Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

Combating Antimicrobial Resistance in Food and Agriculture Sectors

Keith Sumption

FAO Chief Veterinary Officer

Director of the FAO Joint Center for Zoonotic Diseases and AMR

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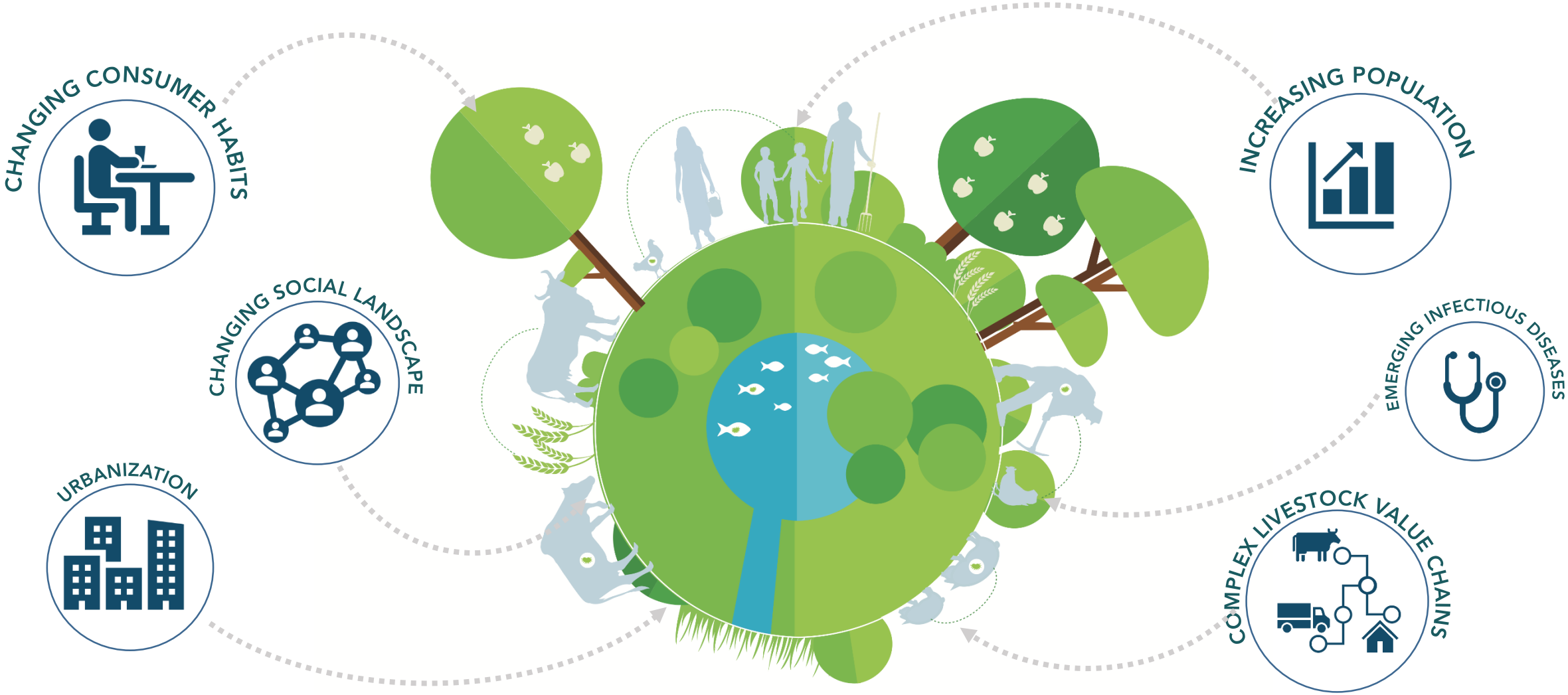
Antimicrobial Resistance, a global challenge for food and agriculture

Antimicrobial resistance: a global challenge for food and agriculture



Antimicrobial resistance: a global challenge for food and agriculture

PNAS

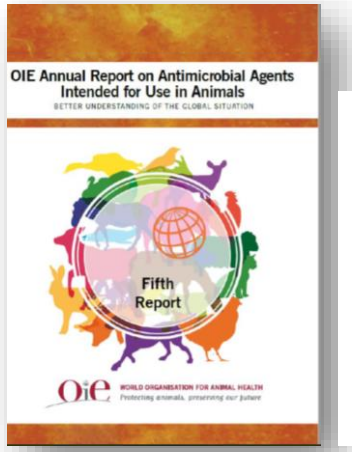
Global trends in antimicrobial use in food animals

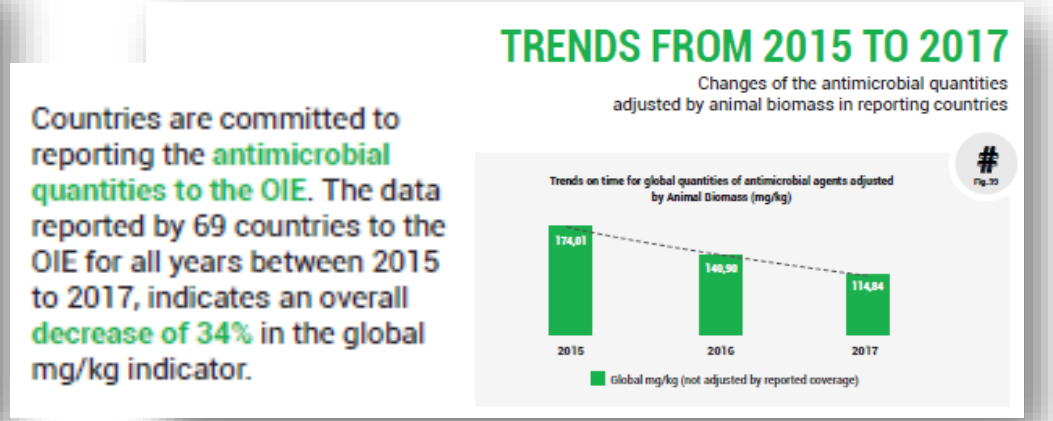
Thomas P. Van Boeckel[a,1], Charles Brower[b], Marius Gilbert[c,d], Bryan T. Grenfell[a,e,f], Simon A. Levin[a,g,h,1], Timothy P. Robinson[i], Aude Teillant[a,e], and Ramanan Laxminarayan[b,e,j,1]

[a]Department of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ 08544; [b]Center for Disease Dynamics, Economics & Policy, Washington, DC 20036; [c]Universite Libre de Bruxelles, B1050 Brussels, Belgium; [d]Fonds National de la Recherche Scientifique, B1000 Brussels, Belgium; [e]Princeton Environmental Institute, Princeton, NJ 08544; [f]Fogarty International Center, National Institutes of Health, Bethesda, MD 20892; [g]Beijer Institute of Ecological Economics, 10405 Stockholm, Sweden; [h]Resources for the Future, Washington, DC 20036; [i]International Livestock Research Institute, 00100 Nairobi, Kenya; and [j]Public Health Foundation of India, New Delhi 110070, India

Contributed by Simon A. Levin, February 18, 2015 (sent for review November 21, 2014; reviewed by Delia Grace and Lance B. Price)

"AMU will rise by 67% by 2030, and nearly double in Brazil, Russia, India, China, and South Africa"





RESEARCH ARTICLE

ONE HEALTH

Global trends in antimicrobial resistance in animals in low- and middle-income countries

Thomas P. Van Boeckel[1,2,6*†], João Pires[1,6†], Reshma Silvester[2], Cheng Zhao[1], Julia Song[3,4], Nicola G. Criscuolo[1], Marius Gilbert[5], Sebastian Bonhoeffer[6‡], Ramanan Laxminarayan[1,2,4‡]

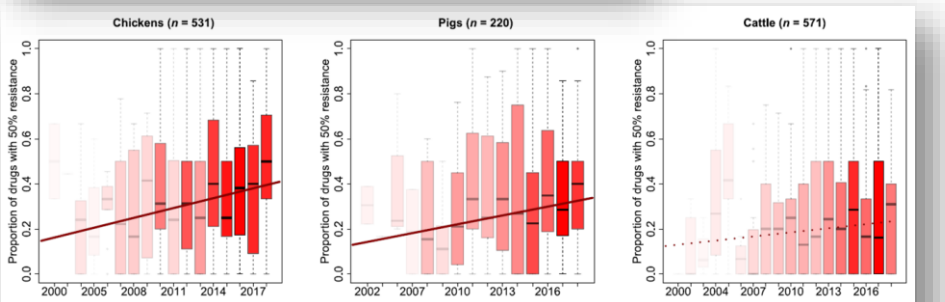
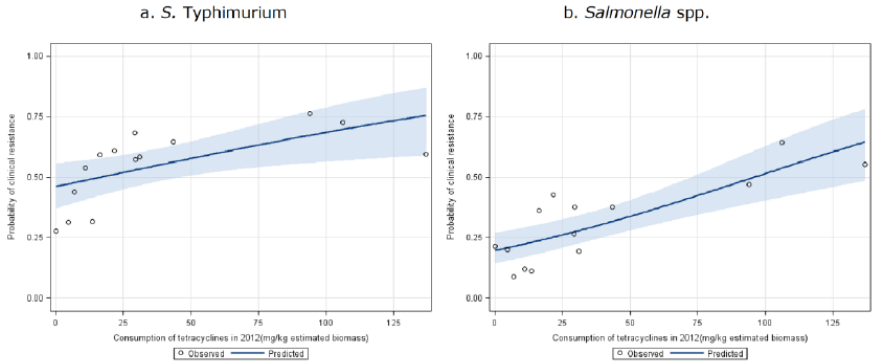


Fig. 2. Increase in antimicrobial resistance in LMICs. Proportion of antimicrobial compounds with resistance higher than 50% (P50) is shown. Solid lines indicate statistically significant (5% level) increases of P50 over time; shading indicates the number of surveys per year relative to total number of surveys per species.

"China and India represented the largest hotspots of resistance, with new hotspots emerging in Brazil and Kenya. From 2000 to 2018, the proportion of antimicrobials showing resistance above 50% increased from 0.15 to 0.41 in chickens and from 0.13 to 0.34 in pigs."

Key papers showing empirical AMR-AMU relationship and positive effects of interventions

Fig.3.8 JIACRA model of animal antimicrobial use and human resistance for *Salmonella* spp. and *Salmonella* serotype Typhimurium.

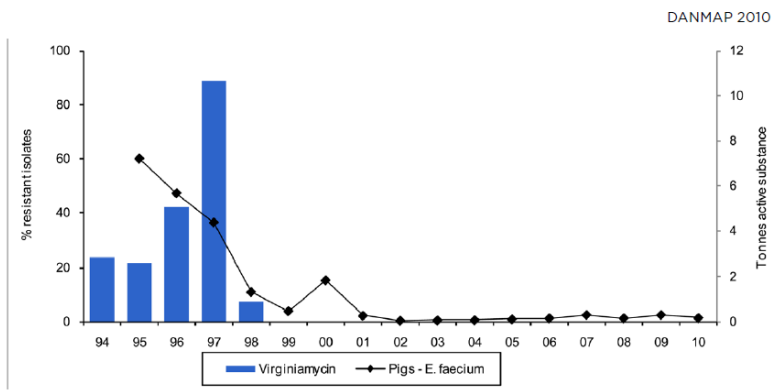


Countries included: AT, DK, ES, FR, HU, IE, IT, LT, LU, NL, NO, SI, SK, UK
p-value < 0.05 OR = 1.009; 95 % PL CI: [1.002, 1.017]

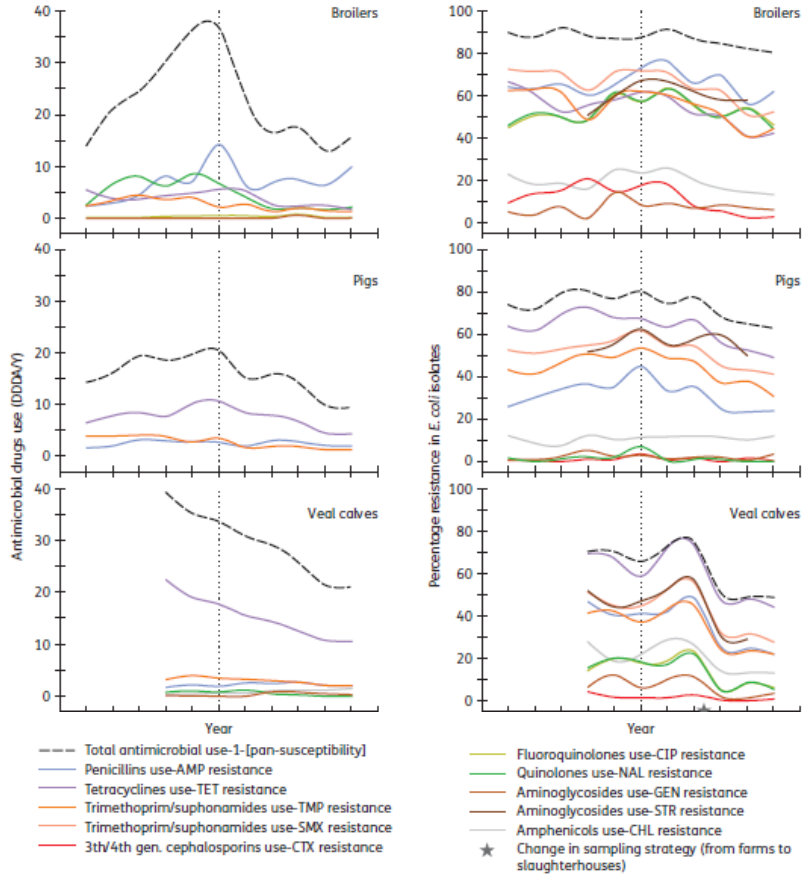
Countries included: AT, EE, ES, FR, HU, IE, IT, LT, LU, NL, NO, SI, SK, UK
p-value < 0.001; OR = 1.015; 95 % PL CI: [1.008, 1.022]

ECDC/EFSA/EMA First joint report on integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals. 2015: Stockholm, Sweden

Fig.AP3.4.5 Resistance (%) to streptogramins in *Enterococcus faecium* from pigs and the consumption of virginiamycin, Denmark



DANMAP 2010. Monitoring AMR and AMU in animals in Denmark



Quantitative assessment of antimicrobial resistance in livestock during the course of a nationwide antimicrobial use reduction in the Netherlands. Dorado-García A., et.al, 2016.

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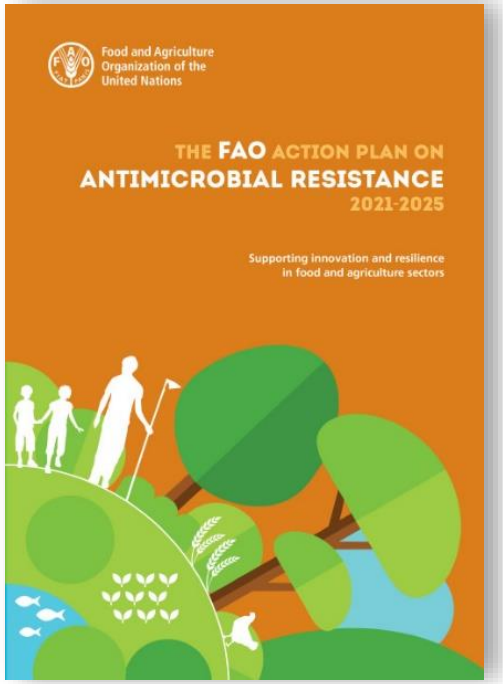
How does FAO support countries to combat AMR?

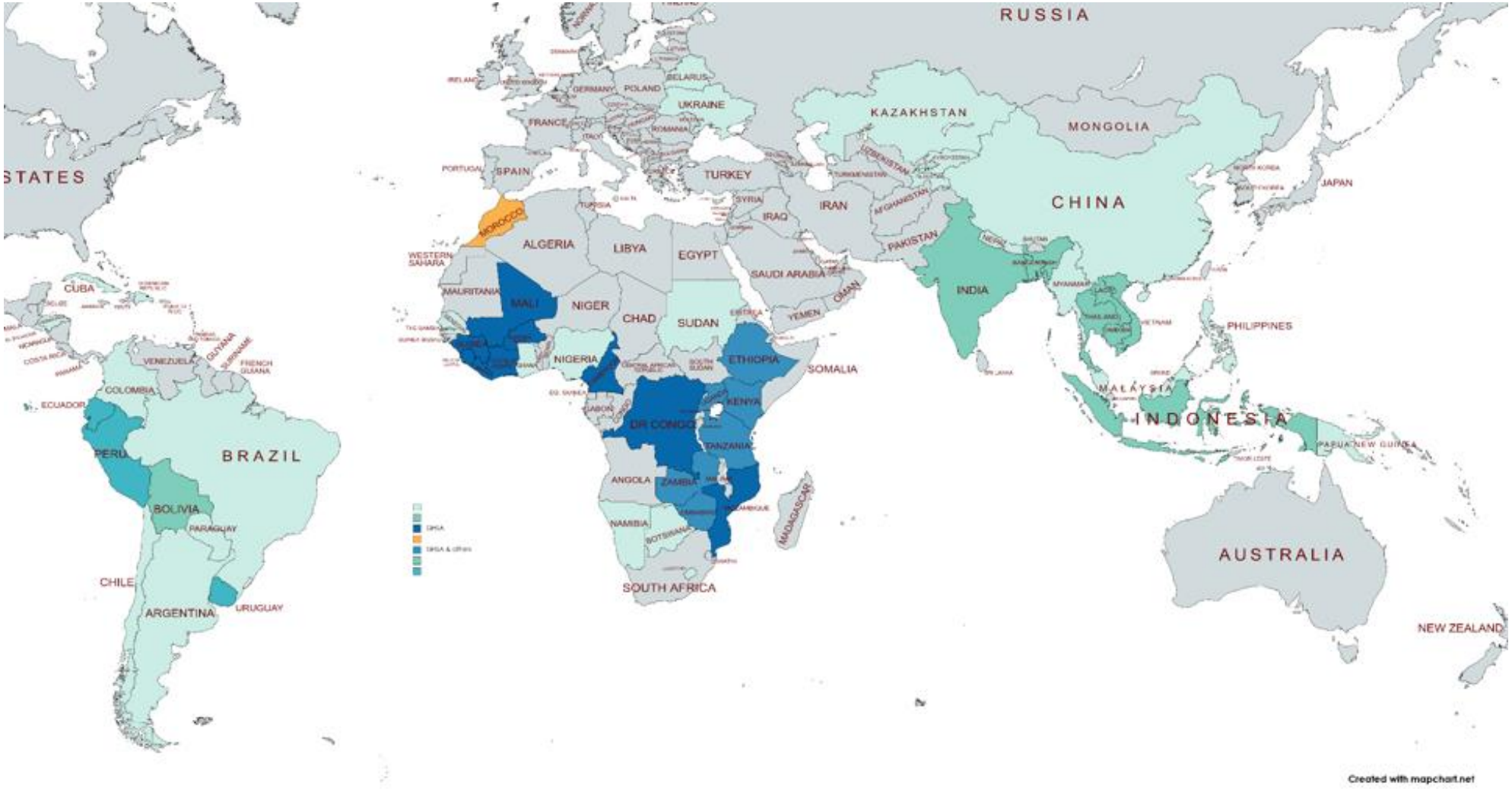
FAO Action Plan on AMR 2021-2025

Work in 47 countries…

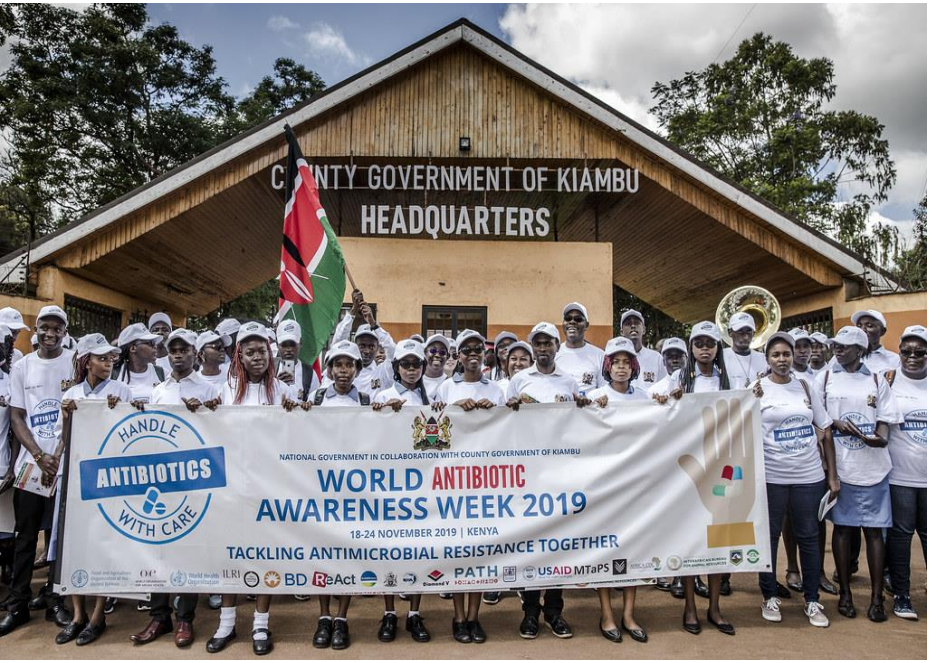


Supporting innovation and resilience in food and agriculture sectors

FAO's AMR work around the world



Awareness campaigns and behaviour change

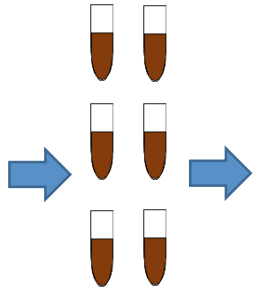


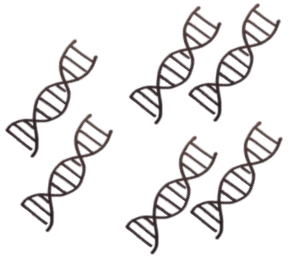
Field interventions enabling good practices and prudent AMU

Stakeholder assessments (farmers, feed industry, agrovets, animal health workers) using various, mix-methods and knowledge, attitudes, and practices surveys across livestock systems

Participatory interventions - Farmer Field Schools

One Health approaches for antimicrobial stewardship among veterinarians and medical doctors



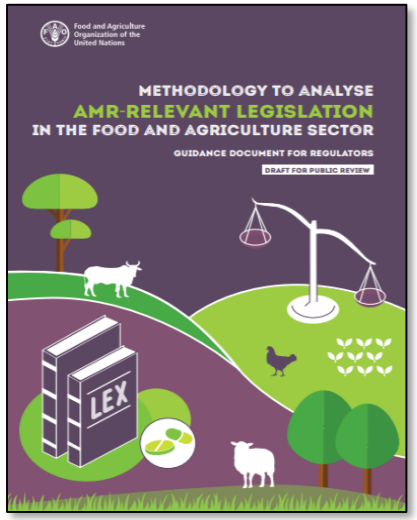


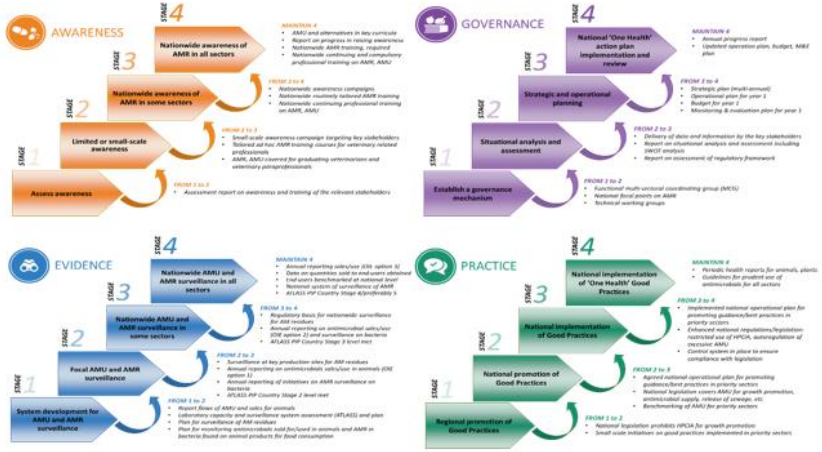
Metagenomics - resistome

National Food Institute
Technical University of Denmark

Tools for capacity building on AMR – surveillance and governance

- Assessment Tool for Laboratories and AMR Surveillance Systems (FAO-ATLASS) **(>140 laboratories, 28 countries)**
- Legal methodology to analyze AMR-relevant legislation in the food and agriculture sectors **(22 countries and 2 regional communities)**
- Global AMR repository of relevant legislation and policies within and across countries (FAOLEX AMR Database)
- FAO Progressive Management Pathway for AMR (FAO-PMP-AMR) **(10 countries)**
- Tool for Situation Analysis of AMR Risks in the food and agriculture sectors **(13 countries)**





International technical networks

FAO Reference Centers for AMR

- National Food Institute, Technical University of Denmark, Denmark
- French agency for Food, Environmental and Occupational Health and Safety (ANSES), France
- Department of Veterinary Medicine, Freie Universität Berlin, Germany
- Integral Unit of Services, Diagnosis and Verification (UISDC), National Service for Agrifood Health, Safety and Quality (SENASICA), Secretariat of Agriculture and Rural development (SADER), 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 of the Ohio State University (OSU), USA
- Pasteur Institute, Dakar, Senegal *(in progress)*

Technical Advisory Groups for AMR/AMU and antimicrobial residues surveillance, data management

- Southeast Asia
- South Asia
- East Africa

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Tripartite collaboration

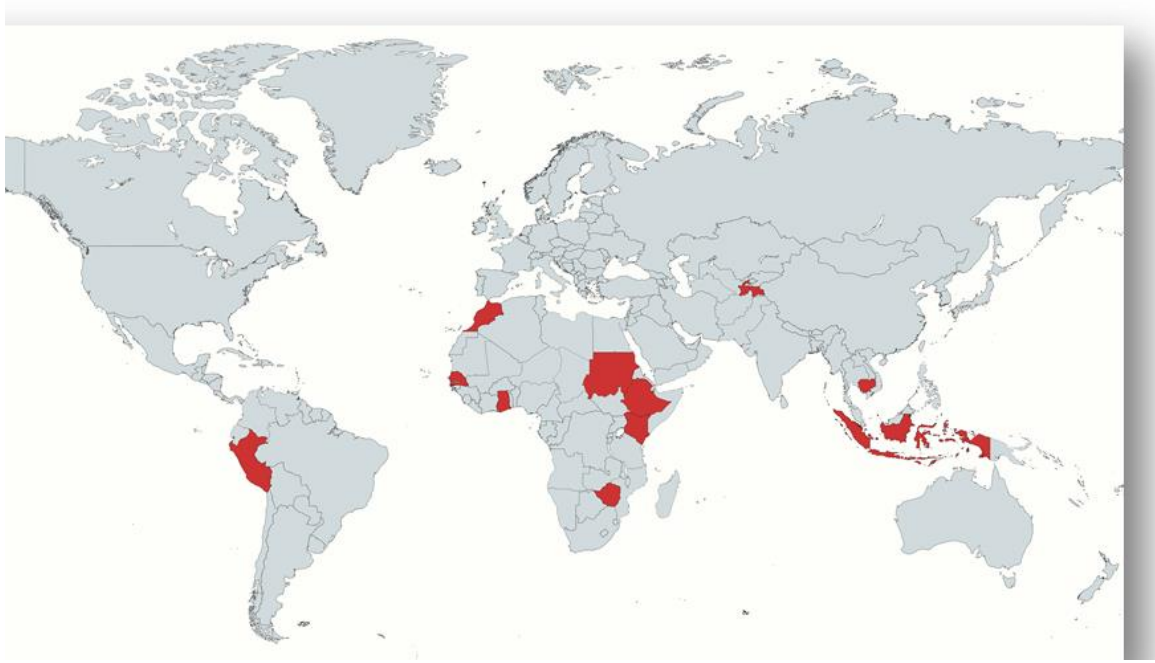
AMR Multi-partner Trust Fund (AMR MPTF)

Promoting One Health approach to contain AMR globally and nationally

Global projects in 2021

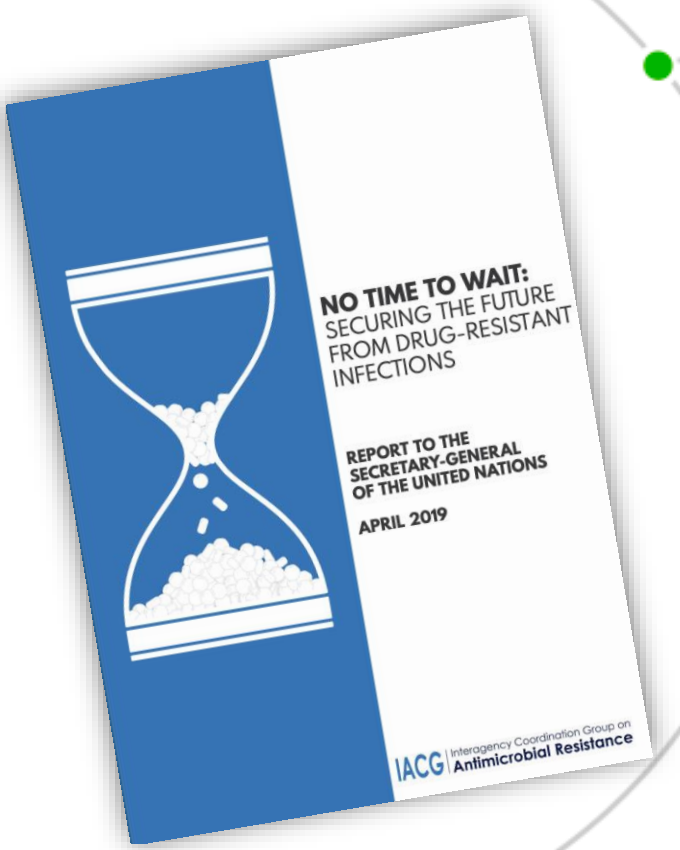
Tripartite Integrated System for Surveillance of AMR/AMU (TISSA)	Global web-based repository on AMR & AMU data across humans, animals, food and agriculture sectors
Monitoring & Evaluation	Global-level monitoring and aggregation of indicator data at sectoral level
Legal frameworks	Development of a Tripartite One Health assessment tool for AMR-relevant legislation
Environment	Strategic global-level governance advocacy initiatives on AMR

Country projects



9 Countries: Morocco, Kenya, Zimbabwe, Ghana, Cambodia, Indonesia, Ethiopia (Peru and Tajikistan)

Global Development | AMR Global Governance



Global Leaders Group (GLG)

Launched in November 2020

Independent Panel on Evidence for Action Against AMR (IPEA)

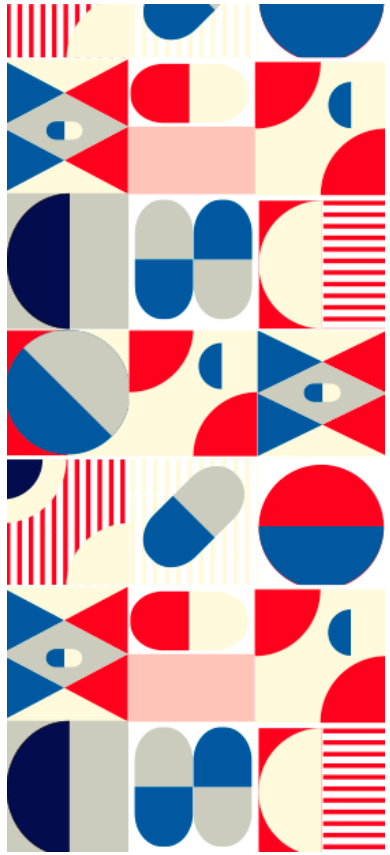
Terms of Reference submitted for endorsement to UNSG in February 2021

AMR Multi-stakeholder Partnership Platform

To be launched in November 2021

Tripartite AMR Multi-stakeholder Partnership Platform

Creating a movement for change through engaging multiple actors and voices



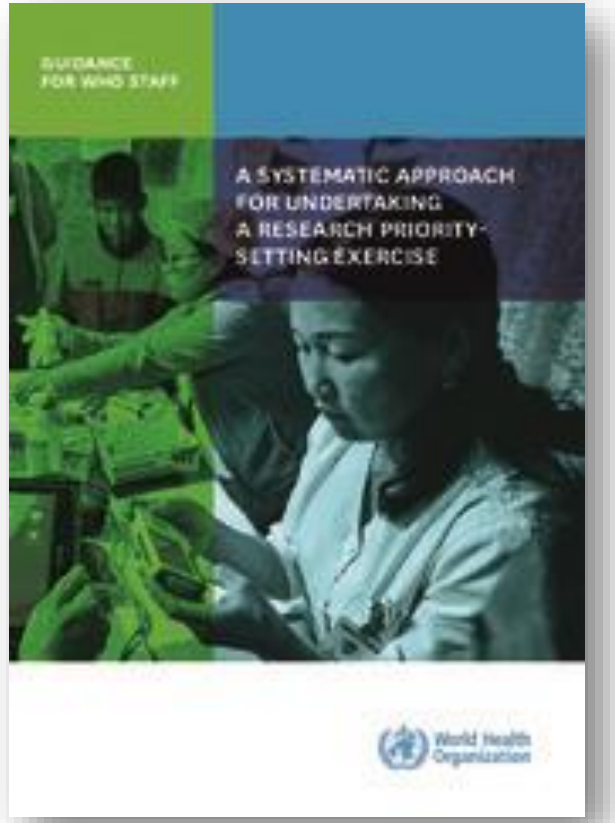
Objectives

- Agreeing on a shared vision, narrative and targets to tackle AMR
- Information sharing and networking
- Taking collective action

What is it aiming to do?

- Attract over 200 members representing different stakeholder voices and a balance across regions.
- Drive multidisciplinary actions at global, regional, and national levels through Action Groups working on key issues of multi-sectoral interest and developing action plans.
- Build global momentum and generate high-level advocacy drive to tackle AMR.
- Share and enhance knowledge, evidence, and innovation to underpin key AMR actions, policy recommendations, and guidance => **key roles of research institutions**
- Generate global commitment to use antimicrobials responsibly and prudently to ensure antimicrobials remain effective.
- Keep the momentum going by developing a clear roadmap facilitated by the Tripartite and the global governance structures.

Tripartite Research Roadmap



The survey is open until **12 September 2021 22:00 Geneva time.**

link: https://extranet.who.int/dataformv3/index.php/633332?lang=en

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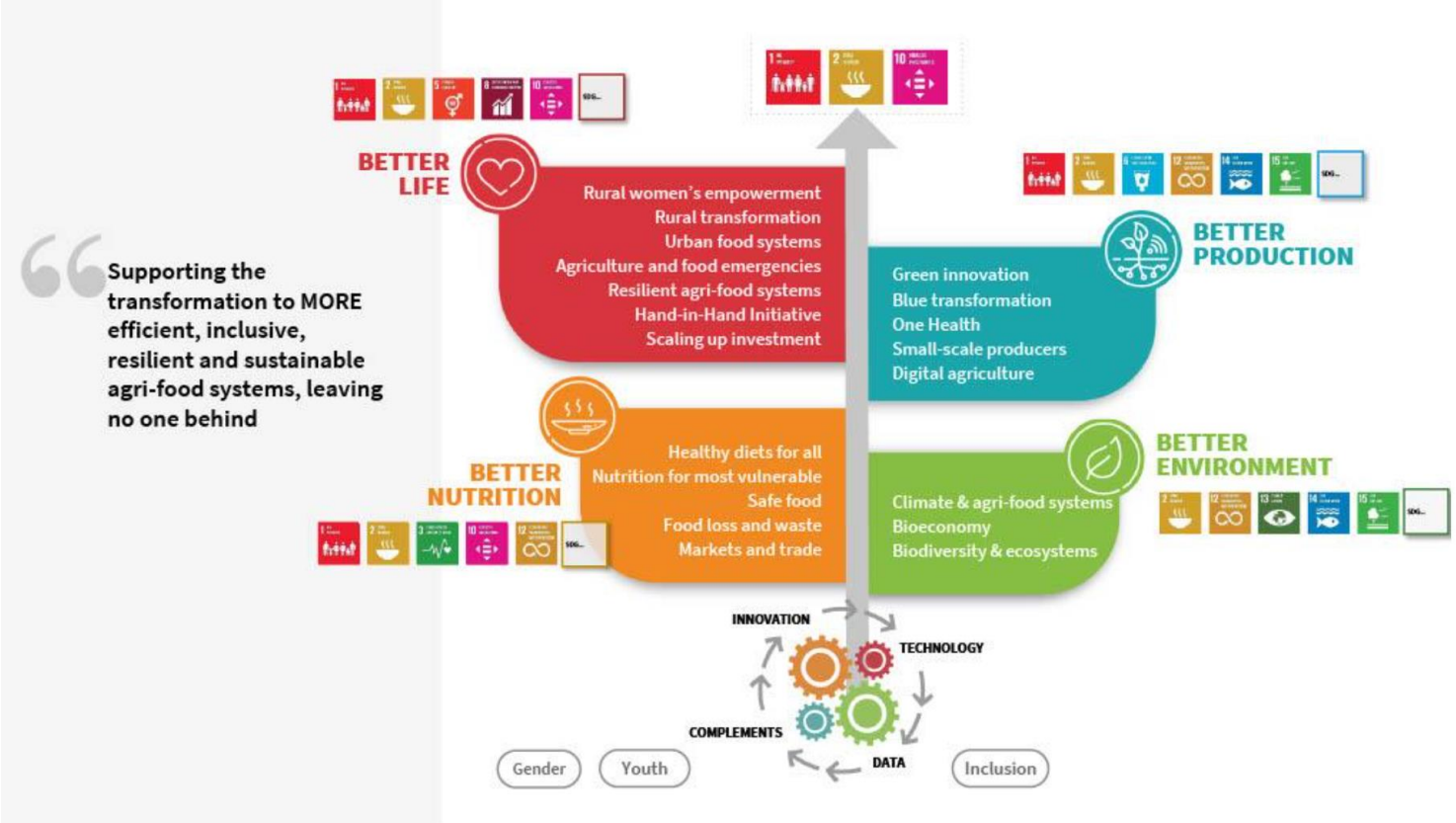
Gaps and FAO future perspectives

What is innovation?

The process of creating value by applying novel solutions to meaningful problems



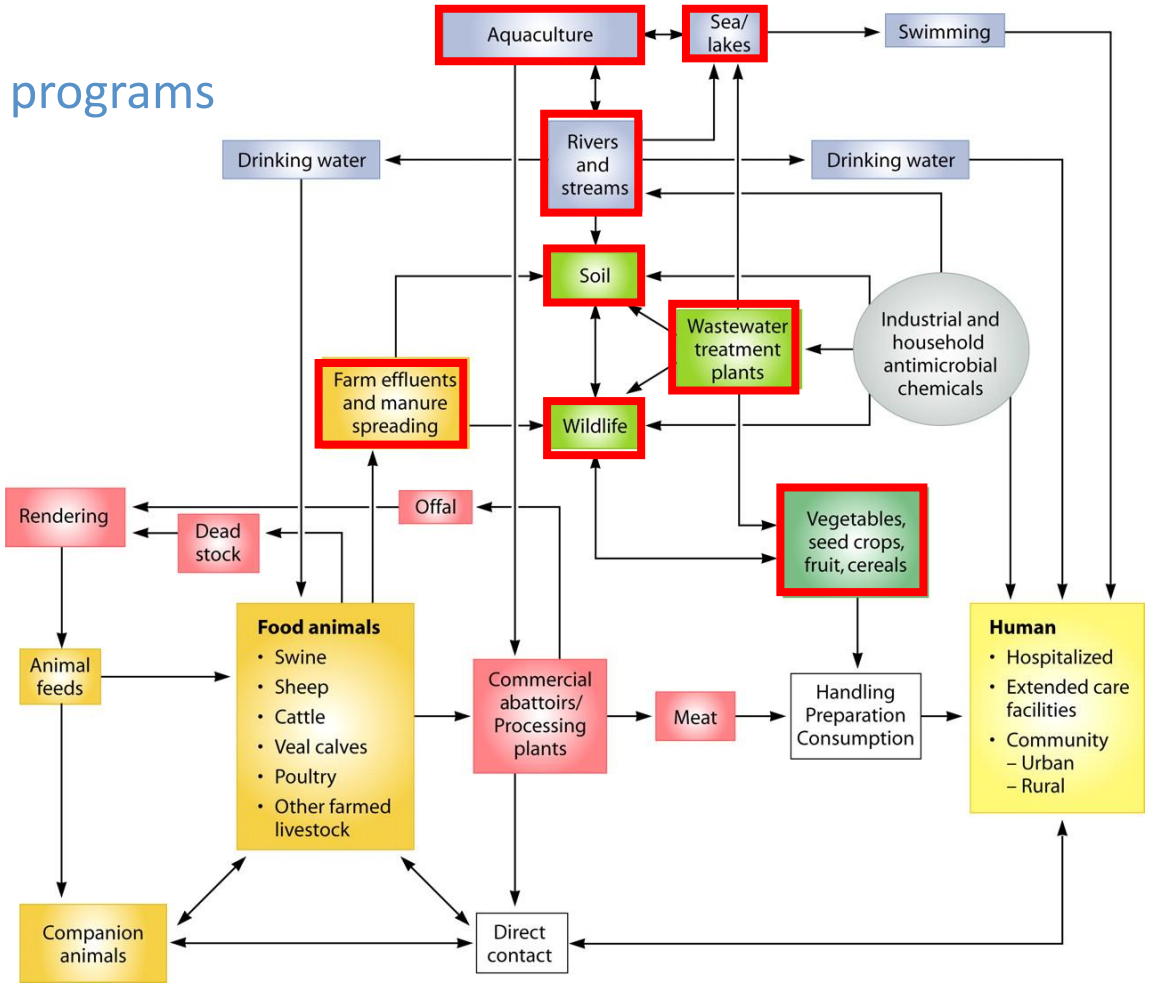
Agricultural innovation is broader than technology and is the process whereby individuals or organizations bring ***new or existing products, processes or ways of organizing*** into use for the first time in a specific context, to increase ***effectiveness, competitiveness and resilience with problem-solving goal.***

Generating more evidence: data gaps in food and agriculture

Integrated surveillance is essential but not all relevant compartments/sectors for FAO are part of current national programs

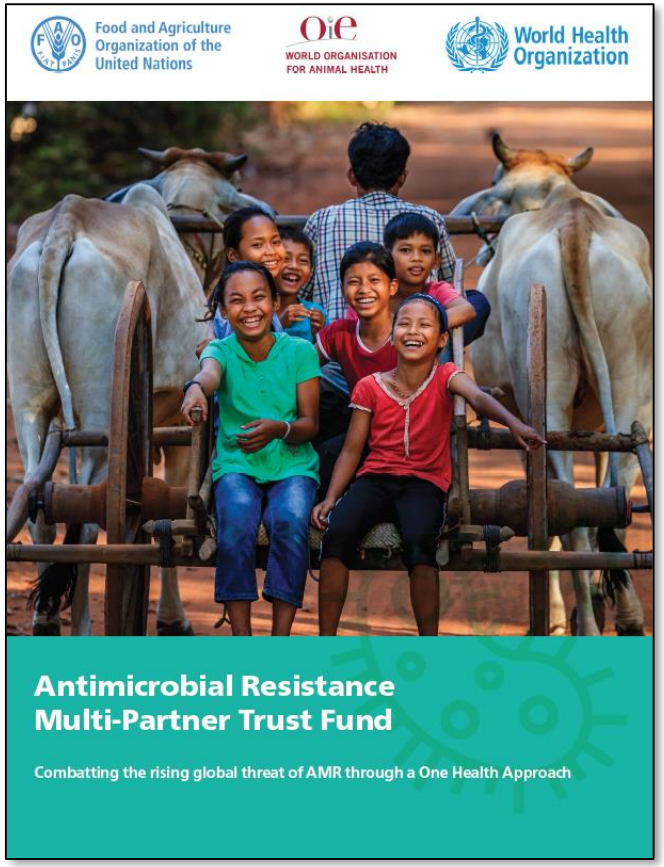
- AMR and AMU surveillance in human and to some extent (food-producing) animal health sectors are usually covered in the National Action Plans on AMR
- LMICs are progressively including AMR surveillance in animals and food
- Other sectors such as aquaculture, plant, environment (soil and water) are usually lagging behind because of

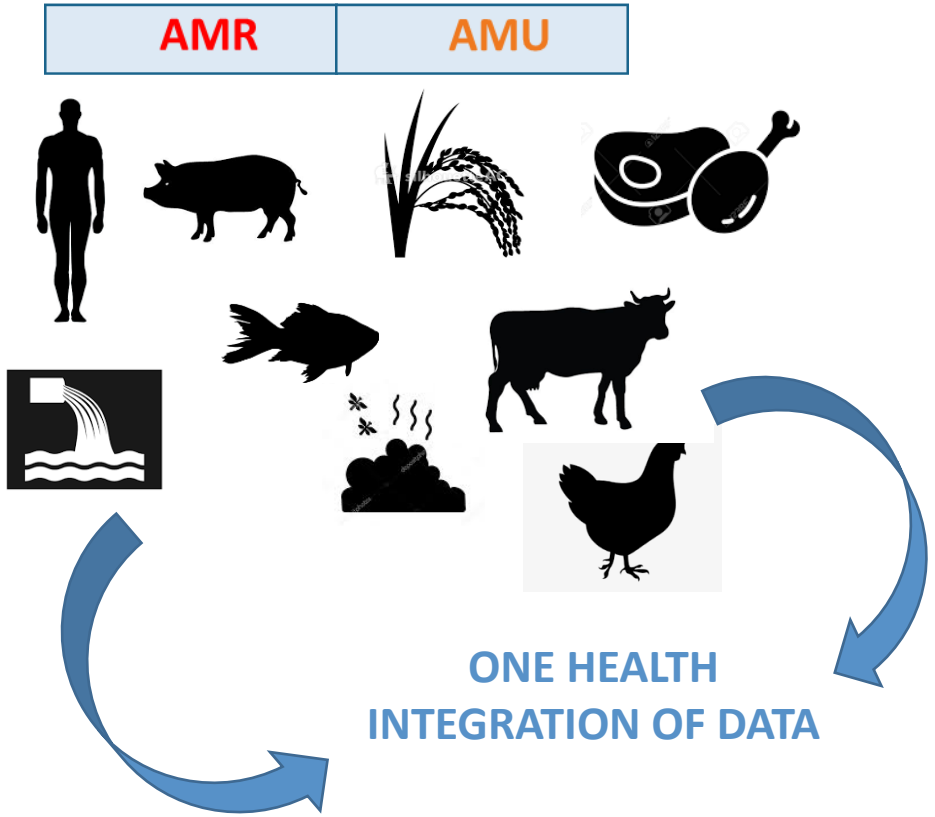
- Lack of harmonized protocols
- Lack of knowledge/ harmonized bacterial species/gene targets
- Lack of resources



Davies J, Davies D. 2010 Origins and evolution of antibiotic resistance. Microbiol. Mol. Biol. Rev.

Generating more evidence: data management systems and platforms





Tripartite Integrated System for Surveillance of AMR and AMU

TISSA

WHO-FAO-OIE

Food and Agriculture Organization of the United Nations
WORLD ORGANISATION FOR ANIMAL HEALTH
World Health Organization

InFARM
(International FAO Antimicrobial Resistance Monitoring data platform)

CODEX ALIMENTARIUS
International Food Standards

Guidelines integrated monitoring and surveillance of foodborne AMR

International FAO AMR Monitoring system (InFARM)

International FAO AMR Monitoring data platform (*InFARM*)

- primarily envisioned **to be hosting data platform and support Members** for collecting, collating, analyzing and reporting AMR/AMU data for the food and agriculture sectors **at National level**
- Be the data source for global Global Action Plan on AMR framework Monitor&Evaluation outcome indicators
- aggregated data into **Tripartite Integrated System for Surveillance of AMR/AMU (TISSA)** to offer **Members and international community** information on global integrated AMR/AMU surveillance

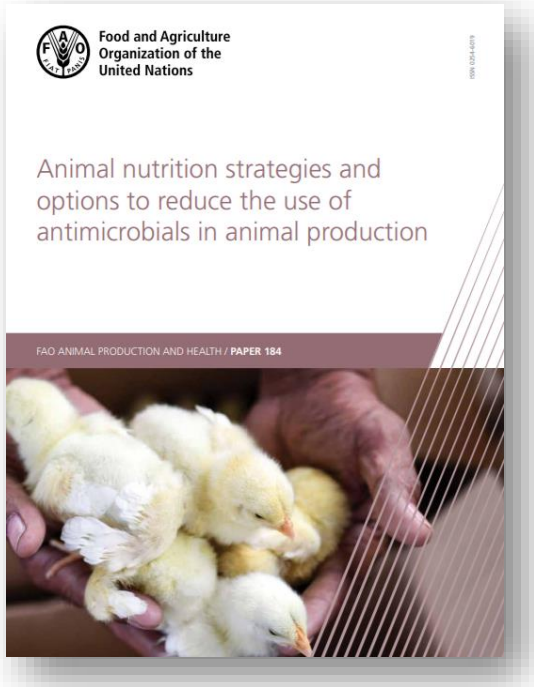
InFARM

Data

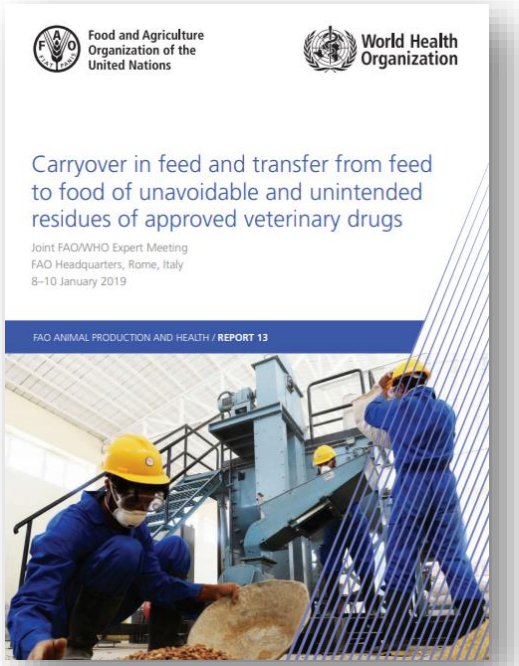
Analyse,
Interpret
Visualize

Information

Covering scientific and technical gaps



http://www.fao.org/documents/card/en/c/cb5524en



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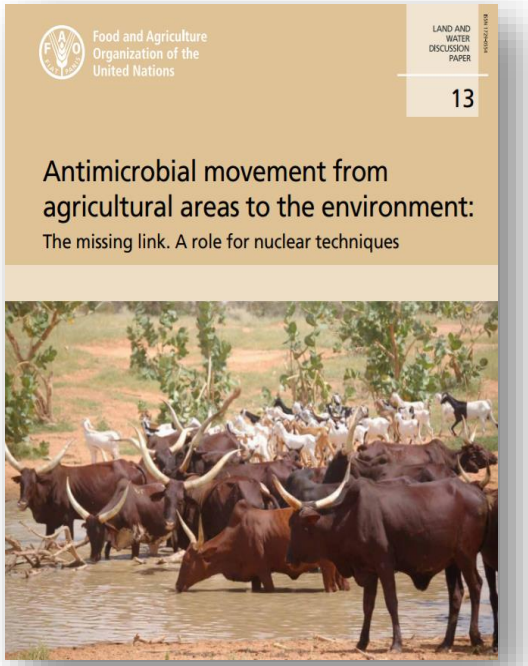

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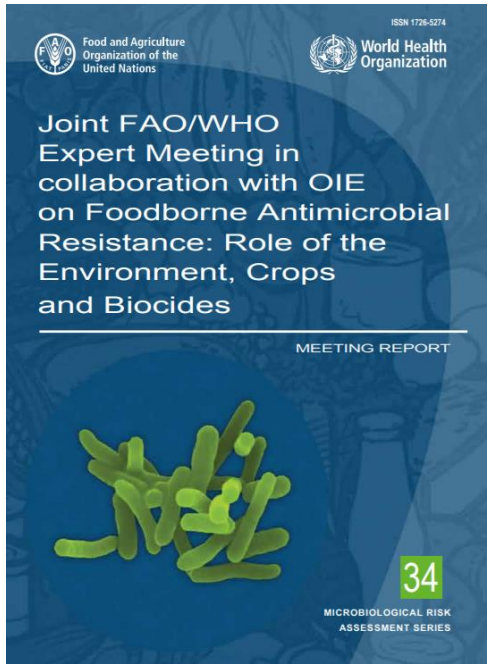

http://www.fao.org/3/ca6724en/ca6724en.pdf

In the pipeline: alternative feed practices to avoid the use of antimicrobials as growth promoters, good production practices to reduce use of antimicrobials through locally adapted and disease resistant breeds, higher animal welfare, and feed safety and security, support to development of vaccines, etc.

Future work: Summary

- More emphasis on **behavior change for adoption of good practices:** testing behavioral science pilot interventions and scaling up what works
- Increasing One Health **Coordination:** multiple projects, multiple partners, more cross-sector engagement
- Boosting collection and analysis of **systematic data to support interventions:** AMR data platform and global systems for data sharing / progressively cover data gaps such as AMU in plant production and AMR in the production environment
- Promoting and supporting **innovation and R&D:** alternative feeding practices, rapid diagnostic tests, development of vaccines, good production practices (use of locally adapted and disease resistant breeds, higher animal welfare, and feed safety and security), etc.

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Thank you

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Twitter @FAOLivestock