Report of Consultancy
Dr. Chin Cheow Keat

Consultation Assignment to WHO Sri Lanka on Food Safety Laboratories

Colombo, Sri Lanka
30 May 2016 – 10 June 2016
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1. Introduction

Sri Lanka is facing chronic kidney disease of unknown etiology (CKDu) and there are many hypotheses and one of them is linked to chemical contamination of food or water. This has raised the concern on the food safety situation in Sri Lanka and on its ability to control food safety. Sri Lanka has identified food safety laboratory as one of the critical component of its food safety control that need to be strengthened including its laboratories capabilities to detect chemicals that maybe linked to CKDu.

This is one of the reasons that Ministry of Health Sri Lanka has requested technical assistance from World Health Organisation of Sri Lanka in conducting an assessment of the food safety laboratory in Sri Lanka including the chemical analytical capacity of existing food safety laboratory and provide practical recommendations to strengthened its food safety laboratories.

2. Terms of reference of consultancy

Under the supervision of the WHO representative and in collaboration with the MOH Sri Lanka focal point on food safety, the consultant shall:-

i. Conduct a needs assessment of food safety laboratories focusing on chemical analysis

ii. Organize a stakeholder meeting to share good practice on food safety in Asia and discuss outcomes of the assessment

iii. Provide practical recommendations on strengthening capacity of existing food safety labs in Sri Lanka (within the Ministry of Health and beyond) including food safety laboratory networking and

iv. Submit a mission report
3. General organisation of the consultancy

The consultancy was organised in such a manner to facilitate the consultant to interact with relevant stakeholders and obtain their inputs; observed laboratories operations and their facilities to obtain information on:

- Present arrangements on provision of analytical and scientific support to the food safety programme
- Better understanding and appreciation of the constraints, limitations and gaps in the of analytical and scientific support
- The current and future demands of food analytical services

The overall 2 weeks programme of the consultant is in Annex 1.

From the information obtained, a preliminary assessment and recommendation was prepared and presented to stakeholders through a meeting (programme as attached in Annex 2) attended by 30 people prior to finalisation of the consultant report.

4. Evaluations of Laboratories and Improvement Needs of Official Laboratory

Each of the laboratories visited by the consultant was evaluated in terms of the key specification for a laboratory encompassing legal mandate, scope and function, quality system management, sample number and testing; instrumentation and equipment; building and facilities; and personnel and training. Annex 3 provides a summary table of the findings of official laboratories and Annex 4 a summary of major constraints and improvement needed for each of these official laboratories

4.1 Food Microbiology Laboratory Medical Research Institute (MRI)

a. Legal Status

MRI, which is under the Ministry of Health Sri Lanka, is an approved official laboratory under the Food Act 1983. It has one Additional Approved Analyst, which is the head of Food Microbiology Laboratory (Dr. Sujatha Pathirage), as prescribed under Section 17(2) of the Food Act 1980.

b. Scope and function

MRI through the Food Microbiology Laboratory only provide microbiological analysis services to the food safety programme of Sri Lanka, testing mainly all kind of food products and water (potable as well as bottled) taken from the domestic
market, entry points (ports) and industry, The laboratory also assist in investigation of food poisoning. The parameters analysed are:

- Aerobic Plate Count
- Yeast and Mould
- Coliform
- Escherichia coli
- Enterococcus
- Staphylococcus aureus
- Bacillus cereus
- Vibrio
- Salmonella
- Pseudomonas
- Listeria, and
- Campylobacter

Water samples from industry and food import samples are analysed by MRI for a fee of about 500 rupees per parameter.

c. **Quality Management System**

The Food Microbiology Laboratory of MRI is not accredited to ISO 17025 and as such do not have a quality manual and a well-organized documentation of all procedures.

All analytical methods are based on so-called Sri Lanka Standards (SLS) methods, which essentially adopts APHA or ISO methods. No full validation of the individual testing methods or verification was conducted on the methods used.

However, MRI Food Microbiology Laboratory has participated in several international inter-laboratory proficiency tests. In addition, incubators and other instruments are calibrated.

d. **Sample numbers and testing**

Food Microbiology section of MRI analysed about 9000 samples a year comprising food, bottled water and potable water samples. Potable water and bottled water contribute the most number of samples. While the most commonly analysed foods are ready-to-eat foods, meat, fish and milk products.

Most of the food samples are official samples from Public Health Inspectors (PHI). While bottled water samples are from the industry for the purpose of registration. A small number of samples are derived from the importers in the private sector.
There is a small sample reception area within the Food Microbiology Laboratory of MRI. The samples arrive with an official seal and receive a running laboratory code number.

The Food Act 1980 prescribed that test report must be produced within 3 months. However, turnaround time (TAT, time between reception of sample and reporting the results) of the laboratory is short, approximate 3 days to a maximum of 14 days. There is no client charter for TATs in the laboratory.

The microbiology tests are carried out using conventional plating methods as prescribed is SLS Method.

e. **Instrumentation and equipment**

The Food Microbiology Laboratory of MRI has the necessary equipment for the scope of test carried out though some upgrade of equipment and storage facilities are needed.

f. **Building and facilities**

Though the MRI building is old, the Food Microbiology Laboratory is appropriate though the house-keeping and cleanliness can be improved.

The space of the Food Microbiology Laboratory is inadequate. All analytical activities including sample storage, food sample preparation, inoculation and are all carried in the same space without any physical separation.

g. **Personnel and training**

The total number of staff in the Food Microbiology Laboratory of MRI is 6, including the head of food microbiology, 4 medical laboratory technologist and 1 research officer.

There are training schedules in place and most of the trainings are in-house training. There is inadequate budget for external trainings.

**Summary of constraints and improvement needed**

The main constraints are the shortage of space to segregate the different activities such as sample preparation, inoculation and incubation to prevent any possible cross-contamination. There is also an urgent need to develop and implement a quality management system based on ISO 17025 prior to seeking accreditation. Sufficient allocation of budget for maintenance, upgrade of equipment and technical trainings of the laboratory staff is also needed.
4.2 City Analyst Laboratory, Colombo

a. Legal Status

City Analyst Laboratory is under the jurisdiction of the Local Government of Sri Lanka. It is one of the approved official laboratories with one Additional Approved Analyst (Mr. R.M.G.B. Rajanayake) as prescribed under Section 17(2) of the Food Act 1980.

b. Scope and function

This laboratory provides chemical analysis for food and water samples. These samples are analysed mainly for the purposes of enforcement, though some samples are for informal/routine purpose.

This laboratory serves mainly the Colombo area with majority of samples taken from the domestic market by PHI from the Colombo Council. The analytical capabilities of this laboratory are confined mainly to composition and quality aspects as prescribed by the Food Regulations. However, the laboratory has recently extended its scope of analysis to heavy metals. The analytical parameters are as follow:

<table>
<thead>
<tr>
<th>Types of Food</th>
<th>Parameter of Analysis</th>
</tr>
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<tbody>
<tr>
<td>Spices</td>
<td>• Physical aspects (appearance, odour, colour, taste, foreign matter, moulds/insects)</td>
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<tr>
<td>Fruits and Fruits Products</td>
<td>• Microscopical examination</td>
</tr>
<tr>
<td>Salt</td>
<td>• Damaged seed content</td>
</tr>
<tr>
<td>Miscellaneous Foods</td>
<td>• Moisture</td>
</tr>
<tr>
<td>Beverages</td>
<td>• Acidity</td>
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<tr>
<td>Fish, Meat and their products</td>
<td>• Ash</td>
</tr>
<tr>
<td>Fat and Oil</td>
<td>• Acid insoluble ash</td>
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<tr>
<td>Sugar and Sugar Products</td>
<td>• Water soluble ash</td>
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<tr>
<td>Milk and Milk Products</td>
<td>• Total Solids</td>
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<td>Fermented products</td>
<td>• Total soluble solids</td>
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<td>• Water soluble extractives</td>
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<td>• Refractive index</td>
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<td>• Total sugar</td>
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<td>• Total reducing sugar</td>
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<td>• Sucrose content</td>
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<td>• Fructose Glucose Ratio</td>
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<td>• Iodine Value</td>
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<td>• Free Fatty Acid</td>
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<td>• Saponification value</td>
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<td>• Added colouring matter</td>
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<td>• Sulphur dioxide</td>
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<td>• Benzoic acid</td>
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<td>• Formaldehyde</td>
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<td></td>
<td>• Lead and Cadmium</td>
</tr>
</tbody>
</table>
c. **Quality Management System**

The City Analyst Laboratory is not accredited to ISO 17025 and as such do not have a quality manual and a well-organized documentation of all procedures.

All analytical methods are based Sri Lanka Standards (SLS) methods, which cross refers to AOAC and APHA method. No validation or verification was conducted on the methods used.

Limited internal quality control measures are applied in this laboratory and calibration of equipment almost missing.

The Laboratory also does not participate in any national or international inter-laboratory proficiency tests. There is no maintenance schedule, though this is carried out periodically in-house by the technician. House-keeping is also sorely lacking.

d. **Sample numbers and testing**

This laboratory analysed approximately 3500 samples per year. Other than water, the most commonly analysed foods are salt, spices, fruits and fruits products, beverages, milk and milk products, fat and oil, fish, meat, sugar and sugar products and other miscellaneous foods.
Most of the food samples are official samples taken by PHI, with only a very small number of samples for routine purpose.

There is a small sample reception area within the Laboratory, where the samples are checked and given a unique laboratory code number.

The Food Act 1980 prescribed that test report must be produced within 3 months. As such, this requirement is used as a general guide for turnaround times (TAT, time between reception of sample and reporting the results) for the chemical analysis in the laboratory, which is normally between 1 to 3 months. There is no client charter for TAT in this laboratory.

The methods for physical/chemical tests available in this laboratory are essentially based on old conventional techniques and not up to date with faster modern techniques.

e. **Instrumentation and equipment**

This laboratory is equipped with a HPLC-Fluorescence, GC-FID and ASS-Graphite Furnace. However, the GC-FID (Shimadzu), which is more than 20 years old, is not functional due to the difficulty in obtaining of spare parts. While the HPLC (Shimadzu) is also facing the same problem of obtaining spare parts and as such is hardly used. The AAS-Graphite Furnace was newly purchased and is currently used only for analysis of heavy metals (lead and Cadmium) in food and other elements in water. The necessary supporting sample preparation equipment such evaporators and microwave digestor are not available.

While many of the other instrument and equipment used by this laboratory for other physical and compositional tests are outdated (e.g. centrifuge, shaker and microscope) and there is a need to upgrade the equipment to be in line with faster, automated and more sensitive modern equipment. There is only one wooden fume-hood in this laboratory and it is in a deteriorating condition due to corrosion from acid. Standards are not available, while glassware and other consumables are also inadequate.

Facilities for storage of samples, chemicals, glass-wares and other consumables are also lacking.

f. **Building and facilities**

This laboratory was formerly a building for a market that was renovated into the existing laboratory in 1992. Currently, the laboratory is in a deteriorating condition
due structural issue and the lack of proper maintenance. For example the work-tables are corroded and the drainage and piping system are poor. Safety aspect of this laboratory is also a concern.

g. Personnel and training

The total number of staff in this Laboratory is 7, including the head of the laboratory, 5 assistant analysts and 1 laboratory technician.

There are no training schedules in place but in-house trainings are periodically conducted. There is inadequate budget for external trainings.

Summary of constraints and improvement needed

The main constraints are the deteriorating condition of this old building and the outdated equipment in this laboratory. Though the laboratory can analysed heavy metals, the bulk of the scope of the analysis of this laboratory is mainly compositional or quality aspects of the food, with limited analysis on food safety aspect that are confined to preservatives (benzoic acid and sulphur dioxide), colours and formaldehyde. The focus for analysing food safety aspects such pesticides residues, heavy metals, mycotoxin or veterinary drug residues are grossly lacking. There is an urgent need to explore the possibility of improving the condition of this laboratory including a major renovation before consideration is given to upgrading its instrumentation and equipment. The development of quality management system based on ISO 17025 prior to seeking accreditation should also be given due consideration. Sufficient budget for technical trainings of the laboratory staff would also be useful.

4.3 National Institute of Health Sciences

a. Legal Status

National Institute of Health Sciences is under the jurisdiction of the Ministry of Health Sri Lanka. It is one of the approved official laboratories with one Additional Approved Analyst (Mrs. Amkhemalatha) for chemical analysis and one Additional Approved Analyst for microbiology analysis (Dr. L.R.I. Jayasuriya) as prescribed under Section 17(2) of the Food Act 1980.
b. Scope and function

This laboratory provides chemical and microbiological analysis for food and water samples. These samples are analysed mainly for the purposes of enforcement, though some samples are for informal/routine purpose.

This laboratory serves mainly the Southern part of Sri Lanka encompassing areas like Kalutara, Galle, Matara, Hambantota, Ratnapura, Moneragala, Badulla, Juwara Eliya, Ampura and Barricaloa areas. Majority of samples are taken from the domestic market particularly at the retail by PHI from these areas and some private samples from importer and bottled water companies for the purpose of registration. The chemical analytical capabilities of this laboratory are confined mainly to composition and quality aspects as prescribed by the Food Regulations. It involves the following parameters:

- Physical aspects (appearance, odour, colour, taste, foreign matter, moulds/insects)
- Moisture
- Acidity
- Ash
- Acid insoluble ash
- Water soluble ash
- Total Solids
- Total soluble solids
- Refractive index
- Total sugar
- Total reducing sugar
- Salt Content
- Added NaCl
- Iodine content
- Iodine Value
- Free Fatty Acid
- Saponification value
- Fat
- Protein
- Fibre content

The microbiological parameters carried out by this laboratory are confined to mainly hygiene indicator organism covering:

- Aerobic Plate Count
- Yeast and Mould
c. **Quality Management System**

The NIHS is not accredited to ISO 17025 and as such do not have a quality manual and a well-organized documentation of all procedures.

All analytical methods are based on Sri Lanka Standards (SLS) methods, which essentially cross-refer to AOAC, ISO or APHA methods. There is no validation or verification carried out on the methods used.

Limited internal quality control measures are applied in this laboratory and calibration of equipment almost missing.

The Laboratory also does not participate in any national or international inter-laboratory proficiency tests. There is no maintenance schedule, though this is carried out periodically in-house. House-keeping is also lacking.

d. **Sample numbers and testing**

In 2015, the laboratory analysed 5699 samples for compositional/quality parameters. The most commonly analysed foods for compositional/quality parameters are spices, iodised salt, cereals & flour and potable water. Others include fruits based products, beverages, milk and milk products, fat and oil, fish, meat, sugar and sugar products and other miscellaneous foods. Of the 5699 samples, a total of 1110 were private samples especially from importers, which are charged a fee. From January till April 2016, a total of 1.278 million rupees were collected from a total of 389 private samples.

While for microbiology, a total of 4044 samples were analysed in 2015 consisting of 2256 for food and 1788 for water.

Most of the food samples are official samples taken by PHI, with only a very small number of samples for routine purpose.

There is no sample reception area within the Chemical and Microbiology Laboratory. All samples are checked and given a unique laboratory code number within the analytical area of the laboratory.
The Food Act 1980 prescribed that test report must be produced within 3 months. As such, this requirement is used as a general guide for turnaround times (TAT, time between reception of sample and reporting the results) for the chemical analysis in the laboratory, which is normally between 1 to 3 months. While the Microbiology Laboratory has a shorter TAT of between 1-2 weeks. There is no client charter for TAT in this laboratory.

The methods for physical/chemical tests available in this laboratory are not up to date with faster modern techniques.

e. **Instrumentation and equipment**
This chemical laboratory is equipped with mainly basic conventional apparatus used to analysed compositional/quality parameters, with no modern instrumentation. Many of these apparatus are outdated and need to be upgraded to be in line with faster, automated and more sensitive modern equipment. There is only one fume-hood in this laboratory. The laboratory uses fan and does not have any air-condition in the analytical area. This resulted in the work area being extremely hot and humid especially with the use of Bunsen burner and heating carried out during the analysis. Work benches are in a deteriorating condition due chemical spills and corrosion. Standards are not available, while glassware and other consumables are also inadequate. Facilities for storage of samples, chemicals, glass-wares and other consumables are also lacking.

Some of the equipment for the microbiology laboratory including glassware, consumables are inadequate, while others need upgrading. Facilities for storage of samples, chemicals, glass-wares and other consumables are also lacking.

f. **Building and facilities**

The space in the chemistry laboratory is extremely small, with all analytical activities ranging from reception of samples, storage of samples, analysis and reporting being carried out in the same confined area. This chemical laboratory is a run-down condition and it is fast deteriorating. Safety aspect of this laboratory is also a concern.

Space is also a constraint in the microbiology laboratory though not as bad as the chemical laboratory.
g. Personnel and training

The chemical laboratory of NIHS has only 3 analysts, though it has a total of 7 positions. The microbiology laboratory has 4 technical staff.

There are no training schedules in place and trainings are hard to come by due to budget constraint for external trainings.

Summary of constraints and improvement needed

The main constraints are the small working space in the Chemical Laboratory, deteriorating condition of in the working laboratory and outdated apparatus used in this laboratory. The bulk of the scope of the analysis of this laboratory is mainly compositional or quality aspects of the food, with limited analysis on food safety aspect that are confined to preservatives (benzoic acid and sulphur dioxide), colours and formaldehyde. The focus for analysing food safety aspects such pesticides residues, heavy metals, mycotoxin or veterinary drug residues are grossly lacking. There is an urgent need to explore the possibility of improving the condition of this laboratory through renovation and expansion. Without any improvement, the existing space and condition in the laboratory will not be able to accommodate the placement of any new modern instrumentation and equipment. The development of quality management system based on ISO 17025 prior to seeking accreditation should also be given due consideration. Sufficient budget for technical trainings of the laboratory staff would also be useful.

4.4 Government Analyst Department

a. Legal Status

Government Analyst Department is under the jurisdiction of the Ministry of Justice Sri Lanka. The officers of the department are the approved analysts under various acts and ordinances such as Criminal Procedure Code, Civil Procedure Code, Offensive Weapon Act, Evidence Ordinance, Dangerous Drugs Act and Food Act. As prescribed under Section 17(2) of the Food Act 1980, it is one of the approved official laboratories with 9 Approved Analyst in the Food Division of this department.

b. Scope and function

This laboratory is divided into two major divisions i.e. Forensic Division and Food Division. The Food Division is the division providing chemical analysis for food and water samples. These samples are analysed mainly for the purposes of enforcement.

This laboratory serves the whole of Sri Lanka. Majority of samples are taken from the domestic market particularly at the retail by PHI as well as port of entry for
The chemical analysis parameters routinely carried out by this laboratory are confined mainly to composition and quality aspects as prescribed by the Food Regulations. At the same time the laboratory is midst of developing method to analyse contaminants and residues in food that encompass heavy metals, mycotoxins and pesticides residues. It is anticipated that the laboratory will be able to provide analytical services for these new parameters by end of this year. The analytical capabilities include the following parameters:

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<thead>
<tr>
<th>Parameter of Analysis</th>
<th>Food</th>
<th>Water</th>
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<tr>
<td><strong>Food</strong></td>
<td>• Physical aspects (appearance, odour, colour, taste, foreign matter, moulds/insects)</td>
<td>• Physical aspects (appearance, odour, colour, taste, foreign matter)</td>
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<td></td>
<td>• Microscopical examination</td>
<td>• colour</td>
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<td></td>
<td>• Damaged seed content</td>
<td>• pH</td>
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<td></td>
<td>• Moisture</td>
<td>• Electrical Conductivity</td>
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<td></td>
<td>• Acidity</td>
<td>• Free Ammonia (as N)</td>
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<td></td>
<td>• Ash</td>
<td>• Albuminoid ammonia (as N)</td>
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<td>• Acid insoluble ash</td>
<td>• Chloride (as Cl)</td>
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<td>• Water soluble ash</td>
<td>• Free Residual Chlorine</td>
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<td>• Sorbic Acid</td>
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<td>• Formaldehyde</td>
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<td>• Lead</td>
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<td>• Cadmium</td>
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<td></td>
<td>• Pesticides residues – multiple residue by Quenchers</td>
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<td>• aflatoxin</td>
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<td>• Lead</td>
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</table>
c. **Quality Management System**

The Government Analyst Department is currently not accredited to ISO 17025 but it has applied for accreditation. A pre-assessment is scheduled end June 2016. The scope of accreditation covers only the compositional aspects for tea.

The Government Analyst Department has a comprehensive quality management with a committed and professional quality manager. It also has in place a quality manual and a well-organized documentation of all procedures. The Standard Operation Procedures (SOPs) for validation of analytical methods and measurement uncertainty are also available.

All analytical methods are based on AOAC or Sri Lanka Standards (SLS) methods and full validation or verification has been carried out for those methods due for accreditation.

Internal quality control measures are applied in this laboratory. Balances and other instruments are calibrated once a year and the calibrations records are well-documented.

The Laboratory also participate in national (Sri Lanka Association for Testing Laboratory) and international inter-laboratory proficiency tests (Food Analysis Proficiency Analysis Scheme-FAPAS). There is proper maintenance and housekeeping schedule.

d. **Sample numbers and testing**

In 2015, the laboratory analysed 5964 food samples, with majority of the samples analysed for compositional/quality parameter and some samples for benzoic, sorbic acids and colour. The most commonly analysed foods for compositional/quality parameter are spices, iodised salt, cereals & flour and potable water salt. Others include fruits based products, beverages, milk and milk products, fat and oil, fish, meat, sugar and sugar products and other miscellaneous foods.
Most of the food samples are official samples taken from PHI for enforcement purpose.

There is central reception area for the Food Laboratory. All samples are checked and given a unique laboratory code number through a computer database. There is a dedicated secured storage area for food samples. It is currently embarking on developing a Laboratory Information Management System (LIMS).

The Food Act 1980 prescribed that test report must be produced within 3 months. As such, this requirement is used as a general guide for turnaround times (TAT, time between reception of sample and reporting the results) for the chemical analysis in the laboratory. However, the laboratory has a client charter which specified the different TAT for the different parameter of analysis.

e. Instrumentation and equipment
This laboratory is equipped with the most recent and modern equipment and instrumentation for analysis of compositional/quality parameters, preservatives, pesticides residues, heavy metals and mycotoxin. The major instrumentation includes:

- High Performance Liquid Chromatograph (HPLC)
- Liquid Chromatograph (LC) MS/MS
- Gas Chromatograph (GC) MS/MS
- Inductively Coupled Plasma (ICP) MS
- Microwave Digestor
- Spectrophotometer
- Polarometer

The laboratory is well-equipped with the necessary supportive apparatus, glassware and chemicals. However, the laboratory faces constraints in obtaining standards for pesticide and aflatoxins and certified reference materials (CRM).

The laboratory is also in the midst of developing an integrated laboratory information system.

f. Building and facilities

The Government Analyst Department move into this newly constructed laboratory only in 2013. As such, the building has a properly designed laboratory with the necessary conducive environment, space and safety features befitting a modern laboratory.
g. Personnel and training

The Food Division of the Government Analytical Department has 13 analytical staff, with 9 being government approved for the purpose of the Food Act 1980. Many of these technical analysts have many years of experience working in the laboratory.

There are in-house training programme in place, with the necessary budget allocated. However, external trainings are hard to come by due difficulty in finding suitable training place.

Summary of constraints and improvement needed

The laboratory has met all the necessary specification including the most recent instrumentation required for a modern chemical food laboratory. Its current initiative of expanding its scope from just doing compositional or quality parameter into analysing food safety parameters like heavy metals, mycotoxin and pesticides residues fit into the need of the Food Control Administration Unit of MOH. Though the laboratory has apply for ISO 17025 accreditation, the scope on food is limited to just tea and its compositional parameter and this need to be expanded to other foods and parameters.

The enhancement of the analytical skills of the technical staff through external training will be necessary to expedite the development and provision of analytical services for food safety parameters such as pesticides residues, heavy metals and mycotoxins.

4.5 Anuradhapura Food Quality Control Laboratory

a. Legal Status

Anuradhapura Food Quality Control Laboratory is under the jurisdiction of the Ministry of Health Sri Lanka. It is one of the approved official laboratories, and has one Additional Approved Analyst (K.G.A. Kumaratunga) for chemical analysis as prescribed under Section 17(2) of the Food Act 1980.

b. Scope and function

This laboratory provides chemical analysis for food and water samples. The chemical samples are analysed mainly for the purposes of enforcement, though some samples are for informal/routine purpose.

Majority of samples are taken from the domestic market particularly at the retail by PHI from nearby province areas. The chemical analytical capabilities of this laboratory are confined mainly to composition and quality aspects as prescribed by
the Food Regulations. The laboratory is also attempting to carry analysis of aflatoxin qualitative using TLC and UV technique. Its current analytical parameters are:

- Physical aspects (appearance, odour, colour, taste, foreign matter, moulds/insects)
- Moisture
- Acidity
- Ash
- Acid insoluble ash
- Water soluble ash
- Total Solids
- Total soluble solids
- Refractive index
- Total sugar
- Total reducing sugar
- Salt Content
- Added NaCl
- Iodine content
- Iodine Value
- Free Fatty Acid
- Saponification value
- Fat
- Protein
- Fibre content
- colours

d. **Quality Management System**

The laboratory is not accredited to ISO 17025 and as such do not have a quality manual and a well-organized documentation of all procedures.

All analytical methods are based on Sri Lanka Standards (SLS) methods, which essentially cross-refer to AOAC or ISO methods. There is no validation or verification carried out on the methods used.

Limited internal quality control measures are applied in this laboratory and calibration of equipment almost missing.

The Laboratory also does not participate in any national or international inter-laboratory proficiency tests. There is no maintenance schedule, though this is carried out periodically in-house. House-keeping is also lacking.
e. Sample numbers and testing

In 2015, the laboratory analysed 3046 samples for compositional/quality parameters. The most commonly analysed foods for compositional/quality parameters are spices, iodised salt, cereals & flour and edible oil.

Most of the food samples are official samples taken by PHI.

There is a sample reception area on the ground floor where all samples are checked and given a unique laboratory code number, which is recorded manually in a log book.

The Food Act 1980 prescribed that test report must be produced within 3 months. As such, this requirement is used as a general guide for turnaround times (TAT, time between reception of sample and reporting the results) for the chemical analysis in the laboratory, which is normally between 1 to 3 months. There is no client charter for TAT in this laboratory.

The methods for physical/chemical tests available in this laboratory are not up to date with faster modern techniques.

f. Instrumentation and equipment

This chemical laboratory is equipped with mainly basic conventional apparatus used to analysed compositional/quality parameters, with no modern instrumentation. Many of these apparatus are outdated and need to be upgraded to be in line with faster, automated and more sensitive modern equipment. There is only one fume-hood in this laboratory which is not working. Work benches are in a deteriorating condition due to chemical spills and corrosion. Standards are not available, while glassware and other consumables are also inadequate. Facilities for storage of samples, chemicals, glass-wares and other consumables are also lacking.

g. Building and facilities

There is adequate space in laboratory based on the current scope of analysis carried out by the laboratory. However, certain areas in the chemical laboratory are in a run-down condition and it is fast deteriorating. Safety aspect of this laboratory is also a concern.

h. Personnel and training

The chemical laboratory has only 2 analysts and one medical laboratory technologist (MLT). There are no training schedules in place and trainings are hard to come by due to budget constraint especially for external trainings.
Summary of constraints and improvement needed

The main constraints are the deteriorating condition in certain areas of the laboratory and outdated apparatus used in this laboratory. Manpower is also lacking. The bulk of the scope of the analysis of this laboratory is mainly compositional or quality aspects of the food, with limited analysis on food safety aspect that are confined to colours. The focus for analysing food safety aspects such pesticides residues, heavy metals, mycotoxin or veterinary drug residues are grossly lacking. There is an urgent need to explore the possibility of improving the condition of this laboratory through renovation in certain areas of the laboratory including the possibility of expansion. Without any improvement, the existing space and condition in the laboratory will not be able to accommodate the placement of any new modern instrumentation and equipment. The development of quality management system based on ISO 17025 prior to seeking accreditation should also be given due consideration. Sufficient budget for technical trainings of the laboratory staff would also be useful.

5. Evaluations of Laboratories and Improvement Needs of Non-Official Laboratory

Annex 5 provides a summary table of the findings of non-official laboratories and Annex 6 a summary of major constraints and improvement needed for each of these non-official laboratories.

5.1 Anuradhapura Food Quality Control Laboratory

a. Legal Status
The microbiology Section of Anuradhapura Food Quality Control Laboratory, which is under the jurisdiction of the Ministry of Health Sri Lanka, has no Additional Approved Analyst for microbiology as prescribed under the Food Act 1980.

b. Scope and function
This laboratory provides microbiological analysis for water sample for informal purpose.

The microbiological parameters carried out by this laboratory are confined to mainly hygiene indicator organism for water covering only:

- Coliform
- Escherichia coli
c. **Quality Management System**

The laboratory is not accredited to ISO 17025 and as such do not have a quality manual and a well-organized documentation of all procedures.

All analytical methods are based on Sri Lanka Standards (SLS) methods, which essentially cross-refer to APHA methods. There is no validation or verification carried out on the methods used.

Limited internal quality control measures are applied in this laboratory and calibration of equipment almost missing.

The Laboratory also does not participate in any national or international inter-laboratory proficiency tests. There is no maintenance schedule, though this is carried out periodically in-house. House-keeping is also lacking.

d. **Sample numbers and testing**

Limited number of water samples was analysed, with a TAT of between 1-2 weeks. There is no client charter for TAT in this laboratory. The petri-film methods are used for microbiology test of coliform and E.coli.

e. **Instrumentation and equipment**

Many of these apparatus are not well maintained and are not calibrated. There was no reference culture for quality control.

Some of the equipment for the microbiology laboratory including glassware, consumables are inadequate, while others need upgrading. Water bath is also rusting. Facilities for storage of samples, chemicals, glass-wares and other consumables are also lacking.

h. **Building and facilities**

There is adequate space in laboratory based on the current scope of analysis carried out by the laboratory. However, certain areas in the microbiology laboratory are in a run-down condition and it is fast deteriorating. Safety aspect of this laboratory is also a concern.

i. **Personnel and training**

The microbiology laboratory has only one MLT. There are no training schedules in place and trainings are hard to come by due to budget constraint especially for external trainings.
Summary of constraints and improvement needed

The main constraints are the deteriorating condition in certain areas of the laboratory and inadequate apparatus. There also lack of manpower including the need for an additional approved analyst. There is an urgent need to explore the possibility of improving the condition of this laboratory through renovation in certain areas of the laboratory including the possibility of expansion. The development of quality management system based on ISO 17025 prior to seeking accreditation should also be given due consideration. Sufficient budget for technical trainings of the laboratory staff would also be useful.

5.2 Kurunegara Provincial Food Laboratory

a. Legal Status
The Kurunegara Food Laboratory, which is under the jurisdiction of the Ministry of Health Sri Lanka, has no additional approved analyst as prescribed under the Food Act 1980.

b. Scope and function
This laboratory provides chemical analysis for food and water samples. The chemical samples are analysed mainly for informal purpose.

Majority of samples are taken from the domestic market particularly at the retail by PHI from nearby province areas. The chemical analytical capabilities of this laboratory are confined mainly to composition and quality aspects as prescribed by the Food Regulations. It involves the following parameters:

- Physical aspects (appearance, odour, colour, taste, foreign matter, moulds/insects)
- Moisture
- Acidity
- Alkalinity
- Total Solids
- Total soluble solids
- Refractive index
- Total sugar
- Salt Content
- Added NaCl
- Iodine content
- Iodine Value
- Free Fatty Acid
• Saponification value
• Fat
• Protein
• Fibre content
• Colour
• Caffeine

c. **Quality Management System**

The laboratory is not accredited to ISO 17025 and as such do not have a quality manual and a well-organized documentation of all procedures.

All analytical methods are based on Sri Lanka Standards (SLS) methods, which essentially cross-refer to AOAC and APHA methods. There is no validation or verification carried out on the methods used.

Limited internal quality control measures are applied in this laboratory and calibration of equipment almost missing.

The Laboratory also does not participate in any national or international inter-laboratory proficiency tests. There is no maintenance schedule, though this is carried out periodically in-house. House-keeping is also lacking.

d. **Sample number and testing**

In 2015, the laboratory analysed 1061 samples for compositional/quality parameters. The sample number is small due to unavailability of an approved analyst for formal samples.

The most commonly analysed foods for compositional/quality parameters are spices, iodised salt, cereals & flour and edible oil. Most of the food samples are taken by PHI for informal purpose.

The methods for physical/chemical tests available in this laboratory are not up to date with faster modern techniques.

e. **Instrumentation and Equipment**

This chemical laboratory is equipped with mainly basic conventional apparatus used to analysed compositional/quality parameters, with no modern instrumentation. Many of these apparatus are outdated and need to be upgraded to be in line with faster, automated and more sensitive modern equipment. Standards are not available, while glassware and other consumables are also inadequate.
Facilities for storage of samples, chemicals, glass-wares and other consumables are also lacking

f. **Building and Facilities**
There is adequate space in laboratory based on the current scope of analysis carried out by the laboratory. However, certain areas in the chemical laboratory are in need of improvement. Safety aspect of this laboratory is also a concern.

g. **Personnel and training**
The laboratory has only 1 chemist and 2 development officers. There are no training schedules in place and trainings are hard to come by due to budget constraint especially for external trainings. Most of the analysts in this laboratory have not attended any training for many years.

**Summary of constraints and improvement needed**
The main constraints are outdated apparatus used in this laboratory, lack of space and the lack of an approved analyst. The bulk of the scope of the analysis of this laboratory is mainly compositional or quality aspects of the food, with limited analysis on food safety aspect that are confined to colours. There is need to increase utensil and improve conditions in the laboratory including its maintenance. The development of quality management system based on ISO 17025 prior to seeking accreditation should also be given due consideration. Sufficient budget for technical trainings of the laboratory staff would also be useful.

5.3 **Industrial Technology Institute (ITI)**

a. **Legal Status**
Industrial Technology Institute is semi-government body under the jurisdiction of the Ministry of Technology and Research Sri Lanka and it has no additional approved analyst as prescribed under the Food Act 1980.

b. **Scope and function**
This laboratory provides chemical and microbiology for food and water samples. ITI provide analysis to anyone requiring analytical services for a fee. Its clients include industry, government agencies and individual.

The laboratory has a wide range of analytical capabilities for food that range from composition and quality aspects to pesticides residues, heavy metals and mycotoxin. The microbiology laboratory is also capable of analysing all hygiene indicators and food pathogens.
c. **Quality Management System**
   The laboratory is accredited to ISO 17025. The laboratory has a comprehensive quality management with a committed and professional quality manager. It also has in place a quality manual and a well-organized documentation of all procedures. The Standard Operation Procedures (SOPs) for validation of analytical methods and measurement uncertainty are also available.

   All analytical methods are based on Sri Lanka Standards (SLS) methods, which cross refers to AOAC, ISO and APHA methods. Validation or verification has been carried out for those methods accredited.

   Internal quality control measures are applied in this laboratory. Balances and other instruments are calibrated once a year and the calibrations records are well-documented.

   The Laboratory also participate in international inter-laboratory proficiency tests

d. **Sample numbers and testing**
   An average of 3500 samples were analysed by this laboratory.

e. **Instrumentation and equipment**
   The laboratory has a wide range of modern equipment that includes:
   - GC-MS
   - GC with different detectors (FID, ECD and NPD)
   - ICP MS
   - AAS Graphite
   - AAS Flame
   - HPLC
   - HPLC MS-MS
   - Microwave digestor
   - A range of other supporting equipment

   All instruments are calibrated and well maintained. Standard and reference culture are available for quality control.

f. **Building and facilities**
   There is ample space in laboratory based on the current scope of analysis carried out by the laboratory. Housekeeping is good and safety aspect of this laboratory is adequate.
g. Personnel and training
The laboratory has a total of 62 staff, out which 12 are in the microbiology laboratory while the rest are in chemistry laboratory. Staffs are well trained and these are recorded and documented.

Summary of constraints and improvement needed
The scope on accreditation of this laboratory can be improved for microbiology and expanded to pesticides residues in vegetables and fruits for chemical analysis. The laboratory also lack automated supporting equipment like Accelerated Solvent Extractor for pesticide analysis.

5.4 Sri Lanka Standard Institute (SLSI)

a. Legal Status
SLSI is semi-government body under the jurisdiction of the Ministry of Technology and Research Sri Lanka and it has no additional approved analyst as prescribed under the Food Act 1980.

b. Scope and function
This laboratory provides chemical and microbiology for food and water samples. SLSI provide analysis to the food industry for the purpose of food product certification in meeting Sri Lanka Standard and for quality assurance. The service is provided for a fee.

The laboratory has analytical capabilities for testing food on composition and quality aspects and heavy metals. The microbiology laboratory is capable of analysing all hygiene indicators and Salmonella. However, the laboratory is planning to extend the scope of analysis to pesticide residues, food packaging material and verification of nutrition labelling.

c. Quality Management System
The laboratory is accredited to ISO 17025. The laboratory has a comprehensive quality management and it has in place a quality manual and a well-organized documentation of all procedures.. The Standard Operation Procedures (SOPs) for validation of analytical methods and measurement uncertainty are also available.

All analytical methods are based on Sri Lanka Standards (SLS) methods, which cross refers to AOAC, ISO and APHA methods. Validation or verification has been carried out for those methods accredited.
Internal quality control measures are applied in this laboratory. Balances and other instruments are calibrated once a year and the calibrations records are well-documented.

The Laboratory also participate in international inter-laboratory proficiency tests

d. **Sample numbers and testing**
   An average of 4500 samples were analysed by this laboratory.

e. **Instrumentation and equipment**
   The laboratory has a mix of outdated and modern equipment that includes:
   - GC with FID
   - AAS Graphite
   - Microwave digestor
   - HPLC
   - UV-VIS Spectrophotometer
   - A range of other supporting equipment

   Most instruments are calibrated and well maintained. A GC is not operating due to gas supply connection problem. Standard and reference culture are available for quality control based on the accredited parameters.

f. **Building and facilities**
   There is ample space in laboratory based on the current scope of analysis carried out by the laboratory. Some sector of the laboratory are old and in deteriorating condition. Housekeeping and safety aspect of this laboratory can also be improved.

g. **Personnel and training**
   The laboratory has a total of 23 staff. Staffs are well trained and this is documented.

**Summary of constraints and improvement needed**

Certain sectors in the laboratory require improvement including renovation to improve its condition. Maintenance of equipment can also be improved, while additional modern equipment would be most useful. The scope of accreditation for this laboratory needs to be expanded to cover heavy metals and microbiology to cover more pathogens.
5.5 SGS Lanka (Pvt) Ltd

a. Legal Status
SGS is a private laboratory and as such it has no additional approved analyst as prescribed under the Food Act 1980.

b. Scope and function
This laboratory provides chemical and microbiology for food and water samples. SGS provide analysis to anyone requiring analytical services for a fee. Its clients include industry, food service outlets, government agencies and individual.

The laboratory has a wide range of analytical capabilities for food that range from composition and quality aspects to pesticides residues and heavy metals. The microbiology laboratory is capable of analysing all hygiene indicators and food pathogens.

c. Quality Management System
The laboratory is accredited to ISO 17025 for both chemical and microbiology, with a wide range of scope of parameters and foods accredited. In fact the laboratory has two accreditations, one by the Sri Lanka Accreditation Board and another by National Accreditation Board of India. The laboratory has a comprehensive quality management with a committed and professional quality manager. It also has in place a quality manual and a well-organized documentation of all procedures. The Standard Operation Procedures (SOPs) for validation of analytical methods and measurement uncertainty are also available.

All analytical methods are based on Sri Lanka Standards (SLS) methods, which cross refers to AOAC, ISO and APHA methods. Validation or verification has been carried out for those methods accredited.

Internal quality control measures are applied in this laboratory. Balances and other instruments are calibrated once a year and the calibrations records are well-documented. The Laboratory also participate in international inter-laboratory proficiency tests

d. Sample numbers and testing
An average of 120 food samples are analysed by this laboratory in a day.

e. Instrumentation and equipment
The laboratory has a wide range of modern equipment that includes:

- GC-MS
- GC with different detectors (FID, ECD and NPD)
- ICP MS
- ICP OES
- HPLC
- HPLC MS
- Microwave digestor
- A range of other supporting equipment

All instruments are calibrated and well maintained. Standards and reference cultures are available for quality control.

**f. Building and facilities**

The laboratory is very well maintained with proper housekeeping and adequate safety facilities. The laboratory also has a good security system for entering and exiting the laboratory. The laboratory has an excellent Laboratory Information Management System (LIMS), which manages samples from receiving samples till reporting of results.

**h. Personnel and training**

The laboratory has a total of 55 technical staff, out which 21 are in microbiology laboratory while the rest are in chemistry laboratory. Staffs are well trained and this is documented.

**Summary of constraints and improvement needed**

The laboratory is very well set-up and very well operated, which is a good model to emulate.
6. **Situational Analysis**

The overall situation analysis identifies the deficiency, weakness and strength that will form the basis for recommendations to strengthen food safety laboratory in Sri Lanka.

6.1 **Legal Provisions for Official Laboratory under the Food Act 1980**

The Ministry of Health Sri Lanka through the Food Control Administration Unit (FCAU) is authority responsible for ensuring for food safety and quality in Sri Lanka based on the mandate provided in the Food Act 1980.

The Food Act 1980 prescribes the administration, power and authority of authorised officers including the Chief Food Authority, penalty and legal proceedings, and power to prescribe regulations. In support of enforcement of this Act, Section 16 prescribes the requirement for food samples to be sent only to Approved Analyst. While Section 17 (1) prescribes that only Government Analyst shall be the Approved Analyst, whilst Section 17(2) states that the Minister can approve Additional Approved Analyst.

Though Section 17 (1) and 17(2) of the Food Act 1980 do not stipulate that approved analyst must be from the government sector but currently only these official food safety laboratories under the various government agencies have Approved Analysts or appointed Additional Approved Analyst:

- Medical Research Institute (MRI)
- National Institute of Health Sciences (NIHS)
- City Analyst Colombo
- Government Analyst Department
- Anuradhapura Food Quality Control Laboratory

These laboratories are the scientific arm of the food safety programme and provide the critical science based evidence in support of food safety management.

6.2 **Analytical Services from Food Safety Laboratories**

With the exception of Government Analyst Department and Anuradhapura Food Quality Control Laboratory, most of the other approved official control food safety laboratories were established by taking over building space and renovated into a laboratory. As such, the existing buildings and infrastructure for these laboratories are found to be unsafe, not conducive to be operated as laboratory and very inadequate in terms of space for the current and future needs.
Fig 1: Conditions in laboratories
All the approved official control food safety laboratories provide mainly analysis for the purpose of enforcement of the Food Act 1980 and its Regulations. The scopes of analysis in these laboratories are confined to analysing compositional/quality parameters and some additives covering only benzoic acid, sulphur dioxide, formaldehyde and colours. This is mainly due to the fact that current Regulations only prescribe these composition/quality and some additives requirements for food.

However, the Sri Lanka Standards developed by SLSI regarding composition, quality and safety limits for many different type of food are also used as reference including for enforcement purpose.

With the exception of Government Analyst Department, all the other official control laboratories at the moment cannot analyse food safety parameters like pesticides residues, mycotoxins, environmental contaminants such as heavy metals and veterinary drug residues due to the non-availability of the necessary instrumentation, equipment and expertise.

The Government Analyst Department, which is under the Ministry of Justice, has taken its own initiatives through the recent purchase of high-end instrumentation to embark on developing methods for analysing heavy metals, pesticides residues and mycotoxin. The City Analyst of Colombo has also recently purchased an AAS-Graphite furnace for the purpose of metals analysis in food and water.

The current situation indicated that there were no planning on activities, resources and requirements from laboratories regarding the improvement of the system, which are mostly on an ad hoc basis.

Only the Government Analyst Department has implemented a quality system and has applied for accreditation, while the rest of the official food safety laboratories have not implemented a quality system. In addition, standard operating procedures are not coordinated and harmonized, where laboratories have different formats worksheets and operating procedures. In fact there are laboratory without worksheets and analytical readings and measurements are just written on a piece of paper.

Figure 2; Hand written readings and measurements on a piece of paper
Thus, the main technical constraints are old and outdated equipment, acute shortage of sophisticated instrumentation and the limited budget for technical service/maintenance, accreditation, and for technical trainings of the laboratory staff. While the physical laboratory infrastructure limitations are the old and deteriorating laboratory structure and the limited working space that can hamper any effort on improvement in terms expansion and upgrading capacity and capability.

Figure 3: Outdated equipment and poor internal condition of laboratories
6.3 Inspection and Surveillance

The analytical need or demand from the FCAU as a consequence from its planning for regulatory as well monitoring/surveillance programme is the main factor in determining the current and future analytical needs and the subsequent planning needed to develop the laboratory to meet those needs.

However, the current situation indicated that there is no proper network of communication between the laboratories, FACU and the inspectorate.

Though some form of a monthly return from the operational level are forwarded to FCAU, these data are not detail enough to provide the necessary information to enable proper evaluation to identify problematic foods and parameter for more targeted risk management. For example, in 2014 a total of 26,000 samples were analysed. Out of these, 18000 samples were domestic food samples including water samples were collected but no details of the types of food and the analysis carried out.

There is a general lack of planning at the national level by FCAU. This is mainly due to the absence of a system in collecting, collating and analysing key information that will enable a more systematic planning in terms of the inspection, enforcement and surveillance program that is more risk-based. Basic key database on food establishments (factories, service outlets), import data (types of food, amount/volume and exporting countries), analytical results of the different types of food (imported, enforcement/formal or informal) are not available.

This deficiency has resulted in current sampling activities, whether at the domestic or import level, being random in nature based on a quantitative target for each PHI of 2 samples per month. This target does not indicate the type of foods that should be targeted or the type of parameter of analysis to be carried out. The type of food samples to be collected is left entirely to the discretion of the PHI. While the parameter of analysis is left to the discretion of the laboratory based on its capabilities in terms of the type of analysis carried, which in most cases are on compositional or quality aspects.

In addition, sampling sites for collection of food samples based on the target for each PHI is confined to the retails. No samples are collected as a consequence from inspection at the factory/manufacturing level.

Such an approach in the sampling and analysis of food as currently undertaken is insufficient to identify all food safety and quality problems with food from which the consumer should reasonably expect to be protected. With no clear guidance as to the right level of sampling and analysis activity, there is huge local variation in the level and effectiveness of such work.
In addition, resources are not devoted to the sampling and analysis of food that are appropriately focused and risk-based, resulting in unnecessary duplication and inability to maximise effectiveness. Such duplication of effort can waste the limited resources available while other parts of the food supply go untested. Duplication also occurs when Public Health Inspectors (PHI) from different locality focus on the same analysis of the same nationally distributed commodities at the same time, oblivious to the work of others.

The sampling kits and sampling technique used by the inspectorate is cumbersome and outdated. For example sealing process of the sample package is by tying and waxing.

![Sampling at the retail](image)

Figure 4: Sampling at the retail
6.4 Situation in Non-Official Laboratories

The non-official laboratories in the semi-government sector and private sector have excellent laboratory infrastructure, adequate modern equipment, human resource and expertise. All these non-official laboratories also have good quality systems that were accredited to ISO 17025. This is in stark contrast compared to the official laboratories, with the exception of the official laboratory of Government Analyst Department. However, these non-official food laboratories has the necessary modern facilities and capacities for food safety (pesticides, heavy metals) available but not fully utilised by FCAU.

Figure 6: Infrastructure and facilities in non-official laboratories
7. Recommendations

In providing recommendations that are practical for strengthening capacity of existing food safety laboratories in Sri Lanka, the following factors were taken into consideration:

- existing situation and performance of current food safety laboratories
- the current and future analytical demands or needs of the food safety programme implemented by MOH Sri Lanka,
- major gaps in current capacity of food safety laboratories
- requirements to improve food safety laboratories based on local realities and requirements, and
- build on existing infrastructure and capabilities.

It also recognises that establishing and maintaining a good food safety laboratory system working in line with the required standards is expensive due high costs of equipment and buildings, maintenance, costs of human capital and running costs. These factors mitigate against a large number of food safety laboratories.

Taking cognisance of these factors, 4 recommendations are proposed:

**Recommendation 1**

1. Create a network of food safety laboratories that consist of all laboratories that are capable of handling current “everyday” food analysis consisting of compositional/quality parameter with some basic parameters of food safety that include colours, benzoic, sulphur dioxide and formaldehyde. In addition to this “everyday” analysis, create three dedicated laboratories with specialisation in at least two areas of analysis related to contaminants and residues in food i.e. pesticides residues, veterinary drug residues, heavy metals and mycotoxin.

All laboratories in this network need to develop and implement a proper quality management system, prior to seeking accreditation to ISO 17025 “General Requirements for the Competence of Testing and Calibration Laboratories”.

This network (Diagram 1) will consist of the following:

I. Established a new Central Food Safety Laboratory in a suitable locality to act as the main referral centre that can:

   a. provides food analytical services on:-
      i. pesticides residues (organophosphorus, organochlorine, synthetic pyrethroid, dithiocarbamates and carbamates)
      ii. heavy metals (lead, Arsenic including inorganic arsenic, cadmium, mercury including methyl-mercury),
iii. mycotoxin (Total aflatoxin, aflatoxin B1, aflatoxin M1, ochratoxin A, zearalenone, fumonisin)
iv. veterinary drug residues (banned drugs such as chloramphenicol & nitrofuran; antibacterial substances such as tetracycline, sulphonamides, oxytetracycline, other residue such as penicillin, amyloglycoside, Streptomycin; Spiramycin; Avoparcin)

b. Explore new areas of concern on food safety:
   i. processing contaminants like 3-MCPD, acylamide
   ii. other environmental contaminants like dioxin and PCB
   iii. taints/frauds like DHEP, melamine, malachite green
   iv. DNA techniques for meat speciation, genetically modified foods
   v. food packages/utensils

c. Develop and validate new methods
   i. “Build-operate and transfer” new methodology to other laboratories within this network

d. coordinate development and implementation of ISO 17025
   i. documentation, operating procedures, accreditation and conduct of proficiency testing

e. Act as training centre for food analysts

As the main laboratory, it will have three major components which comprise the Food Chemistry Analytical, which carry out the chemical analysis; Method Development that develop and validate new methods and Quality Assurance that coordinate the implementation of quality system.

Since this a new laboratory, it will also be practical and more cost-efficient that a food microbiology laboratory be established and integrated together with the Chemistry Laboratory into one laboratory building.

**Rationale:** It envisaged the analytical demands and needs for food safety and quality in the next 10 years from now in Sri Lanka would have expanded. Therefore the development of a new central laboratory that is able to accommodate these new demands will need to planned and develop from now, as a new laboratory is expected to take any time from 8 to 12 years to materialise.
II. The Government Analyst Department, which will be immediately utilised as the main laboratory that provides food analytical services for contaminants and residues that are of food safety and public health significance for the next 5 years. The scope of analysis should include but not limited to:-

- pesticides residues (organophosphate, organochlorine, synthetic pyrethroid, dithiocarbamates and carbamates)
- heavy metals (lead, uran, cadmium, mercury),
- mycotoxin (total aflatoxin, aflatoxin B1, aflatoxin M1)
- veterinary drug residues (banned drugs such as chloramphenicol & nitrofuran; antibacterial substances such as tetracycline, sulphonamides, oxytetracycline; other residues such as penicillin, amyloglycoside, Streptomycin, Spiramycin, Avoparcin)

The number of food samples for “everyday” parameter of analysis involving compositional/quality parameters send to The Government Analyst Department should be reduced to enable this laboratory to focus on the above specialised area of analysis.

**Rationale:** The Government Analyst Department is a very well set-up laboratory that was recently established in 2013, and it has implemented a well-documented quality management system, which is due for assessment to obtain accreditation to ISO 17025 by 2016. The Government Analyst Department has also recently purchased high-end instruments and other supporting equipment that are capable of analysing pesticides residues (GC-MSMS), heavy metals (ICP-MS), benzoic & sorbic acid (HPLC) and mycotoxin including aflatoxin, veterinary drugs (LC-MSMS). Analytical staffs with the necessary expertise and experience are currently developing methods on pesticides residues and aflatoxin and the laboratory is expected to be ready for routine analysis before end of this year. As such, this laboratory will be able to cater to the immediate analytical needs of MOH for these parameters.

III. The Anuradhapura Food Quality Control Laboratory will continue to handle current “everyday” food analysis involving quality/compositional parameters of food, but its laboratory will be renovated, expanded and upgraded with the necessary equipment and human resource to widen its scope of analysis to encompass at 3 specialised scope related to food safety i.e. pesticides residues,
heavy metals and mycotoxin analysis. The expanded laboratory can also carry out wider scope of microbiology analysis.

**Rationale:** The Anuradhapura Food Quality Control Laboratory has a double storey building on its own and has sufficient space where the laboratory is located to accommodate further expansion through renovation to cater to the establishment of specialist area of analysis for pesticides residues, heavy metals and mycotoxin. This laboratory is close to provinces that have large paddy cultivation areas. In addition, majority incidents of reported chronic kidney disease suspected to be due to high cadmium contamination in food and water are from provinces close to this laboratory.
IV. The existing peripheral official food safety laboratories including NIHS, MRI, City Analyst and Kurunegala will continue handling current “everyday” work of routinely testing for quality or compositional aspects of food together with some basic aspects of food safety parameters covering benzoic acid, sulphur dioxide and colours. However, minor internal renovations in these laboratories are needed to provide a conducive environment in the laboratories. Supplemental equipment, glassware, benches, storage facilities need to be provided for them to sustain the “everyday” analytical work.

Rationale: The internal structures of these laboratories are old and do not have the necessary space that can accommodate any cost effective major expansion. Suffice at this stage that current “everyday work” be sustained and continued with some minor renovation.

Recommendation 2

2. Develop a logically derived system for collecting information and establishing a structured surveillance or monitoring programme with appropriate sampling rates at the national level by FCAU in consultation with peripheral public health inspectors (PHI) and food safety laboratories. This system should be based upon planned food premises inspection and sampling, complaint and other ad hoc local investigations and port control inspections. The development of this system will require the following actions:

I. Increased number of technical officers with scientific background including food scientist, chemist, nutritionist and microbiologist at national level

II. Establish a database on
   a. food premises (factories, manufacturers, restaurant etc)
   b. types of food imported, amount (tonnage and value), exporting countries
   c. analytical results from laboratories

III. Develop of a systematic approach to the assessment of the risks presented by different types of foods;
IV. Develop a system for the arrangement and coordination of national programmes including surveillance, inspection, sampling and reposting mechanism.

V. Develop a guidance document on sampling

VI. Review of current transportation and dispatch mechanism of samples to food safety laboratories including feasibility study on the use of courier (with central sample collection area) and/or a central sample collection area prior to dispatch of samples

**Rationale:** In order to ensure that protection of the consumer is effective, the frequency of sampling of any particular food and the scope of analysis undertaken on those samples must be soundly based on the risk to the consumer. In order to do this, sufficient technical officers with the scientific knowledge at the national must be available to collate, evaluate and review the data for planning purposes. In addition, moving away from target based sampling (2 per PHI per month) to a risk based approach to inspection and sampling of food for analysis has the potential to maximise the effectiveness of the process by focusing on risk and by avoiding any unnecessary duplication of efforts. If sampling and analysis are followed by effective action to rectify any problems identified, the result is likely to be a decrease in the proportion of unsatisfactory foods and increased confidence in the food supply. The importance of inter-linkages between planning at national level, the inspectorate and food safety laboratory is reflected in Diagram 2. The network of laboratory with specialise area of analysis will necessitate a sound and efficient transportation to the different locality of the laboratory.
DIAGRAM1: PROPOSED NETWORK OF FOOD SAFETY LABORATORIES

- Central Food Safety Laboratory
- Provides food analytical services on:
  - Pesticides residues
  - Heavy metals
  - Mycotoxin
  - Veterinary drug residues
- Explore new areas of concern on food safety:
  - Processing contaminants; environmental contaminants like dioxin and PCB
  - Taints/frauds like DHEP, melamine, malachite green
  - DNA techniques for meat speciation, genetically modified foods
  - Food packages/utensils
- Microbiological Tests
- Develop and validate new methods:
  - "Build-operate and transfer" new methodology to other laboratories within this network
  - Coordinate development and implementation of ISO 17025
  - Documentation, operating procedures, accreditation and conduct of proficiency testing
- Training centre for food analysts

- Government Analyst Laboratory
  - Carried out "everyday" type of analysis
    - Compositional/quality
    - Basic chemical testing – preservatives, color
  - At least 2 specialist food safety area
    - Pesticides, metals, mycotoxin, veterinary drug

- Anuradhapura Laboratory
  - Carried out "everyday" type of analysis
    - Compositional/quality
    - Basic chemical testing – preservatives, color

- Kurunegala Laboratory
  - Carried out "everyday" type of analysis
    - Compositional/quality
    - Basic chemical testing – preservatives, color

- City Analyst Laboratory
  - Carried out microbiological tests
Recommendation 3

3. Recommendations 1 and 2 must be supported by technical assistance from dialog partners or relevant organisation on these key areas:

   I. Strengthening analytical capabilities of analysts in the food safety laboratories on:
      • Upgrading the analytical skills of analyst in food safety laboratories on specific testing methods for contaminants and food additives
      • Training on laboratory quality management
      • Training on assessment of proficiency testing schemes

   II. Strengthening food inspection capacities with emphasis:
      • exposing and training of Public Health Inspectors (PHI) on modern and risk-based approaches of inspection
      • review and update training curriculum of PHI

   III. Strengthening planning and management of food safety based risks

Rationale: Equipping staffs with the necessary knowledge and skills are pre-requisite in ensuring the recommendations can be implemented successfully.
**Diagram 2: Inter-Relation Between FCAU, Inspectorate and Food Safety Laboratories**

- Develop methods
- Research
- Training
- Quality system

**Food Safety Laboratory**

**Central Food Safety Laboratory**

Data/feedback

- Data needs for enforcement & surveillance
- Funds
- Manpower

ISO 17025 Accredited
Skilled manpower

Professional, efficient & quality analytical services

**Food Control Administration Unit (FCAU)**

**Inspectorate**

Strengthening of enforcement & surveillance

**Safer Food**

New information & knowledge

Risk based inspection & sampling
**Recommendation 4**

4. Utilise existing non-official laboratories that are accredited and with the necessary analytical capabilities for food safety for informal or non-enforcement purposes including:
   - Specific survey or studies on food safety issue of concern
   - Export certification
   - Guide official laboratories in development of quality system
   - Provide training of analysts from official laboratory

Rationale: Non-official laboratories have the required expertise and capacities to support the food safety programme in fact-finding initiatives for further risk management. It can also be utilised for capacity building. Such an approach can maximise existing laboratories that have the required resources for the improvement of the food safety programme implemented by MOH.

8. **Conclusion**

The recommendations provided can serve a basis for the phase approach in improving the official food safety laboratories in Sri Lanka. The implementation of the recommendations requires proper planning and a high level of commitment from all relevant stakeholders to ensure its success.
## Annex 1

### Programme
Consultancy on Food Safety 30 May - 10 June 2016

<table>
<thead>
<tr>
<th>Date</th>
<th>Session</th>
<th>Activity</th>
<th>Objective</th>
<th>Expected Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 May</td>
<td>Morning</td>
<td>Meeting with WHO Officials</td>
<td>Orientation on the consultancy and TORs</td>
<td>Finalization of programme</td>
</tr>
<tr>
<td></td>
<td>Afternoon</td>
<td>Meeting with Ministry of Health Officials:</td>
<td>Orientation on the current state on Food Safety (Food Act and its</td>
<td>1. Detailed on the current state on Food Safety, laboratory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Director General of Health Services, Deputy Director General</td>
<td>implementation), laboratory network and sample collection and transport</td>
<td>network and operation in Sri Lanka</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Environment &amp; Occupational Health), Director /E&amp;OH,</td>
<td>system</td>
<td>2. Documents on Food Safety obtained (Food Act etc)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consultant Community Physician,</td>
<td></td>
<td>3. Laboratory Observation checklist developed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medical Officer, Assistant Director</td>
<td></td>
<td>4. Moderator guide for interviews developed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Food Control Unit) etc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31 May</td>
<td>Morning</td>
<td>Visit to Medical Research Institute (MRI) Lab and discussions with</td>
<td>Observe the operation at MRI</td>
<td>MRI Laboratory operation observed, checklist completed and discussions conducted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>relevant authorities</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Afternoon</td>
<td>Visit to City Analyst Lab, Colombo</td>
<td>Observe the operation at City Analyst</td>
<td>City Analyst Lab operation</td>
</tr>
<tr>
<td>Date</td>
<td>Time</td>
<td>Activity</td>
<td>Location</td>
<td>Notes</td>
</tr>
<tr>
<td>--------</td>
<td>-----------</td>
<td>--------------------------------------------------------------------------</td>
<td>-------------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>1 June</td>
<td>Morning</td>
<td>Municipal Council and discussions with relevant authorities</td>
<td>Lab</td>
<td>observed, checklist completed and discussions conducted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visit to National Institute of Health Sciences (NIHS) Lab, Kalutara and discussions with relevant authorities</td>
<td>Observe the operation at NIHS Lab</td>
<td>NIHS Laboratory operation observed, checklist completed and discussions conducted</td>
</tr>
<tr>
<td></td>
<td>Afternoon</td>
<td>Observe food safety activities at field level – NIHS Field Practice area</td>
<td>Understand the field level activities carried out on food safety and sample collection and transporting – current operation, challenges and needs</td>
<td>Field level activities on food safety observed</td>
</tr>
<tr>
<td>2 June</td>
<td>Morning</td>
<td>Visit Food Lab of the Government Analyst (GA) Department</td>
<td>Observe the operation at Government Analyst’s Food Lab</td>
<td>GA Food Laboratory operation observed and checklist completed</td>
</tr>
<tr>
<td></td>
<td>Afternoon</td>
<td>Discussion with officials from the GA department</td>
<td>Understand the current GA Food Laboratory function, challenges and needs</td>
<td>In-depth interviews/discussions conducted</td>
</tr>
</tbody>
</table>
| 3 June | Day       | Discussion/ interviews with Officers of the E&OH Directorate              | Understand the current function, challenges and needs in relation to food safety and food laboratory operations in the country from a national perspective | 1. In-depth interviews/discussions conducted  
2. Collected data analyzed |
<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Activity</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 June</td>
<td>Day</td>
<td>Data Analysis</td>
<td></td>
</tr>
<tr>
<td>5 June</td>
<td>Afternoon</td>
<td>Travel to Anuradhapura</td>
<td></td>
</tr>
<tr>
<td>6 June</td>
<td>Morning</td>
<td>Visit Food Lab at Anuradhapura and discussions with officials</td>
<td>Observe the operation at Anuradhapura Food Lab Lab operation observed, checklist completed and interviews conducted</td>
</tr>
<tr>
<td></td>
<td>Afternoon</td>
<td>Visit Food Lab at Kurunegala</td>
<td>Observe the operation at Kurunegala Food Lab Lab operation observed, checklist completed and interviews conducted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Travel back to Colombo</td>
<td></td>
</tr>
<tr>
<td>7 June</td>
<td>Morning</td>
<td>Visit to ITI and SGS labs and discussions with officials (private sector labs)</td>
<td>Observe the operation at ITI and SGS Labs and understand the function, challenges and needs</td>
</tr>
<tr>
<td></td>
<td>Afternoon</td>
<td>Visit to the Sri Lanka Standards Institute (SLSI), observe lab and discussions with Officials</td>
<td>Understand the current situation on setting standards and accreditation of food labs, challenges and needs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1. Lab operation observed 2. In-depth Interviews/discussions conducted 3. Documents related to standardization and accreditation obtained</td>
</tr>
<tr>
<td>8 June</td>
<td>Day</td>
<td>Dissemination workshop 9:30 am – 1:30 pm</td>
<td>Disseminate the findings on 1. Situation analysis on food safety 1. Data presented on food safety laboratories</td>
</tr>
<tr>
<td>9 June</td>
<td>Day</td>
<td>Any other discussion/visit</td>
<td>2. Needs assessment of food safety laboratories focusing on chemical analysis</td>
</tr>
<tr>
<td>10 June</td>
<td>Day</td>
<td>Final meeting with WHO and MoH Officials and submission of final report</td>
<td>3. Share good practice on food safety in Asia (including networking) and discuss outcomes of the assessment</td>
</tr>
</tbody>
</table>

|  |  |  | 4. Provide practical recommendations on strengthening capacity of existing food safety labs in Sri Lanka (within the MOH and beyond) including food safety laboratory networking |
|  |  |  | 2. Discussion and feedback obtained from stakeholders |
|  |  |  | 3. Formulation of recommendations |
|  |  | Final data analysis and report writing | Develop final report |
|  |  | Final report submitted |
Stakeholders Workshop on Food Safety Laboratories

Tentative Agenda

Date: 8 June 2016

Time: 9.30a.m. – 1.00 p.m

9.30 am – 10 am Registration of participants

10.00 am – 10.15 am Welcome speech and introduction to workshop
Dr Lakshman Gamlath
D/Environmental and Occupational Health

10.15 am – 10.25 am Speech by Dr. Palitha Mahipala
Director General of Health Services

10.25 am – 1035 am Speech by Dr. Jacob Kumarasan
WHO Representative

10.35 am – 10.50 Morning Tea

10.50 am – 11.50 am Presentation of Food Safety Laboratories in Sri Lanka
Dr. Chin Cheow Keat
WHO Consultant

11.50 – 12.30 pm Discussion

12.20 pm – 1.00 pm Way Forward

1.00 pm Vote of Thanks and lunch
## Current Situation in Official Food Safety Laboratories

<table>
<thead>
<tr>
<th>Laboratory</th>
<th>Scope Parameters</th>
<th>Quality System</th>
<th>Equipment</th>
<th>Building</th>
<th>Manpower Sample Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Research Institute (MRI)</td>
<td>Micro Hygiene Indicator Pathogen</td>
<td>Not implemented</td>
<td>Inadequate</td>
<td>Old &amp; lack of space</td>
<td>6 (1 µ/b, 4 MLT &amp; 1 RO) 9000 samples</td>
</tr>
<tr>
<td>National Institute of Health Sciences (NIHS)</td>
<td>Micro Hygiene Indicator Salmonella Chemical Quality Parameters Benzoic/SO₂ Colour</td>
<td>Not implemented</td>
<td>Inadequate Outdated &amp; inadequate Poorly maintain</td>
<td>Lack of space Old, lack of space &amp; bad condition</td>
<td>4 (1 µ/b, 3 MLT) 4044 samples 3 staff, 4 vacant 5699 samples</td>
</tr>
<tr>
<td>City Analyst Colombo</td>
<td>Chemical Quality Parameters Benzoic/SO₂ Colour, Cadmium &amp; Lead</td>
<td>Not implemented</td>
<td>Outdated &amp; inadequate Poorly maintain</td>
<td>Old &amp; bad condition</td>
<td>7 (1 head, 5 asst analyst &amp; 1 lab tech) 3500 samples</td>
</tr>
<tr>
<td>Government Analyst Department</td>
<td>Chemical Quality Parameters Benzoic/Sorbic, SO₂ Colour, <em>Pesticides, aflatoxin, metals (developing)</em></td>
<td>Implemented &amp; In progress ISO17025 Accreditation</td>
<td>Modern &amp; high-end Adequate but can be improved</td>
<td>Modern lab with sufficient space &amp; set-up</td>
<td>13 (9 approved analyst) 5964 samples</td>
</tr>
<tr>
<td>Anuradhapura</td>
<td>Chemical Quality Parameters Benzoic/SO₂ Colour</td>
<td>Not implemented</td>
<td>Some outdated, inadequate &amp; poorly maintain</td>
<td>2 storey laboratory Need upgrading</td>
<td>3 (2 chemist &amp; 1 MLT) 3064 samples</td>
</tr>
</tbody>
</table>
# Annex 4:

## Summary of Constraints and Improvement Needed in Non-Official Food Safety Laboratories

<table>
<thead>
<tr>
<th>Laboratory</th>
<th>Summary of current Constraint</th>
<th>Improvement Needed</th>
</tr>
</thead>
</table>
| Medical Research Institute (MRI) | • shortage of space to segregate activities - possible cross-contamination  
• Inadequate equipment | • Develop & implement quality system  
• budget & planning external technical trainings |
| National Institute of Health Sciences (NIHS) | • poor condition of lab & limited space  
• Old, not working and outdated equipment  
• Inadequate staff  
• Lack maintenance  
• Only analyse quality parameters & limited analysis on benzoic acid, SO$_2$, colours | • improve condition of lab before upgrade current equipment & utensils  
• Develop & implement quality system  
• budget & planning external technical trainings  
• Fill the vacant post in Food Chemistry |
| City Analyst Colombo | • deteriorating condition of lab  
• Old, not working and outdated equipment  
• Poor maintenance  
• Only analyse quality parameters & limited analysis on benzoic & sorbic acid, SO$_2$, colours and formaldehyde. | • urgent - improve condition lab before upgrade current instrument and equipment.  
• Develop & implement quality system  
• budget & planning external technical trainings |
| Government Analyst Department | • scope on accreditation limited to tea and its compositional parameter.  
• Lack of standards and CRM  
• Lack external training to the latest technique based on lab current instrumentation | • Plan increased in scope of accreditation for food  
• Expedite sourcing of standards and CRM  
• Expedite the development of pesticides, heavy metal and aflatoxin for food  
• budget & plan external technical trainings |
| Anuradhapura | • some equipment are old, not working and outdated  
• Lack maintenance  
• Only analyse quality parameters & limited analysis on colours  
• No proper training for staff  
• Inadequate staff | • improve condition of lab before upgrade current equipment & utensils  
• Develop & implement quality system  
• budget & planning external technical trainings  
• Increase no of staff |
## Current Situation in Non-Official Food Safety Laboratories

<table>
<thead>
<tr>
<th>Laboratory</th>
<th>Scope Parameters</th>
<th>Quality System</th>
<th>Equipment</th>
<th>Building</th>
<th>Manpower Sample Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anuradhapura</td>
<td>Micro Coliform E.coli</td>
<td>Not implemented</td>
<td>Inadequate</td>
<td>Need renovation</td>
<td>1 MLT minima samples</td>
</tr>
<tr>
<td>Kulunegara</td>
<td>Chemical Quality Parameters Benzoic/SO₂ Colour, Formaldehyde</td>
<td>Not implemented</td>
<td>Inadequate</td>
<td>Lack of space</td>
<td>3 Development officer 1061 samples</td>
</tr>
<tr>
<td>Industrial Technology Institute (ITI)</td>
<td>Micro Hygiene indicators pathogens Chemical Quality Parameters Benzoic, sorbic SO₂ Colour, metals &amp; pesticides residues</td>
<td>Accredited to ISO17025</td>
<td>Modern &amp; up-to-date with scope</td>
<td>Proper &amp; well maintain lab</td>
<td>62 staff (12 in micro) About 3500 samples</td>
</tr>
<tr>
<td>Sri Lanka Standards Institute (S LSI)</td>
<td>Micro Hygiene indicators Some pathogens Chemical Quality Parameters Benzoic, sorbic SO₂ Colour, metals</td>
<td>Accredited to ISO17025</td>
<td>Adequate with a mix of modern and outdated, equipment</td>
<td>Some parts of the laboratory require upgrading/renovation</td>
<td>23 staff 4500 samples</td>
</tr>
</tbody>
</table>
## Annex 6:
### Summary of Constraints and Improvement Needed in Non-Official Food Safety Laboratories

<table>
<thead>
<tr>
<th>Laboratory</th>
<th>Summary of current Constraint</th>
<th>Improvement Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anuradhapura</td>
<td>• Poor maintenance of micro lab&lt;br&gt;• Inadequate equipment&lt;br&gt;• Poor internal infrastructure of lab&lt;br&gt;• Lack of manpower including an approved analyst</td>
<td>• improve condition of micro lab&lt;br&gt;• Increase equipment&lt;br&gt;• Develop &amp; implement quality system&lt;br&gt;• Increase manpower including an additional approved analyst (can be a microbiologist)&lt;br&gt;• Improve maintenance</td>
</tr>
<tr>
<td>Kulunegara</td>
<td>• Inadequate space&lt;br&gt;• Poor internal infrastructure of lab&lt;br&gt;• Inadequate and outdated equipment&lt;br&gt;• Inadequate staff including an approved analyst&lt;br&gt;• Lack maintenance</td>
<td>• improve condition of lab&lt;br&gt;• Increase equipment &amp; utensils&lt;br&gt;• Develop &amp; implement quality system&lt;br&gt;• Training for technical staff&lt;br&gt;• Improve maintenance</td>
</tr>
<tr>
<td>Industrial Technology Institute (ITI)</td>
<td>• scope on accreditation limited&lt;br&gt;• Inadequate automated supporting equipment like ASE</td>
<td>• Plan increased in scope of accreditation for food&lt;br&gt;• Obtain supporting equipment instrument and equipment.</td>
</tr>
<tr>
<td>Sri Lanka Standards Institute (SLSI)</td>
<td>• Some areas of the laboratory old&lt;br&gt;• Some equipment are not maintained, whole some are outdated&lt;br&gt;• scope on accreditation limited</td>
<td>• Plan increased in scope of accreditation for food&lt;br&gt;• Renovate to improve some areas of the laboratory&lt;br&gt;• Obtained more updated equipment&lt;br&gt;• Improve maintenance</td>
</tr>
</tbody>
</table>