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Assess the capacity of field surveillance and laboratory capabilities of relevant government organizations (especially DLS) to identify microbiological, chemical, radiation and physical food safety hazard

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EXECUTIVE SUMMARY

This report, 'Assessment survey and outcome report on field surveillance and laboratory capabilities' has been developed through a consultation with officers of the Department of Livestock Services (DLS) and through a questionnaire of 15 DLS laboratories.

Food safety is a global issue now and a priority for Bangladesh. It is crucial to supply safe food to local consumers as well as developing high value export opportunities. To address the issue effectively, it is important to identify food safety at the right time and right place. For that, a nationwide value-chain based surveillance system needs to be in place.

The Department of Livestock Services (DLS) is solely responsible for food safety assurance in the production and primary processing of foods of animal origin.

This study was conducted to assess the food safety surveillance system in place in Bangladesh. All possible areas, where such surveillance systems could be in place were identified. A good number of areas of potential, as well some areas with limitations were identified. The most urgent identified need was an integrated approach involving all potential actors.

In the field service, there are some sampling and surveillance programs, which may be linked with laboratories for targeted sampling, to address some specific hazards.

Most of the DLS laboratories are working to identify some food safety hazards. CDIL and QC lab are well equipped through project supports. Still there is scope for improvement. The VPH lab is also being developed based on project support. Other labs do not have access to modern equipment and continue to use traditional equipment.

Around 10,000 samples are tested in total by DLS laboratories a month, which is a good number. It is essential to improve the FDILs and central labs other than CDIL with updated equipment, so that they can perform a higher level of diagnosis. It is worth mentioning that DLS labs do not test radiation hazards and are therefore not considered in this report.

The manpower situation of CDIL and QC lab seems insufficient. They are working with deputed persons. In total out of 178 positions, 88 are working in the labs. Around 51% positions are vacant. This deserves attention of policy makers to urgently fill the vacancies.

Regarding the identification of food safety hazards, out of 15 laboratories, nine analyze for microbial hazards, seven for zoonotic parasites, five for mycotoxin and other natural toxins, and one (QC lab) tests for antimicrobial residues, heavy metals and pesticides. The VPH laboratory is preparing to test for antimicrobial residues, heavy metals and pesticides.

It is assumed that the majority of laboratories, that are performing analysis using old methods and resources will require additional assistance including financial aid, to modernize to current requirements.

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INTRODUCTION

Diseases that are spread between animals and people are termed as Zoonotic diseases. Consistently these diseases are becoming major public health threats globally, due to various geographical, environmental and other reasons. It is now estimated that more than 6 out of every 10 known infectious diseases in people are spread from animals, and 3 out of every 4 new or emerging infectious diseases in people are spread from animals [1]. Bangladesh lies in the northeastern part of South Asia between 20°34' and 26°38' north latitude and 88°01' and 92°41' east longitude. The country is bounded by India on the west-north and north-east while Myanmar on the south-east and the Bay of Bengal on the south. The area of the country is 56,977 sq. miles or 1, 47,570 sq. k.m. There are three geographic regions of Bangladesh. The country is largely dominated by the Ganges Brahmaputra Delta. The northwest and central parts of the country were formed by the Madhupur and Barind plateaus. The northeast and southeast are home to evergreen hill ranges. As one of the most densely populated countries in the world, as reported in the SVRS, the population (estimated) of the country stood at 171.73 million on 1 July, 2022. The rate of natural growth of population was 1.35%. The density of population was 1,153 per sq.km. in 2021 which increased to 1,163 per sq.km. in 2022. [2].

The animal population is also high in Bangladesh. According to the Department of Livestock Services (2022-23), there are 24.86 million cattle, 1.52 million buffalo, 30.77 million goat and sheep and 385.70 million poultry. Most of the ruminants and a considerable percentage of poultry free-rangers are kept in close proximity to human habitation. So, there is strong risk of transmission of zoonotic disease from animals to humans and vice versa. Formal animal slaughtering and processing is also very limited in Bangladesh. The official meat inspection system is almost non-existent. This situation magnifies the disease transmission scenario.

Chemical and physical hazards pose considerable threats to public health. Most chemicals are man-made and fulfil a variety of functions. As such, they are used widely – from agriculture and industrial processes to producing medicine and household products. During manufacture, storage, transport and disposal, chemicals can leak into the surrounding environment. Those can enter into the animal origin food value chain through feed, water, medication, sanitation, processing etc. Physical hazards may enter through carelessness, unplanned processing etc.

Radioactive contamination, or radiological pollution, is not that common in Bangladesh. It is not considered to be an indigenous problem. Generally imported food items are tested for radiation hazard. Imported foods are tested by Atomic Energy Commission, not by DLS for any radioactive contamination.

In the animal origin food chain, and livestock sector, the DLS is responsible for assuring food safety in production and primary processing. It is essential that there is a continuous surveillance system to assess the introduction of any public health hazard in the value chain at this stage and undertake necessary measures to reduce or prevent the introduction of such hazards. For that, a science-based surveillance system, regular sampling and testing procedure is essential. The purpose of this study is to assess the status and propose recommendations for further improvement in this regard.

OBJECTIVE OF THE STUDY

- a. Assess the surveillance capacity of microbial and chemical hazards analysis in foods of animal origin by DLS.
- b. Assess the laboratory capacity for the identification of food safety hazards to support the surveillance.
- c. Develop recommendations for improvement of the surveillance system to improve food safety in Bangladesh.

METHODOLOGY

To assess the capacity of DLS in its surveillance of microbial, chemical, physical and radiation in foods of animal origin, two activities were undertaken. Information about activities performed by field services and development projects were collected through personal contacts. The assessment of disease investigation laboratories was collected through a questionnaire.

For information about field surveillance, information was collected from responsible officers in different administrative tiers through unstructured interviews. All administrative tiers from central to divisional, district and upazila were considered. Information was also collected from the Epidemiology Cell of DLS which works with both field and laboratory data.

For collecting information from laboratories, first of all, the laboratories of DLS were listed. Then the laboratories having none or minimum responsibility in identifying food safety hazards were excluded. A questionnaire was then developed in consultation with UNIDO experts. The questionnaire was sent to DG DLS with a request to instruct listed laboratories to complete the questionnaire and return to UNIDO. DG DLS provided the necessary support. Having the completed questionnaire from the laboratories, different data were set in different tables and analyzed for inclusion in this report.

ACTIVITIES

Both passive and active surveillance of animal diseases including hazards of foods of animal origin are in place in DLS though not in a planned and structured way. The evaluation looked into the system and collected information through communication to central, divisional, district and Upazila levels.

Passive surveillance

DLS has a veterinary service network around the country up to the Upazila level, which runs through the Director of Extension. The UNIDO expert communicated with following persons to establish the activities of the field services.

1. Director, Extension
2. Director, Divisional Livestock Office Dhaka
3. District Livestock Officer, Dhaka
4. Epidemiology Cell, DLS and
5. Upazila Livestock Officer, Dhamrai, Dhaka

While DLS does not have a dedicated food safety surveillance in place, it has a passive animal disease surveillance system. DLS has 495 veterinary hospitals in the Upazilas and 8 veterinary hospitals in the metros. These veterinary hospitals provide treatments of animal patients brought to the facility, or delivered health advice for sick animals. All clinical diagnosis, advice or treatments given are recorded and reported centrally through district and divisional offices to the Director of Extension and the Epidemiology Cell. In this way clinically diagnosed diseases including food safety related incidences are reported but through a paper based system. Currently, they are developing an online real-time reporting system through the 'Bangladesh Animal Health Intelligence System' (BAHIS), through which the disease information comes to Headquarters in real time. Currently 300 of the 495veterinary hospitals report regularly through this system. Others are not reporting for various reasons. It is expected that all the reports will come under the real time reporting system in near future and the paper-based reporting system will be stopped.

The responsibility of the Epidemiology Cell is the overall supervision of the passive surveillance, to collect and compile the field reports and publish disease reports. The Epidemiology Cell publishes such reports but not regularly. The Cell also takes a leading part in the investigation of disease outbreaks.

In addition, there are 64 district veterinary hospitals, where clinical services are provided. It is headed by a Veterinary Officer. It could be the reference hospital to the Upazila veterinary hospitals with better diagnostic facilities. Currently, the hospitals are under the Director, Central Veterinary Hospital. They report their clinical diagnostic reports to the Director, of the Central Veterinary Hospital who then submits compiled report to DG DLS. Whether these reports have any link with the Epidemiology Cell of DLS is not clear. This information was collected through a telephone discussion with the Director, Central Veterinary Hospital.

Active surveillance

DLS has a routine disease surveillance program operated through officers/para professionals at Upazila level. They visit households in different villages and report their findings on disease occurrences/outbreaks each month. This is a type of limited active surveillance. If 10

households are visited in each Upazila, per month, 5,000 household reports are collected a month throughout the country. Through this system, the disease status of the country could be assessed to some extent. But this system is not linked with sampling and testing of suspect cases.

DLS has another program through which all Upazila offices send samples for testing to the laboratories each month. They are given a monthly target for that. Accordingly, they send samples to different disease investigation laboratories. If this could be associated with the surveillance system, that could be a good idea.

As mentioned above, regarding the sending of samples to the laboratories, if it could have a formal link of the Upazila/District with the concerned labs and if there would have a clear guideline for sending samples to the laboratories, which could result in a good disease surveillance system.

In addition, there are some project-based disease surveillance systems. There is a project of DLS named 'Strengthening the Veterinary Public Health Service to protect public health Project', through which active surveillance is conducted for four zoonotic diseases: Rabies, Anthrax, Brucellosis and Bovine Tuberculosis. Through this project, up to July 2023, a total of 97,800 samples were tested and 693 positive cases (0.70%) were identified. The tests were done in different DLS laboratories. The project has no official link with the epidemiology cell of DLS. If asked for, they provide disease information.

It seems that DLS has some good potential for field surveillance, collection and dispatch of samples to laboratories to identify food safety hazards as well as animal health hazards and take corrective measures wherever needed. But it needs a proper science-based planning and strategy. It also requires central and regional coordination.

Disease Investigation laboratories

DLS has a good number of disease investigation laboratories throughout the country as follows:

Table-1: List of DLS disease investigation labs

Sl No.	Name	Address
1	Veterinary Public Health (VPH) Laboratory	Dhaka
2	Central Disease Investigation Laboratory (CDIL)	Dhaka
3	Endoparasite Laboratory	Dhaka
4	Ectoparasite Laboratory	Dhaka
5	Toxicology Laboratory	Dhaka
6	Pathology Laboratory	Dhaka
7	Field Disease Investigation Laboratory (FDIL)	Barisal
8	Field Disease Investigation Laboratory (FDIL)	Feni
9	Field Disease Investigation Laboratory (FDIL)	Gaibandha
10	Field Disease Investigation Laboratory (FDIL)	Jashore
11	Field Disease Investigation Laboratory (FDIL)	Manikganj

12	Field Disease Investigation Laboratory (FDIL)	Sirajganj
13	Field Disease Investigation Laboratory (FDIL)	Sylhet
14	Field Disease Investigation Laboratory (FDIL)	Joypurhat
15	Field Disease Investigation Laboratory (FDIL)	Chattogram
16	Quality Control Laboratory	Savar, Dhaka
17	Field Disease Investigation Laboratory (FDIL)	Gopalganj

Veterinary Public Health (VPH) Laboratory is specialized for addressing public health hazards. Earlier it worked only with zoonotic disease. Now there is initiative for other public health hazards.

The other five labs in Dhaka, CDIL, Endoparasite, Ectoparasite, Toxicology and Pathology labs are specialized labs with totally separate administration. The well discussed CDIL is actually a microbiology lab.

All the FDILs are generalized laboratories assigned to diagnose all sorts of hazards including parasitic, microbial, chemical or pathological problems.

The Quality Control Lab is also a specialized laboratory, testing for safety and quality of animal origin food and associated materials.

Most of the above laboratories do identify some or other food safety hazards.

To identify the capacities and potential of the laboratories for identifying food safety hazards, a questionnaire was drafted with the support of some international references[3]. The draft questionnaire was shared with national and international UNIDO experts to finalize. The issues taken into consideration in framing the questionnaire were human resources, number of different types of samples received by the labs, sources of samples, food hazards identified by the labs, techniques used, consumables, equipment and skill etc.

The finalized questionnaire was distributed to all the DLS laboratories through DLS except for the Ectoparasite and Pathology laboratories, which are considered to be less involved in food hazard identification.

For that, UNIDO Country Representative requested DG DLS to ask the laboratories to support filling in the questionnaires (Annex-1). Accordingly, Director (Research, Training and Evaluation) of DLS sent a letter to the laboratories with necessary instructions on behalf of DG DLS (Annex-2)

All 15 DLS labs responded positively. The questionnaires were found mostly through email (Annex-3). Then those were analysed for different segments:

a. Manpower:

The allotted and existing manpower were analysed for different laboratories. In addition, UNIDO added some comments based on its observations.

For some laboratories, especially the old FDILs (Joypurhat, Barisal, Feni, Manikganj), allotted headcount were found to be sufficient. Headcount in the Veterinary Public Health Lab seems sufficient considering its current level of activity.

For other laboratories, headcount is not sufficient. Manpower of other labs are not that sufficient. The new FDILs (Jashore, Chattogram) have very levels of headcount.

Table-2: Allotted/Existing posts of DLS laboratories working in food hazard diagnosis

Sl. No.	Laboratories	CSO	PSO	SSO	SO	VS	Lab Tec upper	Office Assistant cum Comp opt.	Lab Tech	Driver	Field man	Lab Attendant	Supporting staff	Cleaner	Additional officer	Additional staff	Total
1	Endoparasite	1/1	1/1	0	2/0	0	2/1	0	0	0	4/3	1/1	0	0	0	0	11/7
2	Toxicology	1/1	1/1	0	2/0	0	0	0	0	0	0	1/0	0	0	1	0	5/3
3	VPH	0	2/2	1/1	6/1	0	0	0	6/1	0	0	3/1	0	0	0	0	18/6
4	Barisal*	0	1/1	1/0	3/3	0	5/2	1/0	2/2	1/1	2/0	2/0	1/1	1/0	0	0	20/10
5	Feni*	0	1/1	1/1	3/0	0	5/3	1/0	2/2	1/1	2/0	2/0	1/1	1/0	0	0	20/9
6	Gaibandha*	0	1/1	1/0	1/0	0	5/1	1/0	0	0	0	0	1/1	0	0	0	10/3
7	Jashore*	0	1/1	3/0	0	0	0	0	1/1	0	0	0	0	0	0	0	5/2
8	Manikganj*	0	1/1	1/1	3/0	0	5/2	1/0	2/0	1/1	2/2	2/2	1/1	0	0	0	19/10
9	Sirajganj*	0	1/1	3/0	0	0	0	0	0	0	0/1	0/2	0	0	0	3	4/7
10	Sylhet*	0	1/1	1/0	1/1	0	5/2	1/1	0	0	0	0	0	1/0	0	0	10/5
11	Joypurhat*	0	1/1	1/1	3/1	0	5/0	1/0	2/1	1/1	2/2	2/1	1/0	1/0	0	0	20/8
12	Chattogram*	0	1/0	3/2	0	0	1/0	0	0	0	0	0	0	0	0	0	5/2
13	Gopalganj*		1/0	1/0	2/0	1/0	2/0	1/0	0	0	0	1/0	1/0	2/0			12/0
14	QC Lab	0	0	1/1	2/0		0	1/0	0	3/3	0	4/4	0	2/2	5	0	13/15
	CDIL	0	1/1	1/0	2/0		0/0	0/0	2/1	0/1	4/2	2/2	1/1	0/0	3+3	0	13/14
	Total	2/2	14/13	18/7	28/6		33/11	7/1	17/8	7/8	16/10	19/13	6/5	6/2	0/12	0/3	185/103

*Field Disease Investigation Laboratory (FDIL)

**FDIL Gopalganj has other 8 non-technical posts, all are vacant

The two most important laboratories with modern capacity in identifying food safety hazards, CDIL and QC lab, have insufficient human resource capacity. CDIL has 13 positions including PSO and SSO one each, two Scientific Officers and two lab technicians. The QC lab is headed by one SSO, it has one SO, and four lab attendants only.

The existing manpower is far less than the allotted positions in most of the laboratories. Out of 178 total allotted positions, there are 88 persons employed (49%). 12 officers and three staff are working in the labs on deputation. In total, the existing manpower is 103.

Some noteworthy events are:

1. The VPH lab is going to establish a modern laboratory with modern microbial and chemical diagnostic facilities. However it needs more efficient manpower. But in place of 18 allotted manpower, it has only six positions in place. The QC lab and CDIL are running with five and six additional officers respectively. If the capacity of the core manpower is not developed, it will not help actual lab capacity building.
2. The newly developed FDIL Gopalganj has 20 allotted posts but no one is posted there. It is kept locked at all times.

The FDILs are also suffering from similar problems. In place of 20 positions, FDIL Feni and Joypurhat has only 9 and 8 positions in place. The Toxicology laboratory in the headquarter may play a very important role in identifying chemical hazards. However, it has only five positions allotted and two are working along with an additional officer.

To address food safety hazards as well as other animal disease, the laboratories require more attention of policy makers.

b. Sampling:

Information about different types of samples received by different laboratories were collected. Laboratories get samples from backyard farmers, different types of commercial farms, Upazila Veterinary hospital, District Veterinary Hospitals, zoos and other specialized establishments.

Laboratories also collect some samples through their fieldman and laboratory assistants.

Central laboratories get some samples from FDILs. CDIL gets some proficiency test (PT) samples.

QC lab gets samples from different companies, manufacturers and importers.

There is no lab surveillance or sampling program in place. Sometimes they support other organizations like FAO, Flemming Fund or the DLS project 'Strengthening the Veterinary Public Health Service to protect public health' through testing provided samples. But these are only event-based activities.

Table-3: Average number of samples received by laboratories in a month

	Blood	Sera	Smear	Swabs	Milk	Milk product	Urine	Carcass	Animal organs	Faeces	Ingesta	Feed	Environmental sample	Meat	Total
Endoparasite	112	0	0	0	0	0	0	0	0	2,200	0	0	0	0	2,312
Toxicology	0	0	0	0	0	0	0	0	5	0	20	15	10	0	50
VPH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barisal*	10	5	40	40	10	0	0	80	0	300	0	0	0	0	485
Feni*	30	30	0	0	20	0	5	715	0	220	0	9	0	0	1,029
Gaibandha*	65	0	65	65	3	0	0	5	0	300	0	0	0	0	503
Jashore*	10	0	70	70	15	0	0	60	5	240	4	5	0	0	479
Manikganj*	6	0	256	256	85	0	0	115	0	745	0	0	0	0	1,463
Sirajganj*	35	0	12	12	6	0	0	0	0	550	2	1	0	0	618
Sylhet*	4	0	35	35	5	0	0	100	5	50	0	2	0	0	236
Chattogram*	0	0	0	0	0	0	0	0	0	200	0	0	0	0	200
Joypurhat*	22	9	205	9	13	0	5	355	2	375			0	0	995
Gopalganj*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QC Lab	0	0	0	0	50	100	0	0	50	0	0	100	0	0	300
CDIL	200	350	170	50	20	0	7	6	30	7	0	7	100	5	952
Total	494	394	853	537	227	100	17	1,436	97	5,187	26	139	110	5	9,622

*Field Disease Investigation Laboratory (FDIL)

As reported by laboratories, the number of average monthly samples received are 9,622, with blood-494, sera-394, smears-837, swabs-537 etc. The largest number of samples are tested by FDIL Manikganj - 1,463 of which 745 are faeces. CDIL tests 952 samples, QC lab tests 300 samples a month on an average.

c. Testing food safety hazards

Laboratories were surveyed to identify which laboratories conducted analysis on which food safety hazards including parasites, bacteria/fungus, mycotoxins and other natural toxins, residues, heavy metals or pesticides. It was found that all the 14 labs conduct testing of one or more food safety hazard.

Table-4: Food Safety Hazards identification by DLS laboratories

	Endoparasite	Toxicology	VPH	Barisal*	Feni*	Gaibandha*	Jashore*	Manikganj*	Sirajganj*	Sylhet*	Joypurhat*	Chattogram*	QC lab	CDIL	Total
Parasites															
Ascariasis	0	0	0	1	1	1	1	0	0	1	1	1	0	0	7
Cysticercosis	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2
Taeniasis	1	0	0	0	0	0	0	0	0	0	1	1	0	0	3
Fasciolosis	1	0	0	1	1	1	0	0	0	1	1	1	0	0	7
Toxoplasma	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2
Giardia	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2
Cryptosporidium	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2
Total	2	0	0	2	5	2	1	0	0	2	7	4	0	0	
Bacteria/Fungus															
Anthrax	0	0	1	0	1	0	1	1	1	1	1	0	1	1	9
Brucellosis	0	0	1	1	1	1	1	1	0	0	1	0	1	1	9
Botulism	0	0	0	0	0	0	0	0	0	1	0	0	1	1	3
Campylobacteriosis	0	0	1	0	1	0	0	0	0	1	1	0	1	1	6
E Coli	0	0	0	1	1	1	1	0	1	1	1	0	1	1	9
Leptospirosis	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Listeriosis	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Salmonella	0	0	0	1	1	0	0	0	1	1	1	0	1	1	7
Shigella	0	0	0	1	1	0	0	0	0	1	0	0	1	1	5
Staphylococcus	0	0	0	0	1	0	0	0	0	0	1	0	1	1	4
Tuberculosis	0	0	1	1	1	0	0	0	1	0	1	0	1	1	7
Pseudomonas	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
streptococcus	0	0	0	0	0	0	0	0	1	0	1	0	1	1	4
Bacillus cereus	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2
Yeast and Fungi	0	0	0	0	0	0	0	0	0	0	1	0	1	1	3
Total	0	0	4	5	8	2	3	2	5	6	9	0	15	15	
Mycotoxins and other natural toxins															
Aflatoxin	0	1	0	0	0	0	0	0	0	0	0	0	1	0	2
Cyanide	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
Nitrate	0	1	1	0	1	0	0	1	1	0	0	0	0	0	5
Total	0	3	2	0	1	0	0	1	1	0	0	0	1	0	
Residues															
Antimicrobial	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1
Anthelmintic	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Malachite Green	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Histamin	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Total	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
Heavy Metals																
Arsenic	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	2
Cadmium	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1
Chromium	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1
Copper	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1
Lead	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	2
Mercury	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	2	6	0	0	0	0	0	0	0	0	0	0	6	0	
Pesticide																
O.C. Pesticides CARBAMATE	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
O.P. Pesticides	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	

*Field Disease Investigation Laboratory (FDIL)

1= conduct this diagnostic test, 0= Don't conduct this diagnostic test

It was found that seven labs diagnose one or more zoonotic parasites mostly the FDILs and endoparasite section, 9 labs including CDIL and FDILs conduct zoonotic microbial/fungal tests, five labs conduct mycotoxins and other natural toxins, only one lab (QC lab) conducts antimicrobial residue and pesticide tests. QC lab and Toxicology section conduct heavy metal tests. Most of the labs practice rapid tests for different diseases.

VPH lab generally conducts Tuberculosis and Brucellosis test. Through a project, this lab is on way of upgrading to a modern lab. They are introducing modern techniques to diagnose bacterial, toxicological, heavy metals, pesticide etc. however their current manpower strength is not sufficient to deliver these tests.

All the labs send their reports to Director (Research, Training and Evaluation), who, without any analysis, compiles the data and forwards to Director General, where no further analysis takes place. This report is not linked with the epidemiology unit of DLS and do not enter into their data system.

d. Diagnostic capability

The laboratories diagnose a good number of diseases. They were asked about the techniques and equipment they use to diagnose diseases. Not all responded to this question. The responses found are as follows:

Table-5: Diagnostic technique/equipment used by labs

Sl. No.	Lab	Diagnostic technique/equipment
1	Endo	Sedimentation + floating: Microscope
2	Barisal	Culture/Microscope/ Rapid test
3	Feni	Culture/Staining/Microscope/Rapid test: Rose Bengal/ D-Phenyl Amine test/ ELISA

4	Joypurhat	Floating/Sedimentation/Microscope/ Brucella kit, TB kit/ Campylobactor culture/ Anthrax Mcfadyen reaction test
5	Manikganj	Anthrax-PMB/Brucella kit
6	Sylhet	Ova-direct smear/Anthrax-1% PMB/ Clostridium-gram staining, E-coli-Mc-Conkey Agar/ Salmonella, Shigella- SS Agar
7	Toxicology	Aflatoxin-ELISA/ Cyanide, Nitrate-Chemical test/ Lead, Arsenic-Kit (String) test
8	CDIL	Rapid test, staining, PCR, Culture and MADDI-TOF-MS

QC lab did not respond to this question. From their website, it was found that, this lab has adopted the up-to-date analytical and microbiological equipment like kjeltech 8400, HPLC, UHFLC, LC/GC-MS, Milk analyzer, Xene Expert, MALDI-ToF-MS, Nanopore gene sequencing system, etc.

Before making comment on this issue, we may look into another information. The labs were asked about any project support they get. The finding was as follows:

Table-6: Projects supporting the laboratories

Sl No.	Lab	Name of the project	Project objective	Supported by the organization	Duration of the Project support	
					From	To
1	VPH	VPHSP-DLS Project.	1.Establishing of BSL-2 level, VPH & microbiology laboratory. 2.Surveillance of Zoonotic diseases (Brucellosis, Tuberculosis, Anthrax, Rabies). 3. Compensation to the Farmers due to positive cases (Brucellosis, Tuberculosis, Anthrax, Rabies).	MOFL and DLS	July-2019	June-2024
2	Feni	Flaming fund	AMR Surveillance	Flamming fund	2022	ongoing
3	Joypurhat	FFCGB	AMR Surveillance	FFCGB		
4	CDIL	AMR and Avian Influenza Sink Surveillance	AMR and Avian Influenza surveillance	FAO	2018	continue
		AMR surveillance	AMR surveillance	Fleming Fund	2023	continue

Beside this, the QC lab was recently developed through a project with international standard.

From these two tables, it may be understood that, the laboratories are getting support from some different projects, and have gained some updated diagnostic capability. Others are using conventional techniques. It is essential to support the upgrading of all the laboratories through some project support.

Among the five central labs (CDIL, Endoparasite, Ectoparasite, Toxicology and Pathology, only CDIL has developed to a considerably satisfactory level. All other labs are operating with outdated technologies and equipment. They have no visible difference to the FDILs. It is necessary to bring all the central laboratories under the same umbrella as the Central Disease Investigation Laboratory (CDIL). Should that occur, the current CDIL may be renamed as the Central Microbiology Laboratory. If it happens, then other labs may be in line for development. The FDILs, instead of the Director (Research, Training and Evaluation), may come under the CDIL.

e. Availability of resources

Laboratories were asked about availability of resources in regard to operating costs, consumables, equipment and skills. Not all, but the majority of them responded. As per their response, we found three have sufficient budgets and six have insufficient resources. With regard to consumables, four have sufficient stocks while five claim to have insufficient consumables. With regard to equipment, nine cite insufficient equipment with just two responding to say they have sufficient equipment. Finally with regard to skills development, only two are satisfied and nine are not satisfied with their existing skill level.

Table-7: Availability of resources

Sl. No.	Laboratories	Operating costs		Consumables		Equipment		Skill	
		Sufficient	Insufficient	Sufficient	Insufficient	Sufficient	Insufficient	Sufficient	Insufficient
1	Endoparasite		√		√		√		√
2	Toxicology		√		√		√		√
3	VPH						√		√
4	Barisal*		√		√		√		√
5	Feni*		√	√			√	√	
6	Gaibandha*	√		√		√			√
7	Jashore*		√		√		√		√
8	Manikganj*	√		√			√		√
9	Sirajganj*								
10	Sylhet*		√		√		√		√
11	Joypurhat*		√		√		√		√
12	Chattogram*						√		√
13	QC Lab	√		√		√		√	
14	CDIL		√		√		√		√
	Total	3	6	4	5	2	9	2	9

OUTCOMES OF THE STUDY

Through this study, the baseline capability status of different organs of DLS was assessed. The findings may be summarized as follows:

- Food safety related disease conditions are recorded and forwarded to the centre by Veterinary Surgeon along with other diseases through the treatment of clinical patients, which is a part of passive surveillance
- There is a system for sending samples to FDIL/CDIL to identify disease agents
- There is a disease surveillance service in place through which Upazila officer/staff visits a number of households to identify if any sort of new disease situation
- Epidemiology units collect the surveillance data from the field
- District and central Veterinary Hospital also treat clinical patients
- Some of DLS projects conduct active surveillance of zoonotic diseases
- VPH laboratory is specially assigned to identify food safety hazards, but conduct the activity in a limited scale.
- VPH laboratory is developing a modern lab to detect microbial and chemical food safety hazards
- CDIL and QC lab have modern facilities to identify microbial hazards
- QC lab has modern facilities to identify microbial and chemical hazards
- 12 other labs including FDILs across the country have limited capacity to identify parasitic, microbial and chemical hazards.
- Laboratories have shortage of manpower. Around 50% positions are vacant.
- Most of the laboratories are not equipped with modern equipment
- A national integrated food safety plan to improve food safety situation through utilizing all the above-mentioned potentials is required.

CONCLUSION

It is a very good indication that, 14 DLS laboratories across the country are identifying food safety hazard at different scales. It is also impressive that there are some disease surveillance

and sampling activities are in place in the field service. If these two potentials are integrated in a systematic way there can be greatly improved outcomes. To be properly effective, the laboratories need proper manpower, updated technologies and continuous technical education and training.

RECOMMENDATIONS

1. DLS should have a food safety hazard analysis plan involving all laboratories and field services.
2. An integration of field services with the lab system and epidemiology cell is essential to develop a hazard analysis surveillance plan.
3. It is essential to upgrade all the laboratories to modern standards by supplying modern equipment and related supports
4. Considering the national and global perspective, vacant positions of labs must be filled on a priority basis
5. Local and overseas skill development of scientists and technicians is essential.
6. QC lab and CDIL lab is performing a very important national role. They are running through deputed persons. Manpower positions of these labs must be revised in line with their workload.
7. Manpower positions of new labs (Jashore, Chattogram and Sirajgnj), needs to be increased to utilize the lab potentials
8. As a new laboratory, FDIL Gopalganj deserves special attention, as there is a good number of allotted positions, but the is yet to start it's activity due to having no manpower at all.
9. As new activities like Food Safety, AMR, trans-boundary animal disease control etc. are emerging, it is essential to rationalize human, physical and technical capability of DLS Disease Investigation Laboratories and Epidemiology cell.

REFERENCES

1. Taylor, L.H., S.M. Latham, and M.E. Woolhouse, Risk factors for human disease emergence. *Philos Trans R Soc Lond B Biol Sci*, 2001. 356(1411): p. 983-9.
2. Bangladesh Bureau of Statistics, Statistical Year Book Bangladesh 2022. 2023(42nd ed).

3. CDC (Centers for Disease Control and Prevention) A-Z Index for Foodborne Illnesses:
<https://www.cdc.gov/foodsafety/diseases/index.html>

ANNEX-1

Data collection from Disease Investigation Laboratories of Department of Livestock Services regarding identification of food hazards

Name of the laboratory:

Reports to which Authority:

Manpower:

Sl No.	Position	Grade	Number			Remarks
			Allotted	Filled in	Vacant	
1	Chief Scientific Officer					
2	Principal Scientific Officer					
3	Senior Scientific Officer					
4	Scientific officer					
5	Laboratory Technician (Upper Scale)					
6	Office Assistant cum Computer Operator					
7	Laboratory Technician					
8	Driver					
9	Field man					
10	Laboratory Attendant					
11	Supporting Staff					
12	Cleaner					
13	Any other (Pl mention)					
14	Additional manpower (pl specify))					

Number and type of samples received/handled on an average in a month in the lab

Sl No.	Name/Type of sample	Average number received in a month	Sample submitted by whom to the lab (in general)	Numbers of samples deliver/test (by the lab) in a month	Remarks
1	Blood				
2	Sera				
3	Smears				
4	Swabs				
5	Milk				
6	Any other dairy products				
7	Urine				
8	Carcass				
9	Animal organs/parts				
10	Feces				
11	Ingesta				
12	Animal feed/Ingredients				
13	Environmental sample				
14	Any other (Pl specify)				

Supporting Projects in operation

Sl No.	Name of the project	Project objective	Supported by the organization	Duration of the Project support	
				From	To

Laboratory Quality Assurance

Lab accreditation	National		International		Remarks
	Yes	No	Yes	No	
Quality Control system in place	Internal		External		
	Yes	No	Yes	No	

Diagnostic facilities for food hazards available/practiced in the lab

Sl No.	Food Hazards	Test facility available (Yes/No)	In practice (Yes/No)	Equipment/Technique in use (May be one or more)	Remarks
Parasites					
1	Ascariasis				
2	Cysticercosis				
3	Taeniasis				
4	Fascioliasis				
5	Toxoplasma				
6	Giardia				
7	Cryptosporidium				
8	Any other				
Bacteria/Fungus					
9	Anthrax				
10	Brucellosis				
11	Botulism (Clostridium Botulinum)				
12	Campylobacteriosis				
13	E Coli				
14	Leptospirosis				
15	Listeriosis				
16	Salmonella				
17	Shigella				
18	Staphylococcus				
19	Tuberculosis				
20	Pseudomonas				
21	streptococcus				
22	Bacillus cereus				
23	Yeast and Fungi				
24	Any other				
Mycotoxins and other natural Toxins					
25	Aflatoxin				
26	Cyanide				
27	Nitrate				
28	Any other				
Residues					
29	Antimicrobial				
30	Anthelmintic				
31	Malachite Green				

Sl No.	Food Hazards	Test facility available (Yes/No)	In practice (Yes/No)	Equipment/Technique in use (May be one or more)	Remarks
32	Histamin				
33	Any other				
Heavy Metals					
34	Arsenic				
35	Cadmium				
36	Chromium				
37	Copper				
38	Lead				
39	Mercury				
40	Any other				
Pesticides					
41	O.C. Pesticides CARBA-MATE				
42	O.P. Pesticides				
43	Any other				
Radiation					

Availability of resources

Items	Sufficient	Insufficient	Remarks
Operating costs			
Consumables			
Equipment			
Skill			

Signed by

Name:

ANNEX-2



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Office of the UNIDO Country Representative in Bangladesh

UNIDO/LDDP/Laboratory_Data_Collections-0709/2023

September 07, 2023

Subject: Request for supporting UNIDO Expert to collect data from laboratories

Dear Sir:

We are pleased to inform you that, as per the article **1.1.6, package 74: Assess the capacity of field surveillance and laboratory capabilities of relevant government organizations (especially DLS) to identify microbial, chemical, radiation and physical hazards** of the signed agreement of UNIDO with LDDP DLS, it is essential to collect data from different laboratories of DLS. National Inspection Expert of UNIDO-LDDP Project Dr. Md. Mehedi Hossain has been assigned to perform this activity. He has developed a questionnaire (attached) to collect the information from following laboratories:

1	CDIL, Dhaka	8	FDIL, Jashore
2	Quality Control Laboratory, Savar, Dhaka	9	FDIL, Barisal
3	Endoparasite laboratory, Dhaka	10	FDIL, Sirajganj
4	Toxicology Laboratory, Dhaka	11	FDIL, Joypurhat
5	FDIL, Manikganj	12	FDIL, Gaibandha
6	FDIL, Feni	13	FDIL, Sylhet
7	FDIL, Chattogram		

You are therefore requested to direct the laboratories to provide the desired information through filling in the questionnaire. They may send the filled in format through email to: mehedi.dls@gmail.com and a.haque@unido.org

Thanks for your cordial cooperation in advance.

Sincerely yours,

Zaki Uz Zaman

UNIDO Country Representative, Bangladesh

To:

Director General

Department of Livestock Services

Attention:

Director, Accounts, Budget and Audits

Department of Livestock Service

CC:

- 1. Project Director, Livestock and Dairy Development Project (LDDP)
Department of Livestock Service**
- 2. Director, Administration, Department of Livestock Service**
- 3. Chief Technical Advisor, LDDP, DLS**

প্রাণিসম্পদ গবেষণা প্রতিষ্ঠান
মহাখালী, ঢাকা।

সন ১৪৩৫

স্মারক নং-৩৩.০১.০০০০.৪০০.১৪.০০১.১৩- ১১৬৪

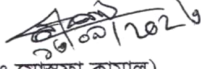
তারিখঃ- ১৬/০৯/২০২৩খ্রিঃ।

- ১-২। চিফ সায়েন্টিফিক অফিসার - এন্ডোপ্যারাসাইটোলজি/টক্সিকোলজি এন্ড জুরিসপ্রুডেন্স, অনুবিভাগ, ৪৮, কাজী আলাউদ্দিন রোড, ঢাকা।
- ৩। প্রিন্সিপাল সায়েন্টিফিক অফিসার, কেন্দ্রীয় রোগ অনুসন্ধান গবেষণাগার, ৪৮, কাজী আলাউদ্দিন রোড, ঢাকা।
- ৪-১২। প্রিন্সিপাল সায়েন্টিফিক অফিসার, এফডিআইএল-ফেনী/বরিশাল/জয়পুরহাট/মানিকগঞ্জ/গাইবান্ধা/সিলেট/সিরাজগঞ্জ/যশোর/চট্টগ্রাম।
- ১৩। সিনিয়র সায়েন্টিফিক অফিসার, কোয়ালিটি কন্ট্রোল ল্যাবরেটরী, সাভার, ঢাকা।

বিষয়ঃ- Request for supporting UNIDO Experet to collect data from laboratories.

সূত্রঃ- UNIDO/LDDP/Laboratory-Data – collection-0709/2023 September 07, 2023

উপর্যুক্ত বিষয়ে সূত্রস্থ পত্র (পত্র সংযুক্ত) এর মর্মানুসারে আপনার অনুবিভাগের ল্যাবরেটরির বিভিন্ন ডাটা সংগ্রহের কাজে UNIDO টিমকে সার্বিক সহযোগিতা করার জন্য অনুরোধ করা হলো।


(ড. মোঃ মোস্তফা কামাল)

পরিচালক

গবেষণা, প্রশিক্ষণ ও মূল্যায়ন
প্রাণিসম্পদ গবেষণা প্রতিষ্ঠান, মহাখালী, ঢাকা।
e-mail: directorlri.dls@gmail.com

অবগতি ও কার্যক্রম গ্রহণের জন্য অনুলিপিঃ (জ্যেষ্ঠতার ভিত্তিতে নয়)

- ১। পরিচালক, প্রশাসন, প্রাণিসম্পদ অধিদপ্তর, বাংলাদেশ, ঢাকা।
- ২। পরিচালক, বাজেট, হিসাব ও নীরিক্ষা, প্রাণিসম্পদ অধিদপ্তর, বাংলাদেশ, ঢাকা।
- ৩। প্রকল্প পরিচালক, প্রাণিসম্পদ ও ডেইরি উন্নয়ন প্রকল্প (এলডিডিপি), প্রাণিসম্পদ অধিদপ্তর, বাংলাদেশ, ঢাকা।
- ৪। চিফ কারিগরী উপদেষ্টা, প্রাণিসম্পদ ও ডেইরি উন্নয়ন প্রকল্প, প্রাণিসম্পদ অধিদপ্তর, বাংলাদেশ, ঢাকা।
- ৫। UNIDO কান্ট্রি রিপ্রেজেন্টেটিভ, বাংলাদেশ।
- ৬। ডা. মো. মেহেদী হোসেন, ন্যাশনাল ইনসপেকশান অব এক্সপার্ট UNIDO-LDDP প্রকল্প।

সদয় অবগতির জন্য অনুলিপিঃ-

মহাপরিচালক মহোদয়ের ব্যক্তিগত সহকারী, প্রাণিসম্পদ অধিদপ্তর, বাংলাদেশ, ঢাকা। ইহা মহাপরিচালক মহোদয়ের সদয় অবগতির জন্য।



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