

Strengthening monitoring systems for AMU and AMR in cattle production systems in South-Kivu, D.R. Congo

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With growing numbers of livestock, antimicrobial resistance (AMR) is an increasingly difficult issue harming animals and humans. Therefore, monitoring antimicrobial use (AMU) is becoming a necessity to fight this trend. As part of a larger initiative, project AMRAfrika's goal is to build a digital system in South-Kivu in D.R. Congo that combines AMU monitoring with a helpful tool for cattle farmers, providing easy data management, AMR risk assessment, and decision support for the treatment of diseased animals. This provides a tool specifically tailored to the region where conventional solutions fail, as it accounts for the socioeconomic status of the farmer and the existing infrastructure.

Project AMRAfrika

The main goal of the AMRAfrika project is to develop an antimicrobial use and resistance assessment model in cattle production systems, combining upstream participatory approaches in data gathering with current digital data management systems and online analyses and modeling techniques to support decision-making (Figure 1). The project will approach AMR risk assessment in a holistic way to provide timely, relevant decision support evidence on cattle disease occurrence and AMR risks at the nexus between environment-plant-livestock-human (One Health approach).

Using the samples and data accumulated on-site at the farm, it was assessed as to where the project should focus its efforts and what kind of digital system is not only useful for recording AMR and AMU but also helpful for the farmer. The first step was to develop an easy-to-use open-source application with minimal requirements and on- and offline capabilities. While offline, it is meant to deliver a digital helper for the farmer, helping with decision-making and acting as a small encyclopedia for additional information. When connected to the internet, additional features will be available, like disease and weather warnings, contacts to other farmers, veterinarians, and research institutes, and the upload of data to the cloud. Over the course of development and testing, features will be added, adjusted, or removed according to the farmers' and researchers' feedback to guarantee acceptance and use of the system.



Figure 1: The AMRAfrika project team from ISTM-Bukavu taking milk samples on cattle farms in South-Kivu, DRC.

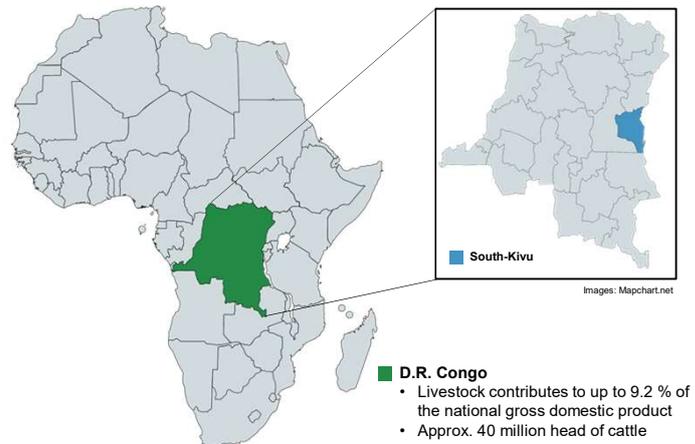


Figure 3. Map of the study site in D.R. Congo.

Current Status

We collected first-hand data on antibiotic use in cattle rearing and the prevalence of antibiotic resistance in animals, humans, and the environment from 216 farms in the South-Kivu province (Figure 2). Samples from cattle, humans, and soil have been collected and analyzed for the presence of bacterial pathogens, AMR, and parasites. Results from the laboratory analyses and the survey show that the disease environment in South Kivu is already high and antibiotics are frequently used for prophylaxis. Out of 300 samples taken, 168 (56%) were resistant to at least one antibiotic and 89 (30%) to at least three antibiotics.

Of the surveyed farmers, those with a smartphone were chosen as the first to test the currently developed app. This will be one part of the monitoring system that includes helpful tools to aid in the use of antibiotics and farm management. This open-source software will include AMU monitoring, herd management, vaccine reminders, weather information, and more. It is able to work offline with only occasional connection to the internet when data will be shared and new information downloaded.

Unfortunately, due to the fights in the region and the takeover of Bukavu by rebels, on-site sample collection and app testing have become too dangerous, and parts of the project are on hold.

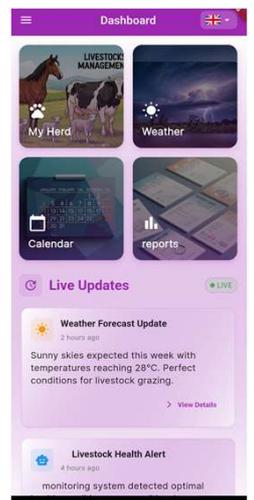


Figure 4. Current prototype of the AMU monitoring and farm management app

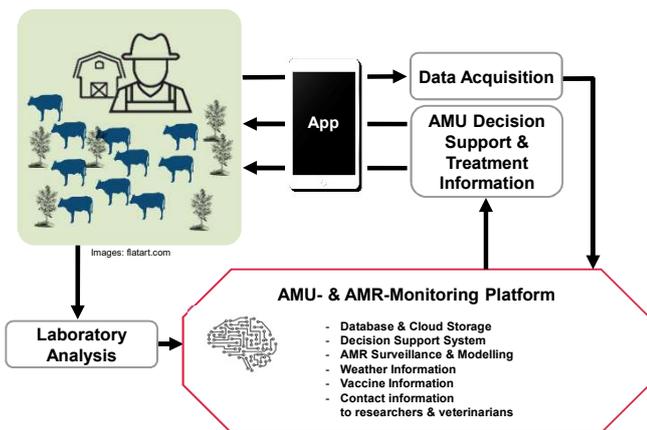


Figure 2: Representation of the AMR- & AMU-monitoring system.

Current findings of AMR and survey results in South-Kivu, DRC emphasize the need for a suitable solution to document and fight dangerous pathogens in the region. The AMU- and AMR monitoring system will provide free, open-source solutions specifically tailored for the lack of infrastructure in the region and the needs of farmers and researchers alike. The system is developed in cooperation with the ISTM-Bukavu such that farmers profit from better AMU information, decision support, and farm management, while the researchers can collect valuable data without the need to get through treacherous terrain with missing infrastructure. The offline capability allows the app to be used in remote areas with no internet connection and as the system will be open-source it can be used in other but similar regions.