Terms of Reference

Second Fleming Fund Country Grant to Uganda

1. Overview of this grant

These are Terms of Reference (TOR) for a second Country Grant to support surveillance of antimicrobial-resistant bacteria in Uganda. The grant will be funded by the UK Department of Health and Social Care, under its Fleming Fund Grants Programme, which is managed by Mott MacDonald, the Management Agent.

This Fleming Fund Country Grant for Uganda will focus on sustaining earlier investments in CG1, strengthening surveillance systems for antimicrobial resistance (AMR), antimicrobial use (AMU), and antimicrobial consumption (AMC) in both the human, animal health and environmental sectors. It will aim to further support the One Health approach to surveillance, bringing together multi-sectoral stakeholders to share surveillance data and gain a better understanding of AMR, AMU and AMC.

In addition to the surveillance sites in CG1, CG2 will support 5 Human Health sites including Soroti , Jinja, Gulu, Masaka and Lira Regional Referral Hospitals and 4 animal health zonal laboratories Arua, Gulu, Nakasongola and Mbale.

The Grantee will be responsible to Mott MacDonald for all aspects of the grant, including the management of any partners, their performance, technical delivery and financial accountability. The Grantee will be required to sign a Grant Agreement and will be expected to enter into sub-granting arrangements with partners on the same back-to-back terms.

The Grantee will need to work in close coordination with the Uganda National Antimicrobial Resistance Committee (UNAMRC), the One Health Platform and other national stakeholders. The Grantee will also be required to harmonise efforts on this Country Grant with other types of grants under the Fleming Fund Grants Programme, namely the Regional Grants Programme and the Fleming Fellowship Scheme.

This grant is expected to last until February 2022. Grant application should be in the region of **£3.5million**, including all capital and recurrent costs, overheads and management costs.

2. Overview of the Fleming Fund

2.1 Introduction

The UK Government has established the Fleming Fund to respond to the global threat of increasing AMR. The Fleming Fund will be a critical support in achieving the resolution of the 68th World Health Assembly, 2015
(WHA A68/20), and in realising the Political Declaration of the High-Level Meeting of the United Nations General Assembly (UNGA) on Antimicrobial Resistance, 2016. These recognise that urgent cross-sectoral rationalisation of antimicrobial use in humans, animals, food, agriculture and aquaculture sectors are key to tackling AMR, and call for innovative research and development; affordable and accessible antimicrobial medicines and vaccines; improved surveillance and monitoring; increased governance on antimicrobial use; and increased international cooperation to control and prevent AMR.

The Fleming Fund aims to address critical gaps in the surveillance of antimicrobial-resistant bacteria in low- and middle-income countries (LMICs) in Asia and Sub-Saharan Africa. Countries in these areas are set to bear the highest burden of antimicrobial-resistant infections. A Global Action Plan on AMR has been developed by the World Health Organization which acts as the blueprint for a multi-stakeholder global response to averting a global health crisis caused by AMR[1].[1]

The Fleming Fund comprises of a few workstreams. One workstream provides support to the Tripartite Alliance – the Food and Agriculture Organization (FAO), the World Organisation for Animal Health (OIE) and the World Health Organization (WHO) – as part of the 'One Health' approach. Through funding to the Tripartite Alliance, the Fleming Fund has contributed to the development of National Action Plans in Sub-Saharan Africa, South and South East Asia, and to the building of the evidence base and guidance for AMR surveillance. The Fleming Fund also funds initiatives in academic institutions to develop guidance on the development of AMR surveillance systems, such as the LSHTM Roadmap for developing an AMR surveillance protocol in human health systems[2].[2]

The Fleming Fund Grants Programme is the largest stream of financial support available through the wider Fleming Fund. The UK Department of Health and Social Care has appointed Mott MacDonald as the Fleming Fund Management Agent for the Fleming Fund Grants Programme. Mott MacDonald is a global company with expertise in multi-sectoral international development and fund management. On behalf of the UK Government, Mott MacDonald is responsible for funding allocation and oversight of all investments made across a wide portfolio of grants in different activities and in different countries.
Part of the aim of the Fleming Fund Grants Programme, particularly through Country

[1] http://www.who.int/antimicrobial-resistance/global-action-plan/en/

[2] https://amr.lshtm.ac.uk/wp-content/uploads/sites/12/2016/11/AMR-Surveillance-Protocol.pdf

Grants, is to improve the ability of recipient countries to diagnose drug-resistant infections, with an emphasis on bacterial infections, and to improve data and surveillance to inform policy and practice at national and international levels. The overall goal is to reduce the human and economic burden of AMR.

The geographic focus of the Fleming Fund Grants Programme is 20-24 LMICs from Sub-Saharan Africa and South and South East Asia. The Fund is providing financial support over a five-year period from 2017 to 2022 to participating countries via three funding channels:

- Country Grants
- Fleming Fellowship Scheme Grants
- Regional Grants

The Fleming Fund will be independently evaluated by ITAD, a specialist evaluation firm appointed by the UK Department of Health and Social Care.

2.2 Problem statement to be addressed by the Fleming Fund Country Grants

The main issues to be addressed by Fleming Fund Country Grants are:

- There are too few trained microbiologists to undertake the volume of testing required for representative surveillance on AMR.
- There are few health facilities that routinely undertake bacterial culture; even fewer who do routine antimicrobial susceptibility testing or that meet the requirements for accreditation.
- There is no culture of routine surveillance for AMR in healthcare delivery and there are barriers to developing it.
- There is little perceived use of surveillance data at any level, including low demand for information related to AMR from policy makers.
- There is a lack of knowledge on the use and consumption of antimicrobial agents across One Health sectors.
- There is a lack of antimicrobial stewardship.
- Logistical challenges are significant. Transporting samples in a safe and secure manner under often challenging transport conditions; ensuring a quality assured and sustained supply chain for reagents and consumables; and ensuring appropriate servicing of equipment are some examples.
- Surveillance systems (national, regional and global) that do exist are often vertical in nature, are not linked across sectors, and are often unwilling to integrate.
- There is a mixed picture across countries and regions in terms of starting points, political will, capability, and donor interest and engagement.
- There are poorly defined and applied quality assurance standards in laboratory testing.
- There is a lack of understanding from basic surveillance of pathogens on transmission patterns and drivers such as inappropriate use of antimicrobial drugs across all sectors.

2.3 Fleming Fund investment areas and outputs

To address the problems above, the Fleming Fund Grants Programme invests in:

- Laboratory infrastructure enhancement.
- Human resource strengthening and workforce reforms.
- Surveillance systems strengthening.
- Establishing mechanisms for AMR surveillance data use.
- Promoting rational use of antimicrobial medicines.

Investment in these areas is expected to achieve the following outputs:

- Improved laboratory conditions for bacterial identification and antimicrobial susceptibility testing (AST) and improved data quality.
- Strengthened One Health workforce with the necessary skills for AMR surveillance.
- Stronger AMR surveillance systems and processes at country and regional levels.
- Stronger demand for AMR data at regional, country, subnational and facility levels.
- Better knowledge of country level practices and use of antimicrobials (particularly for bacterial infection) across sectors.

Fleming Fund outputs are expected to contribute to the following country outputs:

- Increase in quality and quantity of AMR data collected.
- AMR data shared in country to support evidence-based policy and practices.
- AMR data shared internationally to improve and inform the global response.
- The TOR'Ss for Country Grants have been designed to ensure that investments and activities contribute directly to these outputs. Grantees are expected to adhere to and demonstrate this alignment and contribution to outputs in their applications.

2.4 Core principles within the Fleming Fund Grants Programme

The Fleming Fund is built on four core principles. Grantees are expected to demonstrate how they will align with these principles while implementing the grant.

1. **Country Ownership:** The Fleming Fund Grants Programme will work closely with national governments to ensure that country plans and aspirations, as laid out in their National Action Plans, are implemented; Mott MacDonald as the Fleming Fund Management Agent will consult and work hand-in-hand with national governments to agree the approach and ensure sustainability. Grants and TOR'Ss will conform to national priorities outlined in the National Action Plan and as articulated during Country Assessment visits. Unless there are good reasons not to do so, Fleming Fund grants will chiefly invest in public sector laboratories and surveillance systems, thereby supporting national public health systems.
2. **One Health:** The Fleming Fund recognises that the problem of AMR is a great danger to human health and cannot be controlled without a One Health approach. A specific set of One Health investment parameters has also been developed and is summarised below. This approach is aligned with key documents and guidelines from OIE[3] and FAO[4] as well as the Global Action Plan.

[3] OIE Standards, Guideline and Resolution on Antimicrobial resistance and the use of antimicrobial agents
[4] The FAO Action Plan on Antimicrobial Resistance, 2016-2020.

a. ***Collaborative multi-sectoral governance of AMR*:** Leadership and resourcing of AMR surveillance and mitigation measures in all sectors that directly contribute to the emergence of AMR.

b. ***Integrated AMR and antimicrobial use and consumption surveillance in all sectors*:** Surveillance, data collection and analysis in humans, livestock, aquaculture, crops, food and the environment to produce information that is interpreted by multi-sectoral teams to help understand factors associated with AMR emergence within and between sectors

c. ***AMR mitigation policies and programmes prioritised across multiple sectors*:** Evidence-based policies and programmes for AMR mitigation measures that are prioritised across the relevant sectors, based on information generated through AMR and AMU/AMC surveillance in all sectors.

3. **Alignment of Approach:** The Fleming Fund Grants Programme will seek to invest in areas which complement and build on work done to date, rather than create new systems. Grant applicants will need to demonstrate that they understand other actors' work in the field of improved laboratory capacity (both within and outside the sphere of AMR surveillance), improved disease surveillance and the One Health approach. The Fleming Fund Grants Programme will assess grants for duplication of efforts and/or the development of parallel systems. To the extent possible, prospective Grantees will need to demonstrate how their proposals add value to existing and planned investments and systems.

4. **Sustainability:** The Fleming Fund Grants Programme will focus assistance on national systems with a view to long-term sustainability. Investment size and scope should, as far as possible, be aligned with national government spending so that systems created with Fleming Fund grants are sustainable within the public health system. We also recognise that the public good of conducting AMR surveillance means medium- to long-term support, and it is expected that countries that demonstrate good performance will have access to additional funds to provide ongoing support. The lead grantee will be expected to: take a strategic approach to sustainability; identify key challenges and critical factors relating to sustainability; explain concrete strategies specifically designed to address these challenges and factors; and outline an exit strategy.

2.5 The Fleming Fellowship Scheme

The Fleming Fellowship Scheme is part of the broader Fleming Fund Grants Programme and is managed by Mott MacDonald. Fellowships provide funding to support on-the-job training over an 18- to 24-month programme of structured learning, mentoring and skills development for four to eight Fellows in each investment country. The Fellowships do not duplicate basic training, rather they focus on building advanced skills and leadership to promote the application of best practice in identified 'Beneficiary Institutions', while promoting the One Health principle. Beneficiary Institutions are organisations such as AMR reference laboratories national epidemiology units in the human and animal health sectors, hospitals and/or national drug administration agencies

that add strategic value and complementarity to achieve the Fleming Fund's aims in the country. They are also institutions most likely to derive sustainable benefit from the Fellowship activities.

The initial focus of the Professional Fellowship Scheme is on strengthening the quality of laboratory diagnostic data and the analysis and use of AMR and AMU surveillance data in Beneficiary Institutions. Fellows in each country are supported by mentors who provide the expertise required to support the needs of the Fellows as well as to help them to improve the sustainability of AMR programmes in their institution. The data they generate will be applied to deliver evidence-based approaches to tackling AMR, for example to improve antimicrobial stewardship.

Priority areas to be supported through the Fellowship Scheme are discussed by a Mott MacDonald scoping team together with the national AMR committee in each country and reviewed with the Beneficiary Institutions to which they are assigned. A template is provided for each Fellowship terms of reference which is adapted to the Beneficiary Institutional needs. One, or at most two, expert 'Host Institutions' are matched with all the Fellowships in a specific country. The Host Institution is drawn from a preselected pool, and after attending an initial workshop with the Fellows and Beneficiary Institution, the Host Institution develops a budgeted work plan. Once workplans and budgets have been agreed by Mott MacDonald, Fellows are formally accepted, and their Fellowship activities expensed through the Host Institution.

3. Progress, outcomes and gaps under Country Grant 1

3.1: Human Health Laboratory Capacity

3.1.1 Progress under Country Grant 1

There has been an enhancement of capacity of 7 laboratories which have received equipment, staff training and IT support for installation of WHONET. AMR data has been collected from all the laboratories and analysed at the national level at the NHLDS. The NRL has been strengthened and is now preparing to apply for accreditation with the College of American Pathologists and is receiving an increase in the number of isolates reported as part of the national AMR surveillance system.

Although data has been generated at the hospital level there has been limited dissemination and utilization and has been presented only at the One health Coordinating Committee. Data use in hospitals is limited by the fact that there are no functional Antibiotic Stewardship Committees. Frequent stock-outs and poor-quality results have meant that historically, clinicians disregard of the competencies of laboratory staff, and a major focus of CG2 will need to be clinical engagement of doctors and nurses to ensure that there is a scale up of demand and increased utilization of services.

In the procurement and supply chain, microbiology services have been neglected and are highly dependent on donor/partner support. The UNHLS was recently upgraded into a department which provides an opportunity to incorporate these requirements within the national budget, which may increase the visibility of diagnostic services.

Data has been generated and submitted to GLASS during the 2018/2019 reporting window. Although only 2 sites submitted data, those sites were able to report on urine, stool and genitourinary specimens, where previously only blood culture data was submitted.

3.1.2 Gaps to address under Country Grant 2

Whereas CG1 has strengthened the laboratory infrastructure by equipping them with the necessary equipment, reagents and consumables, and strengthened human resources through training, the grant has not supported some areas that are considered vital to the full functioning of the laboratory infrastructure. These areas have been noted as records management, supply chain management capacity and equipment maintenance. CG1 has also not supported the clinicians to enhance linkages with the laboratory system.

3.2: Animal Health laboratory capacity status

3.2.1 Progress under Country Grant 1

Under CG1, 3 Veterinary laboratories are being supported to identify E.coli, Salmonella spp, Enteroccoccus faecium and E. faecalis, and Campylobacter spp. Proficiency testing and External Quality Assurance System (EQAS) have been initiated. Data has been generated and analysed by the College of Veterinary Medicine, Animal Resources and Biosecurity (COVAB) laboratory. Several policy and guideline documents including but not limited to the National Surveillance Strategy, AMU/C Surveillance Plan, protocol for active AMR surveillance in poultry, surveillance strategy and Standard Operating Procedures have been developed and training has been provided on data analysis and use.

A protocol for active AMR surveillance in poultry was developed and implemented, in broilers and layers in Wakiso and Mbarara districts. The surveillance targeted 800 farms and 4 priority pathogens. There was also AMR data collection in cattle which was spearheaded by COVAB in Mbarara.

3.2.2 Gaps to address under Country Grant 2

Although substantial progress has been achieved, renovation of all the laboratories has not been completed and the sector is still constrained in terms of human resource capacity. Veterinary laboratory practice underwent liberalization in the early 90s and this has progressively affected clinical services. In practice there is limited appreciation and utilization of laboratory services except in limited circumstances. Additionally, there are nominal fees charged for laboratory tests which is compounded by an inadequate sample transportation system. This discourages farmers who resort to agrovets for self-management of diseases.

There is a need to strengthen current microbiology capacity at all the laboratories including but not limited to update Standard Operating Procedures (SOPs) that address sample handling, data management and flow, and microbiology testing. There are several regional laboratories that are not supported under CG1, and CG2 will therefore include site assessments for an additional 4 laboratories, and subsequent support.

Veterinarians and farmers regularly face treatment failure of mastitis and dairy production, and there is therefore interest in providing bacteriology culture services to

understand the contribution of AMR for this important aspect.

3.3: Environment and food safety sector

3.3.1 Activities under Country Grant 1

Country Grant 1 has focused on human and animal health sectors, but as noted above, there is significant interest in including additional sectors under CG2.

The Ministry of Water and Environment is a member of the One health technical working group and was involved in the formulation of the National Action Plan as a key stakeholder. It already has a system that collects samples from various sources5 mainly for water purification and protection. There is a national water quality referral laboratory with a microbiology section which is capable of identifying common pathogens such as E. coli from samples from treated water and sewers. It doesn't have a microbiologist but has chemists and other laboratory personnel

3.3.2 Gaps to address under Country Grant 2

The FF CG1 implementation program in Uganda has demonstrated good improvement in the detection and isolation of enterobacteria such as E. coli in human faecal and poultry samples. However, the CG1 support was limited to identification of E. coli only and did not cover the detection of the extended spectrum beta-lactamase (ESBL)-E. coli. ESBL E. coli a is a common indicator bacterium detectable in human faecal samples, poultry and water bodies such as sewage, market runoff and river sites in urban areas. In order to strengthen the implementation of an integrated multi sectoral AMR surveillance under GLASS-One Health approach in Uganda, incorporation of a model based on (ESBL) -producing E. coli (the Tricycle Project) in the FF CG2 is paramount. Moreover, the inclusion of the environmental sector, in particularly the water and sewage department, is a good recipe to scale up the implementation of the GLASS-One Health. The microbiology departments at the Human, Animal and Environment health sectors, should be technically strengthened to produce quality assured ESBL-producing E. coli.

Further support to the environmental sector will be directed towards strengthening their involvement in the AMR governance structures, training of laboratory technologist to safely culture, isolate bacteria, perform AST, package and transport isolates to NMRL for further analysis, storage and biosecurity management. Given the need to strengthen the OH collaboration it is critical for the CG2 to support the development of a strategy for AMR surveillance in the environment.

3.4: AMU / AMC surveillance

3.4.1 Human health

A Point Prevalence Survey (PPS) on AMU is being conducted at two hospitals; Mulago and Mbarara RRH during CG1. It is expected that the lessons learned in those surveys will be incorporated when AMU surveillance is expanded to other sites in CG2. Policy documents including the AMU strategy, guidelines and tools have been developed. This AMU data should be shared locally to advise hospital administrators, antimicrobial stewardship

[5] Surface water (lakes, rivers), Waste water (liquid waste from industries), Piped water (consumption), Bacteriology done for E.coli and total coliform counts (using methods such as membrane filtration, Quanty tray, membrane broth.

committees and IPC, and the methodology can be adapted for further surveys.

3.4.2 Animal Health

Within the AH, an AMU/C surveillance plan was developed and a pilot survey on AMU conducted on 78 poultry farms in Wakiso and Mbarara Districts.

CG1 has supported NDA to improve its ability to monitor import, manufacturing and sale of drugs which has ultimately supported reports of AMU data to OIE. Under CG1 Uganda has shifted from reporting qualitative data to the OIE to reporting using Option 1 of OIE reporting options.

3.5: Strategy and Policy

3.5.1 Progress under CG1

A number of policy documents have been developed, or are in development, including

- AMR Surveillance Plan for Human Health
- Integrated Framework for AMR in Animal Health
- Site manual for implementation of AMR Surveillance
- MAAIF protocol for implementation of AMR surveillance in Animal Health
- BSBS manual for surveillance of food borne AMR in Uganda
- National Guidelines for AMU/C surveillance in Human Health
- Laboratory and clinical SOPs

Several relevant committees have been constituted and supported to ensure that the respective government departments and agencies are represented.

3.5.2 Gaps to address under CG2

Respondents proposed different strategies to enhance policy discourse in AMR. Other inputs received on strategic/policy level AMR related issues include:

- The animal health technical working committee is not fully constituted which has hampered policy actions, finalization of key documents at the Ministry level in the Agriculture sector
- There is still limited awareness of the AMR data and the work that the laboratories can do at the highest levels of policy in the sectors
- Multisectoral Coordination is still work in progress because different sectors are not yet fully on board
- Academia is not yet fully integrated in the governance system especially in the animal health sector

Stakeholder suggestions on how these gaps could be filled include

- Incorporating AMR strategies in the national policy debate. For example, in the Agriculture sector data and communication strategies should be aligned with the National Development Plan.
- Supporting the constitution of a representative Technical Working Committee at the MAAIF to enhance high level communication with the management.
- Integration of AMR data and reporting systems into the national database such as the DHIS2 and MAAIF sector reports for better visibility and actions at the top management level.

- Support for the integration of data from other institutions such as the national Drug Authority, Professional associations to enhance the implementation of recommendations.
- Reinforcing and strengthening multisectoral coordination on AMR, AMU and AMC surveillance with a One Health approach. There is a need to facilitate meetings so that the staff included in the governance structures are guided in their discussions, choice of topics, and their methods to address issues that arise. Ongoing support is especially important in the context of federalisation.
- Strengthening the One Health Technical Working Committee and other governance structures so that they can propose evidence-based policy changes.
- Developing engagement strategies for local governments/governance in support of AMR surveillance initiatives. This could be enhanced by development of a reporting framework to the health committees at the district.
- Exploring ways in which data generated at surveillance sites, and other non-supported sites, can be used nationally to inform policy, create prescription guidelines, train prescribers on best practices.
- Exploring ways in which the national data surveillance systems already in place can be enhanced to take into account AMR data so that regular epidemiological bulletins may include AMR information thus sensitising a wider public.
- Improving human resources management to mitigate the impact of high staff turnover and advocate for human resource reforms to ensure adequate technical and administrative support is present at AMR surveillance sites and other relevant departments.

4. The current AMR situation in Uganda

4.1: Investments by other development Partners in AMR

Since the initiation of Country Grant 1, other stakeholders have also provided investments with relevance to AMR/AMU surveillance. These include but are not limited to:

- MTaPS, funded by USAID, which is supporting stewardship activities and development of policies and guidelines at national and hospital levels.
- Infectious Disease Detection and Surveillance (IDDS), also funded by USAID and implemented by PATH, which is supporting surveillance activities related to Infection Prevention and Control in selected surveillance sites. This aims to improve the detection of diseases of public health importance, including drug resistant infections, through responsive, integrated diagnostic network system.
- US-CDC has been supporting the Uganda government to achieve the Global Health Security Agenda with initial focus on three areas: Biosafety and Biosecurity, Antimicrobial Resistance, and capacity building for the National Laboratory System.
- The US CDC Foundation has a GHSA programme, Strengthening Global Health Security in Uganda, which supports planning, logistics, and evaluation training for 14 Districts and 3 regions. Training integrates Emergency Operations Centre Activation, Frontline Field Epidemiology Training Program, Infection Prevention and Control and case-based notification (e-IDSR).
- The US Department of Defense has been supporting a stand-by clinical research team for outbreaks so that research can be conducted on investigational compounds at the site of outbreaks. This includes suspected outbreaks of bacterial infections.
- WHO Special Programme for Research & Training (TDR) supports a fellowship scheme which is supported by the Fleming Fund. The shortage of AMR experts in low and middle countries presents a barrier to comprehensive antimicrobial resistance (AMR) surveillance and antibiotic usage stewardship programmes in low- and middle-income countries. The WHO TDR Programme facilitate and strengthen elimination-oriented operational research in selected communicable diseases which are in line with FF fellowship Programme.
- The International Livestock Research Institute (ILRI) has a research program supported by The German Corporation for International Cooperation (GIZ) that is targeting specific pathogens.
- The World Bank East Africa Public Health Laboratory Networking Project is active in several facilities, supporting renovations and equipment purchase to improve diagnosis and surveillance for communicable diseases.

4.2: Multi-sector inputs for proposed CG2 objectives and outputs

4.2.1 Information and surveillance systems and platforms/stakeholders:

Several surveillance and information management systems are in operation in Uganda in the human and animal health sectors.

- In human health, the public health sector is mainly coordinated through DHIS2, managed by the Ministry of Health resource center. DHIS2 collects data from all health centres in the country, although some hospital laboratories have Laboratory Management Information Systems (LIMS) and WHONET that can generate AMR data, the data is not captured, both WHONET and LIMS are not networked into DHIS2. Data managers at all the health facilities, District Health Officers, District Biostatisticians and HMIS focal persons at districts or health sub-districts are involved in data entry. At the district level the teams work with implementation partners to ensure that data from partner supported projects is entered into the national database. AMR data is not yet included as part of the indicators to be monitored by the MOH.

- For emergency response, the USG CDC in collaboration with other donors provided support for the establishment of a national Public Health Emergency Operations Center (PHEOC). The PHEOC was established to guide the detection and response to outbreaks, by monitoring threats in real-time in collaboration with the network of laboratories. The PHEOC has effectively coordinated and responded to serious infectious disease outbreaks such as yellow fever, Marburg virus, Rift Valley fever, Crimean Congo haemorrhagic fever, influenza, measles, cholera, typhoid, meningitis, and anthrax. Attempts have been made to incorporate AMR indicators in the EOC data so as to be mainstreamed in the management of pandemics. The PHEOC is the coordinating centre of the One Health Secretariat which overseas AMR work in the MOH.
- In the Animal Health sector there is a routine surveillance system coordinated by the office of the Commissioner of veterinary services. Routine surveillance is mainly done on notifiable diseases[6] and the chief veterinary officer coordinates with the District Veterinary Officers (DVOs) and veterinary extension officers to receive information and make decisions.
- The National Animal Disease Diagnostics and Epidemiology Centre (NADDEC) heads a network of 16 regional veterinary laboratories. As the reference laboratory, NADDEC also receives occasional diagnostic requests from farmers and veterinarians and responds to multiple disease outbreaks. All samples received at the laboratory are first registered in a laboratory request book before being entered into the laboratory information management system: SILAB.
- The Epidemiology Unit at NADDEC is responsible for managing SILAB. In

[6] Anthrax, Rabies, Foot and Mouth Disease, Contagious Bovine Pluero Pneumonia, African Swine Fever, Rift Valley Fever

addition, WHONET was installed at NADDEC and the Mbarara Regional Veterinary laboratory Under CG1. However, these have not been linked to SILAB. The Epidemiology Unit reports weekly and quarterly to the Commissioner for Animal Health and the Ministry of Agriculture.

4.2.2 National Drug Authority

The National Drug Authority was established by an act of parliament to regulate the importation, registration and use of medicines in Uganda. It also licenses the practice of private and public pharmacies in consultation with the professional bodies. It conducts pharmacovigilance which involves post market surveillance of medicines quality and documentation of adverse drug reactions. Additionally, it has a monitoring system for the sale of antibiotics by compelling community and public pharmacies to record prescriptions that have been dispensed, however, these prescription and record books are not regularly audited. NDA has a management information system that collects information on imported medicines and tracks the medicine sources, the importers, quantities and distribution at the national level. The NDA is working with IDI and the MOH pharmacy division in the public health sector and the MAAIF to collect the AMC data which is reported regularly to WHO and OIE respectively. The NDA has had discussions with IDI to create a link of their database with the Data Integration Service Center at the One health Secretariat which will act as a National Coordinating Center (NCC) for all AMR and AMU data.

4.2.3 MOH Pharmacy Division

The MOH has been working with the Grantee and Makerere University School of Pharmacy to develop the AMU/AMC strategy, methodology, guidelines and collection of data on AMU. The Pharmacy division is the coordinator of all the data related to AMC/U surveillance in the health sector and it has been working with Makerere and the National Drug Authority to collect data and prepare it for presentation in the Stewardship Technical Working Committee.

Using the WHO protocol to collect data on the Point Prevalence Survey for hospitals and facilities a guiding document, a national protocol was developed. It is awaiting final approval by the MOH. Training of data collectors was done by the team at the MOH HQ level and site level. The MOH also coordinates a Logistics Management Information System (LMIS) in collaboration with the National Medical Stores and Joint Medical Stores for quantification and forecasting of all the medicines and supplies required by health facilities

4.2.4 National Bureau of Standards

The National Bureau of Standards is another body with a wide standard setting mandate, including for food safety. The organization does post market surveillance of product and is involved in checking of food components. Although minimally involved in AMR, it has been working with experts at the Faculty of Food Science and Technology in Makerere University to look at antibiotic residues.

4.2.5 Dairy Development Authority (DDA)

The Dairy Development Authority is a regulator under MAAIF which oversees the dairy farming sector by registering and licensing milk processors and traders, supporting dairy farmers marketing organisations, registering dairy farmer groups and coordinating the enforcement of standards. DDA is currently heavily involved in enforcement of standards due to demands from consumers in export markets such as the Middle East and Europe. The laboratory and technical analysis capacity has been strengthened to test milk effectively for drug residues at national level while mobile and minilabs are in the future plans in addition to the requirement for farmers to take all their milk to milk collection centers.

4.2.6 Food and Agriculture Organisation (FAO)

FAO strategy spans over 5 years (2020-2025), aiming to support establishment of at least four District AMR Coordination Committees, Organizing quarterly AMR-OH National Committee meetings to enhance integrated approach that is required to effectively control AMR and undertaking bi-annual multisectoral M&E of AMR activities will also support a midterm review of the NAP implementation, including resource mobilization.

4.2.7 International Livestock Research Institute (ILRI)

The International Livestock Research Institute (ILRI) has supported the AH sector to understand antimicrobial use in poultry value chains, assess risks to humans from poultry-associated antimicrobial resistance, undertake evidence-based policy dialogue for surveillance and strategies and build capacities of researchers, consumers and value chain actors. The "Boosting Uganda's Investment in Livestock Development" (BUILD) project aims to support existing livestock health initiatives by helping to upscale solutions through a collaborative effort in research. The project started in January 2019 and will run till December 2023. The project has four components: support for ongoing campaigns to eradicate peste des petits ruminants, control of zoonotic diseases, control of antimicrobial resistance and improved veterinary public health at the point of slaughter. The control of antimicrobial resistance component specifically aims to understand the current antimicrobial use in poultry value chains, assess risks to humans from poultry-associated antimicrobial resistance (AMR), support evidence-based policy dialogue for surveillance and strategies and build capacities of researchers, consumers and value chain actors.

Some of the planned activities to mitigate the risks of AMR in the poultry production systems in Uganda include:

- Investigating and quantifying the use of antimicrobials in the poultry value chains in the country,
- Establishing a phenotypic resistance pattern of selected Enterobacterales, specifically Escherichia coli and Salmonella spp, by conducting sampling of faecal matter, meat and eggs from the poultry farms and along the poultry value chain,

- Assessing public health risks related to AMR in the poultry value chains,
- Supporting the involvement and training of stakeholders in the poultry sector in Uganda, which would include animal health workers, producers, suppliers such as feed stores and drug stock suppliers, and policy makers,
- Contributing information to the national AMR action plan, which has been derived from synthesizing and discussing the results of the data generated.

5. Scope of this Country Grant

5.1 Grant Objective and Outputs

Objectives and outputs for this Country Grant are summarized below, and Section 6 provides more detail. It is expected that applicants will respond to this TORs by developing and proposing activities that are costed and by proposing appropriate indicators (see Section 9). All inputs must be permitted under the list of Eligible Funding Items, as outlined in Annex 1.

For human health, the Country Grant is intended to support / improve implementation of the WHO GLASS programme and Grantees should refer to the roadmap for GLASS participation produced by the London
School of Hygiene and Tropical Medicine:
(https://amr.lshtm.ac.uk/wp-content/uploads/sites/12/2016/11/AMR-Surveillance-Protocol.pdf)

Table 1: Uganda Country Grant 2 Objectives and Outputs.

Objective/Output
Objective 1: Strengthen governance of AMR surveillance with a One Health Approach
Output 1.1: Enhancement of Government of Uganda's mechanisms for multisectoral governance and coordination of AMR related activities, whether led by partners or government.
Output 1.2: : A cost evaluation to identify cost drivers of setting up AMR surveillance in Uganda and requirements to ensure AMR surveillance is sustained
Output 1.3: Improved procurement systems
Output 1.4: Strengthened human resources
Objective 2: Sustain existing support to AMR and AMU surveillance in human health and expand to additional sites
Output 2.1: Support to human health laboratories is sustained for AMR surveillance
Output 2.2: Improved biosafety and biosecurity at all Fleming Fund supported laboratories
Output 2.3: Clinical staff and hospital administrators are actively engaged in AMR surveillance and using locally generated data to inform decision making processes
Output 2.4: Enhanced interoperability of AMR surveillance into National surveillance systems (DHIS 2 and EOC).
Output 2.5: National use of data is promoted for policy recommendations and therapeutic guidelines
Output 2.6: Support implementation of regular, sustained PPS on AMU in hospitals
Objective 3: Sustain existing support to AMR and AMU/C surveillance in terrestrial animals, and expand to additional sites
Output 3.1: The animal health technical working committee is supported to strengthen the AMR/U/C surveillance systems
Output 3.2: Support Animal Health AMR National reference laboratory and selected regional veterinary laboratories to contribute to the AMR surveillance network
Output 3.3: Strengthen data management, analysis and use
Output 3.4: Sustain and develop support to enhance AMR surveillance
Output 3.5: Support the development of a system to monitor veterinary drugs imports, manufacturing, sale and uses and support AMC and AMU surveillance by NDA and MAAIF .
Output 3.6: Increased engagement of veterinary practitioners and farmers in AMR surveillance
Objective 4: Expand AMR surveillance to include the Environment sector
Output 4.1: Strengthen the Department of Environment's inclusion in AMR governance structures and national AMR surveillance
Output 4.2: Enhancing AMR Surveillance Capacities of the National Water Quality Referral laboratory (NWQRL)

5.2 Laboratories to be supported by the grant

The sites identified for Fleming Fund support are listed in Table 2, below.

Table 2: List of human, animal and Environment surveillance sites

No.	Site	Location	Sector
1	Arua Regional Referral Hospital	Arua	Human
2	Kabale Regional Referral Hospital	Kabale	Human
3	Makerere University College of Health Sciences	Kampala	Human
4	Mbale Regional Referral Hospital	Mbale	Human
5	Mbarara University of Science and Technology	Mbarara	Human
6	Mbarara National Referral Hospital	Mbarara	Human
7	Uganda National Health Laboratory Service	Kampala	Human
8	Soroti Regional Referral Hospital	Soroti	Human
9	Jinja Regional Referral Hospital	Jinja	Human
10	Gulu Regional Referral Hospital	Gulu	Human
11	Masaka Regional Referral Hospital	Masaka	Human
12	Lira Regional Referral Hospital	Lira	Human
13	National Animal Disease Diagnostics and Epidemiology Centre (NADDEC)	Entebbe	Animal
14	College of Veterinary Medicine, Animal Resources and BioSecurity (COVAB)	Kampala	Animal
15	Mbarara Regional Veterinary Laboratory	Mbarara	Animal
16	Arua Regional Veterinary Laboratory	Arua	Animal
17	Gulu Regional Veterinary Laboratory	Gulu	Animal
18	Nakasongola Veterinary Laboratory	Nakasongola	Animal
19	Mbale Regional Veterinary Laboratory	Mbale	Animal
20	National Water Quality Referral Laboratory	Entebbe	Environment

5.3 Duration of the grant

This Country Grant to Uganda is expected to last for 19 months, until February 2022.

5.4 Funding envelope

Grant applications should be in the region of £3.5 million, including all capital and recurrent

costs, overheads and management costs. Applicants should include a placeholder budget within this funding envelope to the value of **£1,200,000** for renovating and equipping the laboratories (human and animal health).

Mott MacDonald is responsible for driving Value for Money (VfM) on behalf of the UK Department of Health throughout the Grant programme and will carefully consider how the proposal addresses efficiency, effectiveness, economy and equity in delivering the Request for Proposal (TOR'S) outputs in relation to the proposed costs. The Guidance Notes for the Grant Application Form provide more information on different dimensions to be considered as part of a VfM approach.

5.5 Procurement

An indicative procurement plan for laboratory equipment, reagents and consumables was compiled during the site assessments under CG1 by the Management Agent. This information provided evidence for budgetary allocation of a placeholder amount of £100,000 per site for Human health laboratory and a placeholder budget of £50,000 per site for animal health laboratory. The prospective grantee should conduct further assessment at all new sites including the environmental/water laboratory to determine renovation requirements, consumables, supplies and reagents, and develop the procurement plan to ensure optimal operation of the AMR surveillance.

For centrally precured equipment, highly preferential rates have been secured by the Fleming Fund for the purchase of key laboratory instruments, automated antimicrobial susceptibility testing platforms (Vitek II or BD Phoenix).
To take advantage of these rates, these instruments will be procured centrally by the Management Agent's procurement partner, International Procurement Agency (IPA), who will also co-ordinate delivery. Blood culture analysers will be supplied to laboratories providing clinical services, with the final number determined by the laboratory assessments. These items will be paid for directly by the Fleming Fund via a grant to IPA. The costs include the instruments, delivery, import duties (up to 15%), installation, basic training, software and first year service contracts.

Reagent costs and subsequent service contracts will come from the Country Grant budget and should be factored in the budget application preparation for CG2. All other laboratory equipment and costs will also come from the Country Grant budget and should also be factored in.

Country suppliers (Biomerieux or Beckton Dickinson) have been preselected by the Management Agent, however, purchase and delivery will be co-ordinated by IPA, and the Grantee will need to work with IPA to confirm readiness for delivery. Purchase of additional instruments, if required, should also be done via IPA, with the approval of the Management Agent, to secure the highly preferential prices offered to the Fleming Fund

6. Detailed Objectives and Outputs

Objective 1: Strengthen governance of AMR surveillance with a One Health Approach

Uganda has recorded considerable progress in strengthening AMR surveillance in human and animal health sectors which has resulted in increased data that is discussed at the national level.

A multisectoral governance structure (UNAMR, One Health Platform) comprised of human health, animal health, environment, education and local government representatives has been established and is supported by relevant committees. Subsequently, reporting and coordination management of AMR surveillance activities has improved. Despite this progress there are still challenges related to limited functionality of sector specific technical working committees which is mainly due to the time needed to officially nominate members. The committees are also heavily reliant on development partners' support to perform their core functions, which is a threat to sustainability.

Output 1.1: Enhancement of Government of Uganda's mechanisms for multisectoral governance and coordination of AMR related activities, whether led by partners or government.

In Uganda, limited resources and a difficult fiscal situation have led to reduced resource allocation to social services, and the current COVID-19 pandemic is expected to worsen the situation. As a result, the AMR landscape has attracted a number of development partners willing to contribute to its containment. Although this support is geared towards supporting the implementation of the NAP, coordination by the government is still nascent. There is a significant risk that some of the investments of FF and other partners will not be sustained and there partner coordination needs to be strengthened to enhance value for money, avoid duplication of efforts and work with government to ensure funding in the long term. Multisectoral coordination efforts are also required to improve AMR, AMU and AMC surveillance with a One Health approach. For example, governance structures' meetings need to be facilitated so that they are inclusive of all sectors present and collaboration and understanding of members is strengthened.

At the end of the grant we expect that the following will have been achieved:

- The government has a coordination mechanism which includes a live workplan and budget that captures all implementing partners' contributions.
- The UNAMR and national coordinating center have increased engagement with stakeholders both within government (at national and county levels) and among the wider stakeholder community e.g. development partners and research organizations engaged in AMR.
- OHTWC and TWCs have ToRs, which include formal cross-sectoral information sharing mechanisms, that are updated to include sectors that will be added to the new NAP.
- Opportunities are identified for intersectoral collaboration e.g. for training, equipment maintenance, consumable and reagent supply chains etc to

improve value for money and sustainability

- OHTWC and TWGs have been capacitated to support the design of sector-specific and multisectoral surveillance strategies that will contribute meaningfully to the national AMR surveillance strategy.
- Improved capacity, at national and local levels (OHTWC, other national governance structures, hospitals, prescribers, etc.) to propose data-driven changes, sector-specific or multisectoral as relevant, in policy and guidelines.
- Engagement strategies for selected local governments/governance in support of AMR surveillance initiatives developed.
- Results from the AMR, AMC and AMU surveillance in animals and humans have been adequately presented at multisectoral AMR platforms and conferences: Such as Uganda Veterinary Association (UVA) Annual symposium, One Health Platform.

Output 1.2: A cost evaluation to identify cost drivers of setting up AMR surveillance in Uganda and requirements to ensure AMR surveillance is sustained.

There is limited evidence regarding the economic needs for AMR surveillance and consequently resource allocation has not been adequately addressed by policy makers, across ministries. The Grantee should therefore undertake a cost appraisal to inform future policy and programming. This should address actual costs of improving and maintaining adequate laboratory capacity (examples: cost benefit of preventative maintenance of equipment, staff capacity building plans), identify cost savings opportunities, and estimate potential impact on other expenditures e.g. hospital drug budgets. The evaluation should be carried out in animal and human health, at least, and be shared with the relevant TWC and AMRCC to advocate for better use of resources.

By the end of the grant, we expect that the following will have been achieved:

- An economic evaluation (including cost) of maintaining AMR surveillance has been completed and shared with the relevant TWGs and the AMRCC.
- The UNAMR and NCC have identified strategies to increase the national budget contribution to AMR surveillance in all relevant sectors.

Output 1.3: Improved procurement systems

During the inception phase of CG1, the grantee worked in consultation with the Management Agent, the Management Agent's procurement supplier (International Procurement Agency) and the UK Department of Health and Social Care and determined the most suitable method of procurement for laboratory equipment and reagents. Uganda has developed an optimal stock management and supply systems for consumable and microbiology reagents which can be relied upon for CG2 implementation.

The lead grantee will also be expected to:

- Assist with the importation and delivery of equipment and consumables to recipient sites;
- Work closely with the procurement partner (whether IPA or an alternative organization) to ensure the appropriate delivery sequence of items;

- Maintain an asset register of all items defined as assets by the Programme;
- Regularly monitor the items that have been procured by the Fleming Fund Grants Programme to ensure: a) items are being used for the intended purpose; b) items are being maintained appropriately; and c) to report any misuse or misappropriation of assets to the Management Agent.
- A thorough assessment of current procurement processes in human and animal health sectors' bacteriology laboratories should be undertaken to inform improvement plans presented to key stakeholders.
- By the end of the grant, we expect that the following will have been achieved:
- An assessment of the procurement processes for bacteriology laboratories in animal and human health sectors has been presented to relevant stakeholders (i.e. laboratory management, TWGs, etc)
- Plans to develop a procurement system which guarantees the uninterrupted supply of quality items has been presented to relevant stakeholders.

Output 1.4: Strengthened human resources

Although human resource reforms have been undertaken by the Ministry of Public Service, laboratory services, in all sectors, are still underserved. Coupled with frequent turnover of personnel, this has affected service delivery. To sustain the investments made by the Fleming Fund the government will need to ensure that microbiology skills are available in all the key laboratories targeted for AMR surveillance, in animal and human health sectors.

There is comparatively good microbiology capacity in the private and private not for profit sectors and creating a community of practices across private and public sectors could be beneficial to the public sector. The One health secretariat intends to continue to develop and implement a One Health AMR mentoring scheme across public, private, and research

laboratories in human and animal health, following a successful implementation at a few surveillance sites. Development of a pool of experts who could be available in person or online is also a solution to be considered. The NMRL at NHLDS and NADDEC should work with the grantee to enhance supportive supervision at different sites.

By the end of the grant we expect that the following will have been achieved:

- Assessment of the reasons for high staff-turn over and under-staffing of bacteriology laboratories as well as costed corrective and mitigation measures are presented to relevant stakeholders.
- Means to advocate for human resource reforms which ensure adequate technical and administrative support is present at AMR surveillance sites and other relevant departments is provided to relevant stakeholders.
- A mentoring scheme is in operation across all human and animal health surveillance sites, with a microbiology curriculum developed under CG1 and ToRs for mentors / mentees developed and scaled up
- There is a plan in place to extend the scheme to human and animal laboratories beyond the current network to ensure ongoing expansion of the

surveillance programme.

Objective 2: Sustain existing support to AMR and AMU surveillance in human health and expand to additional sites

Output 2.1: Support to human health laboratories is sustained for AMR surveillance

Seven human health laboratories including the National Reference Laboratory are presently being supported under CG1. These are

- Arua Regional Referral Hospital, Arua
- Kabale Regional Referral Hospital, Kabale
- Makerere University College of Health Sciences, Mulago
- Mbale Regional Referral Hospital, Mbale
- Mbarara University of Science and Technology, Mbarara
- Mbarara National Referral Hospital, Mbarara and
- Uganda National Health Laboratory Service, Butabika

The capacity of these laboratories to conduct bacterial identification and ASTs has been enhanced through training and mentorship, and provision of equipment and consumables. The laboratories have also been equipped with computers and WHONET has been installed to enhance reporting and decision making However, the sites require ongoing support to achieve full capacity. In addition, it is proposed to support a further 5 laboratories in Soroti, Jinja, Gulu, Masaka and Lira, whose needs have to be assessed, using the MM tool.

By the end of the Country Grant 2, the following should have been achieved for all sites (those included in CG1 and those added in CG2):

- Procurement list and renovation plans have been conducted and implemented in the 7 sites in CG1 and 5 laboratories to be added under CG2.
- All Fleming Fund supported sites have undergone the necessary renovations, have been equipped and consumables have been provided to enable them to function as AMR surveillance sites.
- Maintenance and service contract for procured equipment are in place, and a plan is in place to ensure their sustainability beyond the life of the grant
- National calibration centre at NHLDS is supported to service and maintain basic microbiology laboratory equipment including biosafety cabinets, fridges, incubators, centrifuge, pipettes and others
- National Biomedical engineers at NHLDS attend in-country bi-annual in-service training on equipment maintenance, servicing and calibration, including basic training on specialist equipment by engineers from FF implementation partners such as BD.
- Low performing laboratories have been identified. These laboratories have been provided with continuous supportive supervision for on-site bench training of staff to promote good microbiological practices.

- All the Fleming Fund supported sites have active quality management programmes
- All the Fleming fund supported laboratories are monitoring contamination rates and providing ongoing training and feedback to ensure that contamination rates are minimised and that good quality samples are received.
- All sites in the surveillance system send quality assured data on the relevant GLASS pathogens in a uniform format to NCC for compilation and analysis.
- A mechanism should be designed that takes into consideration the national policy and guidelines in the procurement and supply of consumables, ensuring the most efficient and effective way of obtaining the products to reduce stockouts and wastage of reagents.

Output 2.2: Improved biosafety and biosecurity at all Fleming Fund supported laboratories

- The laboratory is equipped with appropriate safety equipment and staff are wearing personal protective equipment while conducting testing.
- All biosafety cabinets are regularly maintained and calibrated. Staff have been trained on their use.
- All waste is disposed of in a safe manner.
- All staff are trained and supervised to the appropriate level for their job descriptions / roles
- Appropriate ongoing supervision of Biosafety and Biosecurity is undertaken by training and appointment of a Biosafety Officer.

Output 2.3: Clinical staff and hospital administrators are actively engaged in AMR surveillance and using locally generated data to inform decision making processes

The focus of the CG1 was aimed at building foundations for AMR surveillance and the grant concentrated on the equipping laboratories and providing training to improve the quality of clinical microbiology services. However, these improvements are of little value unless clinical staff have a good understanding of the function of diagnostic microbiology and are sampling appropriately. Clinical staff (doctors, nurses, pharmacists) must be actively engaged in order to establish a sustainable, passive surveillance programme, and should be proactive in sending samples and liaising with the site laboratory. This will reduce the current syndromic management that is frequently practiced in hospitals and it will also build the confidence of practitioners to utilize diagnostic services before prescription of antimicrobials. Similarly, AMR surveillance data generated at surveillance sites should be used to inform clinicians and management about their practices, and to promote infection prevention and control measures.

By the end of the grant we expect that the following will have been achieved:

- AMR champions have been identified at each site (including doctors, nurses, pharmacists and laboratory staff) and supported to establish or strengthen existing AMR or stewardship committees
- Increased number of good quality blood culture samples sent to the laboratory, with acceptable contamination rates and relevant, key clinical data

(age, infection syndrome, severity indicators and hospital/community acquired) recorded on the request form.

- Results are communicated to clinicians in a timely manner, and systems are in place to communicate critical results (e.g. CSF samples, positive blood cultures) without delay
- Clinicians and pharmacists at the surveillance sites demonstrate an improved understanding of how to incorporate bacteriology results into their practice.
- Data generated at the site is analysed locally and being used to inform hospital level decisions on training, stewardship and drug policies. This may be via Medicines and Therapeutic Committees, Antimicrobial Stewardship Committees or similar entities.

Output 2.4: Enhanced interoperability of AMR surveillance into National surveillance systems (DHIS 2 and EOC).

There are several information systems used at hospital, laboratory and sector levels, including individual LIMS and DHIS2, in addition to the diverse systems set up for surveillance of specific diseases (e.g. enteric pathogens). All the regional referral hospitals, district hospitals and sub districts are connected to DHIS 2, and the Emergency Operations Center (EOC) also operates a dashboard that provides real time data on possible epidemics. Consequently, there is huge amount of data that is generated and reported at the sector level on different indicators.

The Ministry of Health with support from partners has implemented a harmonization strategy to ensure that data is coordinated for better decision making. The Grantee is also working with other sectors to support a Data Integration Sharing Centre (DISC) which will be hosted by the One health Secretariat, working closely with the Emergency Operations Center.

The grantee is expected to continue working with the OH secretariat and explore ways of collaborating to integrate AMR data from the different surveillance systems and databases.

By the end of the grant the following should have been achieved:

- The AMR surveillance data is integrated to current surveillance system
- Collaboration with the EOC, MOH and MAAIF data centres to integrate AMR surveillance data into a common platform

Output 2.5: National use of data is promoted for policy recommendations and therapeutic guidelines

There is a need for results generated by the AMR surveillance system to be used nationally. To promote the use of AMR surveillance data, and improve integration into national systems, we expect the following to be undertaken:

- NCC and OH secretariat have clear ToRs for the collection, use and sharing of AMR data, as described under objective 1

- AMR surveillance findings are used to develop guidelines for pharmacists and physicians, which may need to be national, regional or site specific, depending on findings.
- AMR surveillance data is analysed, and results presented in regular epidemiology bulletins, interpreted alongside findings from AMU and AMC studies as well as with data generated from other Animal Health and environmental sector.
- AMR surveillance findings have been used to produce policy recommendations that take into account the findings and needs of all sectors engaged in AMR surveillance

Output 2.6: Support implementation of regular, sustained PPS on AMU in hospitals

A PPS on AMU is being conducted at two hospitals during CG1. This is being conducted as a pilot with lessons learnt to be used to expand AMU surveillance to other hospitals in subsequent grant(s). PPS studies have also been conducted in a few select hospitals supported by the MTaPS program. Several policy documents have been developed such as the AMU/C strategy that has tools and several guidelines for use. PPS will be scaled up to all the hospitals that supported in order to collect robust AMU data for analysis and use at the sector level. This AMU data should be shared locally to advise Hospital administrators, Antimicrobial stewardship units and IPC and the methodology can be adapted for further studies in the hospitals.

By the end of the grant the following would be achieved:

- Implementation of a regular programme of point prevalence surveys (e.g. using the Global PPS or the WHO PPS methodology with integration of findings of the PPS conducted as a pilot during CG1). Site staff should be trained in the methodology and sites should be capable of undertaking the survey on an annual basis.
- The information from these PPS should be shared locally with Hospital administrators, Antimicrobial stewardship committees, and Infection Prevention and Control committees
- The information will have been shared nationally with NCC, OHTWG to ascertain trends and association of antimicrobial use with antimicrobial resistance

Objective 3: Sustain existing support to AMR and AMU/C surveillance in terrestrial animals, and expand to additional sites.

Output 3.1: The animal health technical working committee is supported to strengthen the AMR/U/C surveillance systems

The technical working Committee (AMR/AMU) at MAAIF are tasked with building sustained partnerships to facilitate and oversee implementation, monitoring and evaluation of AMR and AMUsurveillance, and are responsible for information sharing and liaising with relevant stakeholders. This committee needs to be supported to strengthen their capacities to fulfil these tasks effectively.

By the end of the grant we expect that the following will have been achieved:

- MAAIF Animal health committee has technical and practical capacity to oversee development and implementation of the surveillance documents such as strategies, protocols, SOPs, workplans and budgets etc
- Quarterly meetings have been held to discuss results, review of technical reports and documents, to oversee implementation of the NAP and recommend policies relevant to AMR containment.

Output 3.2: Support Animal Health AMR National reference laboratory and selected regional veterinary laboratories to contribute to the AMR surveillance network

Under CG1, NADDEC, COVAB, and one regional laboratory was supported to identify E. coli, Salmonella, Enterococci and Campylobacter (for NADDEC and COVAB). The capacity of these veterinary laboratories to conduct bacterial identification and ASTs has been strengthened through training and provision of laboratory supplies (e.g. equipment and consumables). This has resulted in an increase in the number of pathogens identified and in the amount of data being reported to One Health Technical Working Committee and to GLASS. However, the capacity of these laboratories vary widely because of the resources available. As a result, support to these laboratories will be continued and diversified. In addition, four regional laboratories will be supported under CG2, to acquire basic microbiological capacity namely: Arua, Gulu, Nakasogola and Mbale. These laboratories have limited bacteriology capacity, and substantial support will be needed to carry out AMR surveillance.

However, their specific needs will be determined during CG2, using the needs assessment tool provided by the management agent. The decision to develop a full bacteriology laboratory section in each laboratory or a reliable transport system between laboratories that would ensure good service provided to users should be discussed with the management once the assessments are done.

In addition, support will be provided to Diary Development Authority laboratory to improve its microbiology capacity.

NADDEC needs continuous strengthening of its data management capacity, and quality control management. Its procurement and supply chain should also be capacitated to provide bacteriology EQA to the regional laboratories.

By the end of the grant we expect that the following will have been achieved:

1) At laboratories supported under CG1:

- Laboratories can identify and test for antimicrobial sensitivity, a limited number of pathogens among the most frequently identified in clinical practice (with a focus on dairy practice).

2) At NADDEC:

- NADDEC is strengthened to provide EQA for priority pathogens in live poultry and milk, to all laboratories in the AMR surveillance network.
- Quality management systems are strengthened
- A stock management system is strengthened to ensure reliable and timely

supply of laboratory supplies for NADDEC and the regional veterinary laboratories which are supported by NADDEC, as described in 1.3.

- SOPs for culture, identification and AST of additional pathogens are developed and disseminated to all surveillance sites.

3) In the four newly supported laboratories:

- Needs assessments done and subsequent procurement list and renovation plans submitted to management for action.
- Laboratory personnel can culture, isolate, and identify bacterial pathogens, at acceptable standard as recommended by the quality management system, and perform ASTs by disc diffusion where necessary or send isolates to NADDEC for ASTs and further testing as requested.
- Samples and isolates can be transported between the different laboratories and sampling sites in a secure and reliable manner without significant delays, including sample tracking.

4) At the Diary Development Authority laboratory:

- Laboratory personnel are able to collect samples from milk collection centres, processing plants and selling points for culture, isolation and identification of pathogens and carry out ASTs at acceptable standards;
- A safe, reliable and efficient transport system is in place for samples submitted to DDAL (ensuring timely response to key stakeholders) and isolates sent to NADDEC for confirmatory testing, PT, further testing, etc.

5) In all laboratories:

- The laboratories have been equipped and where necessary upgraded, to meet minimum OIE standards.
- All laboratory supplies t identified by the assessments and agreed on with the Management Agent have been procured and installed, with maintenance / service contracts and staff training, and a sustainability plan to ensure ongoing maintenance and training post FF grant.
- All SOPs used in the laboratories from sample handling, bacterial identification, AST, data management, reporting to farmers/veterinarians/management/NADDEC, MAAIFetc) have been updated/corrected as necessary to ensure they are complete, meet current international standards and are used by appropriately trained laboratory staff.
- NADDEC and COVAB supported to provide diagnostics mentoring to all laboratories in the AMR surveillance network.
- Each laboratory has a functioning IT system, LIMS, and trained staff who are able to efficiently enter data from laboratory results, accurately matched to demographic details.
- All sites in the surveillance system send all data in a uniform format to NCC at NADDEC Epidemiology Unit for compilation and analysis.
- Laboratory personnel at laboratory surveillance sites are trained in safe sample handling, labelling, packaging and documentation as per the recommended standards, guidelines and regulations following appropriate international regulations and guidelines.

Output 3.3: Strengthen data management, analysis and use

The AMR surveillance system should be integrated, as much as possible, into current information systems. To do so, data systems used to collect AMR surveillance data need to be interoperable with other national surveillance systems. In addition, Results generated by the AMR surveillance system need to be used nationally.

The epidemiology unit (NADDEC) has the technical capacity to analyse the data and present the results to UNAMRC and other policy makers. However, the epidemiology unit needs to be capacitated to handle large volumes of data, such as the amount that will be generated through planned AMR surveillance activities. This will require additional support for data management systems, internet connectivity with faster bandwidth, training, as well as IT support. Data entered in the LIMS should be easy to access and download by the epidemiology unit.

By the end of the grant, we expect that the following will have been achieved:

- IT systems (software and hardware) have been procured and where necessary upgraded to provide adequate management of AMR/C/U data, including regular and secure back up. These systems should be interoperable with other national surveillance systems.
- Staff from laboratories and NADDEC epidemiology unit and Veterinary Drug Office have been trained in AMR, AMU and AMC data collection, quality management, analysis and interpretation, as required and relevant to their roles.
- Regular reports on AMR, AMU/C are shared with relevant stakeholders, such as the MOH, MAAIF MWE
- Policy briefs based on AMR surveillance findings have been produced and presented to the UNAMRC/OH platform.

Output 3.4: Sustain and develop support to enhance AMR surveillance

Under CG1, a protocol for active AMR surveillance in poultry was developed and the survey carried out, in layers and broilers, in the regions in which supported laboratories are located. This surveillance did not target testing for AMR in pathogens of interest to veterinary practice.

Veterinary practitioners and farmers regularly have been experiencing increased cases of treatment failure for mastitis, a highly prevalent bacterial disease among dairy cattle. This has greatly affected dairy farmers in terms of reduced milk yields, loss of milk sales, increased costs of production, increased culling rates of dairy cattle among others. This therefore, calls for a need to collect data on AMR in pathogens so as to provide the most appropriate management options for mastitis affecting dairy cattle.

By the end of the grant we expect the following to have been achieved:

- A protocol for active AMR surveillance in dairy and beef cattle developed and implemented, focusing on mastitis causing pathogens as well as well as zoonotic pathogens. Feacal and milk samples will be expected to be collected.
- Staff are trained on sample collection (collection, labelling, transport, relevant biosafety and biosecurity measures), sample processing and data entry

(software system to be determined in previous output), as described in 3.2.
- Appropriate isolates are forwarded from surveillance laboratories to NADDEC for confirmation and/or archiving, as described in 3.2.

Output 3.5: Support the development of a system to monitor veterinary drugs imports, manufacturing, sale and uses and support AMC and AMU surveillance by NDA and MAAIF

As per the NDA Act, 1993, NDA is responsible for regulation of importation, manufacturing, sale of quality and cost-effective drugs at all times. The current law has no chapter on antimicrobial resistance, thus little attention has been given to gather appropriate and reliable data on AMC from imports, manufacturing and sales of any antimicrobials to guide policy formulation by the responsible ministries.
Uganda is a member to World Organization for Animal Health (OIE) and therefore, obliged to report AMC data annually. This responsibility is performed by the Chief Veterinary Officer. In order to fulfil this obligation, NDA has to closely work with MAAIF. Given the need to align the Country's AMC/U data management protocols with OIE requirements, there is a need for the grantee to support MAAIF and NDA to develop and or strengthen their capacity to capture and manage appropriately data for AMC/U, drug imports, manufacture, sales and use to inform policy on AMR control and containment.

There is also a need to support h MAAIF and NDA to undertake surveillance for AMU/C. This will involve mapping of distribution pathways/channels, of veterinary and animal drugs, estimates of antimicrobials by volumes (quantities),type, and class imported, distributed, sold and used in the Country including names of companies, quantity volumes and types and quality of drugs that are traded. By the end of the grant, GoU should be able to know the quantities/volumes of veterinary drugs(antimicrobials) imported, manufactured, distributed, sold, and used per drug type.
As far as reporting data to OIE is concerned, Uganda should explore support towards progress from the qualitative option for reporting to option 2
By the end of the grant we expect the following to have been achieved:

- Software and hardware are in place to monitor drug imports, manufacturing and sales, at least to the wholesale level and use at farm level as required by NDA and MAAIF
- A value chain analysis of distribution pathways for animal drugs has been conducted
- The surveillance plan of AMU/C has been implemented in central region in Uganda and a farm-based AMU survey has been carried out

Output 3.6: Increased engagement of veterinary practitioners and farmers in AMR surveillance

The Fleming Fund supports a One Health approach to AMR surveillance. The core of the One Health surveillance system is a harmonised approach to testing for resistance to a common set of antibiotics in a common set of bacteria in the targeted populations. This

will allow comparison of AMR and AMU patterns within and between human and animal populations to identify potential links and cross over between these populations most probably from animals to humans or vice versa. The focus of the CG1 was to strengthen AMR surveillance in poultry using the active surveillance approach as the first step to strengthen the animal health AMR surveillance system, epidemiological investigations and laboratory diagnostics. Active surveillance facilitates increased sample throughout as tests are seldomly requested for.

Farmers and veterinary practitioners usually demand for laboratory tests once an animal population is affected and various treatment options have failed. To establish a sustainable passive surveillance programme, it is critical to engage the policy makers at Ministry, veterinary practitioners, animal products processors and traders, consumers and farmers to demand for laboratory diagnostic services. This will not only ensure evidence-based treatment of bacterial diseases by veterinary practitioners but also promote rational drug usage thus saving antimicrobials.

By the end of the grant we expect that the following will have been achieved:

- Undertake situational analysis on utilization of bacteriology services for clinical diagnosis in AH.
- In conjunction with the MAAIF Animal health TWC and relevant stakeholders, a strategy to encourage field veterinarians, animal health care workers service providers and farmers to request biological tests has been developed, discussed, agreed up onto and piloted in a limited region.
- Veterinary practitioners and farmers have been engaged at different fora, including during active surveillance to enhance clinical laboratory diagnosis and treatment.

Objective 4: Expand AMR surveillance to include the Environment sector

Output 4.1: Strengthen the Department of Environment's inclusion in AMR governance structures and national AMR surveillance

Given the need to strengthen the OH collaboration it is critical for CG2 to support the development of a strategy for AMR surveillance in the environment and support further inclusion of this sector into governance structures.

By the end of the grant we expect the following to have been achieved:

- A situation analysis has been conducted in order to present the needs for AMR surveillance in the environment in Uganda. The report should provide a set of objectives for AMR surveillance so that findings can contribute meaningfully to the country's overall AMR surveillance strategy and, in parallel, present needs in terms of capacity building and infrastructure in order to carry out these surveillance activities. Finally, the report should present a costed implementation plan in order to inform stakeholders of the investment needed and the outputs that can be expected according to investments.
- A draft AMR surveillance strategy for environment is developed in collaboration with relevant national stakeholders.
- Relevant stakeholders have participated in TWG meetings, as per objective 1.

Output 4.2: Enhancing AMR Surveillance Capacities of the National Water Quality Referral laboratory (NWQRL)

GoU environmental surveillance of AMR, so as to strengthen their One Health approach to AMR surveillance and containment. The Ministry of Environment and Environment has a microbiology laboratory section in the National Water Quality Referral Laboratory (NWQRL) with a microbiologist. As a first step, microbiological diagnostic capacity will be strengthened at the NWQRL, which is currently capable of identifying common pathogens such as E.Coli from water samples.

By the end of the grant we expect the following to have been achieved:

- SOPs for sampling processing, bacterial culture, isolation and identification, and data management are designed and used by appropriate staff.
- Laboratory staff can culture, isolate and identify bacterial pathogens, at acceptable standards following recommended quality management system
- NWQRL is enrolled in an appropriate EQA scheme, preferable one providing proficiency testing.
- NWQRL has an effective supply system to support the provision of quality microbiology reagents.
- Biosafe and bio-secure transport system is in place to send isolates from NWQRL to NMRL

7. Grantee Roles and Responsibilities

The main role of the Grantee(s) will be to plan and implement the activities required to achieve the objectives and outputs outlined above. The Grantee is responsible for providing – either alone or through a partnership or consortium – the technical, financial, and operational expertise required to deliver the grant.

The Lead Grantee is also responsible for monitoring and reporting to Mott MacDonald. Reporting of financial expenditure against budgeted activities is a requirement of the grant and Grantee(s) will need to show evidence of sufficient capabilities to undertake these responsibilities.

8. Measuring success

Country Grants are ultimately expected to generate results that can be tracked using a standard set of indicators that will monitor progress and achievements within and across Country Grants. A copy of the full list of indicators will be shared in the Application Pack. Applicants are to select only the ones they find applicable or appropriate for their implementation plan.

In summary, while the completion and level of attainment for *all* activities requires monitoring, the type/level of activity will determine the monitoring method. When developing the application, applicants should:

- Select from the proposed indicators for activities, where appropriate, or,
- Identify targets and timeframe completion for 'process' type activities (i.e. where indicators provided are not applicable / too advanced).

A mix of these options is also appropriate depending on application content.
The Grantee will be expected to revisit/confirm the monitoring plan, which will then be agreed with Mott MacDonald after the grant is awarded.
In addition to measuring grant performance against the objectives and outputs stated above, the grant will also be monitored on the implementation of, and adherence to, the Fleming Fund core principles described in Section 2.4, and practical implications for this will be discussed with the successful applicant. No further action is required at this stage.

9. Application requirements

9.1 Evaluation criteria

The application form will indicate the scoring and weighting for each section of the application. The Application Pack will also contain Guidance Notes explaining what we are looking for in terms of a good quality response for each question, including approach to Value for Money (VfM).
In particular we are looking for the grantee to

- technical capacity to address the different aspects of AMR covered by this Country Grant.
- ability and preparedness to bring stakeholders together in an effective and productive working arrangement, promoting a One Health approach.
- ability to operate effectively in Uganda.

9.2 Restrictions/limitations

Any conflict of interest, or potential conflict of interest, should be declared to Mott MacDonald when applicants are registering their interest to apply for the grant. If a conflict of interest, or potential conflict of interest, arises after that point the prospective Grantee must clearly declare this in their proposal.

9.3 Key dates

- Application submission deadline: 03 August 2020.
- Anticipated start of grant: August 2020

9.4 Contact details and support information

Any questions on the Request for Proposals should be sent to flemingfundESA@mottmac.com. Mott MacDonald will endeavor to respond to queries within three working days.