

# **RESEARCH & DIAGNOSTIC PRIORITIES IN ANIMAL HEALTH IN ERITREA**

## **Report for the Ministry of Agriculture, Eritrea**

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## **1 SUMMARY OF RECOMMENDATIONS**

The main aim of the mission was to train animal health workers, laboratory scientists and technicians on research methodology, sample collection, cow-side test and laboratory methods for the diagnosis of bovine mastitis.

In addition, a series of meetings were held with experts and policy makers in animal health and production at the Ministry of Agriculture (MOA), the National Agricultural Research Institute (NARI), the National Animal & Plant Health Laboratory (NAPHL) and Hamelmalo College of Agriculture (HAC) to learn about their current priorities and to discuss plans to build a strong research base on animal health.

The mission lasted 3 weeks.

The main recommendations are as follows:

- 1.1. Provide animal health workers and laboratory scientists with further short-term training in diagnostic and research methods for other important viral, bacterial and parasitic diseases of domestic animals, and on food hygiene/meat inspection.
- 1.2. Establish small regional diagnostic and research laboratories to support the work by the only functional laboratory on animal health at the NAPHL.
- 1.3. Provide reliable power supply by using solar powers to the regional laboratories to ensure that fridges, freezers, autoclaves and incubators have continuous power supply.
- 1.4. Expand diagnostic and research capability to include important zoonotic diseases such as bovine TB, brucellosis, rabies, salmonellosis, and leptospirosis.
- 1.5. Include research on infectious diseases of poultry, small ruminants, and camels, as these species are economically important and are more likely to be the main sources of human infection.
- 1.6. Establish incineration facilities at the NAPHL and HAC for the disposal of laboratory and pathological waste.

## **2 INTRODUCTION**

### **2.1. Background to the Mission**

In January 2022, I was approached by Dr Tzeggai Tesfai, Eritrean National Agricultural Research Institute (NARI), to review a research proposal on the prevalence of subclinical mastitis in dairy cows in the Anseba, Maekel and Debub regions of Eritrea. This was part of the DeSIRA projects.

Having reviewed the proposal, I forwarded Dr Tzeggai copies of 5 papers on subclinical mastitis jointly authored by Professor Abdul Bhutto, Dr Richard Murray and myself. The papers were part of a Liverpool University PhD thesis by Abdul Bhutto under my supervision. This led to further email correspondence and discussions through Zoom with Dr Lance O'Brien.

Dr O'Brien and Dr Getachew Ghebru subsequently invited me to join the Research Oversight Committee (ROC) of the Climate Smart Agricultural Research & Innovation Support for Dairy Value Chain in Eritrea (CSARIDE) on a voluntary basis. My involvement with the ROC over the last year has given me the opportunity to meet the members of the ROC and to learn more about the CSARIDE project in Eritrea. It was on this basis that Dr Tzeggai Tesfai asked me to visit Eritrea for 2 to 3 weeks.

### **2.2. Objectives**

The mission was not a consultancy, with clear Terms of References (TOR). However, after consultations with Dr Tseggai Tesfai, NARI, and Dr Lance O'Brien, CSARIDE, the key objectives were as follows:

- 2.2.1. To undertake workshops on experimental design, sample collection and transport, and on isolation and identification of bacterial agents of bovine mastitis to be carried out at the National Animal & Plant Health Laboratory (NAPHL), Asmara.
- 2.2.2. To review a draft paper on the prevalence of bovine mastitis in the Anseba Region.
- 2.2.3. To meet with policy makers and scientists at the Ministry of Agriculture (MOA), the NAPHL, National Agricultural Institute (NARI), Halhale, and Hamelmalo College of Agriculture (HAC) to gain an insight about their research and diagnostic priorities and challenges.
- 2.2.4. To make recommendations on the way forward in research and diagnostic priorities in animal health, in general, and infectious diseases, in particular.

### **2.3. Acknowledgements**

Dr Tzeggai Tesfai for organizing a detailed programme of the mission, including the selection of the 30 animal health workers and 15 laboratory technicians and scientists for the 4-day workshop, and for setting up the various meetings with relevant staff at the MOA, NAPHL, HAC, and NARI.

H.E. Mr Arefaine Berhe, Minister of Agriculture, and other senior staff at the MOA for making time to meet with me and to explain their current research plans and their future priorities in animal health.

Mr Iyassu Ghebrerufael and his team at Vita-Eritrea for looking after me so well during my stay in Asmara.

Mr Sam Kappler of Vita Ireland for arranging my flights with Ethiopian Airlines and for dealing with the procurement of materials necessary for the mastitis project.

Dr Lance O'Brien and other members of the ROC of the CSARIDE for their contributions to research on dairy milk production in Eritrea, and for covering my travelling and living expenses during this mission.

Professor Woldeamlak Araya, Dean, Hamelmalo College of Agriculture, Professor Woldesellasiye Ogbazgi, Associate Dean for Academic Affairs, Professor Hashim, Head of the Department of Veterinary Medicine, and other academic members in the Department of Veterinary Medicine for a brief tour of their facilities and explaining the challenges they face in developing a new veterinary school.

Mr Tsegay Berhane, Head of NARI, and other staff in Halhale for taking time out to explain to me their current research programmes, including their success in tissue culture-based propagation of dates and bananas, research programmes on enhanced production of animal feed, animal breeding and better methods of housing dairy cattle.

The participants of the workshops for their enthusiasm, desire to learn, and their active participation in the discussions about research and diagnostic priorities.

### **3 PROGRESS ON OBJECTIVES**

The main tasks accomplished during the mission were the following:

#### **3.1. Workshops at the National Animal & Plant Health Laboratory, Asmara**

During the first Monday of the mission, meetings were held with senior staff of the MOA and the National Animal & Plant Health Laboratory to establish the resources necessary for the workshops.

Thirty animal health workers from the Anseba, Maekel and Debub regions of the country took part in the first 2-day workshop.

The power-point presentations in Tigrigna and practical demonstrations included guidelines on the correct completion of questionnaires and other forms to identify the farm, animal, and the quarter from which the milk is collected, correct methods of sample collection, cow-side tests for mastitis based on the California mastitis test (CMT), and correct methods of storing and transporting milk samples for bacterial isolation.

During the second day of the workshop, all the participants had the opportunity to observe practical demonstrations of appropriate milk sample collection and cow-side CMT in a dairy farm in a suburb of Asmara.

The second 2-day workshop supported by a power-point presentation in Tigrigna and practical demonstrations involved 15 animal health workers and laboratory technicians from the 3 regions. The workshop included methods of correct recording of farm, cow and sample identity, sample storage, preliminary isolation of bacteria, and a detailed description of methods of bacterial identification to species level.

Each participant was given copies of handouts of the presentations, questionnaires and other forms used in the mastitis project, notes on methods of sample collection, methods and interpretation of the cow-side test, and flowcharts of bacterial isolation, identification and storage.

Upon completion of the workshops, I had a brief tour of the laboratories for bacteriology, virology (including a PCR unit), serology, parasitology, and the newly established vaccine production units for Newcastle disease and peste des petits ruminants virus (PPRV).

There is also a meat inspection and food hygiene unit, but I did not have the opportunity to visit the facility. The NAPHL also has a unit for generating liquid nitrogen. This is an important asset for preserving semen, bacteria, viruses, and heat-sensitive biological products in remote areas, without the need for electric power.

There are several separate units for housing experimental animals. However, there is no facility for incinerating animal carcasses or laboratory waste. As laboratory activity and pathological work increase, the current use of autoclaves to deal with laboratory waste will not be sustainable and installing an incineration unit will become necessary.

It was beyond the scope of the mission to make a full and thorough assessment of the laboratories and other associated facilities at the NAPHL. However, the laboratory has the necessary facilities and equipment to undertake research and diagnostic work in bacteriology, serology, virology and parasitology. It needs support for the supply of laboratory reagents and other consumables.

The vaccine production unit was impressive, with modern and safe facilities for viral growth in cell culture systems and for immunological assays. These facilities will have a positive knock-on effect on developing research capabilities in virology and immunology.

At the end of the workshops, the participants took part in an open discussion on what diseases other than mastitis should be given priority for research, diagnosis and control.

In addition to mastitis, the overwhelming view was that zoonotic diseases such as brucellosis, TB, rabies, salmonellosis, and leptospirosis should be the main priorities for research, diagnosis, and control.

The diagnosis and control of infectious diseases of poultry and small ruminants were also regarded to have the most impact on improving the lives of poor farming communities.

The other issue raised by the participants was the fact that there is only one functional laboratory for diagnostic microbiology in the country based at the NAPHL. This means that milk and other specimens must be transported over long distances under usually hot conditions for hours and sometimes for days. These conditions could compromise the reliability of the laboratory tests. Therefore, there is an urgent need to establish small regional laboratories supported by solar energy to provide 24-hr power for basic facilities such as fridges, freezers, autoclaves, and incubators.

The participants also expressed the need for more regular refresher courses and workshops on other topics to improve their diagnostic and research capabilities.

We also had a series of meetings with scientists running the units in bacteriology, virology, serology, and epidemiology to discuss their current research activities and plans. Their views about research priorities were also on zoonotic diseases.

During one of the meetings, Dr Ephrem G. Meskel presented the results of a study on the prevalence and risk factors for brucellosis in Eritrea.

### **3.2. Review a draft paper on the prevalence of bovine mastitis in Anseba Region**

During my visit, the co-investigators in HAC, NAPHL, NARI and myself reviewed the draft paper on prevalence and risk factors for bovine mastitis in the Anseba Region.

The paper was based on statistical analysis of data from questionnaire, CMT and bacterial isolation data. It was agreed that the paper will be reviewed further by the co-investigators and by myself. A decision will then be made on an appropriate international journal for publication.

### **3.3. Hamelmalo College of Agriculture, Hamelmalo**

At Hamelmalo Agricultural College, I had a series of discussions with the Dean, Professor Woldeamlak Araya, the Academic Dean, Professor Woldeselassie Ogbazgi, Professor Hisham, Head of Veterinary Medicine, and other academic staff regarding the new veterinary and proposed MSc programmes, and potential contributions by myself and other professionals.

I also had the opportunity to visit the laboratories for food science and microbiology, and the teaching units for anatomy, surgery and gynecology.

The progress made so far in developing a 6-year veterinary programme leading to a DVM degree and the dedication of the academic and technical staff are impressive. However, the new veterinary programme will need considerable outside support in developing teaching and research capabilities.

Because of the location of HAC, lack of reliable power supply, which is necessary for functional laboratories, and poor internet connectivity are the main problems. For example, useful laboratory equipment necessary for setting up a microbiology laboratory acquired as part of the HORN Research Project led by my Liverpool University colleague Professor Matthew Baylis a couple of years ago, remained in store because of lack of reliable power supply. Installing solar panels will ensure continuous electricity to fridges, freezers, autoclaves, and incubators in the laboratory.

The microbiology laboratory can then serve as a valuable resource for training DVM and research students, and for diagnostic and research purposes. Initially, HAC scientists and technicians can get trained on basic principles of microbiology at the NAPHL, with further advanced training to be conducted at HAC, once the laboratory is set up.

There is also a plan to start MSc programmes in animal breeding, animal nutrition and horticulture. In the short term, the new DVM and the planned MSc programmes are likely to need additional funding to support visiting academic staff coming in to give intensive lectures and seminars on a regular basis. This would require careful planning of lectures and modules to enable visiting academic staff to complete their lecture sessions in a couple of weeks rather than months. If the problem of internet connectivity can be resolved, some of the seminars can also be carried out using Zoom or Skype.

I also had the opportunity to visit the newly established model dairy unit and the animal feed production plots supported by a solar panel generated water pump.

### **3.4. National Agricultural Research Institute (NARI), Halhale**

During the second week of the mission, I visited the National Agricultural Research Institute at Halhale, to meet the Director General, Mr Tzeggai Berhane and other members of staff to discuss current projects in animal production and animal health.

I visited their model animal feed production and dairy cow housing units.

I also had the opportunity to visit their excellent facilities for tissue culture-based propagation of dates and bananas and their biotechnology unit. The expertise in tissue culture and biotechnology already in place can serve as good models for similar projects in animal health and production at the NARI.

### **3.5. Ministry of Agriculture (MOA), Asmara**

During the first and 3<sup>rd</sup> week of the mission I visited the MOA to meet HE Mr Arefaine Berhe, Mr Semere Amlesom, Mr Emanuel Negasi, Mr Kahsay Negash and other senior staff responsible for livestock production and animal health. This allowed me to have a good general view about their current priorities and future plans on animal health.

I also had a brief meeting with Mr Tekleab Misghena, Executive Director of Regulatory Services, to exchange views on the plan to strengthen animal quarantine services, and to train quarantine inspectors in the Regulatory Services Department.

At the end of the mission, I had a brief meeting with the EU representative in Asmara.

## **4 RECOMMENDATIONS**

The following recommendations are based on discussions I had with participants of the workshops, meetings with senior staff of the three institutions, brief tours of some laboratories and my observations:

- 4.1. Expand the capacity of the NAPHL to diagnose bacterial, viral and parasitic diseases by providing culture media, reagents and other consumables, and by training scientists and laboratory technicians through workshops and refresher courses in diagnostic and research methods.
- 4.2. Encourage young scientists to engage in preparing research projects by organizing research seminars and conferences in Eritrea on a regular basis.
- 4.3. Establish small regional laboratories in Hamelmalo, Halahale, Barentu and other remot regions. This will require the installation of solar panels to provide 24-hr power for fridges, freezers, incubators, and autoclaves.  
Once developed, these regional laboratories and the NAPHL will serve as important centres of training for veterinary students and those undertaking MSc or PhD programmes in the future.
- 4.4. Broaden research programmes in animal health to include zoonotic diseases such as TB, brucellosis, salmonellosis, leptospirosis, and rabies.

I was particularly concerned by the number of stray dogs moving freely in the main streets of Asmara and other towns.

- 4.5. Initiate research programmes on the prevalence of infectious diseases of poultry such as Newcastle disease, pullorum disease and fowl cholera, with a view of developing diagnostic and research capabilities in poultry diseases.
- 4.6. Expand research and diagnostic programmes to include infectious diseases of small ruminants (goats and sheep) and camels, as they are economically important to small farming communities. They are also the more likely sources of human infections.
- 4.7. Establish a national scientific journal in animal health and production to encourage young Eritrean scientists to publish research and review articles in Tigrigna, Arabic or Tigre, with abstracts in English, or in English, with abstracts in Tigrigna.
- 4.8. Establish a trained team of technicians and engineers to maintain and repair laboratory equipment in the various laboratories at the NAPHL, HAC and NARI.
- 4.9. Establish incineration facilities at the NAPHL, NARI and HAC for the disposal of laboratory and pathological waste.
- 4.10. Undertake comprehensive assessment of laboratory facilities, material and human resources necessary to make the three institutions centres of excellence in animal health in general and control of infectious diseases in particular.