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联合国粮食及农业组织 Food and Agriculture Organization of the United Nations Organisation des Nations Unies pour l'alimentation et l'agriculture Продовольственная и сельскохозяйственная организация Объединенных Наций Organización de las Naciones Unidas para la Alimentación y la Agricultura منظمة الأغذية والزراعة للأمم المتحدة

PROGRAMME COMMITTEE

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Evaluation of FAO's role and work on antimicrobial resistance (AMR)

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EXECUTIVE SUMMARY

- This evaluation assesses the results of the work of the Food and Agriculture Organization of the United Nations (FAO) on antimicrobial resistance (AMR). It seeks to trace the contribution of FAO's work and assess the results to date at global, regional and national level. It draws lessons from processes that could inform future decisions by programme teams, donors, FAO Senior Management and Governing Bodies, national governments and the Tripartite organizations on FAO's role in the international AMR architecture.
- The following conclusions and recommendations aim to complement FAO's new Action Plan on AMR and provide insights for the development of FAO's new Strategic Results Framework and future work on AMR. It focuses on FAO's AMR work from 2015 to mid-2020, assessing FAO's achievements and the likelihood of effectiveness. It covers both programmatic and operational aspects and examines the AMR technical capacities of the divisions and offices, as well as regional and national capacities. Importantly, it looks at FAO's internal arrangements to ensure they are appropriate to the aims of its AMR Action Plans.
- **Conclusion 1.** AMR is an undisputed global threat and minimizing it requires concerted collaborative action at all levels. FAO has a strong mandate to work on AMR in the food and agriculture sectors. It is well positioned to deliver on AMR and is moving in the right direction. The COVID-19 pandemic has made it more urgent that FAO prioritizes its global role and work on AMR.
- **Conclusion 2.** Even though FAO is well positioned to deliver on AMR, it lacks a long-term AMR strategy that reflects its priorities and demonstrates its organizational commitment. This hampered progress on the FAO Action Plan on AMR 2016–2020 (FAO-AP) and undermines FAO's role on AMR. There are gaps in fully acknowledging the work required across the antimicrobial lifecycle and food value chains and in adopting a true One Health approach. It has further affected the importance given to sectors associated with food and agriculture in the AMR work of the Tripartite – FAO, the World Organisation for Animal Health (OIE) and the World Health Organization (WHO) – as well as FAO's global influence and visibility on AMR.
- **Conclusion 3.** There is no overarching AMR management team or structure coordinating the entirety of FAO's work on AMR. FAO has relied heavily on the dedication of voluntary members of the AMR Working Groups (AMR-WG) for internal coordination and knowledge sharing. This is not reflective of the ambitions of FAO's current plan and even less so of its role in tackling AMR and the seriousness of the issue. Over the course of the evaluation, FAO's growing commitment to tackling AMR was observed, however, a multidisciplinary approach that sets out the role of all relevant divisions and offices at both headquarters and regional levels is not yet evident.
- **Conclusion 4.** FAO's work on AMR remains aligned with its Tripartite responsibilities and is guided by the WHO-led Global Action Plan (GAP) on AMR. There has been close normative cooperation between the three organizations and closer collaboration is evolving at implementation level through the strengthening of the AMR Multi-Partner Trust Fund (MPTF) mechanism, the Tripartite AMR workplan and the Tripartite monitoring and evaluation (M&E) framework. The recent United Nations Environment Programme's (UNEP) collaboration with the Tripartite organizations on AMR is a positive sign and an important step towards a true One Health approach. However, further opportunities remain for FAO to strengthen its role in the food and agriculture sectors and for closer collaboration.
- **Conclusion 5.** Beyond the Tripartite, FAO has played a strong role in coordinating and collaborating with a wide range of actors on AMR and is making a good effort to broaden its partnering network. However, at all levels, greater systematic coordination with national, regional and global actors is required, along with the engagement of stakeholders along the food and antimicrobial value chains. Furthermore, a clear understanding of all key stakeholders' roles linked to AMR is needed for greater efficiency.

- **Conclusion 6.** FAO's technical expertise is one of its key comparative advantages in its work on AMR. It is underpinned by the strong scientific basis for FAO's work, engendered in its personnel on AMR-WG and supported by its collaboration with research centres, universities and the Tripartite organizations. FAO's recent scientific publications on AMR have been reviewed by a panel of AMR experts established for this evaluation and were found to be of consistently high relevance and quality. FAO's online repository has been a trustworthy source of information on AMR in food and agriculture. The model used by FAO to generate its scientific knowledge for the work on AMR is strong and can be replicated in other areas of FAO's work.
- **Conclusion 7.** Because of the multidisciplinary nature of AMR and the close connections between animal, environmental and human health, a One Health approach is necessary at all levels. Even though there are some promising examples of the approach being advocated by FAO in its work with government counterparts, it has not been able to demonstrate a true One Health approach internally or through its work with the wider array of stakeholders.
- **Conclusion 8.** Through the FAO-AP, FAO has delivered a substantive programme of work in the food and agriculture sectors. It has implemented AMR activities in 45 countries and provided support on AMR National Action Plans (NAPs). The four focus areas of the FAO-AP are strongly interrelated, and it made sense to address them in parallel. The activities and outputs of each focus area are essential to building a strong foundation for future AMR work. Nevertheless, these have shown limited results in achieving optimal antimicrobial use (AMU). A comprehensive, strategic approach would increase the likelihood of achieving results on combating AMR.
- **Recommendation 1.** FAO should prioritize its work in a long-term strategy on AMR that recognizes the seriousness of the threat and is fully integrated into the Organization's Strategic Framework. The strategy should set out FAO's long-term role in combating AMR and that of its divisions, centres and offices, as well as its approach at country and regional level. It should be based on analyses of FAO's comparative advantages and AMR risks along the relevant value chains, while identifying key partnerships and stakeholders at all levels. It further needs to be underpinned by a theory of change that clarifies the links between its activities and expected goals. The strategy should consider how FAO intends to engage on issues of One Health and gender, also based on suitable analyses. The strategy should set targets and outcome-based indicators to measure progress and achievements.
- **Recommendation 2.** Reducing the global threat of AMR is a substantial task and FAO has the mandate for the food and agriculture sectors, which requires strong leadership and advocacy at all levels. To achieve this, FAO should consolidate its work on AMR through a strong programmatic approach with a central coordination and management structure that links with the regional offices and is supported by dedicated core funding over the next biennium. The multidisciplinary approach should be strengthened to fully take into account all of FAO's core technical areas and their connections to AMR. This would give FAO greater visibility on its AMR role and show its commitment to AMR risk reduction.
- **Recommendation 3.** FAO should sustain and strengthen its scientific approach to AMR at all levels, through greater engagement with the AMR-WG, an enhanced role for the Reference Centres in supporting AMR work at all levels, and broader scientific collaboration.
- **Recommendation 4.** In order to make progress on the focus areas, FAO should consider innovative approaches that acknowledge existing resource and socio-economic constraints hindering behavioural change and hampering commitment to combat AMR across value chains.

- Full evaluation report and annexes are available on the FAO website and can be accessed here.

GUIDANCE SOUGHT FROM THE PROGRAMME COMMITTEE

- The Programme Committee is invited to review the contents of the document and provide guidance as deemed appropriate.

Contents

1. Introduction

1. This evaluation aims to provide accountability for the Food and Agriculture of the United Nations' (FAO) engagement in combatting antimicrobial resistance (AMR), as well as on results of FAO's AMR work, keeping in sight that FAO's work is relatively recent and contributes to long impact pathways. It seeks to trace the contribution of its work and assess results to date at the global, regional and national level. It draws lessons from implementation processes that could inform future decisions by programme teams, donors, FAO Senior Management, FAO Governing Bodies, national governments and the Tripartite organizations on FAO's role in the international AMR architecture.

2. The conclusions and recommendations will complement FAO's new plan on AMR and contribute to the development of FAO's new Strategic Results Framework, as well as inform FAO's work on AMR in the future. It focuses on FAO's work on AMR from 2015 to mid-2020. It covers both programmatic and operational aspects and examines the technical capacities of the divisions and offices involved in the AMR Working Group (AMR-WG), as well as regional and national capacities. It looks at FAO's internal structures to ensure they are appropriate to the aims of its AMR Action Plans. This is particularly important, as FAO's work on AMR spans multiple centres, divisions and offices globally.

3. There are three dimensions to the evaluation: (1) FAO's role in the global AMR architecture; (2) the organizational and institutional set-up of FAO's AMR work; and (3) FAO's effectiveness in achieving overarching results, such as supporting countries in reducing or optimizing the use of antimicrobials to address AMR. The latter includes a range of outputs and outcomes as per the four focus areas of the FAO Action Plan (FAO-AP): (1) improve awareness on AMR and related threats; (2) develop capacity for AMR/antimicrobial use (AMU) surveillance and monitoring; (3) strengthen governance related to AMU and AMR; (4) promote good practices and the prudent use of antimicrobials, in the food and agriculture sectors. The evaluation focuses on key criteria of relevance, internal and external coherence, likelihood of effectiveness and results, efficiency, sustainability of results and whether gender, the One Health approach and monitoring and evaluation (M&E) have been sufficiently incorporated into FAO's AMR work.

4. The evaluation team used a mixed-methods approach and triangulated evidence to validate its analysis and support its conclusions and recommendations. The first of a two-phased approach assessed FAO's AMR work at the global level, while the second explored FAO's work at the regional and country level. The team conducted an in-depth review of relevant documentation, key informant interviews with internal and external stakeholders, five country case studies (Armenia, Peru, Ukraine, Viet Nam and Zimbabwe) and a global survey of all countries involved in FAO's AMR work.

5. It also engaged a multi-disciplinary and multi-sectoral panel of AMR experts, to provide an assessment on the scientific quality of FAO's publications and of the FAO-AP, as well as of the technical soundness of the evaluation report. The experts were from international organizations, research institutions, academia and the private sector. The evaluation also

made use of national data collected for the Evaluation of FAO's Emerging Pandemics Threats Programme – Phase II (EPT2), which covered a key project on AMR.

1.1 Context

6. AMR refers to the ability of a microorganism[1] to survive in the presence of an antimicrobial compound, causing once-effective treatments for disease in humans, animals and crops to lose efficacy or become ineffective. This reduces our ability to treat infections, resulting in increased mortality, more severe or prolonged illnesses, losses of agricultural output and, ultimately, reduced livelihoods and food security. Antimicrobial-resistant microorganisms can move between animals, plants and humans by direct exposure or through the food chain and environment (WHO, 2017). Even if used responsibly, unwanted residues can persist in animal-sourced products and animal waste, contaminating the environment. Between 75 and 90 percent of antimicrobials used in livestock are excreted, mostly unmetabolized (FAO, 2020a).

7. AMR is a major global threat to human and animal health and of increasing concern to plant health (Review on Antimicrobial Resistance, 2016). It has implications for both food safety and food security, and the economic wellbeing of millions of farming households. It requires a multidisciplinary and multisectoral approach spanning humans, terrestrial and aquatic animals, plants and the environment. This is where FAO's technical expertise comes in.

8. The 127th Session of the Programme Committee noted the need to raise the visibility of FAO's AMR work at all levels, and for an AMR indicator in the Strategic Results Framework. It also encouraged FAO to maintain its alliance with the World Organisation for Animal Health (OIE), World Health Organization (WHO) and, more recently, with the United Nations Environment Programme (UNEP) to combat AMR.

9. FAO's main activities on AMR started in 2015 with its contribution to the development of the Global Action Plan (GAP). From this, the FAO-AP was developed. Its aim was to minimize the impact of AMR by implementing the GAP (FAO, 2016). FAO works with OIE and WHO through the Tripartite initiative to share responsibilities and coordinate global activities to address health risks at the animal-human-ecosystem nexus (FAO, OIE and WHO, 2020). It is also working more recently with UNEP on the environmental impact of AMU.

10. FAO's activities span multiple units and have been coordinated by the interdepartmental AMR-WG, which reports to the Chief Veterinary Officer. The group brings together personnel from the Animal Production and Health (NSA) Division, the Land and Water (NSL) Division, the Plant Production and Protection Division (NSP), the Fisheries (NFI) Division, the Legal Office (LEG), the Secretariat of the International Plant Protection Convention (IPPC), the Office of Communications (OCC), the Food Systems and Food Safety (ESF) Division, the Secretariat of the Codex Alimentarius Commission, the Joint FAO/International Atomic Energy Agency (IAEA) Centre and Strategic Programme teams SP2 and SP4. The FAO Regional and Subregional Offices each have an officer assigned to it (COAG, 2016)

[1] Bacteria, fungi, viruses and parasites.

and FAO Liaison Offices are also represented. There is a regional AMR-WG in the Regional Office for Asia and the Pacific, while some Country Offices also have AMR officers.

1.2 Project portfolio

11. FAO's work on AMR up to early 2020 was largely implemented through 12 donor-funded projects and 6 Technical Cooperation Programme (TCP) projects. The projects were primarily funded by the United Kingdom of Great Britain and Northern Ireland (the Fleming Fund), the United States Agency for International Development (USAID), the Norwegian Agency for Development Cooperation (NORAD) and the Russian Federation. Since February 2020, the European Commission has funded FAO's work on AMR through a project in Latin America and the Caribbean. The United Kingdom of Great Britain and Northern Ireland, the Netherlands and Sweden have also contributed through the AMR Multi-Partner Trust Fund (MPTF) for Tripartite activities. FAO has recently partnered with Mars Incorporated to expand its work on AMR. The TCP's AMR work done through the Codex Alimentarius Commission,[2] and selected activities in the Near East and North Africa and in West and Central Africa are funded through small contributions from the core budget.

12. The total budget for FAO's AMR activities up to April 2020 was an estimated USD 28 million.[3] Around 40 percent of contributions for FAO's AMR work were from a single project (GCP/GLO/710/UK), but multiple donors are committing to future work on AMR, mainly for joint Tripartite activities through the AMR MPTF. Most of the AMR projects are ongoing and constitute around 90 percent of funding. Although projects have been implemented in 45 countries, AMR activities are concentrated in Africa and South and Southeast Asia, in line with Fleming Fund and USAID funding. Figure 1 maps the coverage of FAO's AMR projects.

[2] Codex normative work is also partly funded by WHO. Specific work on foodborne AMR is funded by the Republic of Korea (which hosts the Ad Hoc Codex Intergovernmental Task Force on AMR).
[3] Excluding AMR MPTF contributions. Insufficient information on precise contributions from the Global Health Security Agenda (GHSA) project and core funding.

Figure 1: Geographic coverage of FAO's AMR projects[4]

13. 

14. 

Source: Mapping based on FAO's AMR project documents

15. These projects are implemented by teams at all levels. In some countries, projects are led by the Emergency Centre for Transboundary Animal Diseases (ECTAD), the joint platform of NSA and the Office of Emergencies and Resilience (OER). Major AMR activities at headquarters include: work to develop methodologies for analysing AMR legal frameworks; the operation of AMR tools, such as the FAO Assessment Tool for Laboratories and Antimicrobial Resistance Surveillance Systems (ATLASS) and the Progressive Management Pathways (PMP); and regulatory work through the Secretariat of the Codex Alimentarius and the IPPC. At regional and national level, a range of activities supports the preparation and implementation of National Action Plans (NAPs) in line with the FAO-AP. There are also initiatives that promote national multisectoral One Health coordination. FAO is also working to establish a global network for its work on AMR. Five institutions have been dedicated so far as FAO Reference Centres for AMR.

[4] Countries part of the individual ATLASS trainings and recent project set up after the finalization of the evaluation terms of reference are not included in this map.

2. Findings

2.1 Relevance of FAO's role and work on AMR

2.1.1 Relevance of FAO's role in the overall AMR architecture

16. AMR risk is outpacing human population growth, owing to increasing consumption and budget for meat and other animal products, the intensification of livestock production and the widespread use of antimicrobials in animals and humans (McKenna, 2015; Van Boeckel *et al.*, 2015; WHO, 2020). AMR-conferring genes have been found in bacteria isolated from foods of plant origin, possibly contaminated through soil, water, insects, animal intrusion, manure and human handling (FAO, 2018b). The COVID-19 pandemic has exacerbated the threat (JPIAMR, 2020). To maintain antimicrobial efficacy, therefore, an immediate, coordinated multisectoral and multidisciplinary approach is needed.

17. AMR is also a serious global challenge for food security and sustainable development, and is directly linked to various Sustainable Development Goals (SDGs). This makes it a highly relevant topic for FAO and for key technical divisions in its Natural Resources and Sustainable Production Stream, including Forestry (NFO), Plant Production and Protection (NSP), the Development Law Branch (LEGN) of LEG, NFI, NSA, NSL, , as well as ESF.

Finding 1. FAO has a strong track record of collaborating with key international organizations working on AMR, notably through the Tripartite agreement. Global collaboration on AMR has increased since 2014, with FAO's contribution to the development and adoption of the WHO-led GAP. The development of the FAO-AP, aligned with the GAP, has reinforced its role in combating AMR within the Tripartite. FAO's increasing work on AMR coincides with the rise in potential challenges associated with AMR.

Finding 2. FAO has a strong mandate for its global work on AMR in the food and agriculture sectors, as confirmed by the United Nations General Assembly, FAO's partners and Members.

18. Since at least 2000, FAO has collaborated with OIE and WHO in developing a joint approach to combating AMR, as seen in the reports produced and meetings organized by the three organizations. Through such collaboration and the 2015 GAP, OIE and WHO continue to recognize FAO's role in the global AMR architecture.

19. FAO's mandate on AMR has been underpinned by the United Nations General Assembly and other global and regional forums. A high-level meeting of the General Assembly on AMR in 2016 reaffirmed the GAP as the blueprint for tackling AMR, as well as FAO's key role in it (United Nations General Assembly, 2016). The African Union and European Union work closely with FAO to support its AMR work. International and regional financial and policy institutions, such as the World Bank, the Organisation for Economic Co-operation and Development (OECD) and the World Economic Forum, have highlighted the threat posed by AMR and FAO's importance in addressing it (World Economic Forum, 2013; World Bank, 2017; OECD, 2018).

20. Importantly, FAO Members endorse its role in the global effort against AMR (FAO, 2015), recognizing that it is better placed to work on AMR in food and agriculture than any other

organization. There is also widespread trust in FAO based on its mix of technical strength, ability to respond to and assist in emergencies, capacity building and neutrality.[5]

Finding 3. FAO has comparative technical and organizational advantages in delivering a broad programme of work on AMR, with expertise in key sectors associated with food and agriculture and a strong global presence. This is clear in its Tripartite collaboration, close working relations with national governments and regional organizations, and its ability to influence policy change. However, FAO's focus on certain countries does not align fully with the scale and importance of AMR issues. FAO's AMR work is also very much centred on animal health, food safety, aquaculture and regulatory frameworks. While the focus is understandable given their relative importance on AMR, other sub-sectors need to also be fully engaged. At country level, FAO's comparative advantage has in some cases been diminished by the presence of other development actors with a strong local presence.

21. FAO has a strong record of achievement in animal and zoonotic disease control, plant disease and pest control, aquaculture and food safety, all of which are components of the One Health approach. It has pragmatically joined with OIE to establish the Global Framework for the Progressive Control of Transboundary Animal Diseases (GF-TADs) and in forming ECTAD, an operational unit that provides rapid support for animal disease emergencies in Africa and Asia. National ECTAD units have been implementing projects on emerging zoonotic diseases, collaborating closely with OIE and WHO (USAID, 2019). These projects have key parallels with FAO's AMR work: building the capacity of government laboratories, supporting national surveillance systems and enhancing One Health collaboration at national and subregional level. FAO's Progressive Management Pathway for AMR approach (PMP-AMR)[6] is partly modelled on the Progressive Control Pathway for Foot-and-Mouth Disease developed by FAO and the European Commission for the Control of Foot-and-Mouth Disease.

22. FAO has a long history of collaborating with national authorities on a range of issues. In some cases, FAO is based in ministerial departments for closer coordination. Similarly, at the regional level, FAO has collaborated with a large number of regional organizations, enabling it to work closely with government counterparts on AMR NAPs, AMU regulations and other key AMR areas.

23. FAO's technical disciplines cover most, if not all, elements of the food and agriculture sectors. It also has access to additional technical skills through its participation in the former Joint FAO/IAEA Division of Nuclear Techniques (now a Joint Centre between the two organizations), the Secretariat of Codex Alimentarius and the Joint FAO/WHO Food Standards Programme. However, not all disciplines/units have been fully engaged on AMR and FAO's AMR technical capacities are predominantly in animal health and production, followed by aquaculture and food safety. For all other areas, the evaluation team found

[5] As covered in recent FAO evaluations (FAO 2019a; 2019b) and AMR survey results.

[6] The FAO PMP-AMR guides Members in putting their NAPs into action. Its progressive approach enables specific sectors to make step-by-step improvements towards the sustainable use of antimicrobials and the management of AMR.

limited technical capacity on AMR. Projects and activities by other departments have mostly relied on temporary capacity or external alliances.

24. FAO's presence in 136 countries gives it extensive, but not comprehensive, outreach. A limited number of countries have been covered by FAO's work on AMR in the Near East and North Africa, while its presence in Latin America and the Caribbean and other areas does not always coincide with the level of AMR threat. Regional initiatives have accommodated some components of FAO's work on AMR. This is important, especially due to the transboundary nature of AMR. Furthermore, FAO's level of engagement on AMR depends largely on extrabudgetary project resources, hindering programmatic coordination on AMR at regional level.

2.1.2 Relevance of the approach and design of FAO's work on AMR

Finding 4. The main mechanism for delivering FAO's work on AMR is the FAO-AP. Its four main focus areas are consistent with the GAP and provide a strong basis for future AMR work. However, regional and country personnel were not very involved in its development and there is an insufficient focus on the One Health approach, implementation pathways and the broader AMR context. Furthermore, the lack of a FAO strategy setting out the Organization's long-term AMR goals has hindered consistent, sustained programming and a full multidisciplinary approach across the food and agriculture sectors.

25. FAO's AMR work and the FAO-AP are consistent with the GAP, which is based on core issues crucial to managing AMR risk. The GAP guides the work of FAO and OIE, setting out their working relationship and the division of labour on AMR in livestock. This has led to greater clarity on roles and responsibilities within the Tripartite and across key organizations. The FAO-AP also targets the foundational AMR work required on developing multisectoral NAPs on AMR for all countries. These are the main tools for delivering the activities and outputs required to reduce the AMR threat at country level. The Tripartite organizations are responsible for ensuring that their respective mandated areas of the GAP are fully incorporated into functioning NAPs for AMR.

26. The FAO-AP specifically addresses the needs of the food and agriculture sectors. Its four focus areas stem from the GAP objectives, providing consistency with the Tripartite AMR approach: (1) improve awareness of AMR and related threats; (2) develop capacity for surveillance and monitoring of AMR and AMU in food and agriculture; (3) strengthen governance on AMU and AMR in food and agriculture; and (4) promote good practices and the prudent use of antimicrobials. The FAO-AP is a lucid, well-presented document and has been a successful project design template.

27. The FAO-AP is deemed highly relevant at regional and country level, with close ties to the GAP and the primary objective of establishing NAPs. However, interviews suggest that regional and country personnel had little to no involvement in its development. The external expert panel assessed its overall quality and relevance, giving it consistently high scores on both criteria. However, they did note some limitations. Some highlighted the lack of implementation pathways, with concrete actions and connections to outcomes. Others observed the need to place AMR in a broader context, take into account potential changes in global food production systems, conduct an overall risk analysis and acknowledge the roles of the pharmaceutical industry, animal production industry and citizen's associations.

28. Moreover, there is no FAO strategy on AMR to support the Action Plan, unlike OIE and WHO. The GAP contains significant strategic components that apply to all Tripartite members, but these are skewed more towards WHO and human health. By not having a strategy, FAO has missed an early chance to spell out its own vision on AMR and assess the commitment it needs to make in terms of capacity, resources and longevity.

29. The evaluation team did not see any evidence of a risk assessment or analysis of AMR carried out by FAO that could have contributed to better intervention targeting and design of the FAO-AP.

30. Its own strategy would allow FAO to have a more targeted approach to its work on AMR and address the concerns raised by the expert panel. The FAO-AP does not include consumers of food products, for instance, pressure from whom could bring about changes in producer behaviour.

Finding 5. The new FAO Action Plan for AMR 2021-2025 (FAO-AP2) enables the Organization to continue its present role and work on AMR. It addresses most of the key issues associated with the previous plan and is more comprehensive, with clear linkages to the SDGs, a detailed list of key activities, a results framework and monitoring indicators. However, it still needs to be situated within a broader long-term AMR strategy that outlines the Organization's approach at regional and country level. The plan does not sufficiently acknowledge the current needs of all sectors, including crops, soil and water, and food safety. Broadening the approach on AMR would allow FAO to redefine and reassert its role in the Tripartite and could prove more interesting to a wider pool of funding agencies.

31. The evaluation team reviewed the proposed new five-year AMR Action Plan, FAO-AP2 in the context of its broader findings on FAO's work on AMR up to the time of the plan's development. While still closely associated with the GAP, it is more comprehensive and ambitious than its predecessor, including a results chain and a detailed list of key activities. It suggests new methodologies and innovative aspects of work that were missing from the previous plan. For example, it emphasizes the need for value chain analyses, case studies and surveys, as well as the development of an economic justification for protecting food systems from the impacts of AMR. The evaluation team believes it to be highly relevant and part of the knowledge base required to inform awareness building, influence policy and, more importantly, shape AMR practices on AMU.

32. FAO-AP2 still needs to be situated within a broader longer-term AMR strategy. The FAO-AP2 clarifies the alignment of AMR with the SDGs, but does not outline AMR's positioning within FAO's broader divisional and departmental work. Nor does it include outcome-level indicators for results in line with the recently introduced monitoring and evaluation for the Tripartite. Similarly, it has a section on funding, but contains little or no details of funding sources.

33. While the new plan gives importance to the One Health approach and on extending AMR activities to cover food safety, crops, soils and water, it maintains the focus on animal health. With most antimicrobials, especially antibiotics, used in livestock and aquaculture, the focus seems appropriate, but the challenge for FAO is to step up AMR efforts in other sub-sectors to provide a complete One Health response to AMR.

34. FAO-AP2 also has limited clarity on the national and regional approach, FAO's role in relation to national partners and its internal coordination structure on AMR. It remains very much rooted in developing tools and guidelines, with similar outputs to those of the first FAO-AP. It still lacks a long-term strategy on how these tools and guidelines will be used for combatting AMR.

2.2 Coherence and alignment of FAO's work on AMR

2.2.1 Compatibility of FAO's AMR work with other interventions in the field

Finding 6. The GAP is a strong, unifying blueprint for Tripartite delivery. Other AMR actors, such as donor agencies and research institutions, have aligned with it. A 2019 Ad hoc Inter-agency Coordination Group (IACG) on Antimicrobial Resistance report flagged some concerns over and knowledge gaps in the overall delivery of AMR work (IACG, 2019). However, the Tripartite's recent drive for common management of its AMR work, with environmental contributions from UNEP, should strengthen the coordination of FAO's AMR work with that of other actors.

35. While there is some overlap of activities, evidence suggests that FAO and OIE are largely delivering complementary activities and outputs; FAO works with relevant authorities from country to farm level and OIE works to maintain and raise the standards of veterinary services, including AMU. FAO collects AMR data, while OIE's focus remains on AMU data based on national statistics. The Tripartite has developed essential mechanisms to coordinate its work on AMR, which should give the three organizations a reinforced structure that ensures coherence in their programmes of work (FAO, 2020b). The AMR MPTF should facilitate greater coordination between the Tripartite and UNEP.

36. The IACG fully supported the Tripartite's and, thus, FAO's work on AMR in its 2019 report. It stressed the need to accelerate the global drive against AMR and to step up the implementation of NAPs and activities. The report cited gaps in scientific knowledge on AMR and in implementation funding. The collective effort against AMR needs to be widened to include the private sector and to tie in with human, animal and environmental health programmes of work. The recommendations are an important advocacy tool for FAO's work on AMR and give direction for future priorities.

37. At regional level, for example in Africa, the Tripartite has aligned its AMR work with the Africa Centres for Disease Control and Prevention and the African Union. Duplication risk at national level is being mitigated by ministry-level coordination platforms involving Tripartite members and AMR stakeholders.

38. The international development agencies and non-profit organizations that work on AMR are generally funded through key donors, such as the Fleming Fund, NORAD and USAID. These agencies have carefully aligned themselves with the GAP, enabling their partners to do the same.

2.2.2 Links between FAO and the AMR scientific community

Finding 7. FAO has good ties with the AMR scientific community to ensure that its work is aligned with the rapidly evolving science, especially in animal health and food safety. However, much of its engagement with the scientific community has been through informal

mechanisms. There has been a conscious effort to formalize and systematize this engagement. FAO has also collaborated with the AMR scientific community to include research based on its work, some of which has been published in peer-reviewed journals.

39. The GAP was prepared after more than ten years of scientific consultation and is deemed scientifically sound. FAO's own work, especially the FAO-AP, closely follows the GAP, so it has the same scientific grounding. Codex regularly updates and revises its guidelines, standards and codes of practice on AMR, with substantial involvement by AMR experts outside FAO and WHO.

40. Within FAO, several permanent and seconded personnel in the Animal Production and Health (NSA) Division, Food Systems and Food Safety (ESF) Division and the Joint FAO/WHO Centre (Codex Food Standards and Zoonotic Diseases) are AMR specialists with strong scientific backgrounds and a network of personal contacts throughout the AMR scientific community. The latter has often led to projects and ties with outside centres of AMR expertise, such as the proposed collaboration on AMR between the Land and Water (NSL) Division, the Joint FAO/IAEA Centre and the University of Munich. Additionally, the AMR-WG, composed of experts from across FAO (including Regional Offices) provides opportunities to keep up to date with scientific advancements on AMR.

41. External funding has enabled Regional Offices to support research to generate evidence for interventions to tackle AMR, such as a mixed-methods ethnographic research project funded by the Fleming Fund in five African countries (Caudell *et al.*, 2020). The Joint FAO/WHO Scientific Advice Programme works with experts to review and assess scientific information to provide advice for the standard-setting work of Codex on AMR. The evaluation team considers such work and the ensuing publications to be positive examples of FAO's scientific leadership in the field of AMR.

42. To date, FAO has recognized five Reference Centres for collaboration and the provision of scientific expertise on AMR: three in Europe, one in North America and one in Asia. They offer an array of skills and knowledge crucial to FAO-AP's focus on surveillance, including diagnostics, sampling and surveillance methods, genotyping and phenotypic characterization, and other analysis.

43. Closer collaboration and better communication between FAO and its network of Reference Centres, other research and development institutions and Members would help accelerate research into a number of areas where there are gaps in the scientific knowledge on AMR. With limited resources, it will be important that activities and outputs can be focused on high-risk situations that have been identified through scientifically sound risk assessments. FAO can be a strong catalyst in promoting this research and using its outputs to inform policymaking.

2.2.3 Alignment of FAO's AMR activities within FAO

Finding 8. Although the FAO-AP for AMR aimed to operate 'within the parameters of the FAO Strategic Objectives', the evaluation team has found no evidence that this was effectively achieved. It did prove a positive stimulus for closer interdepartmental coordination, especially the ad hoc interdepartmental AMR-WG. However, evaluation research suggests that all relevant divisions and departments still need to be fully aligned through greater internal coordination and awareness of AMR.

44. The FAO-AP's links with the FAO Strategic Framework, programmes and objectives have changed over time, though a lack of clarity remains. For example, the plan does not say in which strategic objectives AMR should be embedded. Interviews with FAO personnel indicate that FAO's AMR work is not widely deemed to be fully embedded in the Strategic Framework. This was considered a sign of FAO's limited commitment to combating AMR and a serious disadvantage when it came to the allocation of regular budget funding to it.

45. The FAO-AP and other high-level FAO documents acknowledge AMR as a cross-cutting issue requiring a multidisciplinary solution and a One Health approach, but application across the Organization has been slow. The 2011 FAO Strategic Action Plan for One Health was very animal health-focused and failed to mention AMR as one of the most important candidates for this approach (FAO, 2011). With hindsight, this was a missed opportunity.

46. FAO has been addressing other cross-cutting issues, such as climate change and ocean management, through specific multisectoral programmes, but has not yet approached AMR in the same way. At the decentralized level, there is evidence of collaboration between ECTAD, Food Systems and Food Safety (ESF), and Fisheries (NFI) on issues such as antimicrobial residues and guideline development. Still, a full One Health AMR approach that includes plant health, forestry, soils and water remains nascent.

2.3 Effectiveness of FAO's work on AMR

2.3.1 Results achieved so far

Finding 9. FAO has played a major role in developing and implementing NAPs on AMR along with OIE and WHO,[7] helping to set in motion or strengthen work on AMR at national level. However, overall NAP implementation and multisectoral collaboration on AMR remain a challenge. FAO has, therefore, developed useful tools and supported national One Health coordination units. There has been an increase in multisectoral coordination on AMR, but the tools are recent introductions, and it is too early to assess their effectiveness.

47. FAO has supported the development and implementation of cross-sectoral NAPs on AMR, publishing a joint Tripartite manual for their development and providing technical assistance to national ministries focusing on food and agriculture. The Tripartite AMR Country Self-Assessment Survey (TrACSS) has been central to their monitoring. There was a significant rise in the number of NAPs between 2016 and 2020, from 79 countries in 2016-17 to 120 in 2019-20 (FAO, OIE and WHO, 2018b). The increase cannot solely be attributed to Tripartite support, but the plans are still an important first step in tackling AMR and form a strong basis for future work at national level (WHO, 2015; IACG, 2019).

48. Even though 120 countries had developed a NAP as of 2019-20, only 23 percent identified funding sources, involved relevant sectors and created a defined M&E process (FAO, OIE and WHO, 2018b; Orubu *et al.*, 2020). The evaluation team identified similar implementation challenges in the country case studies. A lack of resources has been a

[7] Beyond the 45 countries with FAO AMR projects, FAO has supported the development of NAPs with OIE and WHO through its existing capacities in animal health and production in countries such as those covered by the Regional Office for the Near East and North Africa.

recurring issue hampering the implementation of NAPs, along with limited or insufficient expertise on AMR within national ministries.

49. FAO's role in strengthening national One Health platforms was underscored by the results of the global survey conducted for this evaluation, where 20 percent of government counterparts cited FAO's work as the most important contribution to tackling AMR. The TrACSS survey also indicated the growing involvement of sectors such as environment, plant health and food safety. However, the gap between these sectors and human and animal health remains significant.

50. FAO has lent additional support to get NAPs up and running, developing tools, such as the PMP-AMR, to support countries through improvements for sustainable AMU and managing AMR (FAO, 2021). A similar approach has been designed for aquaculture biosecurity (PMP-AB) (FAO, 2018b). The evaluation team found the tools to be comprehensive, but it is still too early to assess the results.

Finding 10. FAO's activities have helped to improve awareness of AMR (focus area 1) among national stakeholders. Its activities have been guided by baseline surveys to ensure their suitability. However, direct users of antimicrobials and those who consume products grown using them have not been targeted at scale. To optimize AMU, these groups must be systematically engaged. The FAO-AP2 includes activities focused on behavioural change and involving civil society – critical to achieving results in this focus area.

51. FAO has increased awareness of AMR by supporting the development of awareness-raising components of the NAPs and by working directly with key stakeholder groups, such as farmers, veterinarians and extension workers. In several countries, FAO has supported the setting up of regional and national multisectoral One Health platforms that have been instrumental in raising awareness of AMR among national governments and increasing stakeholder coordination.

52. FAO has supported the development of national communication strategies in selected countries, following a One Health approach. It has provided guidelines for the development of messages, selection of channels and targeting of priority audiences. FAO has conducted good-quality AMR risk communication training with government officials at regional level; and also targeted veterinary students and veterinarians, including work on national veterinary curriculums.

53. FAO's awareness raising work has been underpinned by stakeholder knowledge, thanks to the use of surveys and other baseline studies to assess stakeholder preferences for guidance and targeted advocacy materials. FAO has also conducted knowledge, attitudes and practices (KAP) surveys on AMR in seven countries in sub-Saharan Africa and three in Asia, tailoring its activities accordingly.

54. Despite FAO's work, awareness levels remain low among those who use the antimicrobials. Of the five country case studies, only Viet Nam and Zimbabwe had substantially engaged with farmers on AMR. In Viet Nam, farmers also received competing and non-compatible information from other channels including drug suppliers. The overall result on sustainable AMU was found to be low. Farmers were also not knowledgeable on the transmission of AMR between humans, animals and the environment. Moreover, there was a lack of consumer engagement in FAO's AMR awareness-raising activities, as well as little focus on

the economic burden of AMR. Only in Viet Nam, FAO has worked with WHO to raise awareness of AMR in livestock among the general public. Stronger economic arguments for responsible AMU are envisaged in FAO-AP2.

55. Translating awareness raising into changes in farming practices is key to optimal AMU. The KAP study in Viet Nam noted that farmers were aware of AMR, but that this did not lead to lower AMU, as they rely on antibiotics for livestock productivity (Pham-Duc *et al.*, 2019). FAO has been addressing this through activities that utilize behavioural insights, but this is still early stage and relies entirely on extrabudgetary funding. FAO-AP2 also promotes behavioural insights and consumer involvement to change practices.

Finding 11. FAO has developed and successfully rolled out its tool for assessing in-country AMR surveillance capacity (focus area 2) and, where funding has allowed, worked to improve national capacity. Active AMR surveillance remains a challenge, however: in most countries, FAO's work is not generating the quality data needed to build evidence. Also, while some pilot surveillance projects have been implemented across the One Health spectrum, including in fisheries, environment and food safety, most are focused on livestock and poultry. Scaling up support for a comprehensive One Health approach to surveillance systems that produce quality data on AMR at national levels is an urgent challenge for FAO.

56. FAO's work in focus area 2 is crucial for generating evidential data for stakeholders on the risks associated with AMR and the need to change AMU practices. It mainly involves collecting data on AMR by improving national laboratory capacity and supporting integrated surveillance systems.

57. As of September 2020, FAO had conducted baseline ATLASS missions in 28 countries, in more than 100 laboratories. The mission reports form the basis of targeted training and the prioritization of activities to strengthen national laboratory and surveillance capacity. The ATLASS reports belong to the countries concerned and are confidential, so could not be used for this evaluation. The few reports the evaluation team could review were found to be comprehensive, with a clear focus on technical issues and actionable short- and medium-term recommendations.

58. To scale up its ATLASS work and to harmonize surveillance, FAO is building a global community of assessors to serve as a technical resource at country and regional level. Expert training events in Africa and Asia have been designed to target national needs and include the development of technical capacity on molecular techniques for AMR surveillance and assessment. FAO's ATLASS work has been conducted in close collaboration with national networks and organizations, as well as through the Tripartite, and is supported by the Fleming Fund, the Russian Federation and USAID. Strengthening laboratory and surveillance capacity is a key focus of regional and country projects.

59. To manage and disseminate the data on AMR collected through in-country surveillance, FAO is developing an AMR data platform, building on the Regional Office for Asia and the Pacific's (RAP) successful adaptation of WHO's WHONET software to ensure harmonization of data collection through integrated surveillance. A major constraint on the development of such databases is access to national AMR data. Interviewees said countries may be reluctant to share data because of potentially significant implications for trade. An alternative is being explored, whereby countries could report national surveillance data

confidentially to the platform and publicly through aggregated regional reports to ensure anonymity.

60. Even though FAO has strengthened laboratories through its ATLASS missions and capacity building initiatives, active AMR surveillance is still nascent in most countries. More needs to be done on standardisation and harmonisation routine testing and reporting to generate the evidence needed. Globally, there is a lack of AMR surveillance in the food chain and limited laboratory capacity. Also, much of FAO's support for AMR monitoring and surveillance has been focused on terrestrial animals. FAO AMR surveillance of crops and environment was found to be very limited in all five case study countries, except for Zimbabwe, where FAO is collaborating with WHO on environmental surveillance. OIE and WHO are also integrating surveillance activities in Indonesia, but surveillance across the One Health spectrum still needs to be harmonized.

Finding 12. FAO has provided substantial governance support (focus area 3) to countries involved in its work on AMR, for example, through legal assessments and assistance to policymakers, following a multisectoral and One Health approach. However, for FAO to contribute to optimal AMU, the assessments need to spur changes in legislation. Greater support for regulatory enforcement is also required. Nonetheless, the evaluation team deems this work a key preparatory step towards reducing AMR at country level.

61. Focus area 3 revolves around analysis and support for the better integration of AMR into national policies, institutional and legal frameworks. FAO has assisted in developing and improving national legislation to strengthen the governance of AMU. Some of this work has been done together with OIE and is seen as a good example of collaboration between the two. It also ties in with other work carried out by FAO on setting international reference standards and good practices, in particular, its support for the standard-setting work of the Codex Alimentarius Commission and IPPC, and the development of the International Code of Conduct on Pesticide Management with WHO.

62. FAO's Development Law branch (LEGN) works with national legal consultants to assess countries' AMR legal frameworks, detecting gaps in legislation and contributing to the governance components of AMR NAPs. The assessments have added further value by increasing policymaker interest in AMR issues and encouraging them to strengthen legislation. In most countries, these preliminary assessments have led to FAO and OIE collaborating with host countries to develop new laws. In Ukraine, the new laws, which are currently being adopted by the Parliament, were considered an essential first step for implementing the country's NAP.

63. Though stakeholders consider FAO's work in this focus area to be an essential step towards AMR reduction, awareness and enforcement of new regulations must be improved for it to make a real contribution. FAO has only supported regulatory enforcement in one of the five country case studies, so it is too early to fully assess the impact of this work.

Finding 13. FAO has developed important AMU guidelines and conducted outreach activities for farmers on AMR, supported by other FAO projects promoting biosecurity and good farming practices (focus area 4). In two countries analysed, FAO's activities have been successful in fostering a better understanding of AMR, though there was limited evidence on their effectiveness in reducing AMU. Moreover, given that the work on raising awareness and generating evidence is still in its early stages of delivery and the work on governance

requires support on enforcement, there is limited drive for changes in farming practices and AMU. Building economic arguments for AMR reduction and work on alternatives to AMU are deemed critical to achieving future results in this focus area.

64. Focus area 4 is closely linked to the first three focus areas, all of which are designed to prompt producers to engage in better farming practices and support the prudent use of antimicrobials. FAO's activities in focus area 4 have consisted of support for the research and development of AMU guidelines and farmer outreach activities.

65. FAO has tailored its approaches to the context and socio-economic aspects of AMU, conducting or commissioning studies into how farmers perceive AMR and what they consider important for changes in AMU (Caudell *et al.*, 2020; Pham-Duc *et al.*, 2019). The KAP reports are a major element of this work and are used in awareness raising (focus area 1). They have been conducted in close collaboration with national stakeholders, such as the International Cooperation Centre of Agricultural Research for Development (CIRAD) in Cambodia, and the College of Veterinary Medicine and Agriculture of Addis Ababa University.

66. FAO has been supporting work to develop AMU guidelines and production practices and to provide associated training. For example, guidelines on prescribing antimicrobials and good husbandry practices are at various stages of development in Cambodia, Ethiopia, Ghana, Kenya, the Lao People's Democratic Republic, Sudan and Viet Nam. FAO has been working on uptake of these practices and AMU guidelines through its farmer field schools (FFS) and direct farmer training. FAO's other projects to promote prevention and control, biosecurity and good farming practices have reinforced its work in this focus area.

67. All farmers interviewed in Viet Nam and Zimbabwe who took part in FAO training have applied biosecurity measures and reported fewer clinical diseases in their enterprises, reducing the need for therapeutic AMU. However, in both countries, they have continued to use antimicrobials for preventive use. The unavailability of suitable vaccines or their high costs compared with antimicrobials might explain such use. As part of the Fleming Fund grant to Zimbabwe, implemented by an FAO-led consortium, vaccine production for East Coast fever in cattle is set to increase, with the aim of reducing reliance on antibiotics. Overall, the evaluation team found only limited evidence that FAO had engaged with vaccine producers to boost availability and affordability for small-scale farmers.

68. Information analysed by the evaluation team suggests that switching livestock production systems from high dependency on antimicrobials to prudent AMU can incur significant initial costs, depending on the practices adopted. This makes it even more difficult for small-scale producers to change practices (Carminati, 2020; Osbjer, 2020). FAO's work through the KAP studies in Africa and Asia confirm that most farmers are reluctant to try new techniques without a guarantee of economic viability (Caudell *et al.*, 2020; Pham-Duc *et al.*, 2019). Consequently, economic justification for a reduction in AMU and/or the engagement of consumers are factors that could contribute to effectiveness in this focus area.

2.3.2 Quality of FAO's AMR publications

Finding 14. FAO's publications on AMR are an important output of its overall work. These provide a scientific basis for FAO's AMR activities and technical advice to its stakeholders.

The expert panel believes its publications to be relevant and of good quality, especially those by the Regional and Country Offices. Still, given the evolving nature of the AMR threat, FAO needs to continue to engage with its partners across the One Health spectrum on scientific and technical work and regularly update its publications.

69. One of FAO's significant outputs on AMR is technical advice in the form of guidelines, manuals and good practices. FAO has been collaborating more with the Tripartite organizations, universities and research centres to boost its scientific base. Its total number of publications on AMR has risen significantly since 2015, coinciding with the development of the FAO-AP. However, this has largely been led by publications on AMR in animal health and production. Reports on AMR in aquaculture or in relation to food safety have been consistent over the years, whereas reports on AMR in plants and the environment are fewer and more recent.

70. Based on the analysis of the expert panel review, FAO's AMR publications were relevant to their subject areas and of good quality, with the potential to inform policymakers and lay the foundation for future AMR activities. Publications based on the KAP surveys, or characterizing the structure of national livestock or aquaculture production systems were deemed important to gaining a better understanding of AMU and AMR. The experts also valued recent publications on AMR issues in the environment. However, they also suggested a broader approach, to engage with the pharmaceutical and animal production industries, citizens associations and changes in global food production systems. Similarly, they stressed the need to take into account socio-economic and national contexts for a holistic view on AMR issues. Greater coordination between FAO headquarters, Regional and Country Offices in developing these publications could improve their relevance. Moreover, emphasis needs to be placed on regularly updating the information available in FAO's online repositories.

2.4 Partnerships

Finding 15. Because of the need for a One Health approach on AMR, strong partnerships are pivotal to its success. FAO has increasingly engaged with partners on AMR and plans to do more, such as strengthening its Tripartite collaboration through the Joint Secretariat and MPTF mechanism, its work with UNEP and the FAO Reference Centres for AMR. However, these are all relatively new or still being formalized. Within the Tripartite, thanks to its broad mandate, there are opportunities for FAO to play a greater role in food and agriculture. Outside the Tripartite, there are actors across the antimicrobial lifecycle and in the food value chains with whom FAO should systematically engage to enhance its work on AMR.

2.4.1 FAO within the Tripartite

71. FAO's key partnerships on AMR at global level have been with the Tripartite organizations, supporting countries in conducting situational analyses and in developing and implementing their NAPs. They have participated in intersectoral groups and committees on AMR in several countries, reinforcing the One Health approach at country level.

72. The evaluation noted close working relationships between the Tripartite organizations at most regional and subregional levels in Africa and Asia, particularly where substantial projects were facilitating significant work on AMR. FAO and OIE are also working closely to develop guidance for use of veterinary products for the Southern African Development

Community (SADC). WHO personnel have been based in the FAO Regional Office for Asia and the Pacific (RAP) in Bangkok, while the Regional Office for Latin America and the Caribbean (RLC) has been involved in establishing a European Union-supported Tripartite project on AMR.

73. More recently, the AMR MPTF mechanism has provided funding opportunities for joint Tripartite proposals (MPTF, 2020). FAO's approved MPTF budget for AMR work as of December 2020 was USD 1.7 million (around 30 percent of available funding). The Fund has approved a joint OIE/FAO project on AMR legislation and it is expected to start in 2021.

74. Still, some Tripartite activities have a disproportionate focus on human health. This is partly due to the higher visibility of AMR work in relation to human health and the far larger financial and human resources WHO commits to AMR. FAO's limited representation at Tripartite meetings is also partly behind the more prominent focus on human health. Also, until recently, FAO's Tripartite focus was almost entirely on animal health issues, whichwas not representative of its broad mandate.

75. With AMR now embedded in OIE's Performance of Veterinary Services (PVS) system, WHO carrying out joint evaluation exercises and FAO conducting ATLASS assessments and applying its PMP-AMR, there are opportunities for closer collaboration. FAO has formed a partnership with OIE on the evaluation of country-level legislation frameworks, which is closely related to OIE's work on the PVS. They have also conducted joint missions under the Veterinary Legislation Support Programme (VLSP) and FAO personnel are often invited to join joint external evaluation missions. A formal arrangement to share information on AMR could enhance Tripartite work and avoid duplication.

76. There are also opportunities for closer collaboration in the Tripartite to help FAO meet its FAO-AP targets, for instance, on the delivery of AMU and AMR data. OIE is building a system to report AMU in livestock, primarily based on data submitted at national level, but with less information on AMU at local and farm level. Here, FAO could be more involved in AMU data collection at farm level, while ensuring alignment with OIE requirements for AMU surveillance. Similarly, OIE with its role and influence in the international movement of livestock could be a useful partner for FAO in compiling AMR surveillance data against the backdrop of its potential impact on international trade. Another area for enhanced Tripartite collaboration would be for FAO to liaise more with WHO on food safety, particularly to raise consumer awareness at national and regional level.

2.4.2 FAO partners at the global, regional and national level

77. FAO's other key partnerships at the global level on AMR include UNEP, donor agencies, universities and research centres. FAO is beginning to collaborate with UNEP on AMR issues through its Land and Water (NSL) Division.

78. Resource partners have proved important for FAO in coordinating with other actors and networks at the national level and in monitoring its AMR work. Both the Fleming Fund and USAID have organized their AMR work with a large network of global and national partners. This has provided opportunities for FAO to coordinate with other implementing partners.

79. FAO has also collaborated with universities and research centres to gain scientific backing for its AMR work and by supporting further research on AMR. The recent establishment of

FAO Reference Centres for AMR provides new opportunities for FAO to expand its network of local and international research institutes and academia. It should also continue to explore avenues to incorporate non-governmental organizations and other relevant stakeholders, including the pharmaceutical and food industries into this network.

80. At the national level, governments repeatedly cited FAO as a strong partner in the evaluation survey and interviews. The Organization is valued for its technical support and capacity building on AMR, together with its work on coordination. FAO is considered a neutral and trusted partner which facilitates multisectoral collaboration.

81. FAO is working towards strengthening its collaboration with the private sector. In terms of AMR, this would mean actors in both the antimicrobial value chain, from production to disposal, as well as the food supply chain, especially large commercial livestock producers and producer associations. At regional and national levels, FAO is beginning to engage with the private sector by enabling public-private partnerships to combat AMR and build on existing collaborations at national level, particularly those involved in food production.

82. However, other key private stakeholders are lacking. Private laboratories, for instance, are not being used to collect AMR data. In Peru, large commercial poultry producers conduct regular culture and antimicrobial susceptibility testing on their flocks to inform treatment plans. Similarly, in Armenia and Ukraine, AMR and residue testing is conducted through a few private laboratories for trade purposes only. These are opportunities to enhance national surveillance that are not being grasped.

2.5 FAO's institutional arrangements and capacity to work on AMR

Finding 16. The implementation of the FAO-AP has been hampered by the lack of full-time AMR management, which has left gaps in coordination, planning and communication. It has also led to limited visibility of FAO's work on AMR globally. A significant number of key AMR personnel are also temporary consultants. The evaluation team considers the underlying reasons for these to be FAO's lack of strategic planning on AMR, including its failure to properly integrate AMR into the Strategic Framework and its allocation of only limited resources from the core budget. This is detrimental to the long-term continuity of FAO's work on AMR and puts at risk its ability to fulfil its AMR commitments and remain a relevant partner within the Tripartite.

83. Multiple FAO technical departments and divisions have links to its work on AMR, but there is no overarching AMR management and coordination structure. There has been an FAO AMR Coordinator (Chief Veterinary Officer, Animal Health Branch, NSAH) and numerous focal points for AMR in various divisions, but no central management structure. Over the course of the evaluation, the new Joint FAO/WHO Centre was set up, which will include AMR. It is not yet clear how the Centre will coordinate with all divisions concerned for a One Health approach.

84. The evaluation team noted that the absence of a central management structure for AMR had negative effects on both FAO's ability to coordinate internally and on its external visibility. Most external interviewees said FAO should improve its coordination and communication. They cited difficulty in identifying contacts for AMR within the Organization and slow response times on correspondence and joint activities. Internal stakeholders raised similar concerns.

85. There are also few elements to bind FAO's work on AMR into one programme. The evaluation team even found it difficult to assemble FAO's AMR work and its links to the Tripartite. The FAO website on AMR has been updated, but it lacks regional and national information. There was also a notable absence of records of FAO's work on AMR. The progress reports to the Programme Committee are useful to a certain point, but more detail should be available through a central repository.

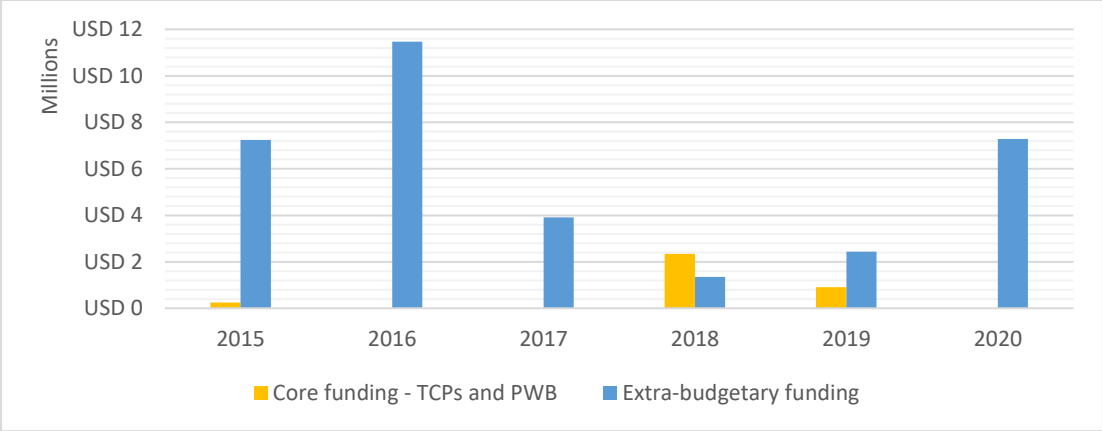
86. The AMR-WG has partly compensated for the lack of a central coordination structure and management. The evaluation team considers the AMR-WG to be an effective mechanism for developing the FAO-AP and an essential source of technical know-how and interdisciplinary communication on AMR. However, though the AMR-WG is a considerable asset in sustaining FAO's work on AMR, attendance is largely voluntary. While this aspect might be part of the group's appeal, it is a forum where technical matters outweigh managerial ones and is not a sustainable mechanism for coordinating and managing FAO's work long-term.

87. FAO's delivery of AMR projects relies on a small number of full-time personnel and a significant number of short-term consultants. AMR capacity at headquarters has been bolstered by seconded Member personnel. While FAO has managed to sustain its global commitments to the Tripartite, IACG and other bodies through extrabudgetary resources and limited core funding, interviewees said the lack of core funding had been challenging, with personnel often working on AMR outside their terms of reference and occasionally being discouraged from doing so. Significant personnel turnover was also cited as an issue, contributing to a lack of institutional memory. OIE and WHO, in contrast, have dedicated departments, personnel and budgets to implement their work on AMR.

88. Moreover, FAO's lack of a long-term strategy on AMR and its failure to integrate AMR into the Strategic Framework have been detrimental, most obviously in the dearth of core resources allocated to its work on AMR. In FAO's Programme of Work and Budget (PWB), aside from the USD 1.7 million allocated for AMR/One Health posts, one in animal health and another in food safety, there is no direct budgetary allocation to AMR. There were five TCP projects on AMR funded from FAO's core budget from 2015 to 2020, worth around USD 1.8 million. Uncommitted funds from divisional or project budget lines are sometimes used for key AMR activities, such as the World Antimicrobial Awareness Week (WAAW), but there are few clear allocations.

89. For most of its operational outputs on AMR, FAO relies upon short-term projects supported by extrabudgetary funds (Figure 2). The Tripartite MPTF is unable to provide consistent programmatic support for FAO, as the funding is for country operations and activities jointly implemented by the Tripartite organizations (FAO, OIE and WHO, 2019b). This has important implications for the scope and geographic scale of FAO's work.

Figure 2: FAO's AMR resources – core and extrabudgetary[8]



Source: FPMIS project documents and PWB reports, March 2020

90. As FAO has not committed to a long-term strategic approach for its work on AMR, the time span of its work is linked to the 2016–2020 FAO-AP, plus outstanding portions of externally funded projects. New country and regional projects supported by extrabudgetary funds are in the pipeline, but the lack of a sustained strategic and programmatic approach inevitably means that FAO's AMR work is constantly at risk of discontinuation. All technical interlocutors suggest that FAO's AMR work needs to be a long-term programme of at least a decade. This seems realistic, as it has taken northern Europe, for instance, 25–30 years to reach current levels of AMR awareness, surveillance and compliance (FAO and Danish Veterinary and Food Administration, 2019). If FAO wishes to maintain its global role on AMR, it must accept its responsibility over a similar time horizon. An overarching strategy, integrated into FAO's Strategic Framework, supported by the core budget, would ensure greater effectiveness and sustainability.

Finding 17. At regional and country level, coordination and technical support arrangements on AMR projects have worked well. In countries not covered by extrabudgetary funding, FAO has supported the development of AMR NAPs and raised awareness through other initiatives and activities. However, a programmatic approach on AMR does not exist in all regions and the evaluation team noted issues with administrative procedures and procurement.

91. Regional and Country Offices have led the delivery of FAO's work on AMR at country level. While most decentralized interviewees said FAO's coordination and technical support was effective, some said technical gaps in technical capacity prevented them from meeting AMR-related needs. The gaps mainly pertained to crops, the environment, social sciences and legal/policy aspects and were nearly all due to financial and human-resource constraints in these areas.

92. In countries that do not have specific AMR projects, some activities to support NAPs have been implemented through regional initiatives and structures. Coordination and level of involvement vary depending on the resources available. There is, however, a general lack of clarity on the involvement of personnel across food and agriculture subsectors in AMR,

[8] The figure does not include funding from the USAID-funded GHSA project, since allocation to AMR activities from total funding is unavailable.

as well as on coordination. There have there been efforts to develop a programmatic approach to AMR only in the Regional Office for Asia and the Pacific (RAP).

93. FAO's administrative and procurement procedures have also affected the efficiency of its work on AMR. The bureaucracy of its accreditation processes and slow response times on contracts have limited its ability to form functional partnerships and complicated its financial management and funding disbursement at national level, hindering both its applications for national grants and project delivery. Sixty-five percent of internal survey respondents cited delays in project delivery.

2.6 Sustainability

2.6.1 Sustainability of FAO's AMR results

Finding 18. FAO's country-level AMR activities have facilitated the creation of intersectoral One Health platforms, raised awareness and developed capacity, creating a strong basis for future collaboration and work on AMR. However, there is still limited buy-in from national governments, as evidenced by their limited investment in AMR and capacity to continue without FAO support. For FAO's AMR results to be sustainable, national stakeholders must recognize the significance of AMR, commit resources to tackle it and enforce associated legislation. Greater support for a systematic approach to AMR that attempts to address resource constraints at national level could boost the sustainability of FAO's AMR results.

94. Institutional strengthening, capacity development and ownership are instrumental in ensuring the sustainability of results. As AMR is invisible and there is a delay in observable consequences, national political commitment is lacking, stalling prioritization and the allocation of resources. The continuation of AMR work at country level has also been challenged by competing public health risks and limited resources, all of which have been exacerbated by the COVID-19 pandemic.

95. More than 60 percent of external survey respondents in countries covered by the FAO's Regional Office for Asia and the Pacific (RAP), Regional Office for Africa (RAF) and Sudan reported inadequate or limited national capacity on AMR. This means that many countries have to rely on external funding to implement their AMR NAPs. Consequently, while FAO has done substantial work on AMR, the results are not yet sustainable without external funding.

96. Another issue raised in the surveys concerned the inclusion of AMR in existing One Health groups for the control of zoonotic diseases. Within these national groups, as at FAO itself, this leads to AMR often being lumped together with zoonotic diseases as part of animal health or as a food safety concern, neglecting AMR's much broader One Health nature compared with most zoonoses. Thus, the role of AMU in plant health, forestry, soil and water tends to be undermined by more well-worn, though important, topics, such as AMU for growth promotion in animals.

2.7 Cross-cutting issues

2.7.1 Gender

Finding 19. AMR projects have the potential to contribute to gender mainstreaming, gender equality and women's empowerment. However, the FAO-AP and proposed FAO-AP2 do not specifically address issues of gender and there has been no structured effort to integrate them into FAO's work on AMR. Across its AMR projects, where possible, women have participated in AMR activities, and gender-disaggregated data are being collected at the country level. Systematic reviews and analyses will be necessary, however, to assess the standing of gender issues in FAO's work on AMR and to contribute to FAO's gender goals.

97. FAO involves women in its workshops and training initiatives on AMR and collects sex-disaggregated data on its activities. This is not the same as gender mainstreaming and does not make a project gender-inclusive. It is important to explain the rationale for the focus on women, how the interventions will improve gender relations and create greater access and benefits for women and men. The evaluation team saw no analysis of AMR-related gender issues at global or country level.

98. According to FAO's gender markers (FAO, 2017) and the evaluation survey, FAO's work on AMR includes some projects with great potential to address gender issues. Further, women have an important role in livestock production and agricultural activities in many countries. These also indicate that FAO's work on AMR needs to be informed by gender reviews and analyses at global and country level.

99. In the case study countries, there are examples of the role-based inclusion of women. In Zimbabwe, for example, women are being targeted for farmer field school activities as they are often responsible for poultry and small ruminants. However, role-based targeting has not worked in all countries and, without gender analysis, it is hard to say whether it is contributing to FAO gender goals.

2.7.2 The One Health approach

Finding 20. FAO has not been able to develop a complete One Health approach to AMR, despite it being promoted in the FAO-AP, reports and project documents. It has been applied to projects with varying levels of success. While the livestock, aquaculture and food safety teams are significantly involved in AMR, the various plant, forestry, soil and water teams have had limited involvement. While this is understandable in view of the significant knowledge gaps in these fields, FAO, as part of the global AMR infrastructure, is committed to a holistic One Health vision and should take greater leadership in these areas.

100. While the One Health concept has been taken on board by some key FAO units, it has taken time for it to be accepted by all multisectoral disciplines. This could have been avoided if FAO had shown a more determined institutional and strategic commitment to One Health from the outset.

101. In recent years, FAO has made some improvements in its One Health approach. The Tripartite memorandum of understanding of 2018 confirms the inclusion of AMR in each organization's working arrangements and could contribute to a fully multisectoral approach to AMR (FAO, OIE and WHO, 2018a). Encouragingly, the FAO Land and Water

Division (NSL) has recently collaborated with the Joint FAO/IAEA Centre to create new methods for tracking the movement of antimicrobials in the environment (FAO and IAEA, 2019).

102. The AMR-WG, under the One Health umbrella, has representatives from different FAO units. However, participation tends to depend on the senior managers of the technical divisions, who juggle other work priorities and the additional personnel costs involved. Crucially, not all have the expertise to contribute to FAO's work on AMR. This creates disparate contributions towards AMR work between different FAO divisions, and does not reflect well on FAO's commitment to a One Health approach to AMR.

103. FAO, OIE and WHO have played a strong role in promoting country level coordination and collaboration through One Health intersectoral groups and committees, though their institutionalization, functionality and operational capacities have varied. In the five case study countries, stakeholders other than government have limited awareness of the importance of AMR.

104. UNEP's increased involvement in AMR could enhance coordination with the environment sector. There are also opportunities for FAO to coordinate and collaborate on crops and environment with its network of AMR Reference Centres and other organizations, for example, the CGIAR AMR Hub and United Kingdom Research and Innovation.

2.7.3 Monitoring and evaluation

Finding 21. There was no comprehensive M&E framework covering all of FAO's AMR work from 2016 to 2020. As part of AMR-AP2, FAO has designed a results chain with appropriate indicators. Even though this is a positive development, it does not include outcome-level indicators or details of links between activities and targeted outcomes. The Tripartite M&E framework is widely recognized and gives FAO a strong basis for strengthening its M&E capacity. Both the existing databases and those being developed for AMR present opportunities for FAO to complement its future M&E work.

105. The FAO-AP did not have an embedded M&E component, relying instead on project-level progress and evaluation reports, and on AMR updates submitted to the FAO Governing Bodies. Thus, during the evaluation period, there was no reporting on outcome-level indicators, such as success in reducing levels of AMU in countries or impact on reduced incidence of AMR. The FAO-AP2 and its indicators also focus on indicators such as the number of training courses held and publications developed. These do not support a higher-level assessment of progress on tackling AMR.

106. As part of the Tripartite, FAO has participated in developing the M&E framework for the GAP (FAO, OIE and WHO, 2019c). The framework was finalized in 2019 and its data should soon be available. It involves the comprehensive monitoring of outputs and implementation of NAPs and includes outcome- and impact-level AMU and AMR indicators. The framework, however, does not replace monitoring of FAO's work in the food and agriculture sectors. FAO is currently preparing a performance indicator that would help assess its delivery on AMR.

3. Conclusions and recommendations

3.1 Conclusions

Conclusion 1. AMR is an undisputed global threat and minimizing it requires concerted collaborative action at all levels. FAO has a strong mandate to work on AMR in the food and agriculture sectors. It is well positioned to deliver on AMR and is moving in the right direction. The COVID-19 pandemic has made it more urgent that FAO prioritizes its global role and work on AMR.

107. FAO's key role has been recognized by Members, the United Nations General Assembly and partner organizations. It has a strong comparative technical and organizational advantages in key food and agricultural sectors, such as its global presence, close working relations with national governments and its ability to influence policy change. FAO has made steady progress on all four focus areas of the FAO-AP, laying the foundation to deliver these outputs in the FAO-AP2. Its collaboration with the Tripartite organizations and other key partners on AMR is strengthening over time, which is critical for global and regional coordination and cooperation on AMR. FAO has also developed good ties with the AMR scientific community, consolidating them with its network of Reference Centres.

Conclusion 2. Even though FAO is well positioned to deliver on AMR, it lacks an AMR strategy that demonstrates its organizational commitment. This hampered progress on the FAO-AP and does not reflect well on its global commitment to AMR. There is less than full acknowledgement of the work required across the antimicrobial and food value chains and in adopting a true One Health approach. It has further affected the emphasis placed on sectors associated with food and agriculture in the Tripartite's AMR work, as well as FAO's global influence and visibility on AMR.

108. The absence of an AMR strategy has resulted in limited alignment with FAO's Strategic Framework, which has translated into insufficient core resources for AMR. In addition, the roles, responsibilities and extent of involvement of the various FAO divisions and offices on AMR are not clear. The work is, therefore, heavily reliant on and guided by extrabudgetary funding, concentrated in certain divisions and geographic regions, and mostly led by temporary personnel on specific projects. Again, these factors have affected FAO's role within the Tripartite, in some cases undermining its capacity to fully engage in meetings and to contribute as fully as the other partners that have allocated greater resources to AMR work. A cross-cutting strategy that sets out FAO's commitment on AMR, builds on its broad mandate and is fully embedded in the Strategic Results Framework, with an accompanying framework for monitoring, evaluation and learning, would create greater internal and global visibility and an evidence base to demonstrate the impact of its work.

109. Not having a comprehensive strategy has meant less than full acknowledgement of the role of all actors associated with AMR, their context and importance. For example, the role of consumers and the general public is missing from FAO's work and most consumers of food products remain unaware of AMR risks. They could be instrumental in generating greater demand for products free of antimicrobial residues and contributing to a change in farming practices. Similarly, even though farmers are the direct users of antimicrobials, there are no clear approaches for engaging them on AMR on a large scale that takes into account the socio-economic context in which they operate. It is particularly important to understand the drivers of AMU and to explore cost-effective and sustainable alternatives to antimicrobials while protecting farmers' livelihoods and food security. It is also necessary

to engage with large pharmaceutical companies and commercial farming enterprises in multi-stakeholder dialogue on AMU and AMR at country and global level to achieve impact at scale.

110. FAO's Action Plans have been important instruments in guiding its work on AMR, however, they do not provide sufficient detail on its approaches. FAO-AP2 recognizes the importance of developing good practices and an economic case for farmers, but it does not sufficiently set out how its activities will result in prudent AMU. It also does not specify FAO's role in relation to its government partners and other actors in achieving these results. What's more, it provides only for output indicators such as the number of training courses delivered and the amount of guidance material produced, which yield limited measurable information on results. Moreover, there is no theory of change underpinning FAO's work on AMR that explains such linkages. It addresses the cross-cutting issue of the role of gender in AMR in a limited way. Greater clarity on FAO's approach to AMR through a long-term strategy would lead to more focused work, positioned for better results.

Conclusion 3. There is no overarching AMR management team or structure coordinating the entirety of FAO's work on AMR. FAO has relied heavily on the dedication of voluntary members of the AMR-Working Groups for internal coordination and knowledge sharing. This is not reflective of the ambitions of FAO's current plan and even less so of its role in tackling AMR and the seriousness of the issue. Over the course of the evaluation, the evaluation team observed FAO's growing commitment to tackling AMR, however, a multidisciplinary approach that sets out the role of all relevant divisions and offices at both headquarters and regional levels is not yet evident.

111. Until the establishment of the Joint FAO/WHO Centre, FAO's work on AMR had been led by a few divisions. The Centre is a welcome development and could enhance internal coordination. However, FAO's work on AMR and the development of a strategy setting out roles still require considerable involvement from all relevant divisions and offices, including Markets and Trade, Fisheries (NFI), Food Systems and Food Safety (ESF), Forestry (NFO), Land and Water (NSL), the Legal Office (LEG), Plant Production and Protection Division (NSP), Markets and Trade (EST). Moreover, FAO's work on AMR is not classified as a programme with clear lines of responsibility and leadership at headquarters and regional levels. While the evaluation team recognizes the key role played by the AMR-WG on coordination and knowledge sharing across FAO, the contributions of its members should be systematized and formalized in their job descriptions. A clear allocation of roles and responsibilities and an overall coordination and management unit would directly benefit action plan implementation.

Conclusion 4. FAO's work on AMR remains aligned with its Tripartite responsibilities and is guided by the GAP. There has been close normative cooperation between the three organizations and closer collaboration is evolving at implementation level through the strengthening of the MPTF mechanism, the Tripartite AMR workplan and the Tripartite M&E framework. UNEP's collaboration with the Tripartite organizations on AMR is a positive sign and an important step towards a true One Health approach. However, further opportunities remain for FAO to strengthen its role in the food and agriculture sectors and for closer collaboration.

Conclusion 5. Beyond the Tripartite, FAO has played a strong role in coordinating and collaborating with a wide range of actors on AMR and is making a good effort to broaden its partnering network. However, at all levels, greater systematic coordination with national,

regional and global actors is required, together with the engagement of stakeholders along the food and antimicrobial value chains. Furthermore, a clear understanding of all key stakeholders' roles linked to AMR is needed for greater efficiency.

112. Because of its multidisciplinary and multisectoral aspects, partnerships are key to addressing AMR. FAO has formed strong alliances at both global and country level on AMR, though a more cohesive approach would contribute to greater effectiveness. The recent establishment of FAO Reference Centres for AMR is a positive step towards solid scientific collaboration. However, FAO has yet to make full use of their expertise and networks. Similarly, getting the perspectives of and engaging other value chain actors, such as the consumers, the pharmaceutical and food industries, is an important part of a holistic approach to AMR. There are also opportunities for stronger strategic partnerships with organizations such as the World Bank and the OECD, which have recently recognized the seriousness of AMR. However, FAO would need to have greater clarity on its long-term vision of and role in different areas associated with AMR.

113. The evaluation team also acknowledges that building and managing such partnerships requires substantial resources. Being able to systematically identify key actors and engage them is likely to increase the effectiveness and sustainability of AMR activities, and provide greater opportunity to ensure long-lasting results.

Conclusion 6. FAO's technical expertise is one of its key comparative advantages in its work on AMR. It is underpinned by the strong scientific basis for FAO's work, engendered in its personnel on AMR-Working Groups and supported by its collaboration with research centres, universities and the Tripartite organizations. FAO's recent scientific publications on AMR have been reviewed by a panel of AMR experts established for this evaluation and were found to be of consistently high relevance and quality. FAO's online repository has been a trustworthy source of information on AMR in food and agriculture. The model used by FAO to generate its scientific knowledge for the work on AMR is strong and can be replicated in other areas of FAO's work.

114. The scientific basis of FAO's work on AMR is deemed generally strong owing to its in-house expertise and scientific partnerships. However, it should take into consideration the ongoing evolution and diversity of production systems and the scenarios in which its work is implemented. The FAO-AP and most publications assessed by the expert panel were deemed highly relevant and of good quality, particularly those that included socio-economic context for specific countries or regions. The experts recommended the inclusion of animal health economics in future KAP studies, along with details of target audiences and national/regional context.

Conclusion 7. Because of the multidisciplinary nature of AMR and the close connections between animal, environmental and human health, a One Health approach is necessary at all levels. Even though there are some promising examples of the approach being advocated by FAO in its work with government counterparts, it has not been able to demonstrate a true One Health approach internally or through its work with the wider array of stakeholders.

115. In view of its clear mandate in disciplines associated with the food and agriculture sector and in line with its global role on AMR, FAO has advocated a One Health approach through its AMR projects and documents. The establishment and composition of the AMR-WG attest to its intention to build this broad alliance. Nonetheless, there is limited clarity on the role of each division and how they are involved in combating AMR. For FAO to deliver a complete One Health approach, AMR knowledge gaps and implementation pathways for

each discipline need to be identified. This has affected FAO's work in countries where there is limited awareness in its mandated areas, including AMR in plants, soil and water.

116. At country level, FAO has made good progress in encouraging national bodies to implement and coordinate AMR activities through One Health platforms. However, their operational and functional capacity varies according to resourcing. Insufficient evidence on AMR in different areas (plants, water and soil) has led to a lack of awareness and prioritization of AMR activities.

Conclusion 8. Through the FAO-AP, FAO has delivered a substantive programme of work in the food and agriculture sectors. It has implemented AMR activities in 45 countries and provided support on AMR NAPs in numerous countries. The four focus areas of the FAO-AP are strongly interrelated and it made sense to address them in parallel. The activities and outputs of each focus area are essential to building a strong foundation for future AMR work. Still, FAO's work on achieving optimal AMU has had limited results. A comprehensive, strategic approach would increase the likelihood of strong results on combating AMR.

117. FAO's overall activities on AMR through its four focus areas have supported countries in developing and implementing their AMR NAPs. The focus areas are closely interlinked and complementary. FAO's implementation of AMR activities in its focus areas has produced key lessons to enhance the implementation of FAO-AP2.

118. There are too few details on the impact pathways of the four focus areas. For example, there is limited clarity on how legal assessments (under governance) will lead to optimal AMU. Similarly, FAO's work on guidelines and sharing good farming practices needs to take into account a country's socio-economic factors and the drivers of AMU, which often supersede training and awareness-raising activities. FAO has recently taken steps to incorporate behavioural insights into its work, but clear linkages between its outputs and results still need to be defined.

119. The scale of FAO's work will be key to successfully contribute to a reduction in AMR. FAO must have a clear idea of how training a few farmer groups will translate into measurable changes in AMU at national level. A value chain analysis should include a better understanding of antimicrobial governance and the stakeholders involved, and identify areas where interventions would be most effective with broad coverage. This will include involving farmers in the analysis to gain a better understanding of the barriers to responsible AMU. In addition, awareness campaigns need to be conducted with consumer groups, so that they become acquainted with the risk of exposure to AMR in their food and their right to safe and nutritious food that is not cost-prohibitive.

120. Lastly, as with the NAPs and AMR surveillance, resource constraints have been a hindering factor, exacerbated by the COVID-19 pandemic. To ensure sustainability of its results, FAO needs to acknowledge these constraints and help address them. Assisting countries in identifying grant opportunities and technical expertise to generate evidence on AMR, for example, could lead to an increase in resources for AMR. International trade could be used to drive greater surveillance: the certification of animal-derived products as safe and antimicrobial residue-free, for instance, could help reduce trade barriers and improve business reputations. Similar incentives could prompt the food industry to adopt best practices and commit to reducing AMU and take a proactive approach to controlling AMR in their sectors.

3.2 Recommendations

Recommendation 1. FAO should prioritize its work in a long-term strategy on AMR that recognizes the seriousness of the threat and is fully integrated into the Organization's Strategic Framework. The strategy should set out FAO's long-term role in combating AMR and that of its divisions and offices, as well as its approach at country and regional level. It should be based on analyses of FAO's comparative advantages and AMR risks along the relevant value chains, while identifying key partnerships and stakeholders at all levels. It further needs to be underpinned by a theory of change that clarifies the links between its activities and expected goals. The strategy should consider how FAO intends to engage on issues of One Health and gender, also based on suitable analyses. The strategy should set targets and outcome-based indicators to measure progress and achievements.

121. The FAO-Action Plans on AMR, their focus areas and the results chain are important steps in defining FAO's AMR work, but they do not sufficiently detail its approach or prioritize its activities and areas of work. Prioritization would make best use of its resources and strengthen its position within the global AMR architecture. FAO should form its own sectoral justification for its AMR work, enabling better targeting of messages to convince national authorities about the threat of AMR.

122. For a complete One Health approach, FAO needs to deliver on all sectors under its mandate associated with AMR. It needs to consolidate up-to-date knowledge on AMR risks in the under-represented sectors within its mandate. If FAO believes it cannot implement a true One Health approach under its own auspices, it could consider developing new partnerships or allying with organizations and institutions to develop an AMR response for those sectors. This could be an opportunity to use the expertise and research networks of the AMR Reference Centres to address gaps in knowledge. Either way, the strategy needs to be developed through the joint efforts of relevant divisions, with an overarching AMR senior management team and coordination structure.

Recommendation 2. Reducing the global threat of AMR is a substantial task and FAO has the mandate for the food and agriculture sectors, which requires strong leadership and advocacy at all levels. To achieve this, FAO should consolidate its work on AMR into a strong programmatic approach with a central coordination and management structure that is supported by dedicated core funding over the next biennium and by links with the Regional Offices. The multidisciplinary approach should be strengthened to fully take into account all of FAO's core technical areas and their connections to AMR. This would give FAO greater visibility on its AMR role and show its commitment to AMR risk reduction.

123. FAO needs to do more to ensure a cohesive and interdisciplinary programme on AMR that can link with all areas of FAO's work. A programmatic approach does not mean a formal programme with a separate technical division on AMR, but a core management structure, possibly within an existing centre, to coordinate between technical divisions and thematic focus areas. The evaluation team recommends that there be a clear allocation of resources from FAO's core budget and that it should not be guided solely by one division or office, to ensure broad collaboration. A dedicated structure would allow more effective coordination and communication right across FAO's work on AMR, including in Country and Regional Offices, to ensure its long-term sustainability.

124. The evaluation team acknowledges the effort made through the interdisciplinary AMR-WG and focal points for different areas and regions, but the overall coordination of activities and their management cannot be voluntary or ad hoc, as turnover of personnel could lead

to AMR activities being discontinued. The evaluation team recommends formal recognition of the contribution of AMR-WG members in the body's terms of reference. AMR is an important area of FAO's work and an urgent global threat that falls under FAO's mandate. Together with the long-term strategy recommended above, a programmatic approach supported by core budget will flag the seriousness of the issue and FAO's commitment to all Members, attract greater extrabudgetary funding and enable FAO to play its role in full within the Tripartite and the global AMR architecture.

Recommendation 3. FAO should sustain and strengthen its scientific approach to AMR at all levels, through greater engagement with the AMR Working Groups, an enhanced role for the Reference Centres in supporting AMR work at all levels, and broader scientific collaboration.

125. FAO's scientific base on AMR remains key to building commitment and confidence in AMR among stakeholders. Internally, greater collaboration to strengthen FAO's scientific approach must be encouraged among personnel at all levels. Channels for collaboration and knowledge sharing between Country Offices, Regional Offices and headquarters should be strengthened and linked through enhanced collaboration with the FAO Reference Centres for AMR. The continuity and appropriate use of AMR-WG should be ensured, so that personnel can use it to engage in technical issues and cross-divisional learning. Its multidisciplinary aspect should be supported and used to better engage with the Reference Centres for AMR. Among other things, this will help to optimize the use of FAO expertise to better support Regional and Country Offices.

126. Through partnerships, FAO should address areas where there is limited scientific evidence on AMR. An immediate starting point would be to boost engagement with the Reference Centres for AMR and expand their role to include support for planning and the development of FAO's AMR strategy, such as risk and value-chain analysis. Reference Centres could also be set up for socio-economic investigations, facilitating informed links between FAO's AMR activities and expected goals.

Recommendation 4. FAO should consider innovative approaches in order to make progress in focus areas where resource and socio-economic constraints are hindering behavioural change across value chains and hampering commitment to combat the threat of AMR.

127. Given the complex and insidious nature of AMR and limited awareness globally, resource constraints on AMR work will persist. In sectors where resistance levels are less known due to a lack of evidence, it will be tough to convince stakeholders of the importance of AMR work and to put in place effective monitoring and control systems. FAO needs to position itself to work around such constraints and find novel entry points for its activities.

128. One way of changing farming practices would be to work directly on raising consumer awareness of products that might contain antimicrobials. Alongside broader public awareness raising, this could help generate demand for antimicrobial residue-free products and step-up incentives for prudent AMU by farmers. Furthermore, cost-effective alternatives to antimicrobials should be explored to protect animal health and farm productivity, thus protecting the livelihoods of farmers and their communities. Any such initiatives would need to be based on evidence from appropriate pilot studies; FAO could also collaborate with WHO on aspects involving food safety and consumers. Similarly, in countries where AMR surveillance is challenging, FAO could support pilot surveillance studies to generate data. Shared with policymakers, this evidence would help call attention to AMR and attract resources accordingly, facilitating the implementation of surveillance systems in key sectors where AMR has been identified as an issue.

Matrix of findings, conclusions and recommendations

EVALUATION DIMENSIONS	FINDINGS	CONCLUSIONS	RECOMMENDATIONS
FAO's role in the global AMR architecture	1. FAO has a significant history of collaborating with key international organisations on AMR. The collaboration and FAO's work on AMR has increased since 2014, which aligns well with increasing AMR challenges. 2. FAO's mandate for its global work on AMR in the food and agriculture sectors is strong, as confirmed by the UNGA, FAO Members and partners. 3. FAO has comparative technical and organizational advantages for delivering a broad programme of work on AMR. However, the focus on selected countries and sub-sectors is not at par with the importance of AMR. 6. Key actors working on AMR have aligned themselves to the GAP and the recent drive for common Tripartite management should further strengthen AMR coordination. 15. Within the Tripartite, there are opportunities for FAO to play a greater role in the food and agriculture sectors and to strengthen its collaboration. Outside the Tripartite, actors across the antimicrobial lifecycle as well as the food value chains need to be systematically engage. 7. FAO has good linkages with the AMR scientific community. In the last two years there has been a conscious effort to formalise and systematise this engagement.	1. AMR is an undisputed global threat and minimizing it requires concerted collaborative actions at all levels. FAO has a strong mandate to work on AMR in the food and agriculture sectors and is well positioned to deliver on AMR. 4. FAO's work on AMR remains aligned with its responsibilities within the Tripartite agreement and is guided by the GAP. However, further opportunities to strengthen its role and for closer collaboration remain. 5. FAO has played a strong role in coordinating and collaborating with a range of actors on AMR. However, at all levels, greater systematic coordination along the food and antimicrobial value chains is required.	1. FAO should prioritize its work in a long-term strategy on AMR, articulating its long-term role on AMR and its approach at the country level. It should be based on suitable analyses, while identifying key partnerships and stakeholders at all levels. It further needs to be underpinned by a theory of change and consider how FAO intends to engage on OH and gender.
Organizational and institutional set-up of FAO's AMR work	4. FAO-AP's focus areas provide a strong basis for future AMR work that remain relevant. However, wider engagement in its development, a complete OH approach and implementation pathways were missing. 5. The FAO-AP2 addresses most key issues associated with FAO-AP. However, it still needs to be situated within a broader FAO AMR strategy. 8. Although the FAO-AP aimed to operate within the FAO Strategic Framework, ther is no evidence that this was effectively achieved. Further a complete alignment with all relevant divisions and offices needs to be stregnthened. 16. The implementation of FAO-AP has been hampered by the lack of full-time overarching AMR management leaving gaps in coordination and planning, as well as internal and external communication. This is detrimental to long-term continuity of FAO's work on AMR and puts at risk the Organization's ability to fulfil its commitments on AMR. 17. At the regional and country level, coordination and technical support arrangements have worked well to deliver AMR projects. However, a programmatic approach on AMR does not exist in all regions and a few issues linked to administrative procedures and procurement were noted.	2. A FAO AMR strategy demonstrating organizational commitment is missing, which is associated with critical issues hampering its progress and global commitment to AMR. 3. There is no overarching AMR management team or structure coordinating the entire work of FAO on AMR. This does not reflect the ambitions of FAO's current plan and, even less, its role and the seriousness of the issue.	2. FAO should consolidate its work on AMR into a strong programmatic approach with a central coordination and management structure that is supported by dedicated core funding and by links to the regional offices. A multidisciplinary approach should be further strengthened.
FAO's effectiveness in achieving results on AMR	9. FAO has played a significant role in the development and implementation AMR NAPs but their implementation and multisectoral collaboration on AMR remains a challenge. 10. Under focus area 1, FAO has contributed to improved AMR awareness across national stakeholders. However, direct users of antimicrobials and those who consume products grown using them, have not been targeted at scale through its activities. 11. FAO has successfully rolled out its tool for assessing in-country AMR surveillance capacity. However, active surveillance for AMR remains a challenge in most countries. 12. FAO has provided substantial support on governance of AMR. Nevertheless, for FAO to contribute to optimal AMU, the work needs to bring about changes in legislation. Greater support on enforcement of AMR regulations is also needed. 13. FAO has developed important AMU guidelines and has conducted outreach activities for farmers on AMR. However, there is limited evidence on their effectiveness in reducing AMU and changing farming practices. 14. FAO's AMR publications provide a scientific basis for its activities and technical advice to stakeholder, notably publications from the regional and country offices. FAO needs to continue to engage on such work across the OH spectrum. 18. Activities implemented by FAO have been important initial steps on AMR across countries. However, there is limited buy-in from national governments. For sustainability o results it is important that all stakeholders recognise the significance of AMR and are able to commit resources for it. 19. AMR projects have the potential to contribute to gender mainstreaming, equality and women's empowerment. The FAO-AP and proposed FAO-AP2 do not address gender issues and there is no structured effort to integrate them. 20. FAO has not been able to develop a complete OH approach to AMR even though this is promoted in its Action Plans, reports and project documents. 21. Multiple results frameworks and databases are associated with FAO's work on AMR. However, there is no comprehensive framework covering the entire its entire work.	8. FAO has delivered a substantive programme of work on AMR that is essential in building a strong foundation for future. Nevertheless, there are limited results towards achieving optimal AMU. 6. FAO's technical expertise is one of its key comparative advantages for its work on AMR. 7. A OH approach is critical for tackling AMR. Even though there are a few promising examples of the approach being advocated, FAO has not been able to successfully demonstrate a complete OH approach.	3. FAO should sustain and strengthen its scientific approach to AMR at all levels. 4. FAO should consider innovative approaches to advance its focus areas that acknowledge existing resource and socio-economic constraints across value chains.

Rating criteria	Conclusions: Assessment	Recommendations: Urgency level
	Not satisfactory	Immediate
	Medium	Medium term
	Satisfactory	Long term

References

Carminati, M. 2020. West Africa, past and present challenges about AMR: the misuse of antibiotics in cattle, small ruminants and camels. In: *Antimicrobials in Livestock: from scrutiny to action in low-income countries* [online]. Webinar, 17 November 2020. Rome: Global Agenda for Sustainable Livestock. http://www.livestockdialogue.org/events/events/webinars/antimicrobials-in-livestock-from-scrutiny-to-action-in-low-income-countries/en/

Caudell, M.A., Dorado-Garcia, A., Eckford, S., Creese, C., Byarugaba, D.K., Afakye, K. et al. 2020. Towards a bottom-up understanding of antimicrobial use and resistance on the farm: A knowledge, attitudes, and practices survey across livestock systems in five African countries. PLOS ONE, 15(1): e0220274. (also available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0220274).

Committee on Agriculture (COAG). 2016. *Update on FAO's Work on Antimicrobial Resistance*. CAOG/2016/16. Rome: FAO. (also available at http://www.fao.org/3/a-mr246e.pdf).

FAO & Danish Veterinary and Food Administration. 2019. *Tackling antimicrobial use and resistance in pig production: lessons learned from Denmark*. Rome. (also available at: http://www.fao.org/publications/card/en/c/CA2899EN/).

FAO & IAEA. 2019. *Antimicrobial movement from agricultural areas to the environment: The missing link. A role for nuclear techniques*. Rome: FAO. (also available at: http://www.fao.org/3/ca5386en/CA5386EN.pdf).

FAO, OIE & WHO. 2010. *The FAO-OIE-WHO Collaboration: Sharing responsibilities and coordinating global activities to address health risks at the animal-human-ecosystems interfaces*. A Tripartite Concept Note. Rome. (also available at: http://www.fao.org/3/ak736e/ak736e00.pdf).

FAO, OIE & WHO. 2018a. *Memorandum of understanding between the United Nations Food and Agriculture Organization and the World Organisation for Animal Health and the World Health Organization: Regarding cooperation to combat health risks at the animal-human-ecosystems interface in the context of the "One Health" approach and including antimicrobial resistance*. Rome. (also available at:

https://www.oie.int/fileadmin/Home/eng/Media_Center/docs/pdf/onehealthportal/MoU_Tripartite_Signature_May_30_2018.pdf).

FAO, OIE & WHO. 2018b. *Global Database for the Tripartite Antimicrobial Resistance (AMR) Country Self-assessment Survey (TrACSS)* [online]. Electronic database. https://amrcountryprogress.org/

FAO, OIE & WHO. 2019a. Monitoring and evaluation of the global action plan on antimicrobial resistance. Framework and recommended indicators. Geneva, Switzerland. (also available at: https://apps.who.int/iris/bitstream/handle/10665/325006/9789241515665-eng.pdf?ua=1).

FAO, OIE & WHO. 2019b. *Antimicrobial Resistance Multi-Partner Trust Fund: Combatting the rising global threat of AMR through a One Health Approach*. Geneva. (also available at: https://www.oie.int/fileadmin/Home/eng/Media_Center/docs/pdf/PortailAMR/AMR_MPTF_Tripartite_Leaflet_HD_3.2020.pdf).

FAO, OIE & WHO. 2019c. *Monitoring and evaluation of the global action plan on antimicrobial resistance. Framework and recommended indicators – Annex 3. Methodology sheets for recommended indicators*. Geneva, Switzerland. (also available at: https://www.who.int/antimicrobial-resistance/global-action-plan/monitoring-evaluation/tripartite-framework/en/).

FAO. 2011. *One Health: Food and Agriculture of the United Nations: Strategic Action Plan*. Brochure. Rome.

FAO. 2015. Resolution 4/2015 of the Conference of the Food and Agriculture Organization of the United Nations: Antimicrobial Resistance. Thirty-ninth Session, Rome, 6–13 June 2015. (also available at: http://www.fao.org/unfao/govbodies/gsbhome/conference/resolutions/2015/en/).

FAO. 2016. *The FAO Action Plan on Antimicrobial Resistance, 2016–2020: Supporting the food and agriculture sectors in implementing the Global Action Plan on Antimicrobial Resistance to minimize the impact of antimicrobial resistance*. Rome. (also available at: http://www.fao.org/3/a-i5996e.pdf).

FAO. 2017. *Evaluation of FAO's Contribution to Strategic Objective 5 – Annex on gender (Summary)*. PC 122/6. Rome. (also available at: http://www.fao.org/3/mu656en/mu656en.pdf).

FAO. 2018a. *Antimicrobial Resistance and Foods of Plant Origin: Summary Report of an FAO Meeting of Experts*. Rome: FAO Antimicrobial Resistance Working Group. (also available at: http://www.fao.org/3/BU657en/bu657en.pdf).

FAO. 2018b. Development of a Progressive Management Pathway to assist national and international improvement of biosecurity in aquaculture production. Rome. (also available at: http://www.fao.org/fishery/static/news/MultistakeholderConsultation/Item1.pdf).

FAO. 2019a. *Evaluation of the Strategy and Vision for FAO's Work in Nutrition.* Rome. (also available at: http://www.fao.org/3/ca3762en/ca3762en.pdf).

FAO. 2019b. *Synthesis of findings and lessons learnt from the Strategic Objective Evaluations.* Rome. (also available at: http://www.fao.org/3/ca3774en/ca3774en.pdf).

FAO. 2020a. Animal production. In: Antimicrobial resistance. [online]. [Cited March 2020]. http://www.fao.org/antimicrobial-resistance/key-sectors/animal-production/en/

FAO. 2020b. *Update on the Work Plan of the Tripartite Memorandum of Understanding for Antimicrobial Resistance*. PC 128/10. Rome. (also available at: http://www.fao.org/3/nc859en/nc859en.pdf).

FAO. 2021. FAO Progressive Management Pathway for Antimicrobial Resistance (FAO-PMP-AMR). In: *Antimicrobial Resistance* [online]. Rome. [Cited 28 January 2021]. http://www.fao.org/antimicrobial-resistance/resources/tools/fao-pmp-amr/en/

Inter-agency Coordination Group on Antimicrobial Resistance (IACG). 2019. *No time to wait: securing the future from drug resistant infections*. Report to the Secretary General of United Nations. Geneva, Switzerland. (also available at: https://www.who.int/antimicrobial-resistance/interagency-coordination-group/IACG_final_report_EN.pdf?ua=1).

Joint Programming Initiative on Antimicrobial Resistance (JPIAMR). 2020. *Considerations for AMR in the Covid-19 pandemic* [online], 16 April 2020. News blog. https://www.jpiamr.eu/considerations-for-antibiotic-resistance-in-the-covid-19-pandemic/

McKenna. 2015. As Appetite for Meat Grows, Farm Antibiotics Use Will Soar. *National Geographic* [online], 25 March 2015. https://www.nationalgeographic.com/culture/food/the-plate/2015/03/25/global-antibiotic-rise/

Multi-Partner Trust Fund Office (MPTF). 2020. Antimicrobial Resistance Multi-Partner Trust Fund. In: *United Nations Development Programme* [online]. [Cited 28 January 2021]. http://mptf.undp.org/factsheet/fund/AMR00

Organisation for Economic Co-operation and Development (OECD). 2018. *Stemming the superbug tide: Just a few dollars more*. Paris, OECD. (also available at: https://www.oecd.org/health/stemming-the-superbug-tide-9789264307599-en.htm).

Orubu, E.S.F., Zaman, M.H., Rahman M.T. & Wirtz, V.J. 2020. Veterinary antimicrobial resistance containment in Bangladesh: Evaluating the national action plan and scoping the evidence on implementation. *Journal of global antimicrobial resistance*. 21: 105–115. (also available at: https://www.sciencedirect.com/science/article/pii/S221371651930253X).

Osbjer, K. 2020. *Experiences from Asia and Africa – working towards responsible antimicrobial use in livestock*. Livestock Antimicrobial Partnership/Global Agenda for Sustainable Livestock Webinar [online], 17 November 2020. https://www.slu.se/globalassets/ew/org/andra-enh/uadm/global/lamp/kristina-osbjer-slu--experiences-from-asia-and-africa.pdf

Pham-Duc, P., Cook, M.A., Cong-Hong, H., Nguyen-Thuy, H., Padungtod, P., Nguyen-Thi, H. & Dang-Xuan, S. 2019. Knowledge, attitudes and practices of livestock and aquaculture producers regarding antimicrobial use and resistance in Vietnam. *PLoS ONE*, 14(9): e0223115. (also available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0223115).

Review on Antimicrobial Resistance. 2016. *Tackling drug-resistant infections globally: final report and recommendations. Review on antimicrobial resistance chaired by Jim O'Neill.* London: Welcome Collection. (also available at: https://wellcomecollection.org/works/thvwsuba/items?sierraId=b28644797&langCode=eng&canvas=1).

United Nations General Assembly. 2016. *Political Declaration of the high-level meeting of the General Assembly on antimicrobial resistance*. A/71/L.2. New York. (also available at: https://digitallibrary.un.org/record/842813?ln=en).

United States Agency for International Development (USAID). 2019. *Emerging Pandemic Threats Program – EPT-2: 2014–2019*. (also available at: https://scms.usaid.gov/sites/default/files/documents/1864/EPT2-Narrative-508.pdf).

Van Boeckel, T.P., Brower, C., Gilbert, M., Grenfell, B.T., Levin, S.A., Robinson, T.P., Teillant, A. & Laxminarayan, R. 2015. Global trends in antimicrobial use in food animals. *Proceedings of the National Academy of Sciences of the United States of America*, 112(18): 5649–5654. (also available at: https://www.pnas.org/content/pnas/early/2015/03/18/1503141112.full.pdf).

WHO. 2015. *Global action plan on antimicrobial resistance*. Geneva, Switzerland. (also available at: https://apps.who.int/iris/handle/10665/193736).

WHO. 2017. Antimicrobial resistance in the food chain. In: *World Health Organization Food Safety* [online]. Geneva, Switzerland. [Cited 28 January 2021]. https://www.who.int/foodsafety/areas_work/antimicrobial-resistance/amrfoodchain/en/

WHO. 2020. *Clinical management of COVID-19: Interim Guidance*. Geneva, Switzerland. (also available at: https://www.who.int/publications/i/item/clinical-management-of-covid-19).

World Bank. 2017. *Drug-Resistant Infections: A Threat to Our Economic Future*. Washington, DC. (also available at https://www.worldbank.org/en/topic/health/publication/drug-resistant-infections-a-threat-to-our-economic-future).

World Economic Forum. 2013. *Global Risks 2013*. Eighth Edition. Geneva, Switzerland. (also available at: http://www3.weforum.org/docs/WEF_GlobalRisks_Report_2013.pdf).