE IN AGRIFOOD SYSTEMS

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FAO's contribution to the AMR response focuses on supporting countries in developing and implementing components of national action plans on AMR that are relevant to the food and agriculture sectors in the context of a One Health approach. To this end, the FAO Action Plan on AMR 2021–2025 established two main goals for the Organization's work on AMR (FAO, 2021a):

1. to reduce AMR prevalence and slow the emergence and spread of resistance across the food chain and for all food and agriculture sectors; and
2. to preserve the ability to treat infections with effective and safe antimicrobials to sustain food and agriculture production.

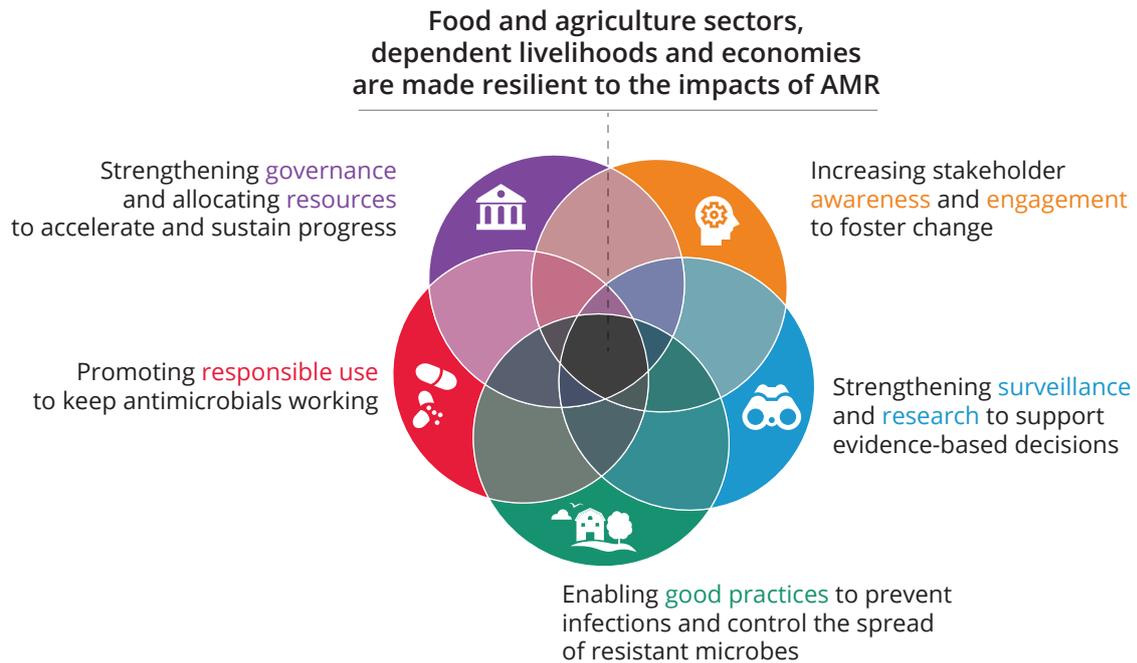
These goals are supported by five strategic objectives that are consistent with the Global Action Plan on AMR and aim to increase the capacity of countries to manage AMR risks and build resilience to AMR impacts in the food and agriculture sectors (Figure 9).

FAO's work to implement the FAO Action Plan on AMR encompasses the development of tools and guidance at global level, as well as work in 47 countries in Africa, Asia, Europe, Latin America and the Caribbean to support the development and implementation of national action plans on AMR. This section summarizes major global- and country-level activities between 2020 and 2022 under each of the five strategic objectives of the FAO Action Plan on AMR. Several of these activities are undertaken in collaboration with partners, including other Members of the Quadripartite collaboration.

### ***FAO partners***

The Fleming Fund is a United Kingdom aid programme, supporting 21 countries across Africa and Asia in tackling AMR. It also funds [FAO's biggest standalone AMR project](#), which expand across 12 countries out of those 21, aiming to contribute to the availability of quality data, which aids in keeping antimicrobials working, and makes the agrifood systems more resilient to the impact of AMR. It also supports the Organization's work to promote the prudent use of antimicrobials, strengthen laboratory capacity, and develop the UK FAO Reference Centre for AMR<sup>3</sup>.

<sup>3</sup> FAOLEX is a comprehensive and up-to-date legislative and policy database, one of the world's largest online repositories of national laws, regulations and policies on food, agriculture and natural resources management.

**Figure 9.** Goals of the FAO Action Plan on AMR 2021–2025

Source: FAO. 2021. The FAO Action Plan on Antimicrobial Resistance 2021–2025. Rome.  
<https://www.fao.org/documents/card/en/c/cb5545en>

**FAO's Global Health Security Programme**, funded by USAID, supports countries in Africa, Asia and Latin America enhancing coordination and collaboration among AMR multi-sectoral stakeholders, as well as increasing institutional and multi-disciplinary AMR and AMU workforce capacity.

The European Union is supporting seven **South American** countries to contribute to addressing AMR through the implementation of the National Action Plans, using a One Health approach. It is also working supporting seven countries in **Asia** to tackle AMR by engaging with major global players and strategic countries, and contributing towards achieving the objectives of the Global Action Plan on AMR by sharing experiences, advocating best practices and stimulating action.

The Republic of Korea funds the **ACT project**, which works at both the global and local levels (four countries in Asia and two in Latin America) to support the implementation of Codex standards, in particular in relation to the containment, reduction, monitoring and surveillance of foodborne AMR.

The **Russian Federation** is supporting five western Asia countries to engage the food and agriculture sector to support the development and implementation of National Action Plans (NAPs) on AMR.

At the time of publishing, other donors that had contributed or were contributing to FAO AMR projects included Australia, France, the Netherlands, Norway and Sweden. Furthermore, a number of bilateral donors, academia, professional and civil society organizations are among other partners working with FAO on AMR-related topics at regional and country level.



## 4.1 Increasing stakeholder awareness and engagement

### *Major global tools and activities*

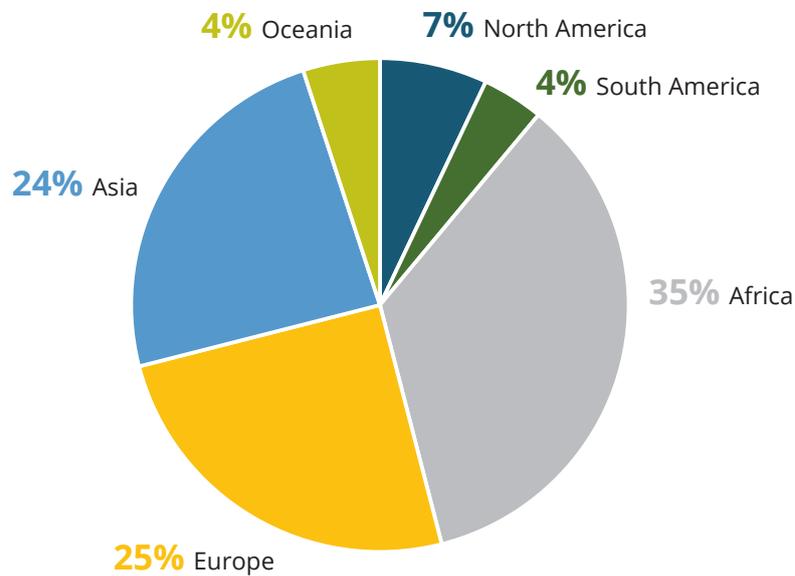
World Antimicrobial Awareness Week (WAAW) is a global campaign held in November each year to raise awareness and understanding of AMR and promote best practices among One Health stakeholders to reduce the emergence and spread of drug-resistant pathogens. In 2021, FAO presented its Action Plan on AMR 2021–2025 as part of WAAW. The AMR microsite on the FAO website saw more than a 200 percent increase in visitors. The average 300–400 visitors per day spiked to 1 000. A total of 4 000 visitors interacted with the website that week. Some 200 multilingual posts were shared by FAO accounts, with more than 1 500 mentions, reaching 26 million accounts.

The theme of WAAW 2022 was "Preventing Antimicrobial Resistance Together". It called for cross-sectoral collaboration to preserve antimicrobial effectiveness. The overall slogan to raise awareness of AMR during WAAW remained the same as in previous years: "Antimicrobials: Handle with care". Hundreds of events and activities were organized around the world, including the launch of the AMR Multi-Stakeholder Partnership Platform at FAO headquarters. The week ended with the Third Ministerial Conference on AMR in Oman, where the Directors-General of the Quadripartite organizations held a special advocacy event on the Partnership Platform.

FAO has established and published the bi-monthly Newsletter on AMR since December 2020, to update on FAO efforts to achieve the FAO action plan on AMR, and to advocate for the FAO collaboration to address and combat the antimicrobial resistance at global, regional, and country levels in the sectors of food and agriculture. The newsletter is administered by CJWZ and the updating news are shared by FAO AMR focal points for regions, sectors, and thematic areas.

In April 2022, FAO launched an [e-learning course](#) on "understanding AMR in food and agriculture", aimed at a broad range of stakeholders in the agrifood system. The course helps learners to understand the impact of AMR on food safety, food security and the economic well-being of farming households. It also explains the potential role of agrifood system stakeholders, as well as FAO's work with other partners to support countries on AMR mitigation. This online training course consists of five lessons that cover: i) what AMR is and why it is a global public health challenge; ii) AMR in the context of One Health; iii) the role of food and agriculture stakeholders in AMR; iv) how AMR can be contained and its impacts minimized in food and agriculture; and v) FAO's role and current initiatives to tackle AMR. The course was developed in collaboration with the FAO UK Reference Centre for AMR.

By early October 2022, 1 474 users had accessed the course, 36 percent of them from Africa, 24 percent from Asia, 25 percent from Europe, 7 percent from North America, 4 percent from Oceania and 4 percent from South America (Figure 15). Of these, 27 percent were from academia, 23 percent were from government, 20 percent were individuals, 10 percent were from international organizations, 9 percent were from the private sector, 5 percent were from other affiliations 4 percent were from non-governmental organizations and 2 percent were from intergovernmental organizations. The course is available in English, Spanish and currently in the process of being made available in Russian.

**Figure 10.** Users who accessed the e-learning course

Source: Authors' own elaboration

FAO is also holding a series of monthly webinars, called “Knowledge Dissemination Dialogues” to bring participants up to date on specific scientific and technical topics related to AMR. Topics addressed in the webinars include microbiology, epidemiology, environmental and behavioural science, plant and animal production, and health. The webinars are co-organized by the FAO AMR Working Group and various FAO technical networks. Participants are expected to have at least a basic knowledge of AMR. Ten webinars had been delivered as of October 2022.

In November 2021, FAO organized a virtual “expert consultation on the sustainable management of parasites in livestock challenged by the global emergence of resistance”. The consultation advised FAO to develop guidelines for the strategic control and management of acaricide and trypanocidal drug resistance and called for greater advocacy, awareness and resource mobilization to address this challenge. As part of the follow-up, a community of practice on the acaricide resistance management of livestock ticks is being established.

In July 2021, the FAO communications division organized a knowledge-sharing session on the impact of storytelling. These stories are being used to demonstrate FAO’s expertise and are available on its various media channels (website, social media, publications and podcasts).

FAO signed a letter of agreement with the College of Wooster, Ohio in December 2021 to conduct an experimental valuation auction to elicit willingness-to-pay premia for products that carry a microbial food safety certification label. In addition, as part of its collaboration with the International Dairy Federation, FAO was represented at and actively participated in the World Dairy Summit in India in September 2022.



### **Regional and country-level activities**

In **Asia and the Pacific**, the Quadripartite of FAO, UNEP, WHO and WOAH have collaborated virtually since 2020 to hold series of webinars on AMR in celebration of WAAW. A [video](#) co-produced with the partners was also launched in 2020. The FAO Regional Office for Asia and the Pacific (RAP) also released a [video overview](#) of the AMR situation and how FAO is addressing it.

FAO RAP continued to collaborate with the Federation of Asian Veterinary Associations on reaching veterinary professionals and students in the region by holding a series of webinars in celebration of WAAW. This collaboration was ongoing during the reporting period. In 2020 alone, it reached more than 14 000 individuals in Asia. The subsequent WAAW celebrations co-organized with the Federation of Asian Veterinary Associations (FAVA) reached the same number of people in the region.

FAO RAP's Twitter campaign on AMR for WAAW was one of the top 20 tweets from the account during the reporting period, reaching more than 3 000 users and engaging more than 500 users.

In October 2021, an FAO mission in Ghana addressed the issue of “refining and implementing evidence-based solutions developed by the AMR behaviour change community of practice”. The aim of the mission was to identify and overcome behavioural barriers to footbath use among Farmer Field School participants in Kade and Dormaa, Ghana. Two interventions were designed together with participants and implemented on home farms: i) a poster intervention to remind people to use the footbath and ii) the use of a common household item (a 500ml water bottle of any brand) to assist in diluting disinfectant, as recommended by the brand. While still in the pilot phase, these interventions appear to be useful in reminding people entering the farm or poultry house to use the footbath, helping farmers to educate visitors, staff and management on biosecurity measures, reducing production costs by curbing the waste of disinfectant, and changing the mindset that disinfectant is a costly intervention.

In Africa, FAO and the other Quadripartite organizations, together with the African Union, developed and published a joint continental AMR communication and advocacy strategy in 2021 (FAO, OIE, WHO, UNEP and African Union, 2021). The strategy supports countries and regional institutions in communicating on AMR in a harmonized manner, addressing limited awareness about AMR and supporting government engagement on the issue. In addition, 267 journalists, animal health professionals and pastoralist farmers' associations were trained on AMR and AMU to strengthen their knowledge, attitudes and practices and better communicate on AMR.

FAO signed a letter of agreement with the Real-time Assessment of Community Transmission (ReACT, Johns Hopkins University) in December 2021 on “Seeding and Scaling One Health Awareness and Action on AMR”, an initiative to support ongoing communication activities to foster policy dialogue and youth engagement on AMR in Africa, Asia and Latin America.

### Case study 3: Understanding antimicrobial use practices and antimicrobial resistance awareness in Europe and Central Asia

In 2021, the FAO Regional Office for Europe and Central Asia began to conduct face-to-face surveys to assess AMU and AMR awareness in the livestock sector. These are currently being conducted in 14 countries across the region. In some countries, milk and faecal samples are also being collected from the surveyed farms for the isolation of bacteria and for AST to establish a national AMR baseline.

The surveys involve the main stakeholders in the livestock sector, namely, producers in priority livestock production systems, field veterinarians, veterinary pharmacies and feed mills. The surveys are targeting 500–700 participants per country with a view to identifying major gaps in knowledge and (husbandry and animal health) practices. Besides questions on AMU and AMR, the surveys also address other, related factors, such as hygiene and biosecurity measures on farms that can have an impact on the need of antimicrobials and the prevalence of resistant bacteria. Responses are currently being analysed, and a survey report on every participating country will be prepared. These reports will include recommendations for the country in question based on the main findings. The weak areas identified can be targeted for capacity-building and awareness activities.

Once the results of the AST become available, a combined analysis with the survey data will allow key risk factors and action points for AMR to be identified. It is also foreseen that in 2023, the survey will be implemented in additional countries to establish a comprehensive baseline of AMU and AMR in the region.

## 4.2 Strengthening surveillance and research

### *Major global tools and activities*

**The InFARM platform:** FAO is committed to developing the building blocks that will catalyse national efforts to regularly generate, share and analyse reliable and comparable AMR data in food and agriculture and AMU data in plants and crops. Substantial progress has been made in this regard. In the second half of 2021, FAO completed a requirements analysis to inform the development of an IT solution for the InFARM platform. FAO has finalized the piloting of the InFARM platform, and it is completing its development in preparation for an open call for data in 2024, in which all countries will be invited to share data on the platform. The main objective of the platform is to support countries in the collection, analysis, interpretation and use of AMR data in food and agriculture for informing the development and monitoring of interventions against AMR. The initial scope of InFARM is to host AMR data on priority bacterial species of interest to public and animal health and indicator bacteria from animals and food, according to international standards and the recommendations of the Codex Alimentarius and WOAHA. This data platform will support national, regional and global surveillance efforts, providing countries with a mechanism for hosting and analysing AMR data from terrestrial and aquatic animals and food. It will complement the integration of data from other sectors (led by WOAHA and WHO) under a global platform –the Tripartite Integrated System for Surveillance of Antimicrobial Resistance and Use (TISSA) – to be launched by end 2022.



**The FAO Assessment Tool for Laboratories and Antimicrobial Resistance Surveillance Systems (FAO-ATLASS)** is a tool, available in four languages, for assessing and defining targets to improve national AMR surveillance systems in the food and agriculture sectors. It comprises a surveillance module and a laboratory module. Each module includes two standardized questionnaires, which are completed by assessors. FAO-ATLASS aims to collect descriptive data and score the performance of national AMR surveillance-linked activities by: i) mapping laboratory analytical capabilities and networks and ii) assessing activities on data collection and analysis, governance, communication and sustainability. Based on the FAO-ATLASS assessment, a progressive improvement pathway stage is assigned to each laboratory, each “pillar” is assessed (laboratory network, epidemiology unit, governance, communication and sustainability) and the national AMR surveillance system is assessed as a whole. These results help assessors to provide recommendations for priority improvement actions.

FAO-ATLASS assessment missions are carried out by trained assessors. The recommended approach at country level is that external assessors always carry out the first assessment mission to establish baseline information, while follow-up assessments may be carried out by national assessors or, as for laboratory self-assessment, by ATLASS focal points. FAO is also building a worldwide community of assessors to serve as a technical resource with a view to harmonized regional and global surveillance efforts. FAO is working with WOH and WHO to coordinate country-level assessments across sectors using a One Health approach.

FAO has supported work by the Quadripartite Joint Secretariat to establish a **technical group to support and coordinate integrated surveillance activities across organizations**. In June 2021, the Secretariat launched a call for experts to establish the Quadripartite Technical Group on Antimicrobial Resistance and Use Integrated Surveillance (QTG-AIS) to provide global guidance to the Global Leaders Group on AMR and to provide support to countries in this area. The group will be formalized by the end of 2022. The Quadripartite Joint Secretariat group on integrated surveillance is currently undertaking a selection process for QTG-AIS candidates.

As research is a critical element of the fight against AMR, FAO and the other Quadripartite organizations have fostered and supported the process of developing a **One Health priority research agenda** on AMR. This work aims to catalyse scientific interest among researchers and donors and to provide direction for investment in One Health AMR research, including the identification of research areas to better prevent, control and respond to AMR. These focus on five areas: i) transmission; ii) integrated surveillance; iii) interventions; iv) behavioural insights and change; and v) policy and economics. The project started in 2021 with a global open-call survey to identify key gaps. The results of this survey were analysed and, together with a grey literature review, served as the basis for the consolidation and prioritization exercise on gap research areas using a Delphi Panel process with 150 global experts invited to contribute. Nearly 100 experts from around the world took part, with backgrounds in surveillance, microbiology, animal health, human health, environmental health, crop science, epidemiology, genomics, pharmacy, artificial intelligence, ecology, public health, behavioural

science, law, political science, psychology, behavioural economics, gender, communication, human rights, anthropology and sociology. The results of this exercise are expected to be available in 2023.

### **Regional and country-level activities**

Missions using FAO-ATLASS either as an externally or self-administered assessment tool for the overall national AMR surveillance system for food and agriculture and/or for laboratories were conducted in 28 countries in 2021 and 2022, with support from different sources including the ACT project, a European Union-funded project in Latin America and the Caribbean, the Fleming Fund, the Russian Federation and USAID. Case studies 4 and 5 illustrate the application of this approach in Kazakhstan and Latin America, respectively. The FAO Regional Office for Asia and the Pacific (RAP) recently summarized and presented the findings on the countries assessed in Southeast Asia to identify cross-cutting needs and regional priorities for action. Overall, the tool has now been used in around 45 countries.

FAO supported the development of the **Codex Alimentarius** guidelines on integrated monitoring and surveillance of foodborne AMR, which were adopted in 2021 (FAO and WHO, 2021). As a follow-up, FAO is now leading the [ACT project](#), funded by the Republic of Korea, which focuses on the practical implementation of these guidelines and the revised Code of Practice to Minimize and Contain Foodborne AMR (FAO and WHO, 2005, revised in 2021), with a focus on six countries as proof of concept (Bolivia, Cambodia, Colombia, Mongolia, Nepal and Pakistan).

### **Case study 4: Kazakhstan aims to reduce threat of antimicrobial resistance in food and agriculture**

In April 2022, in collaboration with the Ministry of Agriculture of Kazakhstan, FAO assessed the national AMR surveillance system and laboratories in the food and agriculture sector. The objective of the assessment was to identify and recommend next steps to improve national surveillance capacity for AMR detection in the food and agriculture sector using FAO-ATLASS.

During the five-day mission, meetings were held with key national experts on AMR surveillance in the food and agriculture sectors, as well as with representatives of other sectors, to gather information on the context of ongoing AMR surveillance and monitoring activities in Kazakhstan.

FAO representatives also visited several national laboratories to map available analytical capacity for AMR detection and to assess data collection and analysis activities, and the governance structure as regards surveillance, communication and sustainability. The findings and recommendations of the assessment are expected to help Kazakhstan prioritize improvement actions and to enable FAO to better support the country.

In Europe and Central Asia, FAO-ATLASS has so far been deployed in Armenia, Belarus, Kyrgyzstan, Tajikistan and Ukraine.



## Case study 5: Strengthening the evaluation capacities of laboratories involved in antimicrobial resistance surveillance in Latin America

Strengthening the surveillance and monitoring of AMR and AMU in human and animal health in line with international standards is one of the specific objectives of the "Working together to fight antimicrobial resistance" project implemented by FAO, WHO and WOAH, with technical and financial support from the European Union.

FAO's area of work under this framework is to support the diagnostic capacity of official national laboratories for animal health and food safety, a key component of the AMR surveillance system in the target countries of Latin America. The FAO-ATLASS tool is used to assess and set targets for improving national AMR surveillance systems in the food and agriculture sector.

The activities carried out in 2021 led to the first ATLASS self-assessments of national laboratories for animal health and food safety in Latin America, aimed at mapping laboratory analytical capacity for AMR in the sector. The self-assessments were conducted by delegates from the official laboratories of the seven beneficiary countries of the project and the FAO Reference Centre for AMR, the Integral Unit of Services, Diagnosis and Verification-National Service for Agro-Alimentary Public Health, Safety and Quality (UISDC-SENASICA) Mexico, who were trained by the FAO-ATLASS team.

The laboratory delegates trained in the use of the tool met again to identify lessons learned from the evaluations and common or specific gaps and to define approaches for capacity-building at regional level in coordination with the FAO Regional Reference Centre for AMR.

The self-assessments conducted were specific to each laboratory, establishing a baseline and classifying laboratories according to the "stage" they were at in terms of their ability to detect AMR. In addition, participants were provided with an aggregate analysis of results from the eight countries.

During the workshop, participants received information on the FAO-ATLASS surveillance module, which enables the systematic mapping and evaluation of AMR surveillance systems from the food and agriculture sectors. They also received information on the forthcoming InFARM platform, which aims to establish data-sharing mechanisms to support the collection, analysis and use of data on AMR from the food and agriculture sectors worldwide.

Carlos Jasso, Director of the FAO Reference Centre for AMR in Mexico, UISDC-SENASICA, presented on the support the centre can provide to countries in the region. He identified several activities to strengthen the capacity of the laboratory network for AMR surveillance in Latin America that could be carried out with the support of the Reference Centre.

Compliance with and the application of Codex general principles and recommendations for integrated surveillance are also being mainstreamed through all currently active AMR projects and by developing practical guidelines and supporting national strategies for the monitoring and surveillance of AMR and AMU in food and agriculture. For example, the RAP guidelines (see below) support the implementation of the WOH and Codex Standards for AMR and AMU monitoring. As part of the ACT project in Latin America, the Phyto and Zoosanitary Regulation and Control Agency of Ecuador, as the host of the Codex Coordinating Committee for Latin America and the Caribbean, and the FAO Regional Office for Latin America and the Caribbean (RLC) have come together to support the containment and reduction of foodborne AMR, offering a series of virtual seminars to promote the application of Codex Alimentarius standards for the strengthening of national food safety systems.

In **Asia and the Pacific**, FAO has continued to develop its series of regional guidelines for the monitoring and surveillance of AMR, AMU and residues. The proposed series comprises the following:

- Regional guideline 1: Monitoring and surveillance of AMR in bacteria from healthy food animals intended for consumption (co-developed with Chulalongkorn University, published);
- Regional guideline 2: Monitoring and surveillance of AMR in bacterial pathogens from diseased livestock and poultry (almost finalized);
- Regional guideline 3: Monitoring and surveillance of AMR in bacterial pathogens from aquaculture (co-developed with the Singapore Food Agency and National Parks Board);
- Regional guideline 4: Monitoring and surveillance of AMR in farm animal environment (tentative title, in development);
- Regional guideline 5: Monitoring AMU at farm level (co-developed with WOH, almost finalized);
- Regional guideline 6: Monitoring and surveillance of antimicrobial residues in food of animal origin (tentative title, co-developed with the UK Veterinary Medicines Directorate, in development).

Regional Guideline 1 has already been used extensively in the region and has proved pivotal to improving AMR monitoring in healthy food-producing animals in Southeast Asia. RAP also developed an online learning module for Regional Guideline 1, with technical support from the Chulalongkorn University/FAO Reference Centre for AMR and operational support from the RAP Virtual Learning Centre. The course consisted of lessons delivered through self-guided modules and live sessions in August and September 2022. A total of 26 participants from 17 countries completed the epidemiology course, while 37 participants from 14 countries completed the laboratory course. In addition, Chulalongkorn University and RAP organized the online “Regional training on the use and application of polymerase chain reaction (PCR) techniques for monitoring AMR in livestock in Southeast and South Asia” in February 2022.

Following the third PTAST in 2021, where a total of 35 laboratories in South and Southeast Asia were assessed, Chulalongkorn University launched the fourth PTAST in August 2022, with support from RAP. This expanded from previous years to include AST and bacterial identification in *E. coli*, *Salmonella*, *Enterococcus* and *Campylobacter*. A total of 30 laboratories in Southeast Asia, South Asia and East Asia have signed up for the programme.



Efforts are under way to align this with the EQAsia project led by the FAO Reference Centre on AMR (and WHO Collaborating Centre) in Denmark. Backstopping missions as a post-PTAST initiative in requesting countries have also been added as part of the same collaboration.

A “Multi-centre retrospective study on antimicrobial susceptibility profiles of *Enterococcus* spp. using the regionally customized broth microdilution plates” was launched in Asia and the Pacific in 2022. The initiative brings together research institutions and expertise in the region to provide retrospective data on this organism and creates a network and platform for future exchange and subsequent capacity-building initiatives. The study will utilize regionally customized plates designed for the bacterial species.

A regionally customized broth microdilution plate for Gram-negative aquatic pathogens (AS1AQ) was also developed and finalized for Asia and the Pacific in 2022, in collaboration with global and regional experts on aquaculture AST. This builds on the RAP’s recent success in AMR surveillance of *E. coli* and *Salmonella* spp, *Enterococcus* spp and *Campylobacter* spp in 2019. The final format is now in the manufacturer’s library and a regional mechanism for coordinated procurement is under discussion. A call for expressions of interest to participate in the multi-centre testing of Gram-negative aquatic pathogens has also been developed for implementation in 2023.

RAP has also updated a series of regional AMR data management templates for the monitoring and surveillance of AMR in bacteria from healthy food animals (volume 1), diseased livestock and poultry (volume 2) and diseased aquatic animals (volume 3). FAO and WHONET developers have further revised the long-standing WHONET software and adapted it for food and agriculture use.

RAP received a total of 12,673 AST results from eight countries using regional AMR data management template volume 1, following a call for submissions of current, country-generated AMR data in 2021. FAO’s Emergency Centre for Transboundary Animal Diseases at RAP collated these submissions, de-identified them and transferred them to the Chulalongkorn University/FAO Reference Centre for AMR for blind analysis in 2022. Although the dataset from the region presents limitations, a general picture of the AMR situation in the animal sector and national AMR surveillance schemes could be drawn. The results highlight the high prevalence of AMR among zoonotic and commensal bacteria from food animals in the participating countries.

FAO RAP, in collaboration with experts around and beyond the Asia-Pacific region, organized a webinar and regional consultation meeting on “Advancing regional contributions to the global work on veterinary pathogen clinical breakpoints” in November 2022. The webinar was held with the aim of providing information on the development of clinical breakpoints, while the regional consultation served as a technical discussion for planning ahead and forming a technical working group to address the gaps on missing clinical breakpoints for bacterial pathogens in major livestock, including swine, poultry and cattle in the region.

In September 2021 and March 2022, in the **Europe and Central Asia** region, FAO provided Armenia and Tajikistan with laboratory training for national experts on international standards for AST. In addition, laboratory reagents and equipment were procured and samples are being collected

## FAO Reference Centres on AMR

FAO has established eight Reference Centres on AMR that support the Organization's work to combat AMR in food and agriculture. The main objectives of the Reference Centres are aligned with the strategic objectives of the FAO Action Plan on AMR 2021–2025 (FAO, 2021a). As distinguished centres of excellence, these entities become FAO's Reference Centres for AMR designation by demonstrating key AMR capacity and a track record of active engagement in specific fields of expertise. These institutions also commit a portion of their own resources to carrying out AMR work in collaboration and coordination with FAO. The centres retain their status for four years, after which renewal is possible depending on the activities undertaken and the value and strength of the collaboration. FAO Reference Centres are currently located in the following institutions:

- National Food Institute, Technical University of Denmark, Denmark
- Agency for Food, Environment and Occupational Health and Safety, France
- Department of Veterinary Medicine, Freie Universität Berlin, Germany
- Integral Unit of Services, Diagnosis and Verification, National Service for Agri-food Health, Safety and Quality, Secretariat of Agriculture and Rural Development, Mexico
- Department of Veterinary Public Health, Faculty of Veterinary Science, Chulalongkorn University, Thailand
- Veterinary Medicines Directorate, Centre for Environment, Fisheries and Aquaculture Science, Animal and Plant Health Agency, United Kingdom
- Infectious Diseases Institute, Ohio State University, United States of America
- Pasteur Institute, Dakar, Senegal

from the field and analysed to produce baseline AMR surveillance data in food-producing animals and food.

Support has been provided and is ongoing to facilitate the participation of laboratories in external quality assurance/proficiency testing for improving laboratory capacities to isolate and identify bacterial species relevant to AMR surveillance along the value chain of food products of animal origin and for AST in Asia and in Africa through the FAO Reference Centres for AMR in Denmark, Thailand and the United Kingdom.

In **East Africa**, an AMR/AMU Technical Advisory Group has been established with the engagement of 10 countries. AMR monitoring and surveillance guidelines for bacteria from healthy food-producing animals have also been developed for those countries. In Sierra Leone, an AMR surveillance and AMU monitoring strategy has been put in place, while a national AMR surveillance strategy and a protocol for broiler and layer poultry surveillance have been devised in Zimbabwe. Case study 6 illustrates FAO's approach to national laboratory training in Ethiopia.



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## Case study 6: Hands-on AMR laboratory training for animal health, human health, environment and private veterinary laboratories in Ethiopia

It is critical to improve laboratory surveillance capacity for AMR through training and mentoring activities to detect AMR accurately and promptly, to conduct surveillance for AMR priority pathogens and to establish efficient epidemiological AMR surveillance data management. Countries can also mitigate the threat posed by AMR by creating a platform for laboratory training and experience sharing, involving all stakeholders and sectors to strengthen the capacity of human and animal health diagnostic laboratories and environmental laboratories.

In July 2022, with the aim of improving AMR surveillance capacities across One Health sectors, FAO Ethiopia supported laboratory training on the “isolation and identification of priority pathogens, AST and AMR surveillance” for regional, national and private laboratories. The training took place at the laboratory facilities of the Animal Health Institute in Sebeta, Ethiopia, which is part of the Ethiopian Ministry of Agriculture. Participants came from both the public and private sectors (the EthioChicken PLC private laboratory participated), forming a public-private partnership (PPP) that will contribute to better public services and improved operational efficiency.

“This training enabled animal, environmental, private and human health laboratory staff to improve their awareness and understanding of the basic principles of AMR surveillance, increase their laboratory diagnostic capacity, recognize the impact of AMR on individuals and society, and understand why AMR is a major human health concern,” said Tesfaye Rufael, Animal Health Institute General Director. Deputy Team Leader of the FAO Emergency Centre for Transboundary Animal Diseases team Nega Tewolde noted that there were challenges related to the technical skills of experts and laboratories in implementing AMR surveillance activities. To this end, FAO remains committed to supporting Ethiopian efforts to contain AMR by providing technical and financial support to national and regional laboratories.

The training improved data collection and management in national public and private laboratories, which will support the integrated surveillance and monitoring of AMR trends and antimicrobial consumption. In addition, these laboratories have strengthened their AMR and AST detection methodologies for human health, animal health and environmental sectors.

PPPs can be a means of strengthening veterinary services and improving animal health programmes. Effective PPPs can contribute to a more efficient use of available resources or to the expansion of veterinary health coverage, especially in remote areas. Private-sector engagement and participation in the fight against AMR can improve capacity for the responsible and prudent use of antimicrobials, as well as national and regional reference laboratories and detection methodologies for AMR and AST.

### 4.3 Enabling good practices

#### ***Major global tools and activities***

FAO is working closely with feed-sector stakeholders to promote animal nutrition practices that reduce AMU identified in the 2021 FAO publication *Animal nutrition strategies and options to reduce the use of antimicrobials in animal production* (FAO, 2021c).

In collaboration with the United Kingdom, FAO produced a series of case studies “Tackling antimicrobial resistance in food producing animals”, that describing how the United Kingdom managed to halve the sale of antimicrobials in the country’s livestock industry thanks to a multisectoral collaborative approach between the UK Department for Environment, Food and Rural Affairs and farmers, producers and veterinarians.

Also, in collaboration with Denmark FAO has published a case study “Tackling antimicrobial use and resistance in pig production”. It describes an arduous campaign to tackle the use of antimicrobials – specifically antibiotics – in the Danish swine-producing sector, by improving hygiene at primary sites, developing options for intervention, identifying sites for intervention, setting targets, restructuring the relationship between the veterinary services and farmers, and implementing changes in behaviour for greatest impact.

#### ***Regional and country-level activities***

In August 2021, FAO held a six-week course entitled “Poultry Farmer Field School refresher course for facilitators and master trainers with a focus on antimicrobial resistance”. It was the first online course delivered through the Farmer Field School, with participation from two countries in **southern Africa** (Zambia and Zimbabwe). Overall, 756 farmers have now been trained in Farmer Field School approaches, applying good practices, increasing knowledge and changing attitudes, supporting better farm management, improving animal health, decreasing mortality and improving production. More than 350 professionals have also been trained in clinical service provision, farm biosafety and biosecurity, and infection prevention and control.

In **Asia and the Pacific**, a regional survey on bacterial pathogens in major livestock and aquatic animals was conducted in 2021 in collaboration with FAVA to identify common antimicrobials agents used for the treatment of prioritized bacterial pathogens in swine, poultry, cattle and aquatic animals in the region. This received an additional 1 300 responses from field veterinarians, laboratory personnel, animal health workers and other stakeholders. The findings from this work will help with the prioritization of work to address gaps in clinical breakpoints, the development of treatment guidelines and in-field interventions.

As part of the same collaboration with FAVA, a WAAW design challenge was launched in November 2021. It sought designs of small to medium-scale pig farms that allow the implementation of good animal husbandry practices (including strong biosecurity), while taking into account the social, economic and environmental conditions present in Asia. A total of 19 entries from seven countries (Bhutan, Indonesia, India, Malaysia, Nepal, the Philippines and Thailand) were received from various professional disciplines (veterinary science, engineering, architecture/design, agriculture, farming



and business). As with a similar contest for small-scale poultry farms held in 2020, the next step is to have the crowdsourced designs professionally rendered by an architect and make them freely downloadable and accessible to the public. FAO has also provided capacity building for farmers to develop good practices in animal health management and biosecurity control, including for prudent and effective AMU in aquaculture in India, Indonesia and Viet Nam.

RAP, with support from CIRAD, also carried out a stakeholder mapping and scoping review of studies and initiatives assessing the implementation of infection prevention and control (IPC) by field actors (professionals involved in prescribing, selling and administering antimicrobials), as well as studies aimed at improving IPC implementation by those actors. These are part of an overarching plan to create a virtual library of evidence-based resources to promote and improve good practices to reduce the need of AMU. Significant effort has also been made to promote good beekeeping practices and responsible use of antimicrobials in beekeeping, as described in case study 7.

In Asia and the Pacific, FAO is also currently developing a tool to assess the implementation of infection prevention and control (Agri-IPC) in food and agriculture, including water, hygiene, sanitation and wastewater management (Agri-WASH).

#### **4.4 Promoting the responsible use of antimicrobials**

##### ***Major global tools and activities***

FAO has completed developing the Reduce the Need for Antimicrobials in Agrifood Systems (RENOFARM) initiative and initiated pilot activities in selected countries. The ten-year initiative seeks to engage the entire production chain in a collective effort to strengthen capacities at the primary production level with the extensive use of science and innovative technologies, strengthened public-private partnerships and collaboration with the FAO Hand-in-Hand Initiative. RENOFARM aims to support countries to achieve healthier and more sustainable agriculture production with reduced disease risk and reliance on antimicrobials. It is expected to be a global driving force for comprehensive management of antimicrobials in agriculture production, reduce excessive use and drug residues in food, and comprehensively improve healthy animal and plant production and food safety. It encompasses three global targets:

1. One hundred countries participate in the initiative, with their NAPs for AMR fully implemented in Food and Agriculture.
2. Fifty percent animal/plant health workers trained.
3. Eighty percent of all countries contribute with data to InFARM.

It is intended to launch RENOFARM in early 2024 officially.

FAO is also collaborating with Health for Animals, to promote preventive measures at the farm production level to reduce the need of antimicrobials.

In addition, the CODEX Code of Practice to Minimize and Contain Foodborne Antimicrobial Resistance was updated in 2021, which provides essential guidance to governments, food producers, and other stakeholders on strategies to reduce the emergence and spread of AMR through the food chain.

## Case study 7: Promoting good beekeeping practices and responsible AMU in apiculture

Bees and beekeeping make a significant contribution to protecting biodiversity, food security, livelihoods and nutrition. While the number of beehives has increased by more than 13 million in the past 10 years, there are concerns that widespread bee diseases may drive greater use of veterinary medicines, including antimicrobials. Attention to good beekeeping practices and responsible AMU in apiculture is needed to reduce the risks of antimicrobial residues in hive products and to prevent the emergence and spread of AMR.

FAO monitors beekeepers' awareness and practices around AMR through a global survey every three years. The first survey was disseminated from January 2019 to March 2020, with results reported in 2021. Of the nearly 300 responses received, almost half were from Europe, a third from the United Kingdom and 19 percent from North America. It found that only 2–5 percent of beekeepers used antibiotics to control infectious honeybee diseases in their regions. Where antibiotics were used in the three regions, beekeepers from North America tended to acquire antibiotics through the internet and reported treatment failure for bacterial honeybee diseases (American and European foulbrood).

There is a specific need of awareness-raising and training related to a lack of adherence to label indications (especially in North America) and limited knowledge about antimicrobial function and the potential for antimicrobial residues in hive products (notably in Europe). There are also concerns about the use of antibiotics without following instructions.

More effort is probably needed to ensure that beekeepers have access to accurate information and trained experts. The second cycle of the survey was launched in 2022 in all FAO languages and the resulting report will be available in 2023. Adopting good beekeeping practices and improving biosecurity measures are critical to reducing the need of AMU and to promoting sustainable beekeeping. This will ultimately protect not only honeybees, but also the surrounding ecosystem, human health and the environment.

In addition, when antimicrobials are needed to manage clinical cases, the responsible use of antimicrobials according to instructions is critical to control and treat honeybee diseases. FAO and some of its partners have developed the following guidelines to provide beekeepers with practical information:

- **Good beekeeping practices for sustainable apiculture** (2021, English, Spanish and Chinese), with practical guidance for the sustainable management of apiaries;
- **Responsible use of antimicrobials in beekeeping** (2021, English, French and Spanish), with clinical examples of the main honeybee diseases and control measures; and
- **Visual manual on good beekeeping practices for small-scale beekeepers in Africa** (2021, English, French and Swahili), a practical document on sustainable beekeeping.
- **Good beekeeping practices: Practical manual on how to identify and control the main diseases of the honeybee** (*Apis mellifera*) (2020, English, Croatian, and Albanian)

FAO works closely with global partners, including Apimondia (the International Federation of Beekeepers Association), with which it organized World Bee Day in 2021 and 2022), Istituto Zooprofilattico Sperimentale del Lazio e della Toscana (IZSLT, the FAO Reference Centre for Animal Health and Food Security Discipline Apiculture, Health and Biosecurity, Italy) and the Appalachian State University, the United States of America. In 2022, FAO worked closely with IZSLT to develop a progressive management pathway (PMP) approach in order to support countries in managing the issues around AMR in apiculture using a step-by-step approach to sustainable beekeeping. The beekeeping PMP-AMR will provide comprehensive action frameworks under the five objectives of the FAO Action Plan on AMR with a view to reducing the need of AMU and the burden of AMR in beekeeping.



It emphasizes principles such as the prudent use of antimicrobials in food-producing animals, proper hygiene and sanitation practices in food production, and the importance of surveillance and monitoring of AMR in both humans and the CODEX Code of Practice advocates for international cooperation and information sharing to combat AMR effectively. By adhering to these guidelines, countries can work towards ensuring the safety of the food supply chain and protecting public health by minimizing the risk of foodborne AMR transmission to humans.

### ***Regional- and country-level activities***

A set of surveys on the knowledge, attitudes and practices associated with AMU patterns was conducted in **Africa, Asia and the Pacific, Europe and Central Asia**. The [survey outcomes](#) for the Lao People's Democratic Republic were published in August 2021, resulting in a better understanding of the drivers of and motivations for the use of antibiotics in the country's livestock industry. The results also helped to shape the national AMR communication and advocacy campaign.

In **Latin America and the Caribbean**, FAO, in collaboration with WHO and WOA, is working to strengthen animal feed industry engagement in the fight against AMR through a project funded by the European Union. In July 2022, FAO convened a round-table discussion between the public and private sectors, entitled "Policy guidelines for the containment of AMR in the production and use of medicated feed: Moving towards decision-making" at the regional FeedLatina meeting in Mexico City.

In **Asia and the Pacific**, surveys assessing the adherence of pig farms to recommended practices on the prudent use of antimicrobials were conducted between September and December 2020 in Cambodia, Indonesia and Viet Nam. Support is being provided to India, Indonesia and Viet Nam on the mitigation of AMR risk associated with aquaculture, through improved understanding of AMR and related use challenges.

A series of two workshops on developing national veterinary antimicrobial therapy guidelines in Southeast Asia were held in January and March 2022, aimed at boosting regional collaboration on the development of antimicrobial treatment guidelines. Two Southeast Asian communities of practice on antimicrobial treatment guidelines (for poultry and swine) were subsequently established in September 2022, bringing together national and international experts. The sharing of resources, expertise and experience is now facilitated by the communities, and their members will also receive technical support on how to develop evidence-based and practical guidelines.

In 2021, as part of FAO's collaboration with the FAVA, a subcommittee on antimicrobial stewardship was formed under the committee on pharmaceutical stewardship. This subcommittee will lead FAVA's work to promote antimicrobial stewardship among its member organizations in Asia and the Pacific.

In **Africa**, guidelines were developed in 2020 on the prudent use of antimicrobials and stewardship in poultry, the pig value chain, sheep, goats and cattle in Nigeria, Senegal and Ethiopia. More than 200 veterinarians, paraveterinarians, biologists, health workers, medical doctors and pharmacists were trained in the proper use of antimicrobial drugs for treatment of disease.

## 4.5 Strengthening governance and allocating resources

### *Major global tools and activities*

For most countries, the biggest challenges arise, not in the writing of a national AMR action plan, but in implementing it and demonstrating sustained progress. In 2019, FAO launched the FAO-PMP-AMR to address these challenges. It is based on the Progressive Control Pathway for Foot and Mouth Disease (PCP-FMD) developed by FAO and the European Commission on Foot and Mouth Disease. Like the PCP-FMD, the FAO-PMP-AMR focuses on building management capacity through a bottom-up approach with strong stakeholder involvement.

The **FAO-PMP-AMR** serves as a guide to help Members implement their national action plans. The progressive approach enables specific sectors to make step-by-step improvements towards the sustainable use of antimicrobials and the management of AMR. These improvements can start as small-scale initiatives, evolve into broader actions in priority sectors and eventually develop into fully fledged One Health activities, addressing AMR in all food and agriculture sectors nationwide. In this way, the FAO-PMP-AMR enables countries and specific sectors to work progressively toward the optimal and sustainable use of antimicrobials.

In line with the FAO Action Plan, the FAO-PMP-AMR assists countries in four key areas: raising awareness, increasing surveillance capacity, developing governance structures and promoting the prudent use of antimicrobials and good practices.

Each area contains four stages, and each stage requires specific actions be implemented for countries to advance to the next level. The FAO-AMR-PMP provides guidelines, standards and references to help with the planning and implementation of each activity.

To date, FAO has helped 30 countries to integrate agrifood system AMR activities into their national action plans and to step up the implementation of those plans.

**An FAO methodology that analyses AMR-relevant legislation in the food and agriculture sectors** was developed in 2020 to identify key regulatory issues in the food and agriculture sectors that contribute directly to AMR. The methodology can help regulators to identify gaps and weaknesses in their sectoral legislation and governance structures, improving their capacity to better address AMR through legislation. Supporting this work, FAO maintains a global repository of AMR-relevant legislation and policies (the AMLEX dataset of FAOLEX). With support from the MPTF, FAO is now working with UNEP, WHO and WOAHA to upgrade the legal assessment methodology to a One Health Legislative Assessment tool on AMR that will support countries in assessing their legal and institutional systems for supporting AMR work, including institutionalising good practices. The upgraded tool's launch is scheduled for the last quarter of 2023.

The **One Health Multi-Lateral Funding Programme (MUL)** was developed in July 2021 and endorsed in May 2022 with a view to supporting FAO's One Health activities, with four major outcomes built on the seven thematic components of the One Health programme priority area, of which AMR risk management is one. The One Health MUL will be implemented at global, regional and national level.



## Case study 8: Reducing AMU in the broiler value chain in Zimbabwe

In Zimbabwe, the broiler value chain, thanks to its production methods and high consumer demand for affordable poultry products, is a significant user of antimicrobials.

To reduce AMU in the value chain, FAO in Zimbabwe has trained and is working with 18 extension officers from the Department of Veterinary Services to collect farm-level data on AMU using the Kobo Collect mobile application and to develop an economic case for combating AMR within the broiler value chain while promoting good animal husbandry practices. This intervention is being implemented through the Farmer Field School approach and, in Zimbabwe, has supported poultry farmers in Bulawayo, Chegutu, Marondera, Masvingo, Murehwa, Mutare, Mutasa and Zvimba. FAO is also collecting samples from farms to determine the microbes present there and their levels of resistance to available antibiotics. This will be important to finding out how AMU leads to resistance.

Each extension worker works with at least 25 farmers to collect data on the types of antibiotic used to treat the birds, the frequency of use, quantities and growth stages. These data collected at farm level are an important step in setting standards and guidelines for broiler production, which will, in turn, improve animal and human health. The standards and guidelines can also be adapted for related value chains.

Initial data from the application and farmer support on antibiotic use is already showing a reduction in and more responsible use of antimicrobials.

"As an advisor, I not only collect data on the use of antimicrobials, but I also provide farmers with expertise on when and when not to use antibiotics and what

types of antibiotics they should use," says Philemon Matsanhura, Agritex advisor for Mutasa district.

"This has greatly helped farmers to reduce the use of antibiotics while increasing productivity and reducing the number of animal deaths caused by diseases."

One of the project participants, who has been involved in chicken production since 2014, said that by using antibiotics properly, he had been able to reduce his losses and gain access to some markets that were previously closed to him.

"Since participating in the AMR project, I have noticed an improvement in the health of my chickens and a decrease in antibiotic use and have even referred some farmers to our local advisor," said Maxwell Nyandiya from Chigomba village, Mutasa district. "I am proud of the role I play in reducing the use of antibiotics and improving the health and well-being of the population."

This approach strengthens knowledge on holistic agroecosystem management, improves decision-making capacity and facilitates collaboration and joint action. The approach also enables family poultry farmers to develop more efficient and sustainable production systems while enhancing their capacity to address challenges such as the increase in antibiotic resistance.

"FAO has helped Zimbabwe make significant progress in combating AMR. This activity on data collection and surveillance is one of many interventions that FAO is supporting, thanks to funding from the Fleming Fund and the AMR MPTF, to address AMR challenges in line with national objectives," said Pious Makaya, Director of Zimbabwe's Veterinary Technical Services Division.

### **Regional and country-level activities**

FAO helps countries apply the FAO-AMR-PMP approach through 2–4-day in-country workshops. Using the FAO-PMP-AMR tool, stakeholders quantify their progress through a dashboard that displays gaps and the next steps for national action plan implementation. On conclusion of each workshop, stakeholders produce an assessment report that provides the country and its key sectors with recommendations to serve as a baseline for resetting priorities and the strategic planning of AMR mitigation activities. To date, the FAO-PMP-AMR process has been undertaken in 30 countries across all FAO regions.

Since 2019, FAO has supported the implementation of its methodology to revise and update relevant legislation on AMR and AMU in the food and agriculture sectors of more than 25 countries in Africa, Asia, Europe and Latin America. In 2020 and 2021, with financial support from Norway, FAO published analyses of the national legal frameworks of the Plurinational State of Bolivia, Ecuador, Peru and Uruguay, as well as the Andean Community. Reports on institutional AMR coordination, including aspects of policy and legislation, were also developed for Argentina, Chile, Colombia, Paraguay, Peru and Uruguay.

Countries in the Southern African Development Community were also supported in reviewing their regional model on the regulation of veterinary medicines and in assessing its implementation at national level. Other countries, including Armenia, Azerbaijan, Mozambique, Tanzania and Zimbabwe, have initiated or completed national analyses of AMR-relevant legislation. In May 2021, a virtual regional workshop on legislation to address AMR and AMU in Africa brought together more than 300 participants, including experts from different sectors, to identify legal areas and instruments relevant to AMR and AMU, as well as to discuss potential options for addressing AMR through national and regional regulatory frameworks. Regulations relevant to AMR have been mapped and assessed in 19 African countries to date, generating more than 300 pieces of legislation that are available in AMRLEX.

In 2017, FAO activities on AMR in the **Latin American and Caribbean** region revealed a lack of relevant information from the food and agriculture sectors. To address this, between 2019 and 2021, RLC developed the FAO Tool for a Situation Analysis of AMR risks in the Food and Agriculture Sectors (version 2) based on the One Health approach. The objective of the tool is to provide, at national level, a qualitative and systematic assessment of the risks of AMR from animal production systems (terrestrial and aquatic species) to animal and human health.

The tool consists of three instruments, a survey for data collection, a methodological procedure for the analysis of information collected and instructions for the preparation of a national roadmap for the containment of AMR. The roadmap includes guidance on prioritizing needs and sectoral actions consistent with the characteristics of the institutional systems of the countries in question and their national action plans. The tool is available in Spanish and English and has been implemented in 10 countries across the region, as well as in two countries in Africa.

Building on the FAO Action Plan on AMR, FAVA developed the FAVA AMR Strategy 2021–2025 in 2021 (FAVA, 2021). This serves as a tool to guide, encourage and support public and private veterinarians in taking



proactive roles in contributing to AMR mitigation in their countries and in the broader region. It also outlines planned actions by FAVA to help create a reinforcing environment for veterinary professionals and national veterinary associations.





## SECTION 5.

# CHALLENGES AND OPPORTUNITIES: THE WAY FORWARD

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The food and agriculture sectors face major challenges as regards their response to AMR, in particular, weak surveillance and monitoring systems, poor data quality, a lack of harmonized AMR and AMU data, and limited capacity at country level to collect, analyse and act upon AMR and AMU data.

Moreover, attention needs to be paid to operational research and innovative solutions to respond to AMR more effectively in agrifood systems, aquatic and terrestrial animal health, and plant protection and production. Many countries lack adequate resources to comprehensively implement their national action plans on AMR. A lack of political leadership, low levels of awareness and information, a dearth of country-level resourcing and insufficient urgency of action at all levels are also persistent challenges.

Furthermore, sustained efforts are needed to strengthen capacity for multisectoral coordination and One Health collaboration at global, regional and national level. The fight against AMR is also being constrained by weak legal and regulatory frameworks, including the capacity to enforce compliance at national level.

FAO's engagement in the AMR response is also constrained by the availability of resources currently, which stem mainly from extrabudgetary funding, voluntary Member contributions and, to a lesser extent, technical cooperation programmes. Additional resource allocation would strengthen its support to Members at country and regional level and its contribution to the global One Health response to AMR. More attention also needs to be paid to monitoring and reporting on FAO's contribution to the AMR response– a gap that this report aims to fill in part.

Key opportunities to address these challenges include: i) making sustained progress on the development and implementation of the InFARM data platform to support FAO Members in strengthening their generation and usage of AMR data in the food and agricultural sectors; ii) further reducing AMU in the food and agricultural sectors by building the capacity of FAO Members to apply good production and management practices, ensure antimicrobial stewardship, use alternatives to antimicrobials and implement their national action plans, including through the RENOFARM initiative; and iii) further strengthening multisectoral One Health coordination and implementation capabilities by bringing the food and agriculture sectors into the heart of actions against AMR, with assistance from FAO-PMP-AMR and FAO legal methodology on AMR.

More broadly, the future response to AMR in the food and agricultural sectors requires more and better evidence, more informed and more widely implemented interventions to reduce the need of antimicrobials, an increase in resources, greater capacity and stronger governance to ensure

• effective stakeholder engagement and sustained commitment and action, based on a One Health approach, particularly at country level. This calls for stronger and more broad-based engagement (advocacy, collaboration and partnership) with stakeholders at all levels across the public and private sectors, scientific and development community, governments and Members, civil society and regional blocs, to name just a few.



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