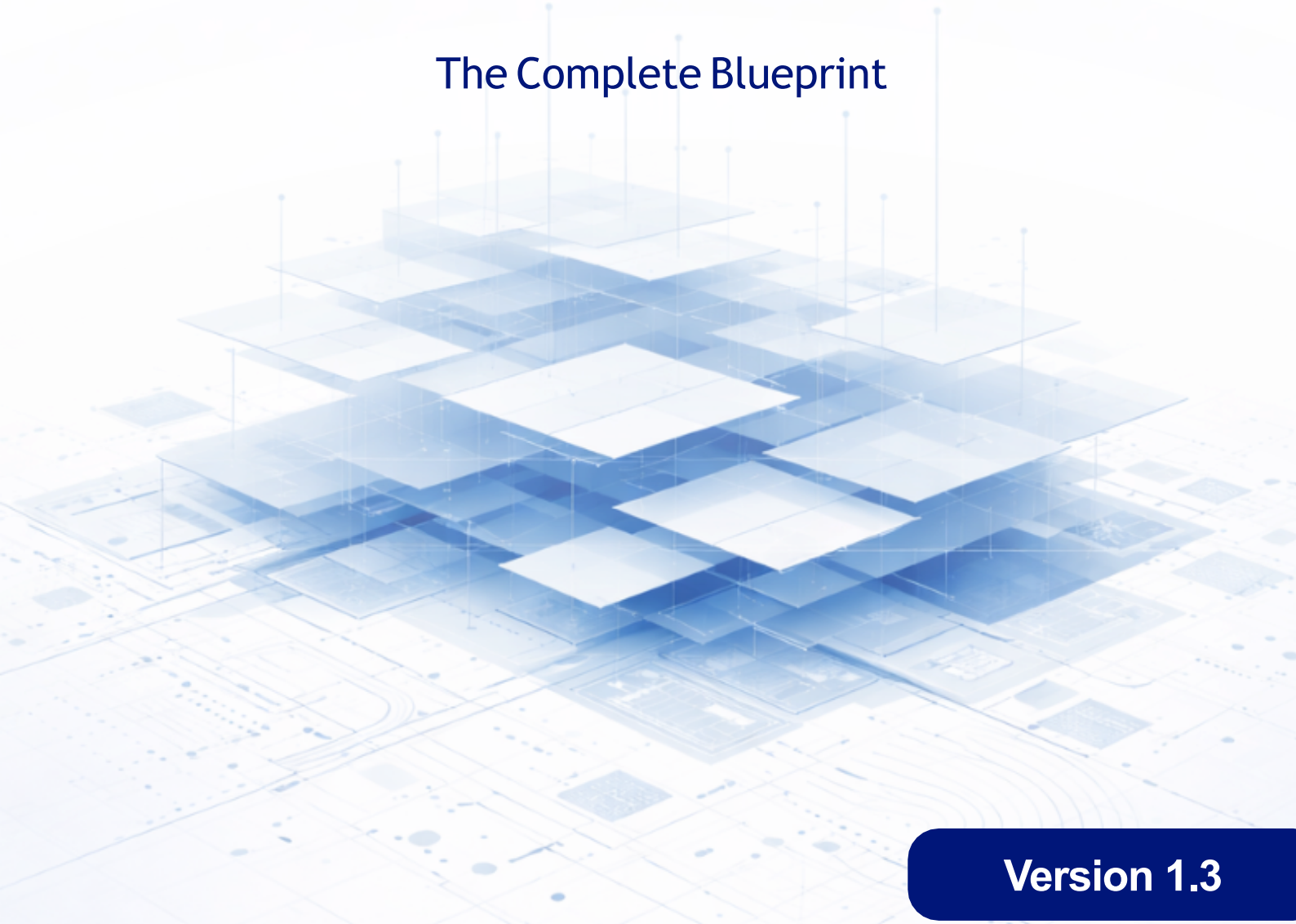
Food and Agriculture Organization of the United Nations

Gates Foundation

Sri Lanka Government

AGRICULTURE ENTERPRISE ARCHITECTURE

The Complete Blueprint



Version 1.3

Preface

Information systems in the Sri Lanka government agriculture sector are affected by data inconsistency, data inaccuracy, and lack of data ownership issues. This has basically slowed down the decision-making power and the ability at crucial junctures in the past. The proposed Sri Lanka Government Agriculture Enterprise Architecture (SL-GAEA) is an effort to fix this key issue. This document provides a comprehensive integration plan along with a comprehensive as-is analysis. By following this, the sector will be able to work seamlessly with proper data ownership with less conflicts and duplications. Furthermore, the proposed architecture has provisions to seamlessly connect with the proposed National Data Exchange (NDX) and other key Digital Public Infrastructure (DPI) components, which will be governed by the Digital Economy Ministry.

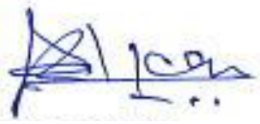
Message from the Hon. Minister of Agriculture, Livestock, Land and Irrigation

The development of the Enterprise Architecture for Sri Lanka's Agriculture Sector is a critical step toward creating a unified, efficient, and digitally empowered agricultural ecosystem. This architecture provides a structured approach for integrating processes, data, and technology across agriculture, livestock, irrigation, and land administration, ensuring that all systems work together seamlessly.

By adopting this enterprise architecture, we aim to improve interoperability, enhance service delivery, and enable evidence-based decision-making. It will serve as a blueprint for aligning institutional objectives with modern technology solutions, reducing duplication, and promoting resource optimization. This initiative supports the Government's broader vision for digital transformation and national priorities such as food security, climate resilience, and sustainable development.

I extend my sincere appreciation to the Food and Agriculture Organization of the United Nations (FAO) for their technical guidance and to the Gates Foundation for their generous financial support. I also wish to acknowledge the dedicated efforts of the Ministry of Agriculture, Livestock, Land and Irrigation, whose commitment and expertise have been instrumental in making this initiative a reality.

This enterprise architecture is more than a technical framework, it is a foundation for innovation and collaboration. It will empower institutions, strengthen governance, and help build a future-ready agriculture sector that benefits farmers and the nation.



K. D. Lalkantha
Minister of Agriculture, Livestock, Land and Irrigation

Message from the Hon. Deputy Minister of Digital Economy

The development of the Enterprise Architecture for Sri Lanka's Agriculture Sector marks a significant milestone in our journey toward building a digitally inclusive and future-ready nation. It establishes a unified, structured, and sustainable framework for digital transformation across agriculture, livestock, irrigation, plantation, and fisheries sectors - each critical to our national economy and food security.

This architecture provides more than a technical blueprint. It represents a strategic approach to aligning policy, processes, data, applications, and technology in a way that promotes interoperability, avoids duplication, and ensures optimal use of public investment. It lays the groundwork for scalable digital solutions that improve service delivery, transparency, and evidence-based decision-making across the sector.

Importantly, this initiative sets a strong precedent for other sectors of government. It exemplifies the whole-of-government digital transformation approach envisioned in Sri Lanka's National Digital Economy Strategy, where platforms are interconnected, citizen-focused, and innovation-driven.

I commend the leadership of the Ministry of Agriculture, Livestock, Land and Irrigation, and the valuable collaboration of sectoral stakeholders. I also extend my sincere appreciation to the Food and Agriculture Organization of the United Nations (FAO) and the Gates Foundation for their technical and financial support.

This Enterprise Architecture is more than a digital framework. It is a foundation for building resilience, equity, and innovation across Sri Lanka's agricultural systems.

Let us now move forward together, turning this foundation into real impact, for farmers, for citizens, and for our country's digital future.

Hon. (Eng.) Eranga Weeraratne
Deputy Minister of Digital Economy

Message from the Secretary, Ministry of Agriculture, Livestock, Land and Irrigation

The Enterprise Architecture for the Agriculture Sector provides a strategic blueprint for integrating systems, processes, and data across multiple domains. It is designed to improve interoperability, enhance efficiency, and support evidence-based policy formulation. By implementing this architecture, we are creating a unified digital environment that strengthens governance and service delivery.

This initiative reflects our commitment to modernizing agriculture through technology and aligns with national priorities on food security and sustainable development. It will help institutions work together more effectively and ensure that farmers benefit from timely and accurate information.

I wish to acknowledge the Food and Agriculture Organization of the United Nations (FAO) for their technical expertise and the Gates Foundation for their financial support. I also express my gratitude to the dedicated staff of the Ministry of Agriculture, Livestock, Land and Irrigation, whose efforts have been instrumental in bringing this vision to life.

This enterprise architecture is a key enabler for digital transformation in agriculture. It will foster collaboration, improve decision-making, and create a strong foundation for a future-ready agricultural sector.

D. P. Wickramasinghe

Secretary - Ministry of Agriculture, Livestock, Land and Irrigation

Message from the FAO Representative for Sri Lanka and the Maldives

The development of the Sri Lanka Government Agriculture Enterprise Architecture represents a critical step in creating a coherent and future-ready digital foundation for the agriculture sector. This architecture provides a shared vision for how institutions, processes, data, and technologies can be aligned to work as a unified system rather than as isolated components.

Enterprise Architecture is a powerful tool for public-sector transformation. By offering a structured blueprint for digital investments, it helps governments reduce duplication, improve interoperability, and ensure that technology solutions are scalable, sustainable, and aligned with policy objectives. In the context of agriculture, this approach is especially important given the sector's complexity, the number of institutions involved, and the growing demand for timely, reliable data.

This architecture is designed not as a static document, but as a living framework that can evolve as technologies, needs, and priorities change. When effectively implemented, it will strengthen governance, improve service delivery, and enable evidence-based decision-making, ensuring that digital transformation ultimately delivers tangible benefits to farmers and rural communities.

FAO is pleased to have led the technical process and facilitated collaboration in shaping the Enterprise Architecture, in partnership with the government ministries and institutional stakeholders. We appreciate the Gates Foundation's financial support through the IDAT Project, and extend our thanks to the many government officials and technical teams whose tireless efforts made this accomplishment possible.

FAO looks forward to continuing this partnership as Sri Lanka advances towards a resilient, inclusive, and digitally empowered agriculture sector.

Vimlendra Sharan
FAO Representative for Sri Lanka and the Maldives

Acknowledgements

The Ministry of Agriculture, Livestock, Land and Irrigation extends its sincere appreciation to all institutions and individuals who contributed to the development of the Sri Lanka Government Agriculture Enterprise Architecture Framework, which serves as a key national instrument for guiding the digital transformation of the agriculture sector.

The Ministry places on record its deep appreciation for the dedication, professionalism, and tireless efforts of its officers and technical teams, whose commitment and expertise were instrumental in the development of this framework. Their sustained engagement ensured that the Enterprise Architecture is practical, forward-looking, and aligned with the operational realities of the agriculture sector, while remaining fully consistent with national digital governance priorities.

The Ministry also acknowledges the valuable contributions of sector institutions across agriculture, livestock, irrigation, plantation, and fisheries. Their collaboration and insights significantly strengthened the relevance, coherence, and applicability of this framework across the wider agriculture sector.

Sincere appreciation is extended to the Food and Agriculture Organization of the United Nations (FAO) for its technical leadership, strategic guidance, and continued support throughout the development process, including the provision of international best practices, technical expertise, and close collaboration with national stakeholders to ensure the quality, relevance, and sustainability of this framework. The Ministry further acknowledges, with gratitude, the Gates Foundation for its generous financial support, which enabled the successful development of this important national digital foundation.

This Enterprise Architecture Framework reflects the collective commitment of all stakeholders to building a coordinated, interoperable, and sustainable digital ecosystem for agriculture, supporting a resilient, data-driven, and future-ready sector.

Contents

Revision History

DATE	VERSION	PRIMARY AUTHOR	DESCRIPTION
31/03/2024	V 1.0	Food and Agriculture Organization of the United Nations (FAO)	Version 1.0 Release
31/05/2024	V 1.1	Food and Agriculture Organization of the United Nations (FAO)	Incorporated the IMC feedback
15/07/2024	V 1.2	Food and Agriculture Organization of the United Nations (FAO)	Incorporated Ministry and Department level feedback
20/12/2025	V 1.3	Food and Agriculture Organization of the United Nations (FAO)	Changed the structure of the document adding more TOGAF content Updated the latest ministry level structural changes Added PGRC and PMEU case studies. Added a separate *Gap Analysis* section to the document

Acronyms

AAIB	Agriculture and Agrarian Insurance Board
ABB	Architecture Building Block
ADM	Architecture Development Method
AEZ	Agro-Ecological Zone
AI	Agriculture Inspector
API	Application Program Interface
ARPA	Agricultural Research and Production Assistant
ASC	Agrarian Service Center
CCB	Coconut Cultivation Board
CCFC	Colombo Commercial Fertilizer Corporation
CDA	Coconut Development Authority
CFC	Colombo Fertilizer Corporation
CFHC	Ceylon Fishery Harbors Corporation
CRI	Coconut Research Institute
DAD	Department of Agrarian Development
DAPH	Department of Animal Production and Health
DEA	Department of Export Agriculture
DFAR	Department of Fisheries and Aquatic Resources
DMT	Department of Motor Traffic
DOA	Department of Agriculture
DOM	Department of Meteorology
DIAL	Digital Impact Alliance
DOAgBiz	Division of Agri Business Development

DPA	Data Protection Authority
DPG	Digital Public Goods
DPGA	Digital Public Goods Alliance
DPI	Digital Public Infrastructure
DS	Divisional Secretariat
DSP	Data Sharing Policy
DUS	Distinctness, Uniformity and Stability
DWLC	Department of Wildlife Conservation
EAC	Export Agricultural Crop
FAO	Food and Agriculture Organization
FCAU	Food Control Administration Unit
FI	Fisheries Inspector
FCRDI	Field Crop Research and Development Institute
FRDI	Fruit Research and Development Institute
GDP	Gross Domestic Product
GDPIR	Global Digital Public Infrastructure Repository
GEA	Government Enterprise Architecture
HADABIMA	*Haritha Danav Bim Sanwardhana Madyama Adikariya*
HARTI	Hector Kobbekaduwa Agrarian Research and Training Institute
HORDI	Horticultural Crops Research and Development Institute
ID	Irrigation Department
IMC	Inter-Ministerial Committee
IMD	Irrigation Management Division
INFORM	Information for Agriculture Information Managers
ITI	Industrial Technology Institute

IPPC	International Plant Protection Convention
ITU	International Telecommunication Union
MASL	Mahaweli Authority of Sri Lanka
MLEL	Mahaweli Livestock Enterprise Ltd.
MOALLI	Ministry of Agriculture, Livestock, Land, and Irrigation
MODE	Ministry of Digital Economy
MOFAOR	Ministry of Fisheries, Aquatic, and Ocean Resources
MOPCI	Ministry of Plantations and Community Infrastructure
NADSA	National Agricultural Development and Settlement Authority
NAICC	National Agriculture Information and Communication Centre
NAQDA	National Aquaculture Development Authority
NARS	National Agricultural Research System
NDSP	National Data Sharing Policy
NFPB	National Food Promotion Board
NFS	National Fertilizer Secretariat
NIPHM	National Institute of Post-Harvest Management
NLDB	National Livestock Development Board
NPQS	National Plant Quarantine Service
OFC	Other Field Crops
PDPA	Personal Data Protection Act
PeTAC	Pesticides Technical and Advisory Committee
PLR	Paddy Land Register
PMB	Paddy Marketing Board
PMEU	Progress Monitoring and Evaluation Unit
PPS	Plant Protection Service

PTWG	Provincial Technical Working Group
RDD	Rubber Development Department
`ROP	Registrar of Pesticides
RPC	Rubber Plantation Companies
RRI	Rubber Research Institute
RRDI	Rice Research and Development Institute
RSCS	Regional Seed Certification Centers
SBB	Solution Building Block
SCS	Seed Certification Service
SDG	Sustainable Development Goals
SEPC	Socio Economics and Planning Center
SHTU	Seed Health Testing Unit
SFC	Subsidiary Food Crops
SLCARP	Sri Lanka Council for Agricultural Research Policy
SLSI	Sri Lanka Standards Institute
SLTB	Sri Lanka Tea Board
SP	Seed Producer
SPMDC	Seed and Planting Material Development Center
STL	Seed Test Lab
TSHDA	Tea Small Holding Development Authority
VMS	Vessel Monitoring System

1.0 Introduction

Sri Lanka's agriculture sector plays a pivotal role in the country's national economy, supporting livelihoods and contributing significantly to its GDP. Over the years, most of the institutions within the agriculture sector have gone through some level of digital transformation. However, the sector has long faced challenges due to fragmented data silos, lack of interoperability, and inefficient decision-making processes (ITU, 2019; DIAL, 2019).

Therefore, it is important to break down the current operational silos by fostering data exchange and seamless integration across the sector. The successful implementation of this will not only modernize agricultural management but also serve as a model for digital transformation in other sectors as well.

According to the latest DPI principles (CDPI, 2025), conceptualizing institutional information domains and giving them proper ownership can minimize the data duplication to a greater extent. This is further supported by well-defined data sharing policies, Interoperability Framework adaptations and other DPI component initiatives.

To implement this integrated approach, it is imperative to establish a well-defined integrated strategy / blueprint. The **Government Enterprise Architecture (GEA)**, which is also known as the "**Whole-of-Government (WoG)**" approach, can be considered as one such approach, which has been adopted by many developed countries with more established e-Government implementations. In addition to that, this approach refers to a cross-sector and cross-organizational consideration of all types of stakeholders' needs (Open Group, 2023).

In GEA, having a well-defined **Enterprise Architecture Framework (EAF)** is essential and will provide a comprehensive snapshot of the current architecture and a comprehensive understanding of the target architecture along with existing gaps. Having the target architecture prepared in advance will certainly give the perfect roadmap for future decision making. It will reduce information system / data duplication and will improve the seamless integration ability across the sector.

Hence, the relevant ministries in focus will benefit immensely by following the said guidelines and recommendations presented in this document.

2.0 Enterprise Architecture - The Digital Transformation Strategy

Enterprise Architecture (EA) provides a strategic, top-down view of an enterprise to enable all stakeholders to co-ordinate, integrate and conduct their activities.

The defined "enterprise" could be a single institution or multiple institutions or even a large sector such as a government. That means EA could be easily adapted to any enterprise setting irrespective of its size.

As explained, any EA is verified through a well-known **Enterprise Architecture Framework (EAF)**. There are many popular EAFs that are being adopted by enterprises worldwide. Some of them are:

1. The Open Group TOGAF
2. Zachman EAF
3. US Government Federal EAF (FEAF)
4. Gartner EAF

All these EAFs have their own evolution, purpose, scope, principles, structures, and approaches. Out of them, the Open Group TOGAF (Open Group, 2023a) stands out among others and is being used by many enterprises in the world including governments.

2.1 TOGAF Framework

In TOGAF, the EAF verification happens with the help of the **Architecture Development Method (ADM)**, which is known as the core of TOGAF. It is basically a method for developing and managing the life cycle of an EA. There are ten (10) phases and eight (08) of them are managed in a cycle, which is known as the **ADM cycle**.

These ten (10) ADM phases are as follows:

1. Preliminary Phase
2. Requirements Management
3. Phase A – Architecture Vision
4. Phase B – Business Architecture
5. Phase C – Information Systems Architecture
6. Phase D - Technology Architecture
7. Phase E – Opportunities and Solutions
8. Phase F – Migration Planning
9. Phase G – Implementation Governance
10. Phase H - Architecture Change Management

Successful use of ADM will provide a customer-focused, value-adding, and sustainable architecture practice that enables the enterprise, that helps to maximize the value of investments and proactively identify opportunities to gain business benefits and manage risk. However, it is not mandatory to follow all steps that ADM tells you to follow. You can always customize according to your project specific needs.

EA describes the current and future state of the Enterprise. Hence, the TOGAF ADM cycle defines the **baseline (current)** and the **target (future)** architectures as one of the primary tasks.

Along with these two pieces of architecture, the following steps need to be followed:

1. Develop the Baseline Architecture Description
2. Develop the Target Architecture Description
3. Perform the Gap Analysis
4. Define Candidate Road Map Components
5. Resolve impacts across the Architecture Landscape
6. Selecting reference models, viewpoints, and tools
7. Finalize the architecture.
8. Create the Architecture Definition Document

2.2 Preliminary Phase

As the first phase of the TOGAF ADM cycle, the main objective of this phase is the preparation and initiation activities required to create the "Architecture Capability" of the project and to establish the parameters for a subsequent successful iteration(s) of the ADM. Once the "Architecture Capability" is established, you will not change it back and forth unless you want to have a complete change of plans. Hence, it is not considered as a non-iterative phase in the ADM.

Some of the steps involved in this phase are as follows:

1. Defining enterprise capability - The capability of the enterprise is evaluated to absorb the change required by the transformation.
2. Confirming the governance frameworks and any other supporting frameworks - Currently the whole EA and governance framework is revolving around TOGAF, and at a later stage this could be customized to tailor to any additional service governance frameworks such as COBIT, ITIL, etc. along with TOGAF as the main EA.
3. Establishing the EA team
4. Define architectural principles.
5. Tailoring the proposed EA framework such as TOGAF based on the architectural requirements.

As the main output, the "**Request for Statement for Architecture Work**" requires multiple factors to be considered such as requirements, structures, organizational context, tools, and any architectural frameworks as explained.

Defining the EA Team

The core EA team consists of the following department / ministry officials.

1. Ministry of Agriculture, Livestock, Land and Irrigation – The Project Owner
2. Ministry of Fisheries, Aquatic, and Ocean Resources – The Project Owner
3. Ministry of Plantation and Community Infrastructure – Project Owner
4. Ministry of Digital Economy – Project Technology Ownership
5. FAO Sri Lanka - EA and IF Technical Consultancy, The Project Implementation Partner
6. Bill and Milinda Gates Foundation (BMGF) – The Donor

7. Heritage Partners – The Project Legal Consultant

Finally, the completed EA and IF will be owned by all three ministries specified. Future versions of both these artifacts can be accommodated by consulting the relevant ministry.

Defining the Architecture Principles

As explained, the primary architecture principles are based on the TOGAF EAF, and the rest of the technical architecture is based on the following key principles.

1. **A sector based distributed enterprise architecture** - Each sector can have its own API management, message mediations, and message brokering. The inter-sector message mediation could happen via government lead National Data Exchange (NDX) or any other middleware components.
2. **Electronic Registries** - All master data should be governed as electronic registries within a given sector. For example, the agriculture sector may have many registries such as Farmer Registry, Paddy Land Registry, etc. All the identified registries should be owned and governed by a selected department based on the scope already given by Acts and Regulations.
3. **Adhering to DPI** - Need to utilize the Digital Public Infrastructure (DPI) components, which have been already laid by the central government under the supervision of Ministry of Technology. These components are Lanka Government Network (LGN), Lanka Government Cloud (LGC), National Data Exchange (NDX), Sri Lanka Unique Digital ID (SL-UDI), etc.
4. **API based back-end development** - Any department level new back-end developments should be developed based on the electronic registry architecture and all registries should pull meaningful APIs based on the IF defined for the sector. The legacy back-ends can utilize current databases to pull custom APIs with some mediations in the middle.
5. **Adhering to Open Standards** - Need to give priority to Open-Source Technologies and Open Standard implementations considering the sustainability of all future implementations.
6. **Government Interoperability Framework** - Need to follow Lanka Interoperability Framework (LIFe) for all domain level data definitions.
7. **Personal Data Protection** - Need to follow the Personal Data Protection Act (PDPA) drafted by ICTA (Parliament of Sri Lanka, 2022), Personal Data Protection Act No 9 of 2022. PDPA sets the guideline for especially on the personal data storage restrictions based on their criticality.
8. **Data Sharing** - Need to follow the National Data Sharing Policy drafted by ICTA (ICTA, 2013). This provides a set of guidelines on how data needs to be classified at the departmental level. Any data element can be either public, private, or protected.

2.3 Architecture Vision

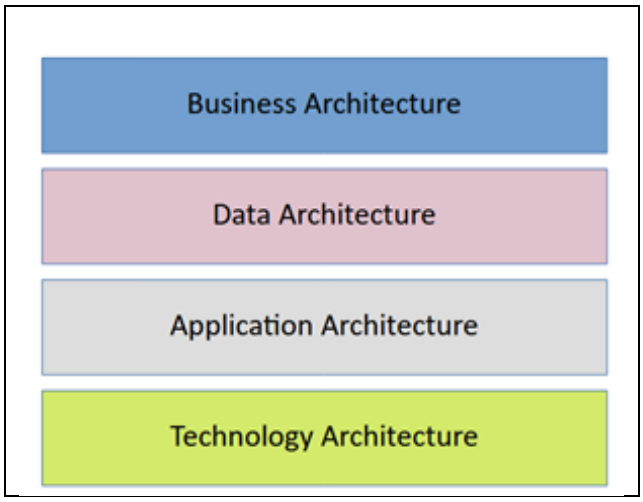
When the preliminary phase basically focuses on preparing the enterprise for the architecture work, the architecture vision phase focuses on defining the goals and the scope.

In addition to defining the goals and the scope of the enterprise, there are two key deliverables identified in this phase.

1. The **architecture vision**
2. The approval of the architecture vision via the "**Statement of Architecture Work**" from all the stakeholders involved.

2.4 BDAT Framework

The TOGAF BDAT is a key architectural approach, which can be used to structure Enterprise Architecture (EA) into four key domains. [B = Business; D = Data; A = Application; T = Technology]. It is a structured way of aligning business goals with an organization's IT strategy.

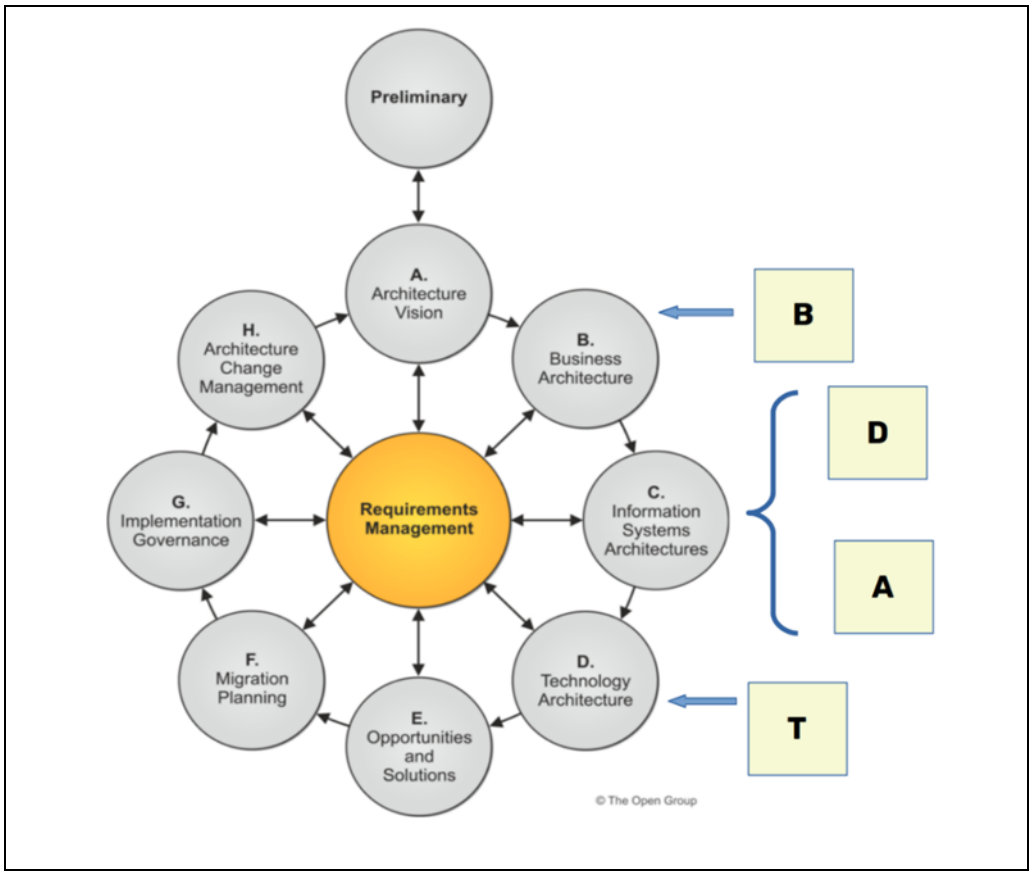


TOGAF BDAT Framework

Implementing any capability within an organization would require the design of these four domain architectures.

1. **Business Architecture (B)** – Defines business strategy, governance, organization, and business process.
2. **Data Architecture (D)** – Describes the structure of an organization's data assets and how data flows within the enterprise.
3. **Application Architecture (A)** – Provides a blueprint for the individual applications to be deployed, their interactions, and their relationships to the core business processes of the organization.
4. **Technology Architecture (T)** – Describes the logical software and hardware capabilities that resulted to support the deployment of business, data, and application servers.

These BDAT domains are mapped to Business, Information Systems, and Technology phases in ADM.



Mapping BDAT to TOGAF ADM

In TOGAF, each BDAT domain can have its own **Candidate Architecture**s before finalizing the Target Architecture.

Candidate Architectures

Candidate architecture is a potential architecture option under consideration.

1. **Phase B** (Business Architecture Domain) – Identify candidate business models, organizational structures, and process frameworks
2. **Phase C** (Data and Application Architecture Domains) – Identify different data models, and application frameworks
3. **Phase D** (Technology Architecture Domain) – Identify different technology stacks, platforms, and deployment models.

Once the candidate architectures are identified for each phase, the "best-fit architecture" for each domain is selected and refined before moving into the next phases.

Then in Phase E and F, all three-candidate architecture road map components of phase B, C, and D will initiate the "**Architecture Road Map**" for the enterprise. In the Architecture Roadmap, **Transition Architectures** are conceptualized based on the selected candidate architectures.

2.5 GAP Analysis

While developing the “Baseline” and “Target” architectures, it is essential to identify relevant gaps in each BDAT domain.

Gap Analysis is a technique, which is used to **identify gaps between the current (baseline) architecture and the target (future) architecture.** These gaps determine what needs to be changed to achieve the desired state. Generally, TOGAF practitioners use **Gap Analysis Matrix** to facilitate this.

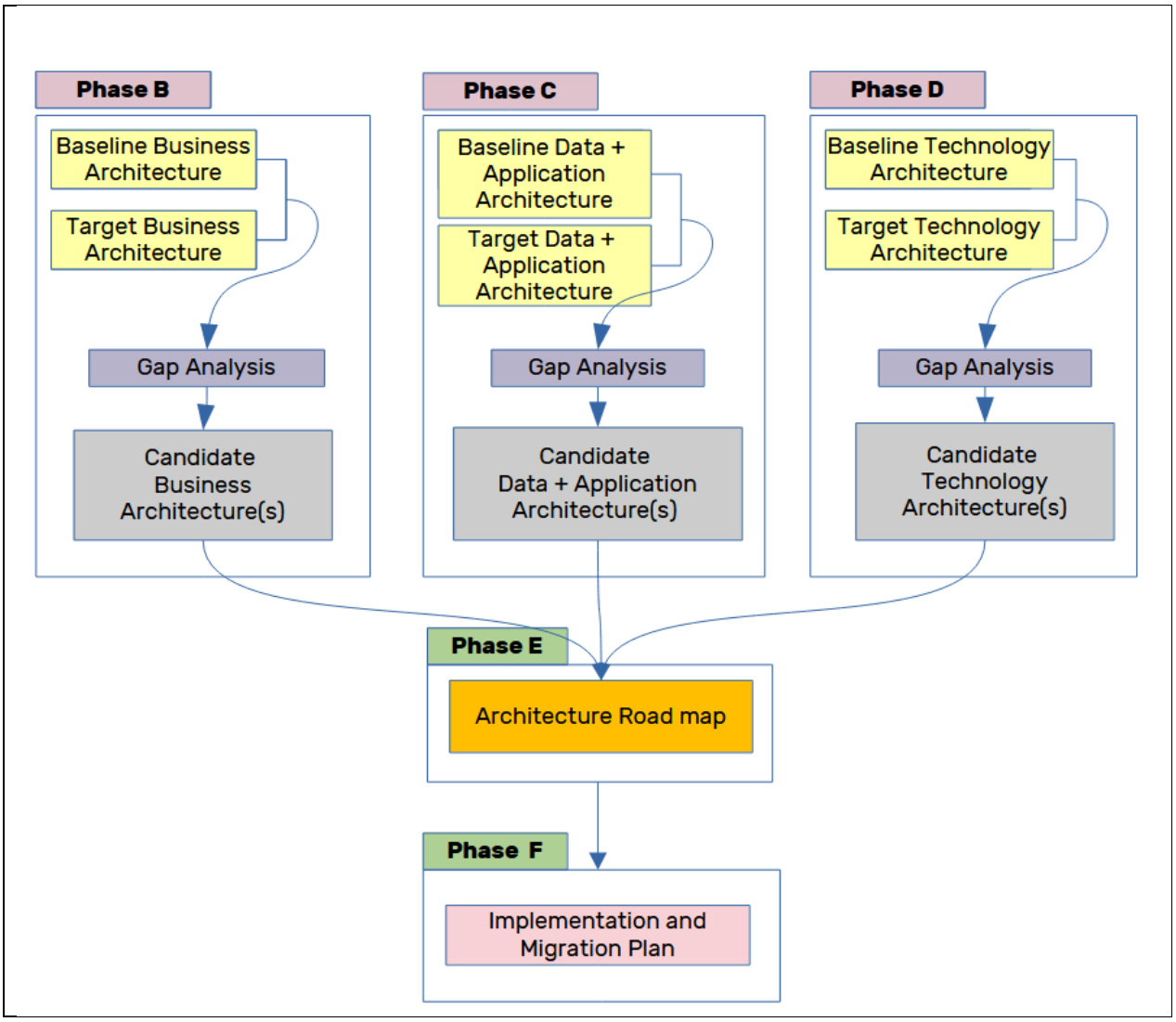
2.6 The Architecture Roadmap

The Architecture Roadmap is developed during Phase E (Opportunities and Solutions) and Phase F (Migration Planning).

It is a key delivery that outlines the transition from its current state to the target state (architecture). It provides a high-level overview of the planned evolution of enterprise architecture over time.

Architecture Roadmap consists of the following components.

1. Work Packages
2. Transition Architectures
3. Milestones and Timelines
4. Dependencies and Constraints
5. Risks and Mitigation Plans
6. Stakeholder Mappings and Responsibilities
7. Business and IT benefits



Steps involved in Developing Enterprise Architecture

Work Packages

The Architecture Roadmap lists **work packages** in a timeline that will realize the Target Architecture. The work packages are group changes that are necessary to realize the Target Architecture.

Transition Architectures

Transition Architecture is intermediate architecture (if an incremental approach is followed), which is a component of the **Architecture Road Map**. It provides manageable phases while ensuring business continuity and minimal disruption.

2.7 The Implementation and Migration Plan

This contains a schedule of projects relating the Target Architecture, grouped into managed project portfolios and programs.

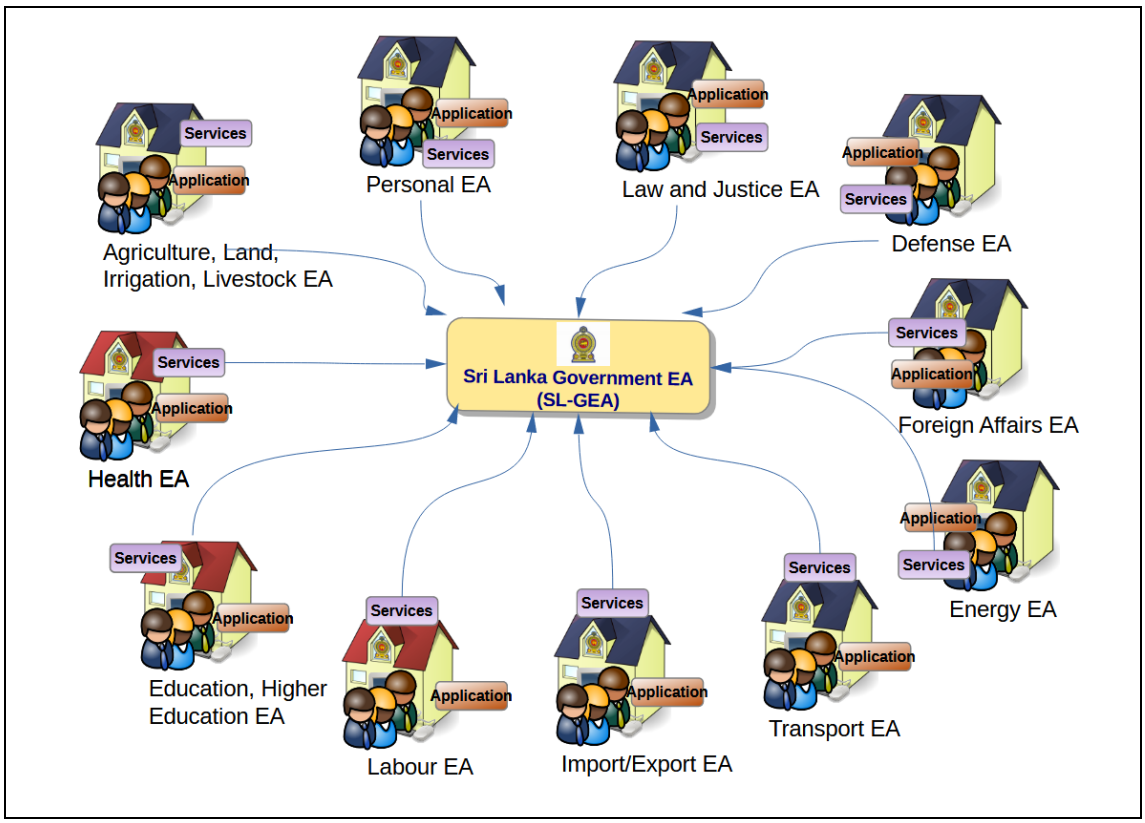
Each project portfolio breakdown with work packages, capabilities, milestones, work breakdown structures, and impact analysis.

The development of architecture is concluded at this phase of the ADM cycle.

3.0 Sri Lanka Government Enterprise Architecture (SL-GEA)

Sri Lanka is ranked 98th in the latest UN e-Government Readiness Survey, which was published in 2024 (United Nations, 2024). This is a low ranking for a country, which started its e-Government implementations around 20 years ago. While looking at the progress of the e-Government implementation road maps in the past, it is quite evident that not sticking to a long-term strategy was one of the key bottlenecks for its progress.

Most of the countries, which have done well in e-Government in the recent past, have adopted a well-defined Government Enterprise Architecture (GEA) as a long-term e-Government strategy (United Nations, 2024). As a response to this, Sri Lanka Government started drafting a Government Enterprise Architecture in 2022 (ICTA, 2022).



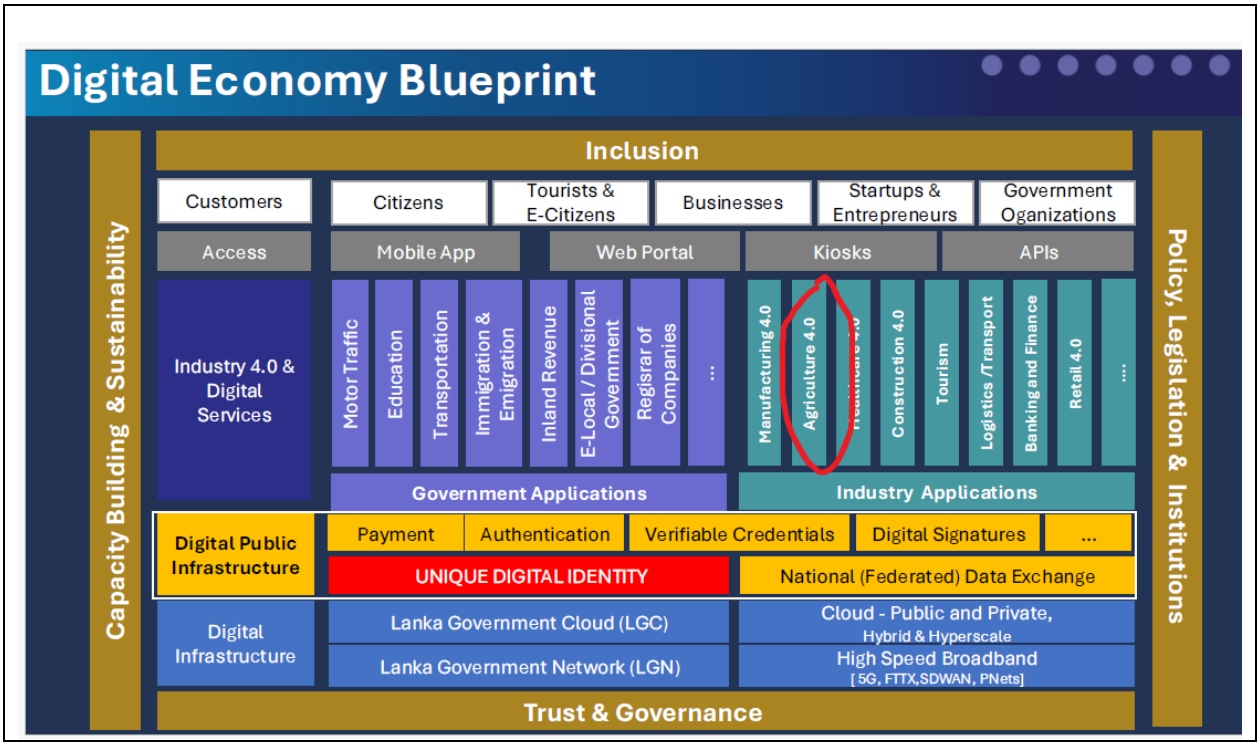
Sri Lanka Government Enterprise Architecture (SL-GEA)

SL-GEA envisioned a **sectoral based federated model**, where each sector in the government is encouraged to have its own EA developed. As the overarching architecture, SL-GEA will work as the "super" EA stitching all the sectoral based EAs underneath. This gives more control to all sectoral based EAs, which are connected to it.

For example, Health sector has its own EA, Land Domain will have its own EA, etc. Similarly, Agriculture will have its own EA as well. In this document we are defining the Agriculture EA, which we present it as **Sri Lanka Government Agriculture Enterprise Architecture (SL-GAEA)**.

3.1 Sri Lanka Digital Economy Blueprint 2025

The latest Digital Economy Blueprint, which was proposed by the Ministry of Digital Economy (MODE) in 2025, also envisions a similar sectoral based federated architecture for all the government sectors including Agriculture. This emphasizes horizontal integration within sectors and among sectors with the help of core DPI infrastructure.



Digital Economy Blueprint, 2025 (Source: Ministry of Digital Economy)

3.2 The Digital Public Infrastructure (DPI)

In the current SL-GEA, the core infrastructure components are primarily discussed under the concept of DPI.

In theory, DPI is a shared service, which works as an enabler of Digital Transformation, and it helps to improve the public service delivery at scale (UNDP, 2024). There are many global initiatives to promote DPI and Interoperability as a concept to promote and share some of their best practices in the public sector.

Some of the key DPI initiatives are:

1. Global Digital Public Infrastructure Repository (GDPIR, 2024)
2. GovStack Initiative (GovStack, 2024)
3. Digital Convergence Initiative (DCI, 2024)
4. Decentralized Identity Foundation (DIF, 2024)

Sri Lanka too have adopted DPI aligning to international best practices. For example, one of the key components of the Sri Lanka DPI is the SL-UDI project, which is built on one of the popular Open-Source platforms (MOSIP, 2024).

DPI implementations in Sri Lanka are currently governed under the supervision of MODE. The DPI has helped to implement the core Interoperability layer envisioning the total "Connected Government".

The current DPI components, which are listed under SL-GEA can be explained under multiple layers. These four layers are leveraging the TOGAF BDAT Framework, which is the base for SL-GEA.

Business and Data Layers (B and D):

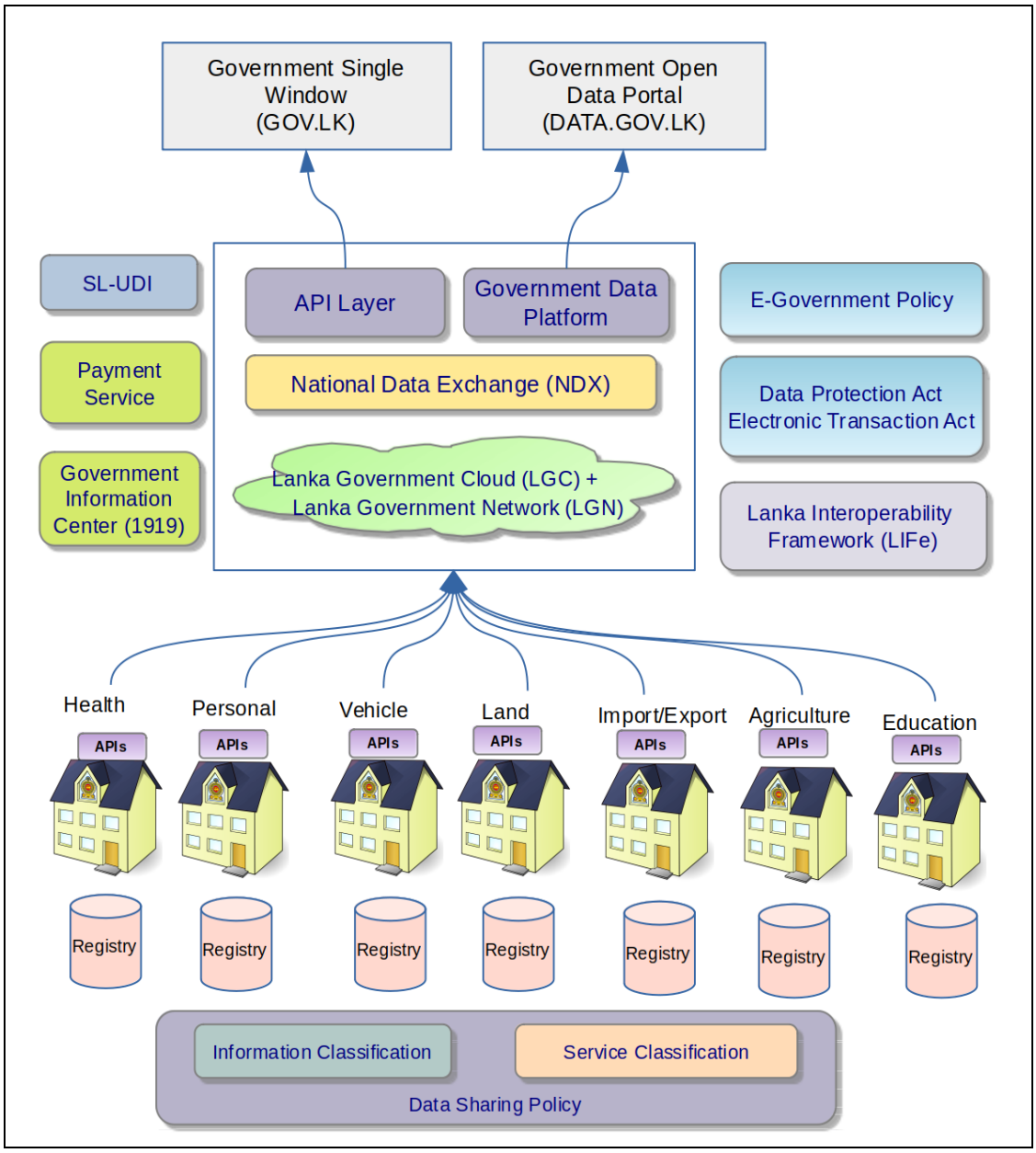
1. Lanka Interoperability Framework (LIFe) – (ICTA. (2010)) – (Published by ICTA)
2. National Data Sharing Policy Framework – (ICTA. (2013)) – (Published by ICTA)
3. Personal Data Protection Act (PDPA) – (Parliament of Sri Lanka. (2022)) - (Published by ICTA)
4. Electronic Transactions Act (ETA) - (Parliament of Sri Lanka. (2006)) - (Published by ICTA)

Application Layer (A):

1. Registry based back-ends (Non-Legacy) – (Personal Registry, Land Registry, Farmer Registry, etc.)
2. Legacy Back-ends

Technology Layer (T):

1. SL-UDI (Sri Lanka Unique Digital Identify) – Digital Citizen ID (Still being rolled out, Managed by MODE)
2. National Data Exchange (NDX) – The Interoperability Layer with inter-domain message mediation and API dissemination (In Operation and new version is being rolled-out, Governed by ICTA)
3. Lanka Government Network (LGN) – Government Network connecting more than 860 government institutions. (In Operation, Governed by ICTA)
4. Lanka Government Cloud (LGC) – Government Private Cloud. (Version 2.0 In Operation, Governed by ICTA)
5. Government Payment Platform (GovPay) - (In Operation, In Association with "LankaPay", ICTA and MODE)



The Digital Public Infrastructure (DPI) within SL-GEA

In this architecture, the government data is populated through various government back-ends / information system databases. Each government domain represents them with one or more "Electronic Registries", which are merely data sources with APIs built-in, allowing them to expose some of the datasets to other entities as well.

These exposed data sets are being controlled by various technical and governance components. For example, APIs can be controlled at the NDX layer with API management component in place. The identified data can be classified logically by using the "Information Classification Framework", which should be prepared by each government organization at the time of data exposure.

Each domain registry should comply with the data dictionaries hosted by Lanka Interoperability Framework (LIFe). If there are any mismatches with the respective data dictionary, then the relevant transformations will happen at the NDX level.

Furthermore, the recently approved Personal Data Protection Act (PDPA) can give you a set of guidelines on exposing some of the personal data sets to the public. The PDPA clearly mentions the Data Protection Authority (DPA, 2024) involvement, while making some of the data sovereignty decisions. Hence, it is critical to consult DPA while organizing and classifying your data before making it available to the masses.

Electronic Registries

An electronic registry is a structured and live identification system that gathers, saves, and maintains uniformed updated data or information on and entity (farmer, farmland, crop, etc.), and is constantly updated to serve as entity's "Single Source of Truth" which is also verifiable.

Compared to a typical database, an electronic registry has a narrower scope, containing records pertaining to a specific type of information or transaction, often adhering to a predetermined format. Electronic registries have structured data records with unique IDs, which can be accessible via APIs.

Having Registries can help to activate and govern an ecosystem and enable trust among all participants of the ecosystem. It provides,

1. Improved transparency – By providing an audit trail, showing who accessed and updated a particular record, and when. This further improves transparency, accountability, and trust.
2. Better data management
3. Enhanced security – Provides encryption, access control, and other measures to protect data from theft, loss or damage.
4. Increased efficiency – Can streamline business processes, and improve turnaround times, allowing organizations to save time and money.

As the world is slowly becoming data rich, it is essential that various data about people, entities, geographies, resources, assets are made available as electronic registries with APIs for other applications to consume, validate and attested as authenticated data.

Registries can basically provide you:

1. Single Source of Truth (SSOT) – Centralized repository to maintain most accurate, complete, and up to date data.
2. Discovery Services – API based discovery with consent.
3. Analytics – Telemetry and Aggregated Tends
4. Verifiable Credentials (VCs)

Verifiable Credentials (VC)

Once an entity is registered with an electronic registry, the registry will automatically create a **Verifiable Credential (VC)**, which can later be used for verification purposes (i.e. QR Code, Digital Certificate, etc.)

Hence, VCs can basically provide:

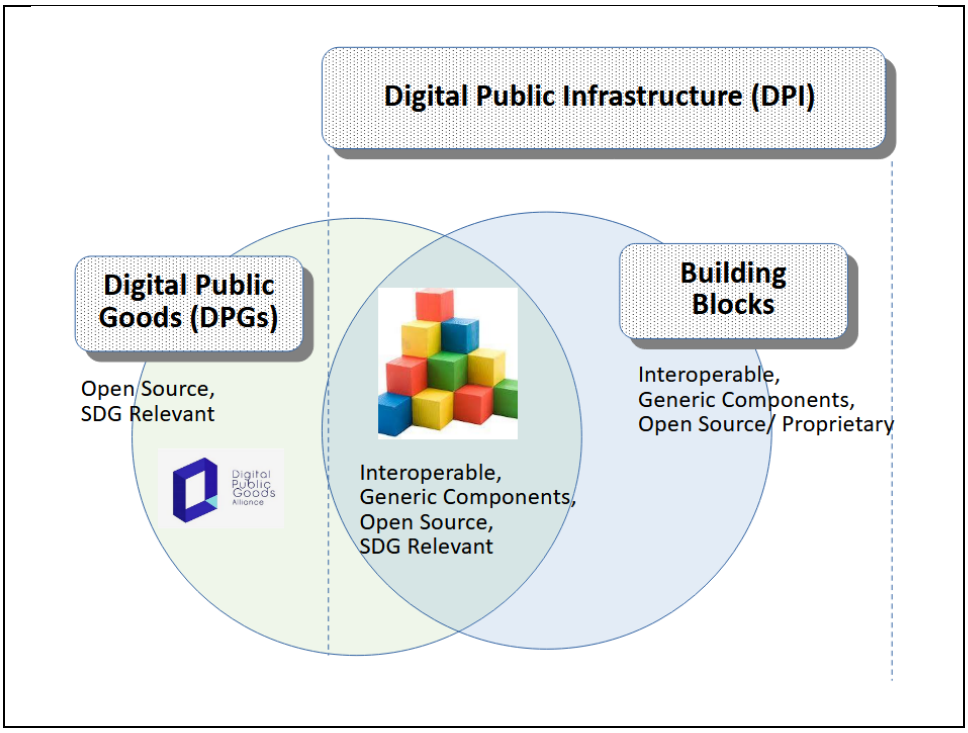
1. Attestation and Claims – Structured workflow for a Self and Issue based credentialling.
2. Identity Issuance Services – Generation, Update and Revocation of services
3. Verification Services – Verification of the Credentials (QR Verifications, etc.)
4. Digital Wallets – VCs can be exported to a Digital Wallet for easy access (Linux Foundation, 2023).

Digital Public Goods (DPGs) and Building Blocks

A solid DPI consists of building blocks to represent reusable generic components. They can be either open source or proprietary.

In contrast, DPGs can represent open-source software, open-data, open APIs, open Artificial Intelligence (AI) models, open standards, and open content that help attain SDGs. **Digital Public Goods Alliance (DPGA)** is a multi-stakeholder initiative to accelerate the attainment of the SDGs in low-and-middle income countries by discovery, development, use of, and investment in DPGs (FAO, 2022). In the Sri Lankan context, MOSIP Digital Identity platform has been a good example of leveraging DPGs. There are nearly 150 DPGs listed currently under the DPGA repository (DPGA, 2024).

DPGs are basically working in cohesion with DPIs. Hence, DPGs on top of a solid DPI can be a good digital transformation strategy in the Sri Lanka agriculture sector as well.



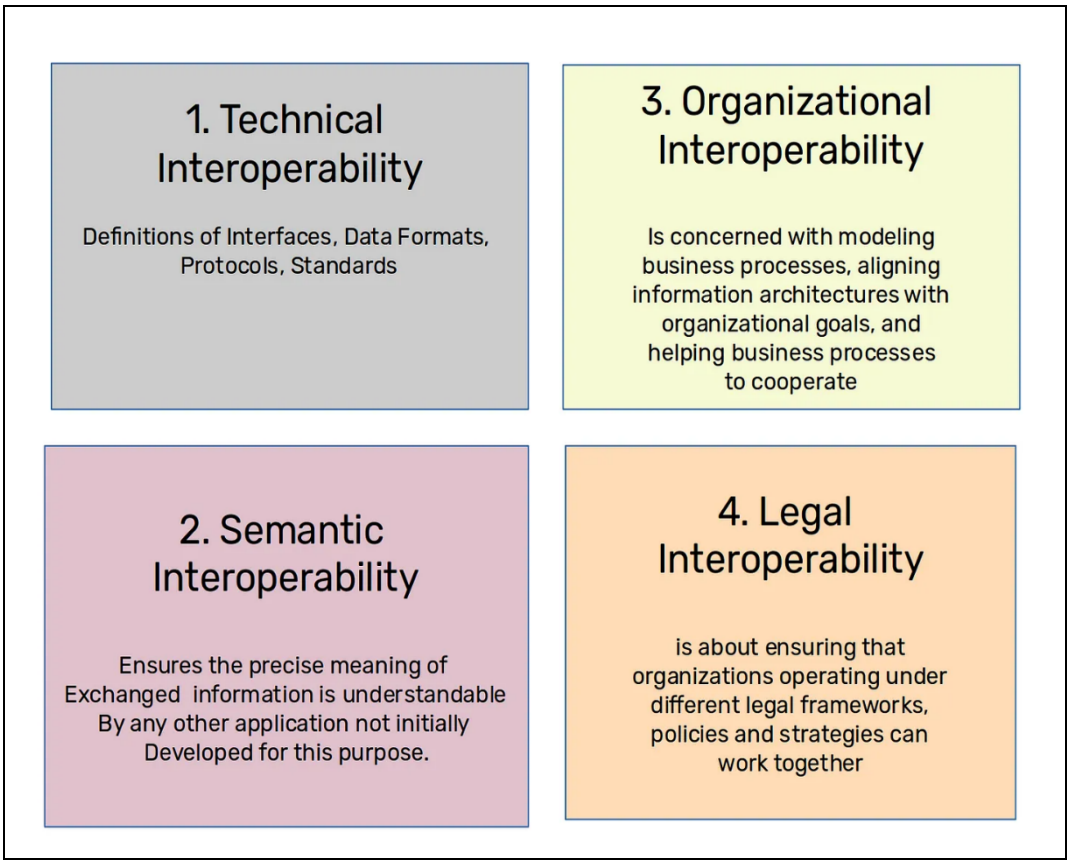
DPI, DPGs and Building Blocks

3.3 Digital Government Interoperability

Digital Government Interoperability in a broader sense is the ability to exchange information and services among different government systems.

According to the **European Interoperability Framework (EIF)** (European Commission, 2017), which is one of the most established Government Interoperability Frameworks in the world, there are four (04) layers of Digital Government Interoperability.

1. Technical Interoperability
2. Organizational Interoperability
3. Semantic Interoperability
4. Legal Interoperability

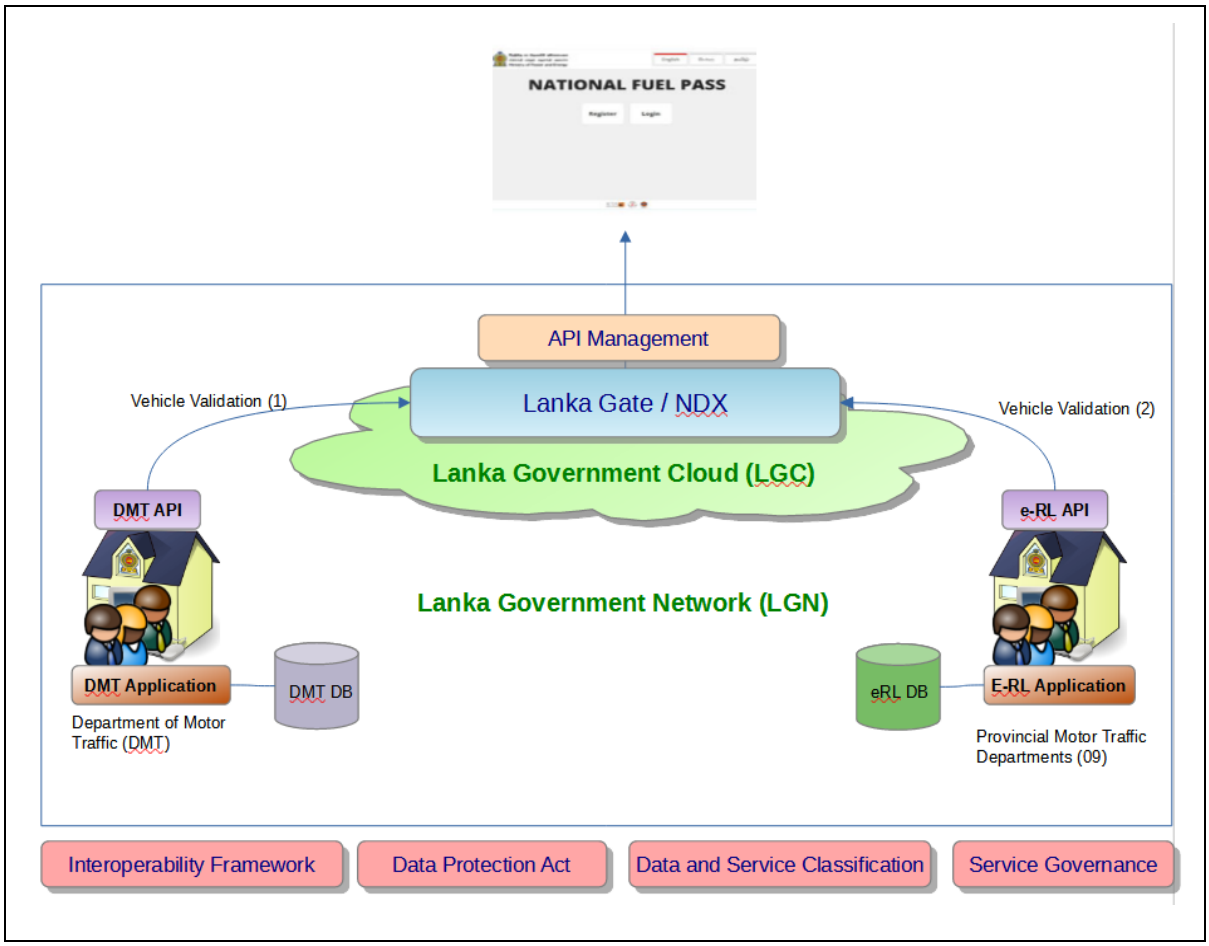


Layers of Digital Government Interoperability (Source: (European Commission, 2017))

Technical Interoperability – This is all about how you facilitate the technical aspects of integration. Technical Protocols (software and hardware), Open APIs. Open Standards and Open Data Standards are some of the key technical interoperability components.

There are some technical interoperability standards that have been already defined specifically for the agriculture sector (FAO, 2024c). One key initiative, which has been completed recently by FAO is the **Agriculture Vocabulary,** which is also known as **AGROVOC** (FAO, 2024c). AGROVOC has been recently drafted as a DPG and made available to the public (FAO, 2024d).

Organizational Interoperability – This is all about assessing the readiness of your organizational information systems business processes 'ability to interact with other organizations. Most of the systems which we find nowadays do not possess the ability to interact with any other organization. Due to this, it is hard to find many online e-Government services, which can access data from more than one organization. Therefore, it is essential to re-engineer organizational business processes with the ability to interact with any other service.

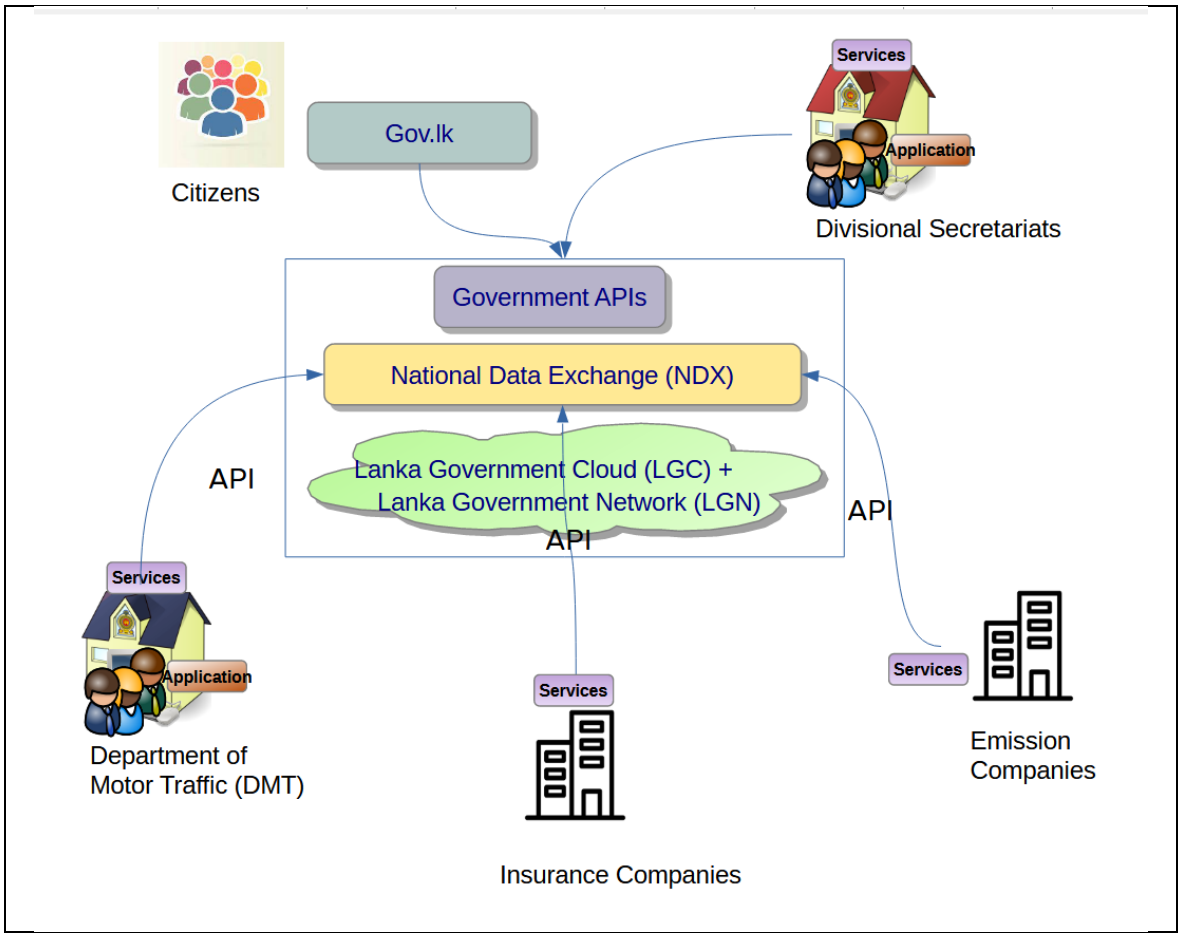


Organizational Level Interoperability (National Fuel Plass System)

The above example (National Fuel Pass System) showcases the organizational level interoperability. This system was introduced by the Ministry of Power and Energy of Sri Lanka during the 2022 fuel crisis. Registering the citizen for the Fuel Pass system, needed vehicle validation from the Department of Motor Traffic (DMT) as an additional authentication. Hence, the Fuel Pass System, which was hosted by the Ministry of Power and Energy had to connect to the DMT system via APIs to get vehicle verification. This was successfully managed since DMT already had a re-engineered back end with proper Vehicle APIs. This is an example of a connected government with interconnected business processes.

Another example, to showcase the Organizational level Interoperability is the Sri Lanka Government e-Revenue license system (e-RL), which ICTA has been running on behalf of the Provincial Department of Motor Traffic (PDMT) for nearly 15 years. This was the first connected e-Service, which was launched in Sri Lanka with a complex distributed business process in mind. This integrated business process connects the Department of Motor Traffic (DMT), Provincial Department of Motor Traffic (PDMT), Divisional Secretariats which are under the provincial setup, Vehicle Insurance Companies, Vehicle Emission Companies, etc. Issuing a revenue license was a single transaction, which runs through all the services under each department, where data related to each department are stored in a distributed manner without harming the data ownership concept.

All the services which were involved with this service were ready with their organizational back-ends with pre-defined APIs / newly developed APIs to embrace this complex government business process.



Organizational Level Interoperability (e-Revenue License System)

Semantic Interoperability – When we are trying to build systems which interact with each other, it is essential to build a common data dictionary (vocabulary), which is probably common to all parties. This data dictionary will consist of words and their meaning along with specific formats they follow. In addition, it is essential to identify the ownership of each data element as well. For example, if two organizations have a Farmer ID in their databases, it is required to find a common format for the Farmer ID and a data owner. The data dictionary for the agriculture sector target architecture can be found in the agriculture sector Interoperability Framework Document (FAO, 2024a).

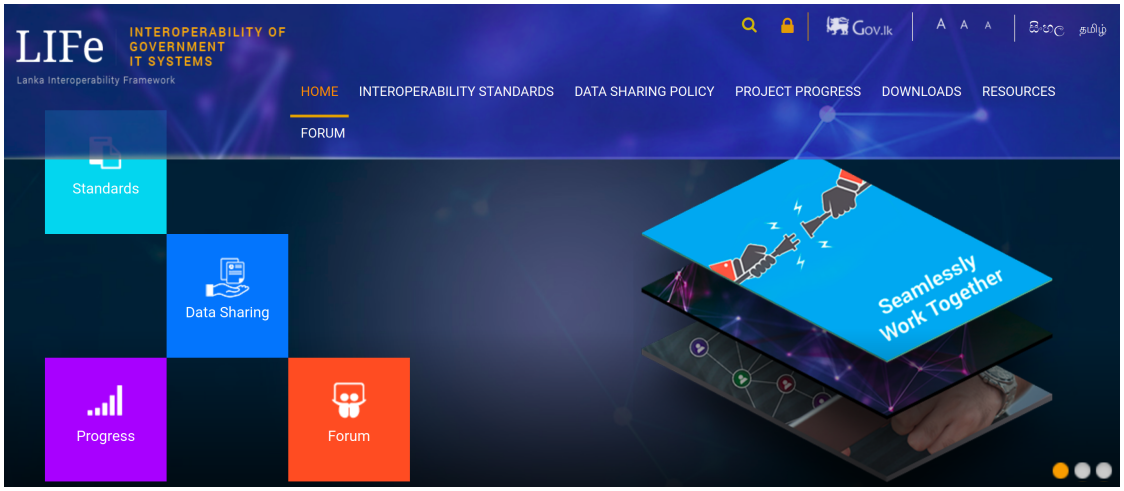
Data dictionaries for all the domains can be found under the Lanka Interoperability Framework (LIFe) (ICTA, 2010).

Legal Interoperability - While finding owners of specific data elements or data registries (databases), it is essential to identify the scope of each organization and their specific data ownerships. Nowadays, when we develop information systems, we tend to store some of the information related to other organizations in our databases simply because there is no data sharing culture. That has created multiple siloes in many related organizations. Hence, it is essential to find the legality of each data element in each organization and find provisions if any changes need to be made prior to the implementation stage.

3.4 Lanka Interoperability Framework (LIFe)

To implement the SL-GEA sectoral / domain based distributed architecture, it is essential to have a common data dictionary (vocabulary) for each domain that is considered.

Lanka Interoperability Framework (LIFe) (ICTA, 2010) is an initiative that allows each domain to publish their own data dictionaries for public reference. That will help all the government domains to get an idea about any other domain data elements, data sharing aspects and policies. LIFe (life.gov.lk) is currently managed by ICTA under the Ministry of Technology.



Lanka Government Interoperability Framework – (Source: life.gov.lk)

These LIFe Standards are defined:

1. To ensure data is not captured in multiple locations.
2. To ensure data captured has a single owner.
3. To ensure data is always current and accurate.
4. To ensure the data is shared only with other authorized systems.
5. To ensure the shared data could be easily understood and used.

Currently there are a few domains which have been published on life.gov.lk such as Personal, Land, Vehicle, etc. Once the Agriculture IF (SL-GAIF) is completed, that also will be published on this website for future reference (FAO, 2024a).

The SL-GAIF first version (FAO, 2024a), which is in review now, has all the proposed data elements, which are common to all the departments/ institutes. In addition to the data element descriptions, it has data element ownership also attached allowing the departments to build key registries in the future.

4.0 Sri Lanka Government Agriculture Enterprise Architecture (SL-GAEA)

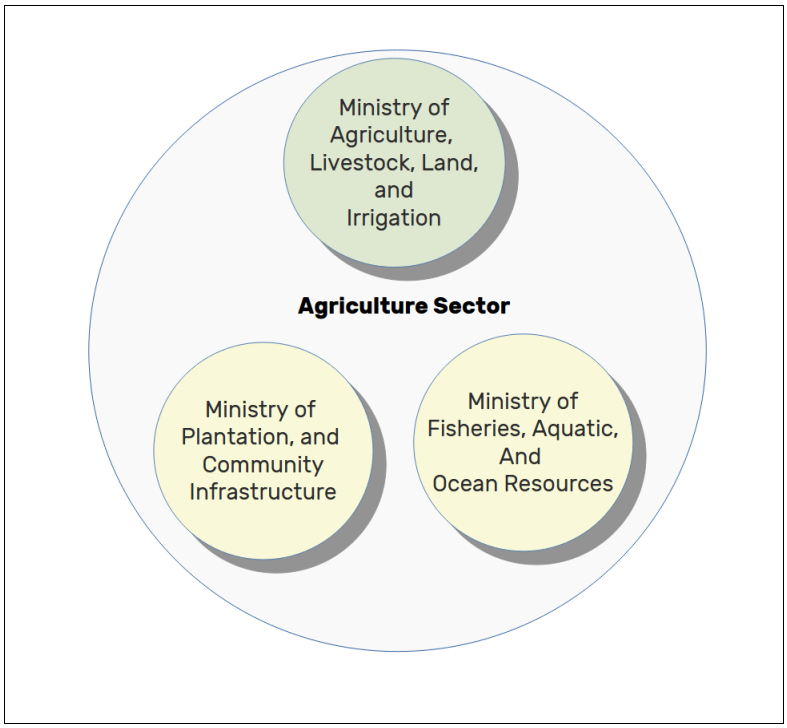
The primary objective of this document is to define Enterprise Architecture for the agriculture sector. Following the conventions, we can consider it as the **Sri Lanka Government Agriculture Enterprise Architecture (SL-GAEA)**. Similar to SL-GEA, this also adheres to the same EAF, which is TOGAF. All four TOGAF BDAT domains are reviewed for both the "current" and "target" architecture settings.

4.1 The Current Architecture

To envision the "target" business and information architecture, it is imperative to understand the "current" business and information architecture. Hence, all the institutions under each ministry in focus will be analyzed in greater detail in this section. The analysis will be further strengthened with carefully drafted case studies for each institution in focus. Each case study analyzes the current business processes, current information systems and gaps around them.

Primarily there are three (03) ministries in focus.

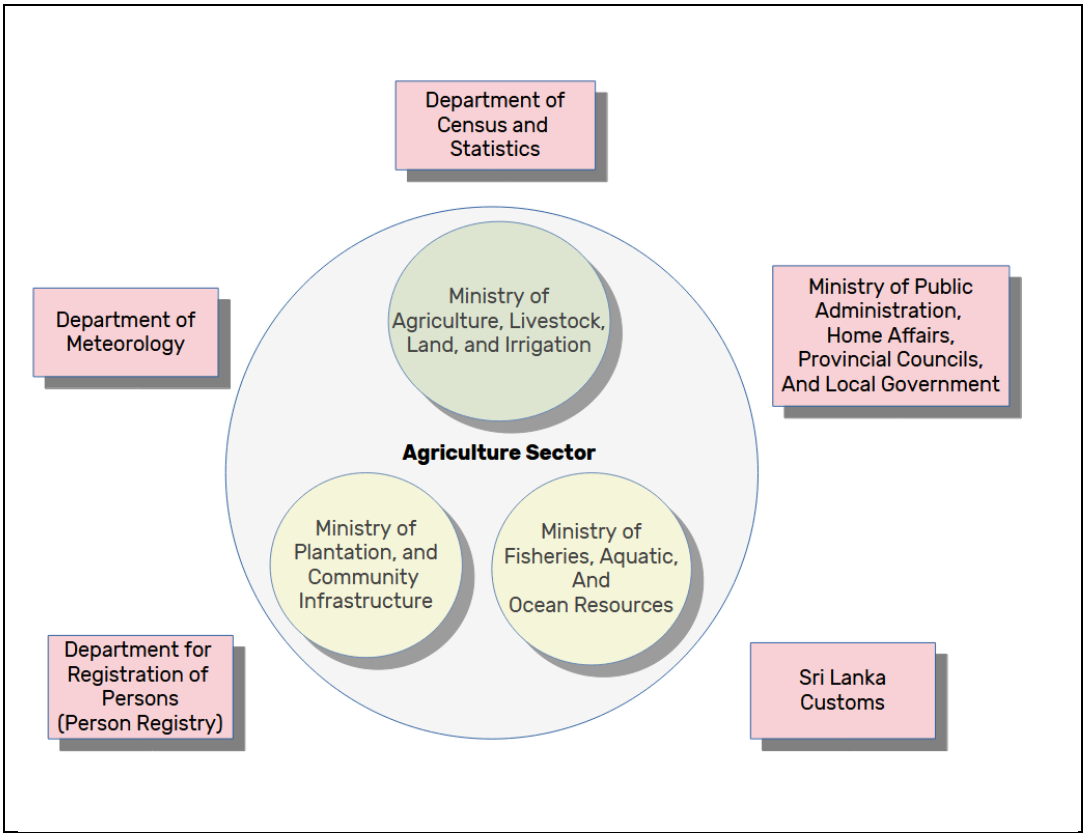
1. Ministry of Agriculture, Livestock, Lands, and Irrigation
2. Ministry of Plantation and Community Infrastructure
3. Ministry of Fisheries, Aquatic, and Ocean Resources



Agriculture Sector Ministries

In addition to these three key ministries, there are multiple "other" departments / ministries that have constant interactions with the agriculture domain. Some of them are:

1. Department of Census and Statistics (DCS)
2. Register General Department (RGD)
3. Sri Lanka Customs
4. Ministry of Public Administration Home Affairs and Provincial Councils and Local Government
5. Department of Registration of Persons
6. Department of Meteorology

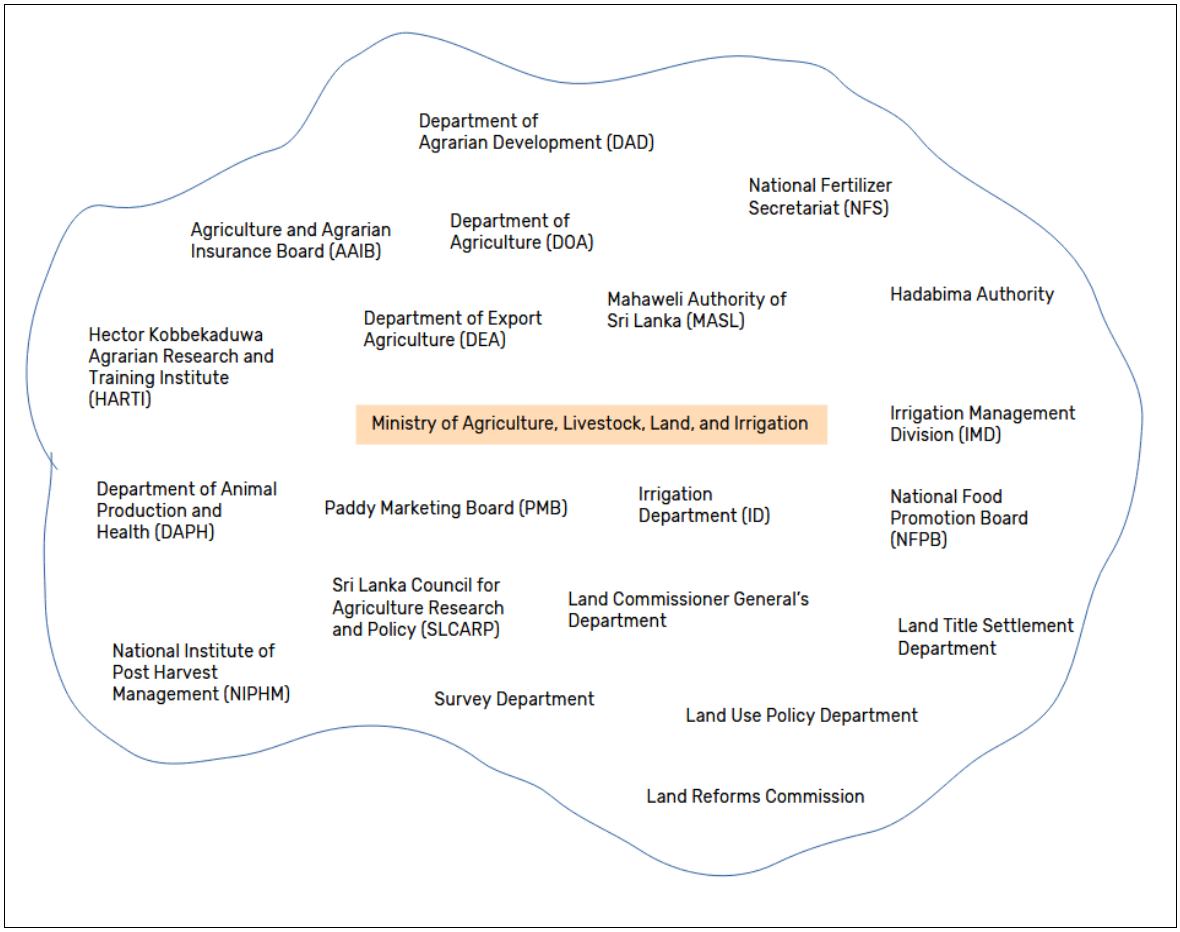


Agriculture sector ministries and other external stakeholders

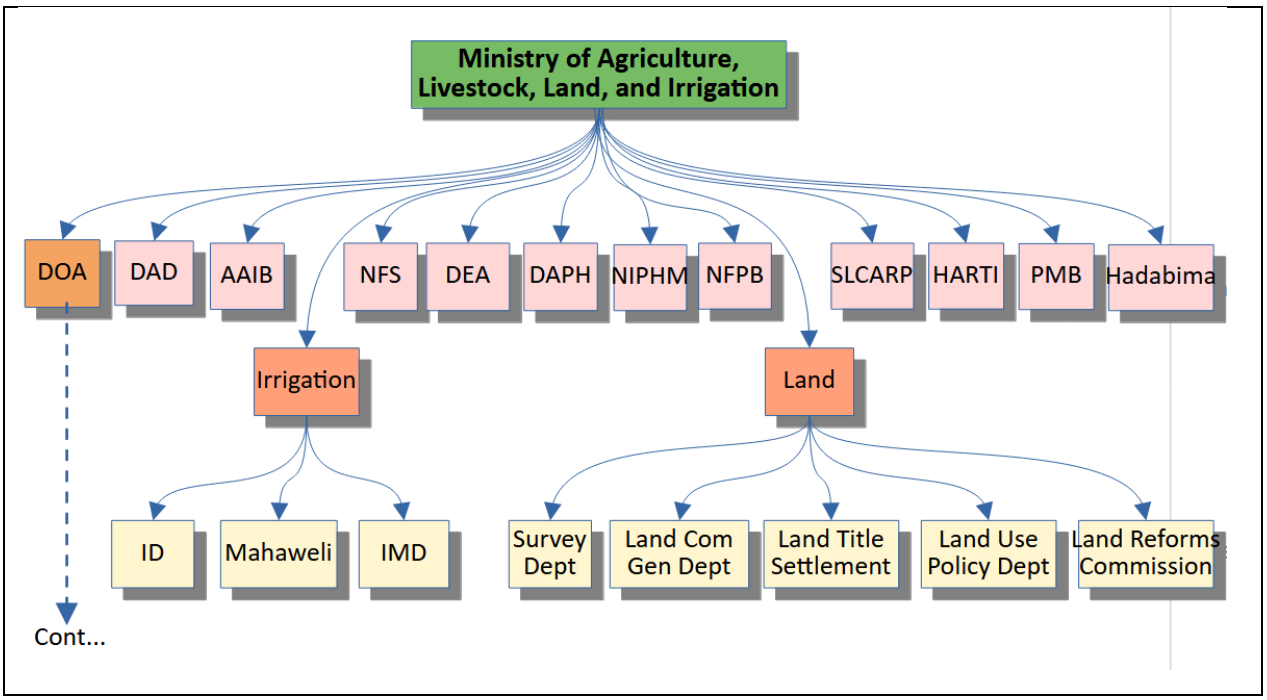
Under each ministry in the agriculture sector (Agriculture, Livestock, Land, and Irrigation, Fisheries, and Plantation), there are multiple departments / institutions established and most of them have their own information systems in place.

The following section will list some of the important information systems implemented in each institution. A detailed analysis including the **current business process** of each department/ institution can be found as a separate case study in **Annexure 1**.

Ministry of Agriculture, Livestock, Land, and Irrigation



Institutions under Ministry of Agriculture, Livestock, Land, and Irrigation



Organization Structure - Ministry of Agriculture, Livestock, Land, and Irrigation

Ministry of Agriculture, Livestock, Land and Irrigation – Key Projects

Institute	**Key Projects**
Department of Agriculture (DOA)	DOA is the main department, which is responsible for Crop information in Sri Lanka. Some of its main activities are: - **Agriculture Research and Development** (Crop variety generation and technology enhancements) - **Providing Crop level statistics** (crop production statistics, forecasting, etc.) - **Monitoring Crop diseases and pest outbreaks** - **Providing extension services** (Agriculture Technology Dissemination and Diffusion in the value chain to the farmer level) - **Seed Production and Certification** (Multiplying the crop varieties generated by Research Institutes and certifying them) - **Maintaining data on major crops** All institutes (See Table 2), which are under DOA, are part of the above three main activities.

	Information Systems: 1. **DOA Web Site** – The department web site, which has all important information of institutions under DOA. The web site and its content are currently managed by NAICC. URL: https://doa.gov.lk/ 2. **Krushi Lanka Gateway** - This is a portal with agriculture related information. Currently it is primarily maintained by NAICC in collaboration with DOA and DAPH. URL: https://krushilanka.lk/ 3. **Cropix – (E-Agri Portal)** - This is a single window web portal, which was developed by DOA in collaboration with FAO. This is also known as the "E-Agri Portal", which primarily works as a single window for the DOA related government e-services (GAP Certification, Seed Act Handler Application, Croplook Application, Crop Type /Variety Registrations, etc.) and key reference data. Some of the key reference data are: *Crop (Crop Categories, Crop Subcategories, Crop Varieties, Crop Calendars for each Crop, etc.)* *Geological Zones (Provincial, Inter-Provincial, Mahaweli, SCS Regions, Ecological Zones, etc.)* *Agriculture Seasons (Yala, Maha, etc.)* *Soil (Soil Types, Soil Subtypes, etc.)* Cropix URL: https://digital.doa.gov.lk/
Department of Agrarian Development (DAD)	Established according to **Agrarian Development Act No 46 in 2000** DAD's primary objective to manage farmer information and farmer related land information. Information Systems involved: **1. GeoGoviya** – The Farmer and Farmer Land Database **2. Agrarian.lk** – To distribute fertilizer and fuel subsidies to farmers. **3. Minor Irrigation Database –** Maintains irrigation schemes of less than 400 acres. (Please Refer "Agrarian Department Case Study" Section for more details)
Agriculture and Agrarian	Established according to **Agricultural and Agrarian Insurance Act No 20**

Insurance Board (AAIB)	**in 1999** Information Systems involved: 1. **Agricultural Information Management System (AIMS)** – Registering Insured Farmers, Identifying and Monitoring Insured lands, Identifying the damages. 2. **Farmer Pension Management System** 3. **Fisheries Pension Management System** (Please Refer "Agrarian Insurance Board Case Study" Section for more details)
Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI)	Established in 1972 under the **Agrarian Research and Training Institute Act No. 05 of 1972.** Information Systems Involved: 1. **Agricultural Market Information System (AMIS)** (Please Refer "HARTI Case Study" Section for more details)
Department of Animal Production and Health (DAPH)	Established to implement following Acts: 1. **Animal Acts No 29 of 1958** 2. **Animal Disease Act No 59 of 1992** 3. **Animal Feeds Act No 15 of 1986** Information Systems Found: 1. **Farm Registration Database** - [On-line] 2. **Livestock Sector Database** (with Year End Data) – [On-line] 3. **Master Return** 4. **Poultry Sector Database** 5. **Poultry Ten (10) year Database** 6. **Population Database** 7. **Animal Health Databases** 8. **Veterinary Regulatory Databases** 9. **Veterinary Research Databases** 10. **Animal Breeding and Fodder Cultivation Databases** 11. **Kiriaswanu Mobile Application**

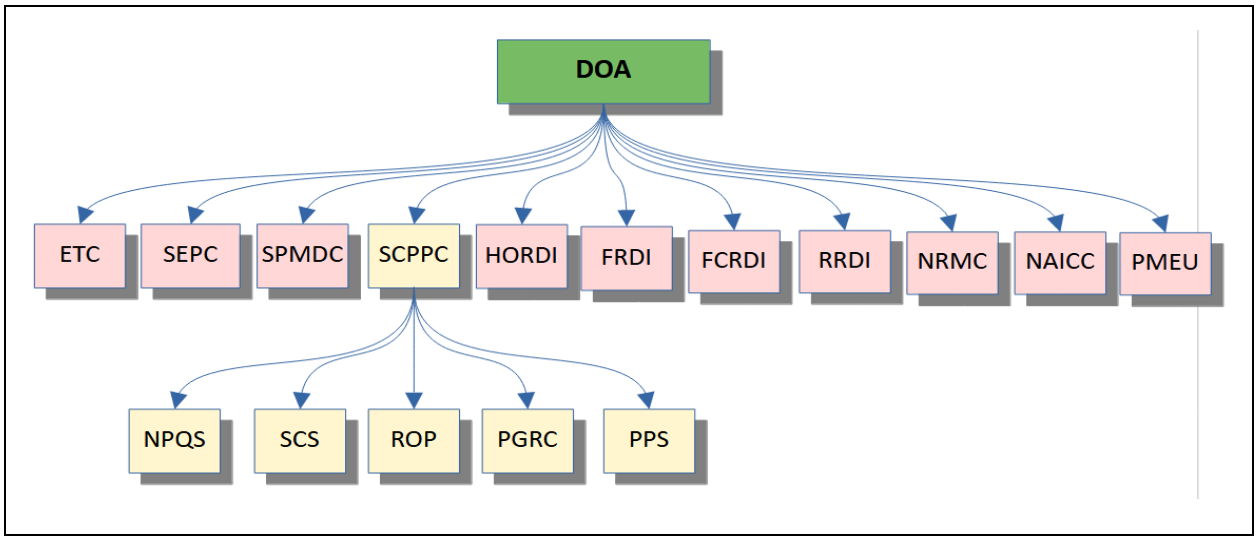
	(Please Refer "DAPH Case Study" Section for more details)
Sri Lanka Council for Agricultural Research Policy (SLCARP)	Established on 22nd December 1987 and works according to the **SLCARP Act No 47 of 1987**. Information Systems Found: 1. **INFORM** (Information for Agricultural Research Managers) (Please Refer "SLCARP Case Study" Section for more details)
National Fertilizer Secretariat (NFS)	Established according to the **Regulation of Fertilizer Act No 68 of 1988**. Information Systems Found: 1. **NFS Management Information System (NFS-MIS)** 2. **Fertilizer Estimate Database for Crop Seasons** (Please Refer "NFS Case Study" Section for more details)
Hadabima Authority	Established under the **State Agricultural Corporation Act No 11 of 1972** as the National Agricultural Crop Diversification and Settlement Authority. Information Systems: 1. **Field and Farm data management System** – A new system is being developed now with Geo mapping features allowing them to capture land details of each farm. (Please Refer "Hadabima Case Study" Section for more details)
National Institute of Post Harvest Management (NIPHM)	Established under the **State Agricultural Corporation Act No 11 of 1972**. Information Systems: There are no enterprise level applications maintained for the moment since it caters to crop post-harvest research related activities. (Please Refer "NIPHM Case Study" Section for more details)
Department of Export Agriculture (DEA)	The **Export Agriculture Crops Act No. 46 dated 22nd September 1992**, gives statutory status to provide the following services. Information Systems: 1. **DEA Farmer Application** (Web) 2. **GAP Certification Application** (Web) 3. **Application for Registration of Spice Processes, Collectors and**

	Manufacturers (Web) 4. **Farm Gate Market Information** (Web) 5. **Cultivation Data – Division wise** (Excel) 6. **DEA Progress** (Excel) 7. **Plant Nurseries** (Excel) 8. **Import/Export Data** (Excel) 9. **Crop Yield Forecasting** (Excel) 10. **Post Harvest Technology Assistant** (Excel) (Please Refer "DEA Case Study" Section for more details)
Paddy Marketing Board (PMB)	This was established under the **Paddy Marketing Board Act No 14 of 1971**. **Information Systems:** Currently there are no enterprise level applications available at PMB. The business process is handled manually with the help of spreadsheets. However, with external funding of FAO and Gates Foundation, a new **Rice Value Chain Traceability System** is being designed and developed now. (Please Refer "PMB Case Study" Section for more details)
Irrigation Department (ID)	**Information Systems:** 1. **GIS Applications Data Portal** - (https://slirrigation.maps.arcgis.com) 2. **Irrigation e-Repository** (http://repo.irrigation.gov.lk/) 3. **HMIS (Hydro Meteorological Information System)** 4. **Climate Resilience Improvement Project (CRIP)** (Please Refer "ID Case Study" Section for more details)
Mahaweli Authority of Sri Lanka (MASL)	**Information Systems:** Agriculture Division: 1. **Farmer Registrations [Excel]** 2. **Farmer Land Registrations [Excel]**

	3. **Farmer Cultivation Cost [Excel]** 4. **Crop Cultivation Details [Excel]** 5. **Cropin Pilot Application** Livestock Division: 6. **Livestock Farmer and Production Details [Excel]** Water Management Division: 7. **Water Management [Excel and Online]** (Please Refer "MASL Case Study" Section for more details)
Irrigation Management Division (IMD)	IMD is a unit which was established to conduct participatory management for some of the selected irrigation schemes coming under ID. Currently, IMD manages around 30-40 specific irrigation schemes. IMD project officers/ managers get involved with the farmer communities / organizations to have a much-improved relationship for better decision making. The rest of the irrigation schemes are managed by the Irrigation Department (ID) staff itself. **Information Systems:** There are no Information Systems in operation under IMD at the moment. All the business processes are handled manually. (Please Refer "IMD Case Study" Section for more details)
Ministry of Agriculture, Lands, Livestock, and Irrigation	There are a few information systems under the following projects: - **Climate Smart Irrigation Agriculture Project (CSIAP)** – csiap.lk – This is a World Bank funded project to improve climate resilience of farmer families and productivity of irrigated agriculture in climatically vulnerable districts in the dry zone of Sri Lanka. Nearly 1,700 minor/medium irrigation schemes are rehabilitated to benefit over 60,000 farm families.

Ministry of Agriculture Institutes and Information Systems

Department of Agriculture (DOA) – Key Projects



DOA Structure

Department	**Institute**	**Key Projects**
Department of Agriculture	Seed and Planting Material Development Center (SPMDC)	Primarily there are three key systems maintained. 1. **Seed Stock Management System** 2. **Seed Production Program and Progress System** 3. **Seed Test Report Data System** 4. **Contract Grower Database** (Please Refer "SPMDC Case Study" Section for more details)
	Seed Certification and Plant Protection Center (SCPPC) Consists of multiple divisions. - SCS - PPS - NPQS - ROP	1. **Seed Certification Service (SCS)** Implements **Seed Act 2003 No 22**. This provides certifications for seed paddy, seed vegetable, seed crops, seed potatoes, fruit plant nurseries, breeder seeds, etc. Currently runs four (04) different systems. 1. **SCS Information System** 2. **SCS Laboratory Data System**

	- PGRC	**3. Seed Act Handler System** **4. SL-GAP Certification System** (Please Refer "SCS Case Study" Section for more details)
		2. **Plant Protection Service (PPS)** Implements the **Plant Protection Act No. 35 of 1999** Implements following systems. 1. **National Pest Surveillance System** (NPSS) **2. Invasive Alien Species (IAS) Database** **3. Permanent Crop Clinic Program (PCCP)** (Please Refer "PPS Case Study" Section for more details)
		3. **National Plant Quarantine Service (NPQS)** Implements the **Plant Protection Act No 35, 1999** There are multiple systems developed in the development stage. 1. **Phytosanitary Certificate Issuance** (Issued via GeNS system) – [On-line] 2. **Import Permit Issuance** **3. Field Certification Module** 4. **E-Payment Module** – For all e-Payments within NPQS 5. **PQIMS -** The internal Information Management System (Please Refer "NPQS Case Study" Section for more details)
		4. **Registrar of Pesticides (ROP)** Implements the **Control of Pesticides Act No 33. 1980** and Amendment **Act No 06 1994** and Amendment **Act No 31 2011**

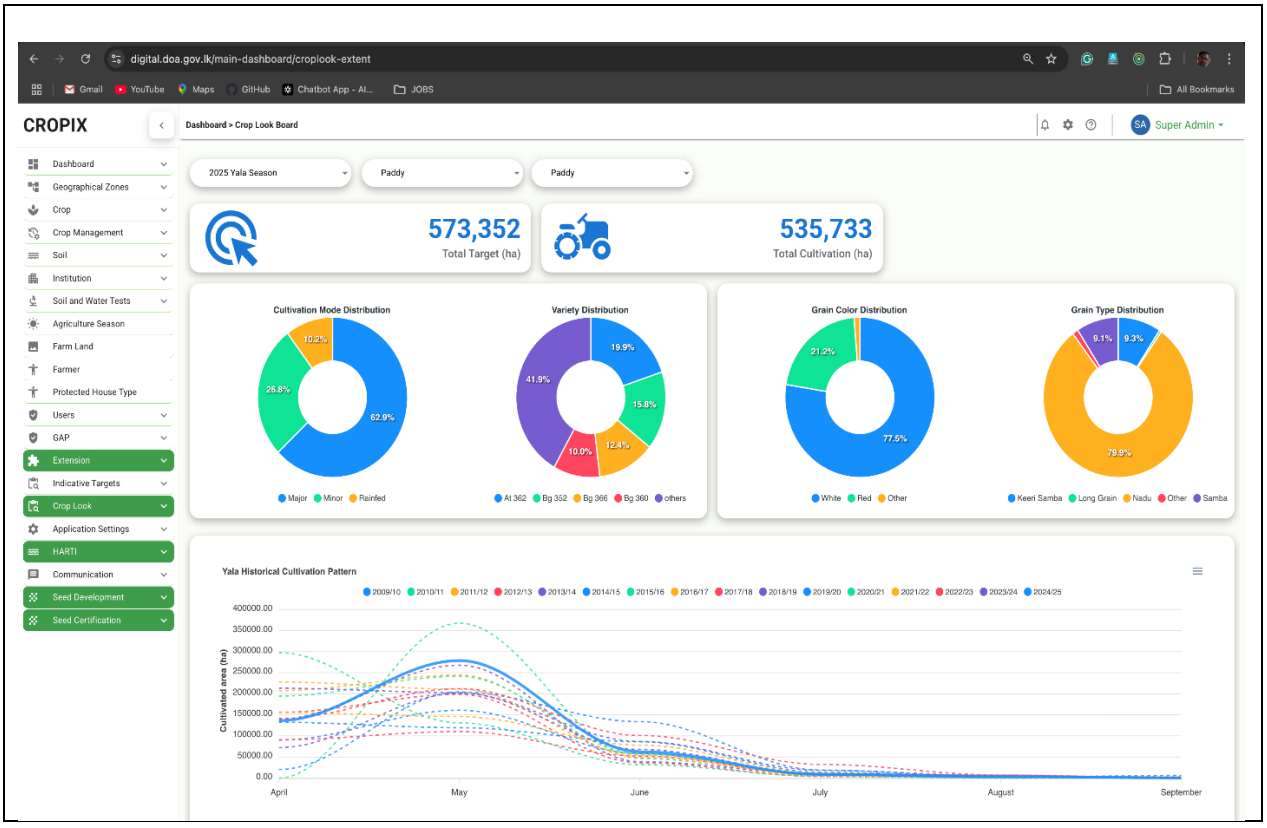
		Information Systems Available: 1. **Pesticide Product Registration and Pesticide Import Approvals System** (Web application on PHP) 2. **Authorized sellers' management system** (MS Access application) (Please Refer "ROP Case Study" Section for more details)
		5. **Plant Genetic Resource Center (PGRC)** PGRC was established in 1988 with the support provided by Japan International Cooperation Agency (JICA). **Information Systems Available:** **1. PGRC Database Management System –** Contains information, which have inputs from four other subunits. Currently a new web-based Data Management System is being developed to replace the older system, which was developed using INFORMIX 4GL and later with MS Access. (Please Refer "PGRC Case Study" Section for more details)
	Socio Economics and Planning Center (SEPC)	Conducting socio economic research and policy analysis in relation to the production and marketing of mandated food crops. Functions as the main advisory body for DOA in formulating agricultural policies and plans and works as a agricultural information and socio information hub. Information Systems: **1. Cost of Cultivation (COC)** 2. **Crop Enterprise Budget (CEB)**. **3. Crop Forecast (CF)** **4. Croplook.net – [On-line]** **5. On-Farm**

		6. **Agri-Look** 7. **Crop Cut Experiments (OFC)** (Please Refer "SEPC Case Study" Section for more details)
	Extension and Training Center (ETC)	Information Systems: There are seven (07) divisions under ETC. Under these divisions, two (02) primary systems have been implemented. 1. **Examination Management System** (For the Examination Division) 2. **GAP Certification System** 3. **Fruit Stakeholder Management System** (For the Extension Division) (Please Refer "ETC Case Study" Section for more details)
	Horticultural Crops Research and Development Institute (HORDI)	Information Systems: 1. **Central Soil Testing Laboratory System** – [Main Application] 2. **Insect Museum Database** 3. **Farmer Field Issues Database** (Please Refer "HORDI Case Study" Section for more details)
	Rice Research and Development Institute (RRDI)	Information Systems: Currently, there are no enterprise level applications maintained, since it caters to rice research related activities. However, there are a few GIS maps being developed. (Please Refer "RRDI Case Study" Section for more details)
	Field Crop Research and Development Institute (FCRDI)	Information Systems: There are no enterprise level applications maintained for the moment since it caters to OFC

		research related activities. It maintains a research database covering all research activities, which is sent to DOA/ MOALLI in every quarter. This is in addition to the INFORM updates, which are sent to SLCARP. (Please Refer "FCRDI Case Study" Section for more details)
	Fruit Research and Development Institute (FRDI)	Information Systems: There are no enterprise level applications maintained for the moment since it caters to fruit research related tasks. (Please Refer "FRDI Case Study" Section for more details)
	National Agriculture Information and Communication Center (NAICC)	NAICC is the software development unit for DOA. Most of the DOA institutes have developed their systems with the help of the NAICC software engineering unit. Some of the software systems developed by them are: 1. Croplook.net (SEPC) 2. Soil Testing System (HORDI) 3. Plant Genetic Resource Center Application 4. Pest Surveillance System (PPS) 5. Krush Lanka Gateway 6. 1920 Agriculture Advisory Service 7. Asset Management System (DOA) Most of the department level software systems are hosted by external cloud providers or internal servers at respective department levels. NAICC does not maintain any hosting facility for any of the developed systems except for the call center system that they maintain.
	Natural Research Management Center (NRMC)	Implements **Soil Conservation Act No 25 of 1951**

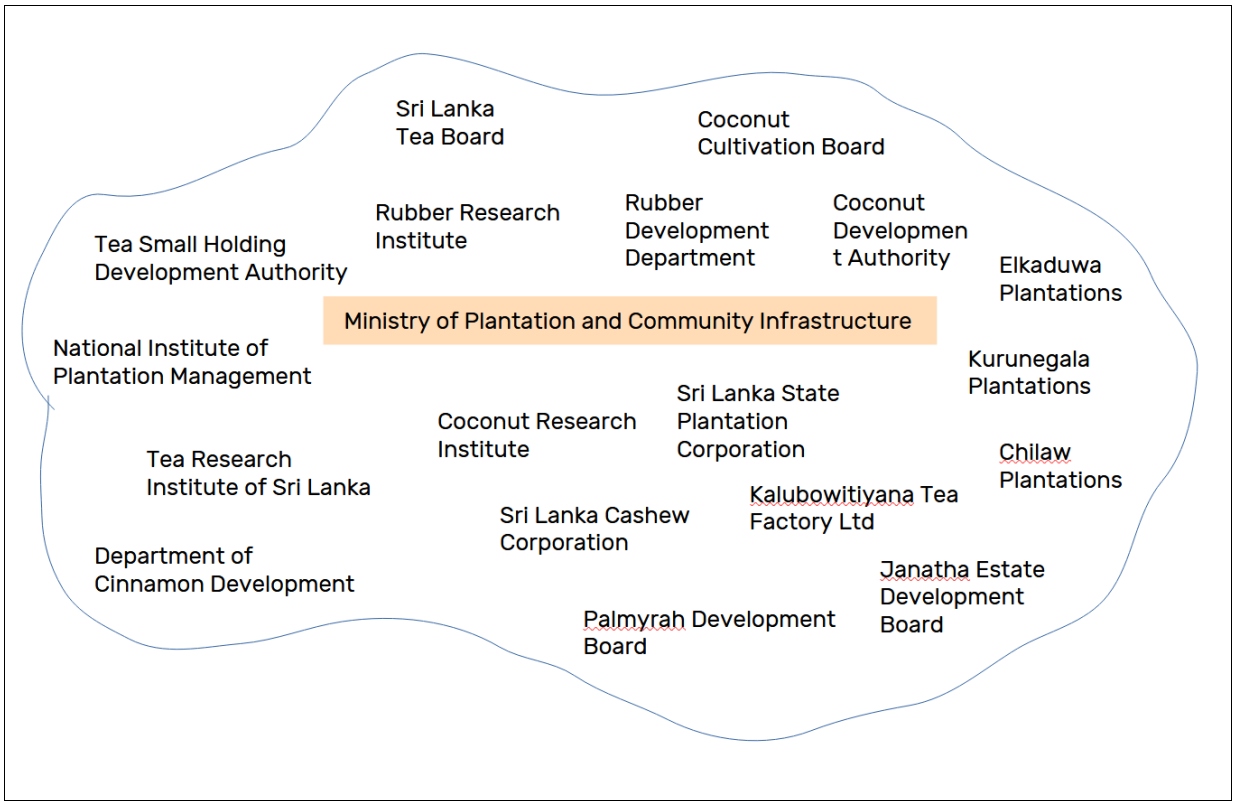
		Information Systems: 1. **GIS Maps** 2. **Agro-Met Advisory Report (Publication)** (Please Refer "NRMC Case Study" Section for more details)
	Progress Monitoring and Evaluation Unit (PMEU)	PMEU is the main Progress and Monitoring Unit representing DOA. The department submits several key progress reports. Information Systems: – Currently there are no information systems (Please Refer "PMEU Case Study" Section for more details)

Department of Agriculture (DOA) Information Systems

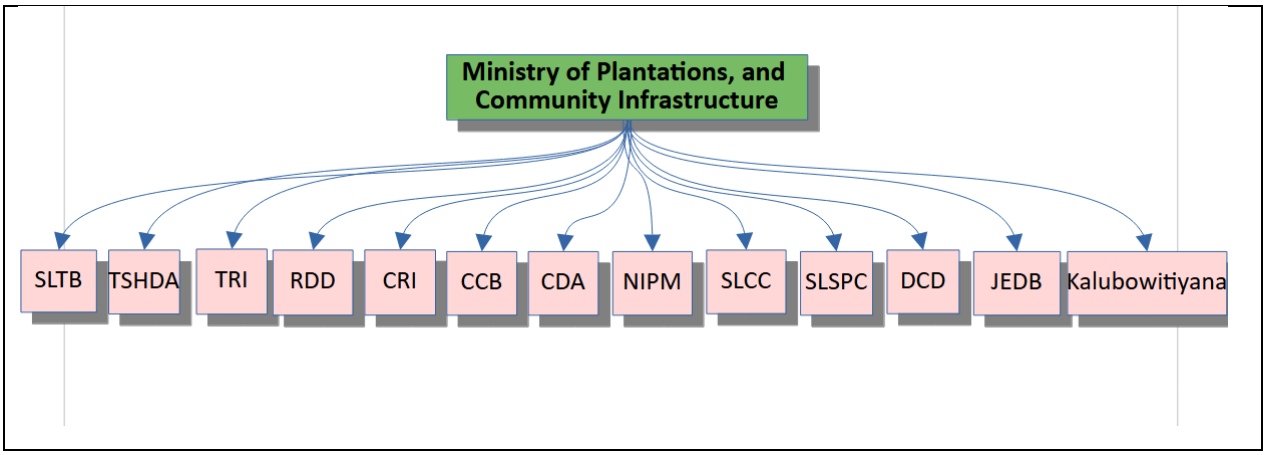


DOA CROPIX Web Portal (URL: digital.doa.gov.lk)

Ministry of Plantation and Community Infrastructure



Institutions under Ministry of Plantation and Community Infrastructure



Organization Structure - Ministry of Plantation and Community Infrastructure

Ministry of Plantation and Community Infrastructure – Key Projects

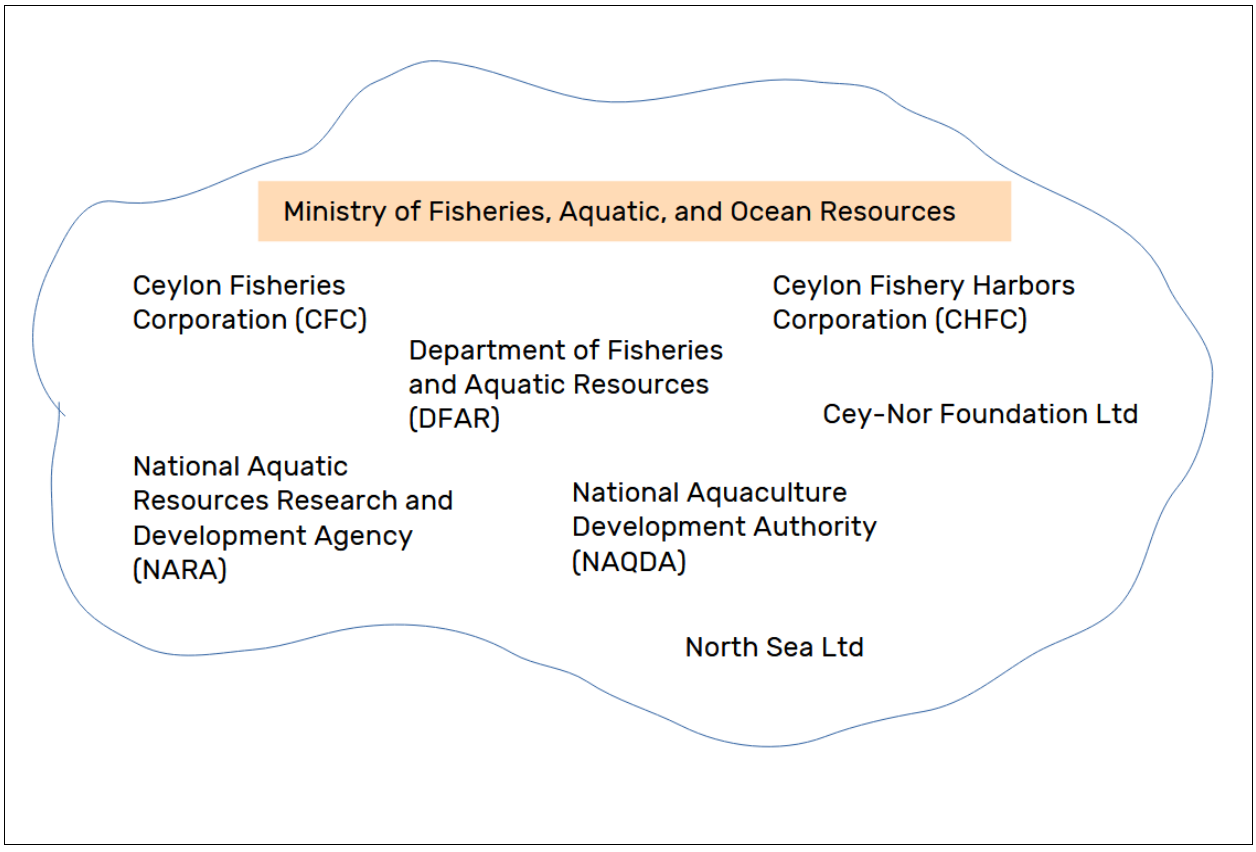
#	Institute	Key Projects
1	Sri Lanka Tea Board (SLTB)	Sri Lanka Tea Board was established under the **Sri Lanka Tea Board Act No 14 of 1975** Information Systems: 1. **Tea System** – Handles the complete business process of SLTB. 2. **Tea Land Registry System** – Captures all tea land ownership information. 3. **Tea Auction Application** – Though this is under SLTB scope currently the ownership of the application has been transferred to Colombo Tea Traders Association. (Please Refer "SLTB Case Study" Section for more details)
2	Tea Small Holding Development Authority (TSHDA)	TSHDA was established under the **Tea Small Holding Development Act No 35 of 1975.** Information Systems: **1. Tea Small Holder Subsidy Application** **2. Tea Inspector Activity System** (Please Refer "TSHDA Case Study" Section for more details)
3	Tea Research Institute of Sri Lanka (TRISL)	Information Systems: 1. **TRI-MIS** – An internal MIS **2. Tea Advisor Mobile Application** (Please Refer "TRISL Case Study" Section for more details)
4	Rubber Development Department (RDD)	It was established to enforce legislative provisions of the **Rubber Control Act No.11 of 1956** and the **Rubber Replanting Subsidy Act No.36 of 1953**. Information Systems: **1. Rubber Information System** (Legacy – In Production) **2. RIMS** (Rubber Information Management System) – (New Web Based – Under Development)

		(Please Refer "RDD Case Study" Section for more details)
5	Rubber Research Institute (RRI)	Information Systems: There are no information systems or databases maintained within RRI for the moment. However, they are heavily dependent on some of the key data, which should be disseminated by RRD. (Please Refer "RRI Case Study" Section for more details)
6	Coconut Cultivation Board (CCB)	CCB was established under the **Coconut Development Act No 46 of 1971** Information Systems: 1. **Coconut Cultivator / Farmer Registration.** 2. **King Coconut Cultivator / Farmer Registration.** (Please Refer "CCB Case Study" Section for more details)
7	Coconut Research Institute (CRI)	Information Systems: - Currently, most of the data are captured in Excel formats and no proper database(s) is maintained. (Please Refer "CRI Case Study" Section for more details)
8	Coconut Development Authority (CDA)	CDA was established under the **Coconut Development Act No 46 of 1971** Information Systems: 1. **Coconut Manufacturers Database** 2. **Marketing Exporters Registration Database** 3. **Desiccated Coconut Sample Processing Database** (Please Refer "CDA Case Study" Section for more details)
9	National Institute of Plantation Management (NIPM)	Established under the **National Institute of Plantation Management Act No. 45 of 1979**. NIPM has been "the" training institute for plantation sector capacity development for nearly 45 years. There are no information systems which have interactions to any other institution in the plantation sector. Information Systems:

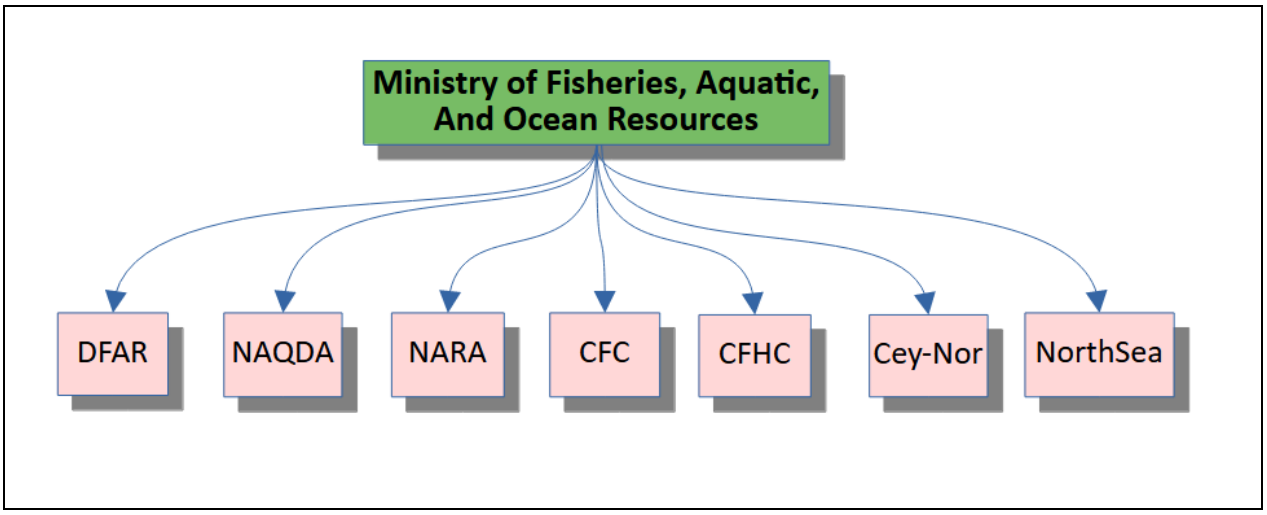
		1. **Learning Management System (LMS)** – [Internal] (Please Refer "NIPM Case Study" Section for more details)
10	Sri Lanka Cashew Corporation (SLCC)	Established under the **State Agricultural Corporation Act No 11, 1972.** Information Systems: 1. **Cashew Inventory System** (Legacy) 2. **Cashew Farmer Database** (Legacy) Both above systems are not functioning now due to various reasons. (Please Refer "SLCC Case Study" Section for more details)
11	Kalubowitiyana Tea Factory Ltd (KTFL)	KTFL is a limited liability company incorporated under the **Companies Act No; 17 of 1982** and re-registered under the new **Companies Act No; 07 of 2007**. Information Systems: **1. Tea Factory MIS and the Tea Grower Database** (Please Refer "Kalubowitiyana Case Study" Section for more details)
12	Janatha Estate Development Board (JEDB)	JEDB was established under the **Ceylon State Plantations Corporation Act No 4, 1958**. Information Systems: 1. **Crop Ledger** (at estates level) 2. **Leased Tea Lands Database** (for all leased out estates) (Please Refer "JEDB Case Study" Section for more details)
13	Sri Lanka State Plantation Corporation (SLSPC)	SLSPC was established under the **Ceylon State Plantations Corporation Act No 4, 1958**. There is no notable information system established. Most of the updates from the estates to the head office are done off-line. (Please Refer "SLSPC Case Study" Section for more details)
14	Colombo Tea Traders Association (CTTA)	CTTA carries out the on-line Tea Auction in Sri Lanka. It is the second largest Tea auction in the world after Kenya.

		CTTA is having all tea export related data for Sri Lanka.
15	Department of Cinnamon Development (DCD)	This department is newly formed and still in the process of establishing its presence and role. Recently concluded the **Strategic Digital Transformation Plan** workshops with all related stakeholders and now in the process of formulating its first draft. In this road map, DCD has managed to capture all important areas including the information systems which they have envisioned in collaboration with some of the government universities in Sri Lanka.

Ministry of Fisheries, Aquatic, and Ocean Resources



Institutions under the Ministry of Fisheries, Aquatic and Ocean Resources



Organization Structure - Ministry of Fisheries, Aquatic and Ocean Resources

Ministry of Fisheries, Aquatic, and Ocean Resources – Key Projects

Institute	**Key Projects**
Department of Fisheries and Aquatic Resources (DFAR)	Established by the **Fisheries and Aquatic Resources Act No 2 of 1996.** **Information Systems:** The following key applications have been developed by the department so far. Out of these MS-DFAR application is the core application, which can handle most of the department level services. 1. **MS-DFAR** (Management System for the Department of Fisheries and Aquatic Resources) 2. **Departure Approval System** 3. **E-Log System** 4. **Payment Module** 5. **VMS (Vessel Monitoring System)** (Please Refer "DFAR Case Study" Section for more details)
National Aquaculture Development Authority (NAQDA)	Established by the **National Aquaculture Development Authority Act No 53 in 1998.** Primarily there are two information systems maintained at NAQDA head office in Battramulla.

	1. **OMSA** (Online Management System for Aquaculture) 2. **MIS for NAQDA** (Please Refer "NAQDA Case Study" Section for more details)
National Aquatic Resources Research and Development Agency (NARA)	Established under the **National Aquatic Resources Act No. 54 of 1981** and amended. subsequently by **National Aquatic Resources Research and Development Agency Act No. 32 of 1996.** There are multiple applications being deployed by NARA divisions for various data collection activities. 1. **MS Access Databases for Small and Large size Fish Quantities** 2. **The Scientific Application (Sri Lanka Norway Bilateral Project)** 3. **The Fish Abundance / Density Survey by Saggarika Vessel** 4. **The Meta-Data Repository / Catalog with GeoNetwork** (Please Refer "NARA Case Study" Section for more details)
Ceylon Fisheries Corporation (CFC)	There are a few master data elements captured in the current business process. However, they are not in any proper database / an application. Some of the key master data generated by the organization are: 1. **The wholesale fish prices (daily)** 2. **The retail fish prices (daily)** None of the regional offices are connected to CFC head office for the moment, and they are in the process of strategizing it. In addition to that, CFC in need of a proper ERP to streamline the current business processes. (Please Refer "CFC Case Study" Section for more details)
Ceylon Fishery Harbors Corporation (CFHC)	Currently there are no enterprise systems running within the department except a small Google Forms application, which is being used to track boat berthing payments across fisheries harbors. (Please Refer "CFHC Case Study" Section for more details)
Cey-Nor Foundation Ltd	Currently there are no enterprise systems running within the department other than a few applications, which automate the internal business processes (Costing, Accounting, etc.).

	1. **Costing System** 2. **Quick Book (QB) System** (Please Refer "Cey-Nor Case Study" Section for more details)
Ministry of Fisheries and Aquatic Resources Development (MFARD) – Statistical Unit (SU)	The Statistical Unit (SU) of MFARD functions as the clearing house and the coordination point of fisheries statistics in Sri Lanka. MFARD-SU obtains data for their statistical analysis from multiple sources within the sector. Inflows: 1. DFAR – Marine related (coastal, offshore, and high seas) 2. NAQDA – Inland Fisheries and Aquaculture data 3. NARA – Large pelagic fishery data 4. CFHC – Fishing vessel and landing data 5. Customs – Import and Export data Outflows: 1. MFRAD – Weekly, Monthly and Annual reports 2. Central Bank – Monthly and Annual reports 3. DCS (Department of Census and Statistics) – Monthly, Quarterly and Annual reports 4. FAO – Annual reports 5. IOTC – Annual reports

Special Data Captured

Data Elements	**Institutions**
Annual Tuna related production for Indian Ocean Tuna Commission (IOTC)	DFAR and NARA are responsible for providing relevant Tuna related data (the catch quantity, etc.) in our oceans to IOTC annually. This will help IOTC to decide on the Tuna sustainability in the region for the future. Currently the data is collected by Fisheries Inspectors (FIs), who are attached to DFAR. They visit fisheries harbors and collect data based on samples defined by them. However, the

	accuracy of the data collected is not even 50% now. Several measures have been taken to improve the accuracy of the catch with the help of Norway technical assistance. The collected data is processed by the statistical section, which is attached to the DFAR and then the final report is produced to IOTC.
Monthly Production	Currently there is no automated system developed to get the monthly fish production. This is due to disconnection among collection points of all 22 main harbors and other fish collection points. Currently the data is finally fed to a system manually by the DFAR statistical staff (who are attached to census department). Having a connected system with DFAR from all fish collection points can speed up the data collection process, which can lead to better data analytics in the future. In addition to that, currently the collected data from collection points is not even 30% accurate due to inefficiencies at data collection. (Irresponsibility of fishermen is the key factor). In addition to that, more than 50% of fish harvest goes to waste due to unavailability of fish stocking facilities in multi-day vessels. There were multiple efforts made by FAO by sending supervisors to educate more on this aspect but still there has not been much improvement made in this aspect.

Current Architecture – Databases

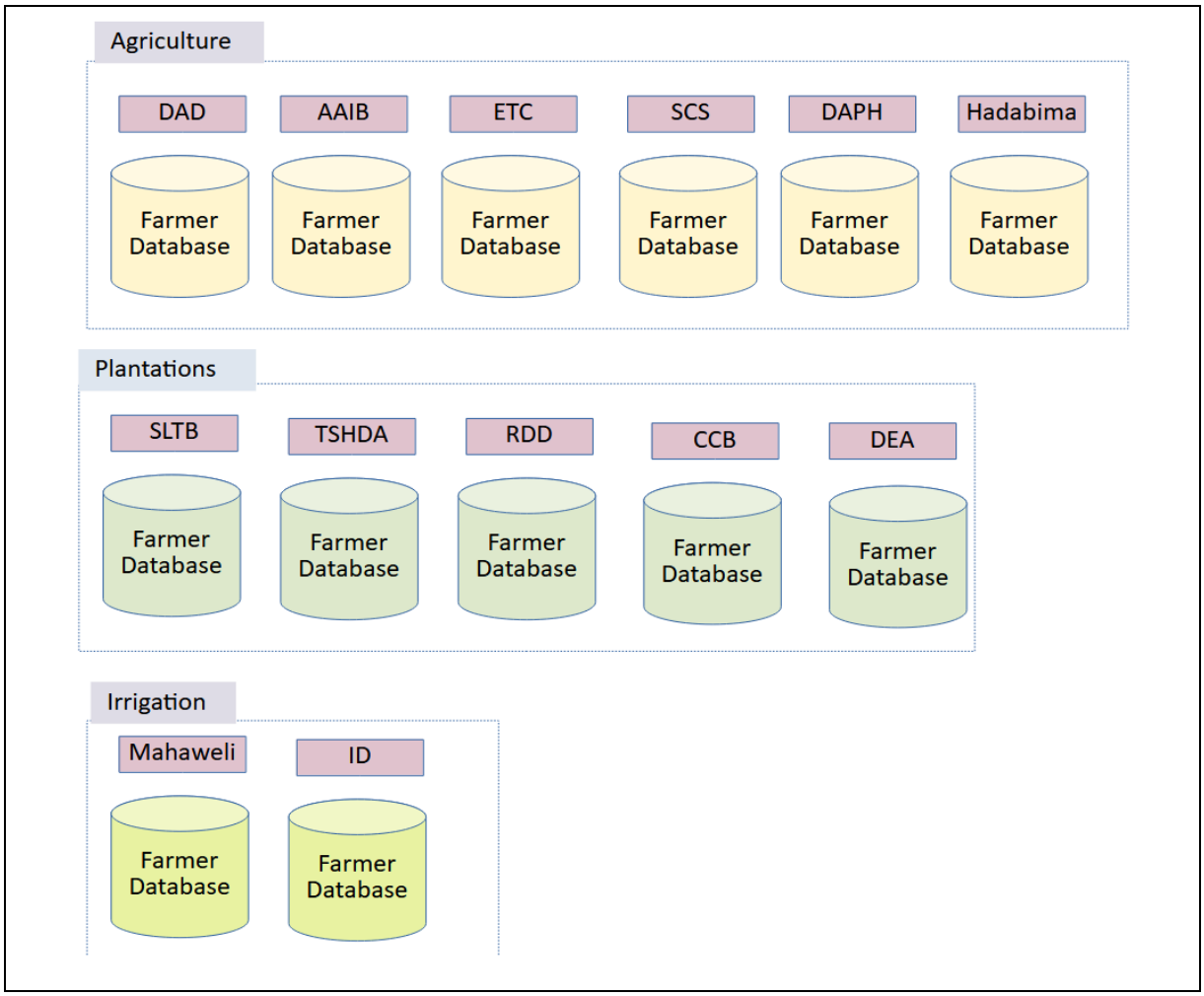
Here are some of the key databases that are maintained by respective departments.

#	Department	Databases (Current)
1	Department of Agrarian Development (DAD)	Farmer Database, Paddy Land Database, Non-Paddy Land Database, Minor Irrigation Scheme Database (Less than 200 Ha), Crop Database, Crop Cultivation Area Database, Crop Damage Database
2	Agriculture and Agrarian Insurance Board (AAIB)	Farmer Database, Paddy Land Database, Non-Paddy Land Database, Farmer Insurance Database, Farmer / Fisherman Pension Database, Livestock Farm Database, Farm Vehicle Database, Crop Database, Crop Cultivation Area Database, Crop Damage Database
3	Socio Economic Planning Center (SEPC)	Crop Database, Crop Cultivation Area Database (Monthly), Crop Forecast Database (Bi-Weekly), Crop Damage Database, Cost of Cultivation Database
4	National Fertilizer Secretarial (NFS)	Fertilizer License Database
5	Department of Animal Production and Health (DAPH)	Livestock Farm Database
6	Hadabima Authority	Farmer Database, Hadabima Farm Database
7	Seed and Planting Material Development Center (SPMDC)	Seed Producer (Contractor) Database, Seed Stock Database
8	Seed Certification Service (SCS)	Seed Certification Database, Seed Act Handler Database
9	National Plant Quarantine Service (NPQS)	e-Phyto Certification Database (for export), Import License Certificate Database (for import)
10	Registrar of Pesticides (ROP)	Pesticide Company Database, Pesticide Database, Dealer Database
11	Extension Training Center (ETC)	Fruit Stakeholder Database
12	Horticultural Crop Research Development Institute (HORDI)	Central Soil Testing Database
13	Sri Lanka Council for Agricultural Research Policy (SLCARP)	Research Database

14	Sri Lanka Tea Board (SLTB)	Tea Land Database – Contains all Tea Land Registrations irrespective of the Land Size.
15	Tea Small Holder Development Authority (TSHDA)	Tea Small Holder Database – Contains all tea small holder information including subsidies
16	Rubber Development Department (RDD)	Rubber Land Database – Contains all rubber land registry information irrespective of the size of the land.
17	Coconut Cultivation Board (CCB)	Coconut Farmer Database, Coconut Land Database
18	Coconut Development Authority (CDA)	Coconut Manufacturer Database, Coconut Exporter Database
19	Department of Export Agriculture	EAC Farmer Database, EAC Plant Nursery Database
20	Mahaweli Authority	Farmer Database (Crop), Farmer Land Database (Crop), Crop Cultivation Database, Farmer Database (Livestock), Farmer Livestock Production Database, Farmer Organization Database
21	Irrigation Department (ID)	Warter Resources Database, Irrigation Scheme Database, HMIS Database
22	Irrigation Management Division (IMD)	Irrigation Scheme Database (More than 2000 Ha), Farmer Organization Database,
23	Department of Fisheries and Aquatic Resources (DFAR)	Fishermen Database - Marine, Fishermen Operation License Database, Fishing Boat Database, Fishing Boat Number Database, Export License Database, Skipper Database, Boat Yard Database, Fishermen Organization Database, Fish (Marine) Production Database
24	National Aquaculture Development Authority (NAQDA)	Fishermen Database – Inland, Aquaculture Farmer Database, Fish (Inland) Production Database, Farmer Organization Database, Irrigation Tank Database
25	National Aquatic Resources Research and Development Agency (NARA)	Small and Larger Scale Fish Quantity Database, Meta Data Database (Open Data Concept after Data Classification)
26	Ceylon Fisheries Corporation (CFC)	Fish Prices (Wholesale) Database (Not Available), Fish Distribution Database (Not Available)
27	Ceylon Fishery Harbors Corporation (CFHC)	Fish Harbor Database (Not Available)

28	Cey-Nor Foundation Ltd	Fishing Equipment and Boat Manufacturing Database (Not Available)

In this analysis, it was evident that there are multiple databases (i.e. Farmer Database, Crop Database, Crop Cultivation Database, Crop Damage Database, Farm Database, etc.) duplicated across the sector with no proper ownership.



The number of duplicated farmer databases in the agriculture sector

4.2 Gap Analysis

The **Gap Analysis Matrix** is a tool used in TOGAF ADM to identify missing capabilities, inconsistencies, or areas requiring change to achieve the desired target state.

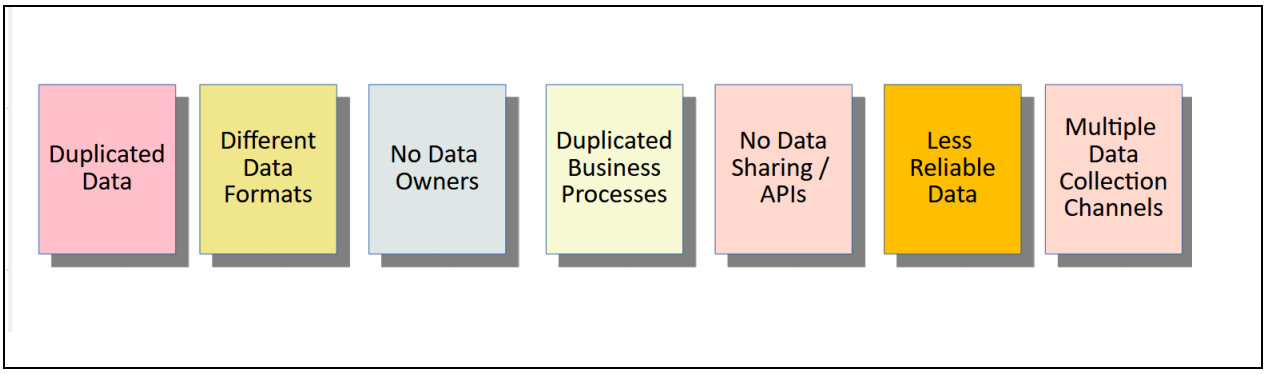
Gap Analysis Matrix

The following gap analysis matrix shows common gaps that you find across the agriculture sector information systems. Each organizational level gap is discussed in *Annexure 1* in detail.

Architecture Domain	Baseline Architecture	Target Architecture	Resolution Approach
Business	Siloed and fragmented business processes across the sector. Individual organizations limit the business processes within the organizational limits but beyond that.	Re-engineered / integrated business processes with minimal duplications across the sector.	Find reusable business processes / components and integrate them across the sector.
Data	Duplicated data silos across the sector. No proper data ownership identified. There is no common Data Catalog / Interoperability Framework (IF) has been developed in the sector. No Data / Information Classification has been done.	Having Data Registries with proper ownership (Single Source of Truth). Having a common Data Catalog for the sector. A proper information classification to allow data sharing ability.	Building a set of key Data registries such as Crop Registry, Farmer Registry, Paddy Land Registry, will eliminate data duplication and ownership issues. Building the Interoperability Framework (IF) for the agriculture sector using LIFe standards in place. Building Data Sharing Polices for each institution in the sector with an information classification.
Application	Siloed software systems with minimal integration. Most of the back-end applications were built following the monolithic pattern and most of them are cloud native. Sustainability has been a key issue in most of the developed back-end systems. No service / API classification has been done.	Organizational level applications built with data sharing in mind. Facilitating microservices based, container based, distributed, decoupled architecture allowing the institutional level back-ends to function independently. They should be fully cloud native and cloud agnostic.	Build applications with an API layer. The brown-field applications (if they have being developed without an API layer), should be modified to have an API layer. Since these APIs are not complying with IF data catalog, it is required to do some level of transformation in middle. These message

		Classified services based on the National Data Sharing Policy Guidelines.	mediations could be done via API Gateways or an Enterprise Service Bus or any other suitable mediation technique. Green field back-end applications should be built using microservices, containers, and automation in mind. They should be cloud native and cloud agnostic. Building a Service Classification along with organizational level Data Sharing Policies.
Technology	There are quite a few legacy back-ends which need a complete revamp. Most of the applications are hosted either on-premises or public cloud hosting. Security has not been a key factor at design level. Data Protection Act guidelines have not being followed.	Require an integrated platform while maintaining data ownership at institutional level. Hosting should happen complying with Digital Government Policies that have been laid out by the Government. (i.e. Leveraging LGC whenever possible) The Personal Data Protection Act (PDPA) adherence.	Build data ownership via electronic registries and share data via APIs. The integration should be facilitated by API Gateways or similar software components. Build applications with cloud native aspect without locking to a single cloud vendor. Should give more emphasis to “Security by Design”.

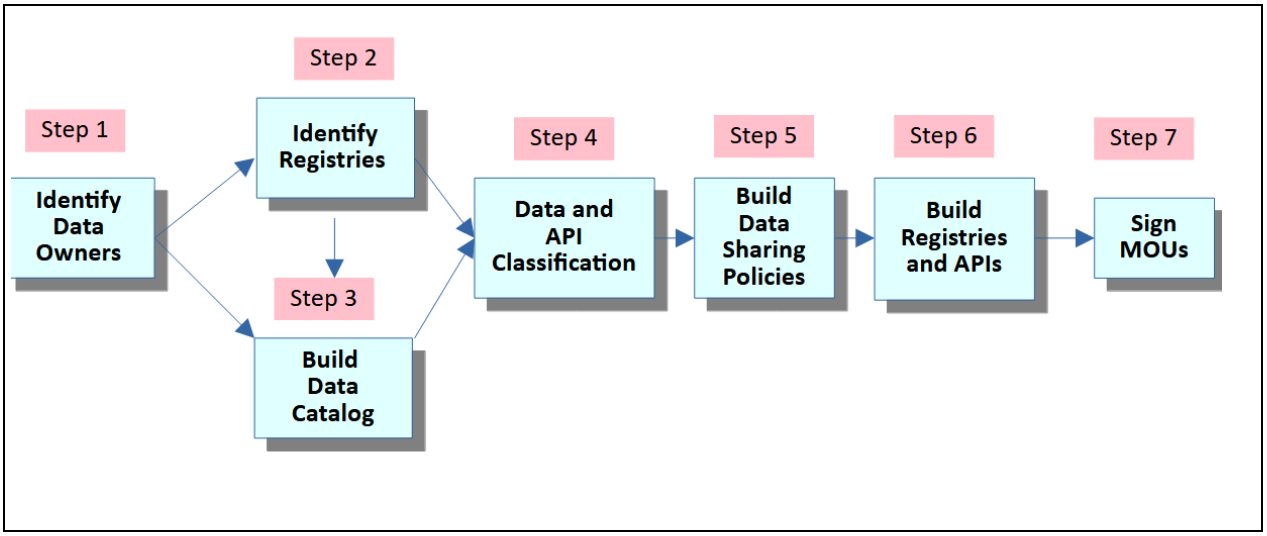
The above gaps can be summarized as follows:



Key Gaps identified

4.3 The Target Architecture

To mitigate the gaps identified, the following steps are proposed in-line with the Target Architecture.



Target Architecture steps

#	Step	Description
1	Identify data owners	It is important to identify data owners for the identified master data across the sector. This is possible by carrying out a legal or a responsibility assessment for each department across the sector. By doing this, the sector can identify master data as "Single Source of Truth" (SSOT).
2	Identify registries	Once the ownerships and master information are identified, it is possible to identify the number of possible registries across the sector.
3	Build data catalog	Once relevant registries are identified, the next step is to build a comprehensive data catalog for the whole sector. Alongside the

		EA efforts, a comprehensive data catalog was developed and presented as the **Interoperability Framework (IF)** for the agriculture sector (FAO, 2024a).
4	Data and API classification	Once all the data elements are identified in IF, the next step is to carry out a detailed analysis on each data element for its shareability. Along with data, it is required to classify services / APIs as well.
5	Build data sharing policies	Once the data and service classification is completed, each department is required to build its own data and service classification guidelines based on the **National Data Sharing Policy** (NDSP), which was first drafted in 2013 by ICTA (ICTA, 2013). Each department level data sharing policy is derived from NDSP and is conformance to the same. The NDSP has its basis from the **Service Classification Framework**, and on the **Information / Data Classification framework**.
6	Build registries and APIs	Once all the above steps are completed, it is required to implement relevant registries and relevant APIs / services for the whole sector.
7	Sign MOUx	Finally, government department to department APIs should be disseminated following a proper governance process. For this purpose, it is essential to govern them through MOUs.

Target Architecture – Key Registries

In the Target Architecture, multiple registries were identified and they can be listed as follows.

#	Registry	Description	Ownership
1	Farmer Registry	Farmer ID could be a digital ID scheme that is designed to be extensible. Given the agriculture value chain, the Farmer ID is functional in nature but can be expanded to include foundational ID schema as well. With e-KYF (Know Your Farmer), it will eliminate the need for re-submitting physical documents to different departments for availing benefits under different schemes. Currently ownership lies with the Department of Agrarian Development (DAD). However, there are multiple farmer databases lying in almost all other departments without any integration to DAD.	DAD
2	Paddy Land Registry	This will contain the paddy land cultivation extent and the land cultivator (farmer) information.	DAD
3	Non-Paddy Land Registry	This will contain the non-paddy land cultivation extent and the land cultivator (farmer) information.	DAD
4	Farmer Organizations Registry	This will contain all Farmer Organization related information.	DAD
5	Yaya Registry	Yaya is a concept in the paddy cultivation in Sri Lanka. Yaya can consist of many Paddy Lands. It has a direct link to a Farmer Organization in the area and has a direct link to water distribution for paddy cultivation as well.	DAD
6	Crop Registry	This stores: - Crop and Crop Variety information (DOA) - Crop Area Cultivation information (SEPC) - Crop Forecast information (SEPC) - Crop Cost of Cultivation information (SEPC) - Crop Damage information (SEPC)	DOA/ SEPC
7	Farmer Insurance Registry	This will contain all the information related to farmer insurance claims.	AAIB

8	Farmer / Fisherman Pension Registry	This contains all farmer / fisherman pension related master data.	AAIB
9	Seed Stakeholder Registry	This contains all stakeholders in the seed value chain and this process is part of the Seed Act. If you are to get the services of SPMDC or SCS, it is required to get registered as a Seed Stakeholder.	SCS
10	Seed Certification Registry	This will contain all seed certification details for seeds maintained under DOA.	SCS
11	Seed Farm Registry	This contains all the Seed Farm registration information	SPMDC
12	Fruit Plant Nursery Registry	This contains all the Fruit Plant Nursery information.	SCS
13	Fruit Plant Certification Registry	This contains all Fruit Plant Certification Registry	SCS
14	Fruit Stakeholder Registry	This contains all Fruit Stakeholder Registry. The department can extend this registry to store all crop related stakeholders in the future depending on the requirement.	ETC
15	Soil Test Registry	This database will contain all soil related testing information irrespective of the crop	HORDI
16	Fertilizer License Registry	This contains all fertilizer license issuance details across the sector.	NFS
17	Animal Farm Registry	This contains Animal Farm registration information.	DAPH
18	Animal Registry	This registry contains information on all animal types such as Cattle, Buffalo, Swine, Sheep, Goat, and Aquatic. Rather not having multiple registries for each “animal type”, it is advised to have a single Animal Registry by maintaining the “animal type” as a parameter. A separate *Animal_ID* is proposed to identify the animal, and it will improve the trackability in a greater detail. Currently, only the *Cattle* and *Buffalo* population is tagged	DAPH

		with an ID.	
19	Animal Feeds Registry	This registry will maintain information related to Animal Feed Stakeholder (Importer, Exporter and Manufacturer) Registration information (AAF Codes), and any other feed production level details.	DAPH
20	Animal Pharmaceutical Registry	This registry will maintain information such as Animal Pharmaceuticals Product Registration Details (VDCA Codes), and any other pharmaceutical product related details.	DAPH
21	Animal Poultry Registry	This registry will maintain information such as Animal Poultry Stakeholder (Importer, Exporter and Manufacturer) Registration information, and any other poultry production related data details.	DAPH
22	Plant Quarantine Certification Registry	This database will contain the e-Phyto certification details for exports and imports	NPQS
23	Pesticides Company Registry	This database will contain the registered pesticide company related information, including pesticide manufacturers, suppliers, and formulators.	ROP
24	Pesticides Product Registry	This registry contains all registered pesticide product related information.	ROP
25	Research Registry	This contains all research-oriented information in the whole agriculture sector for a given year.	SLCARP
26	Plant Genetic Passport Registry	This contains all the Plant Genetic Passport related information, which is collected by PGRC.	PGRC
27	Tea Land Registry	This will contain all tea land registration information irrespective of the size of the tea land.	SLTB
28	Tea Factory / Manufacturer	This contains all tea factory / manufacturer information	SLTB

	Registry		
29	Tea Exporter Registry	This contains all tea exporter information	SLTB
30	Tea Small Holder Permit Registry	This will contain all Tea Small Holder permit information.	TSHSDA
31	Rubber Land Registry	This will contain all rubber land registration and permit information irrespective of the size of the rubber land. (for small holders and RPCs)	RDD
32	Coconut Land Registry	This will contain all coconut land registration information.	CCB
33	Coconut Stakeholder Registry	This will contain all coconut manufacturer and exporter registration information	CDA
34	Coconut Seed Production Registry	This will contain all coconut seed stock level at any given point.	CCB
35	Coconut Seed Certification Registry	This will contain all coconut seed certification information	CRI
36	Coconut Pesticides Registry	This will contain pesticide information including stock level at any given moment. Currently, the pesticide distribution is fully owned by CCB.	CCB
37	EAC Plant Nursery Registry	All EAC Plant Nurseries are registered here.	DEA
38	EAC Plant Certification Registry	All EAC Plant Certifications are stored here	DEA
39	Fishermen Registry – Marine (FR-M)	This will be the master registry for all fishermen (Marine) There is a *Fisherman_ID* with a QR already implemented.	DFAR
40	Fishermen Registry – Inland (FR-I)	This will be the master registry for all fishermen (Inland)	NAQDA
41	Fishermen Boat Registry	This will contain all fishermen boat registration details.	DFAR

42	Fisheries Boat Yard Registry	This contains all fisheries boat yard information	DFAR
43	Fisheries Harbor Registry	This contains all fisheries harbor information.	CFHC
44	Fishing Product Establishments Registry	Contains Fishing Product Establishments information	DFAR
45	Fishing Equipment Supplier Registry (Marine)	Contains all information related to Marine fishing equipment suppliers.	DFAR
46	Fishermen Organization Registry (Marine)	Marine Fishermen Organization information	DFAR
47	Fishing Product Stakeholder Registry	Contains all fishing product importer/exporter information	DFAR
48	Irrigation Scheme Registry	Irrigated areas are managed under Irrigated Schemes under different administrative structures. Currently, based on the size of the Irrigated area the administration has been divided into multiple institutions such as ID, IMD and DAD. However, having a unified Scheme Registry irrespective of the size of the irrigated scheme is important. Hence this unified registry is proposed.	ID/ DAD
49	Irrigation Farmer Organization (FO-I) Registry	This contains all information related to Irrigation Schemes Farmer Organizations' information	IMD
50	Mahaweli Systems Registry	Mahaweli Areas are governed under ten (10) Mahaweli systems. This registry contains all information related to Mahaweli systems.	MASL
51	Mahaweli Farmer Organization (FO-M) Registry	This contains all information related to Mahaweli Farmer Organizations.	MASL
52	Minor Irrigation Farmer Organization	This contains all information related to Minor Irrigation schemes' Farmer Organization information.	DAD

	(FO-D) Registry		
E1	Land Registry (External)	There have been multiple initiatives in the Land Domain. 1. **e-SLIMS** – State Land only. Under the Land Commissioner General Department (LCGD - https://landcom.gov.lk) a. https://www.eslims.gov.lk/eLand/welcome.do b. https://www.icta.lk/projects/eslims-state-land-information-management-system/ 2. **e-Land** – Deed Registration. This is an on-going project, which is handled by ICTA with the Register General Department (RGD). https://www.icta.lk/procurement-notices/designing-developing-deploying-and-maintenance-of-the-eland-registry-document-management-system-ictagoslconqcbs201721/ The deed registration will have its own deed number generated from your land, which is later replaced by the Land title number, which is generated by the Bim Saviya project. Currently according to RGD, there is no indication about land type (whether it is being used for agricultural purposes) in the e-Land registry database or any other database. 3. **BimSaviya** – Title Registration. This is handled by the Land Title Settlement Department - http://www.landsettledept.gov.lk/home Bim Saviya is there to create a Land Title registry for all land information in the country. This will supersede the deed registration, which is done by the e-Land project. 4. **Land Use Policy Planning Department (LUPPD)** - https://luppd.gov.lk/ This department is responsible for executing the policies defined under the *National Land Use Policy* (LUPPD, 2017).	e-Slims – LCGD, e-Land – RGD, BimSaviya – Land Title Settlement Department

		In addition to that, from this department, anyone can get a Land assessment done for your land, which gives a detailed report on the Land information such as soil types, water levels, water resources, etc. This is a chargeable service done by this department. 5. **Sri Lanka Land Development Corporation** - https://www.landdevelopment.lk/ 6. **Mahaweli Authority** 7. **Land Reforms Commission** **P.Note**: Currently the Land Registry is maintained by two main systems. 1. e-Land (The Land Deed Registration Project) – PK – Deed Number 2. Bim Saviya (The Land Title Registration Project) – PK – Title Number **P.Note:** With the initial discussions had with RGD, it was evident that there are no APIs being developed for the e-Land project and more discussions are needed to confirm the rest of the APIs in other projects under the "Land Domain". This will be carried out in early January in 2024. Hence, the agriculture domain data architecture will be developed having a placeholder for any API interactions in the future with Land APIs.	
E2	Location Code Registry (External)	This has been maintaining the Location Code database for some time. This contains a location up to the "Village" level. [Province-District-DS-GN-Village] e.g: Bemmnula in Gampaha District is having the village location code = 1-2-27-300-1 1 = Western Province; 2 = Gampaha District; 27 = DS; 300 = GN Division; 1 = Village] The location code could be accessed via URL: http://moha.gov.lk:8090/lifecode/home	MOHA

		However, though location code has been introduced for a long time, it has not been adopted at the grass root levels. For example, though for GNs there is a location code, most of the places are still using the old GN code system, which is the MPA code. Hence, the above URL has a separate tab to indicate the mapping between the GN location code and the MPA code.	

Key Registries Identified

Target Architecture – Key Registry APIs

The following **key** registry APIs have been identified and can be used to pull all the required APIs, which represent master data for each entity / domain in a distributed setting.

P. Note: The Complete API Listing can be found in a separate Document (API Catalog), which is prepared under the Sri Lanka Government Agriculture Interoperability Framework. The following list only shows the key APIs, which are relevant to the registries identified.

Institute	**Registry**	**Institute Owned APIs**	**APIs Consumed**
DAD	Farmer Registry	Farmer API	Crop API (DOA) Location Code API (MOHA)
	Paddy Land Registry	Paddy Land API	
	Non-Paddy Land Registry	Non-Paddy Land API	
	Farmer Organization (FO) Registry	Farmer Organization API	
	Yaya Registry	Yaya API	
	Minor Irrigation Registry	Minor Irrigation API	
AAIB	Farmer Insurance Registry	Farmer Insurance API Defaulted Farmer API	Crop API (DOA) Crop Calendar API (DOA) Location Code API (MOHA) Farmer API (DAD) Weather (Actual) Data API (MetDept) Paddy Land API (DAD) Non-Paddy Land API (DAD) Yaya API (DAD) FO API (DAD) Vehicle Information API (DMT) Animal Farm API (DAPH)
	Farmer / Fisherman Pension Registry	Farmer Pension API Fisherman Pension API Defaulted Fisherman API	
DOA/SEPC	Crop Registry	Crop API	Weather Forecast Data API

		Crop Calendar API Crop Cultivation Area API Crop Forecast API Crop Damage API Crop Cost of Cultivation API	
DOA/SPMDC	Seed Farm Registry	Seed Farm API	Farmer API (DAD)
	Seed Stock Registry	Seed Stock API	Seed Certification API (SCS)
DOA/SCS	Seed Act Handler Registry	Seed Act Handler API	Crop API (DOA) Farmer API (DAD) Paddy Land API (DAD) Non-Paddy Land API (DAD) Seed Farm API (SPMDC)
	Seed Certification Registry	Seed Certification API	
	Seed GAP Certification Registration	Seed GAP Certification API	
	Fruit Plant Certification Registry	Fruit Plant Certification API	
	Fruit Plant Nursery Registry	Fruit Plant Nursery API	
DOA/RRDI	None	None	Seed Farm API (SPMDC)
DOA/HORDI	Soil Test Registry	Soil Testing API	Farmer API (DAD)
DOA/ETC	Fruit Stakeholder Registry	Fruit Stakeholder API	Farmer API (DAD) Crop API (DOA)
DOA/ROP	Pesticide Company Registry	Pesticide Registrant API	None
	Pesticides Product Registry	Pesticide Product API	
DOA/NPQS	Plant Quarantine Certification Registry	Plant Quarantine Certification API	Farmer API (DAD) Crop API (DOA)
DAPH	Animal Farm Registry	Animal Farm API	Farmer API (DAD)

	Animal Registry	Animal API	SL Customs API – (SL Customs) Plant Quarantine Service API (NPQS) Import/Export Controller API
	Animal Pharmaceutical Registry	Animal Pharmaceutical Product API Animal Pharmaceutical Stakeholder API	
	Animal Feeds Registry	Animal Feeds Products API Animal Feeds Stakeholder API	
	Animal Poultry Registry	Animal Poultry Products API Animal Poultry Stakeholder API	
NFS	Fertilizer License Registry	Fertilizer License Information API	SL Customs API (for Fertilizer Import approvals) – (SL Customs)
	Fertilizer Registry	Fertilizer Estimates API (for each crop) Fertilizer Distribution API (for each Crop and Fertilizer Type) Fertilizer Cost API (for each Crop)	Fertilizer Recommendation API (for each Crop) – (MOALLI / DOA)
SLCARP	Research Registry	Research API	None
SLTB	Tea Land Registry	Tea Land API	Location Code API (MOHA)
	Tea Factory / Manufacturer Registry	Tea Factory / Manufacturer API	Location Code API (MOHA)
	Tea Exporter Registry	Tea Exporter API	Location Code API (MOHA)
TSHDA	Tea Small Holder Permit Registry	Tea Small Holder Permit API	Tea Land API Location Code API (MOHA)
RDD	Rubber Land Registry	Rubber Land API	Location Code API (MOHA)
CCB	Coconut Land	Coconut Land API	Location Code API (MOHA)

	Registry		
DEA	EAC Plant Nursery Registry	EAC Plant Nursery API	Farmer API (DAD) Non-Paddy Land API (DAD)
	EAC Plant Certification Registry	EAC Plant Certification API	
DFAR	Fishermen Registry (Marine)	Fishermen (Marine) API	
	Fishermen Boat Registry (Marine)	Fishermen Boat (Marine) API	Fishermen (Marine) API
	Fisheries Boat Yard Registry	Fisheries Boat Yard API	
	Fishing Product Establishment Registry	Fishing Product Establishment API	
	Fishing Equipment Supplier Registry	Fishing Equipment Supplier API	
	Fishermen Organization Registry (Marine)	Fishermen Organization API	Fishermen (Marine) API
CFHC	Fisheries Harbor Registry	Fisheries Harbor API	
NAQDA	Fishermen Registry (Inland)	Fishermen (Inland) API	
	Fishermen Boat Registry (Inland)	Fishermen Boat (Inland) API	Fishermen (Inland) API
ID	Irrigation Scheme Registry	Irrigation Scheme API	Farmer API (DAD) Paddy Land API (DAD) Non-Paddy Land API (DAD) Crop API (DOA) FO (Irrigation) API (IMD)
IMD	Farmer Organization Registry (Irrigation)	FO (Irrigation) API	Farmer API (DAD) Paddy Land API (DAD)

			Non-Paddy Land API (DAD) Crop API (DOA) Irrigation Scheme API (ID)
MASL	Mahaweli System Registry	Mahaweli System API	Farmer API (DAD) Paddy Land API (DAD) Non-Paddy Land API (DAD) Crop API (DOA) Irrigation Scheme API (ID)
	Farmer Organization (MASL) Registry	FO (MASL) API	

High-level APIs from each Registry

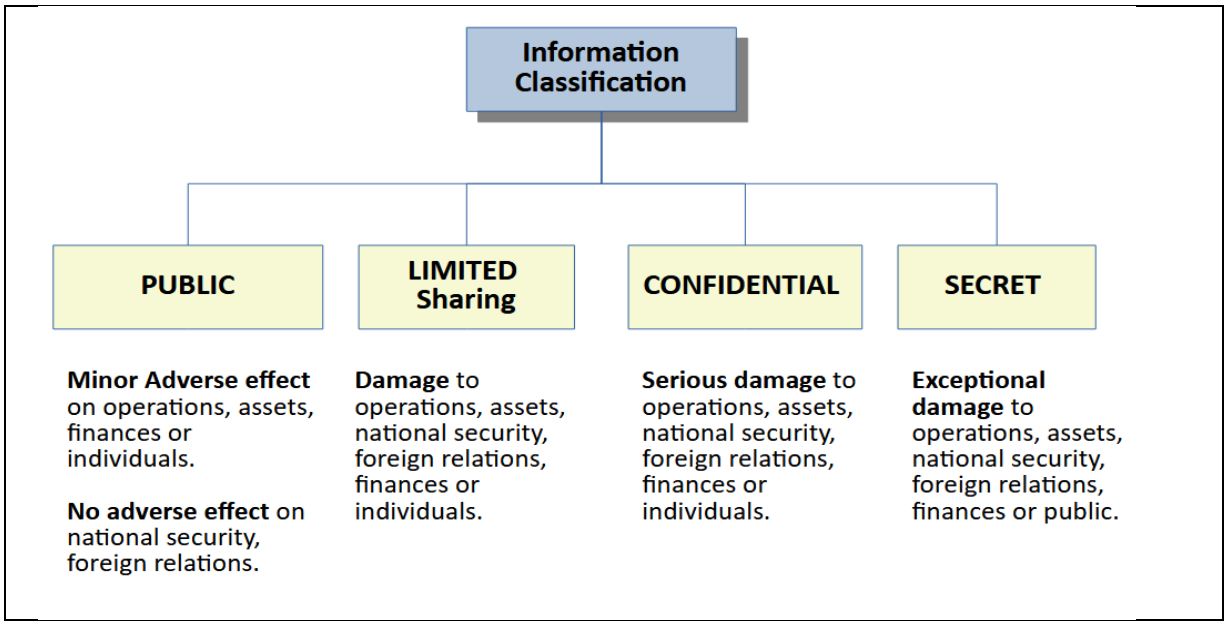
[P. Note: A detailed list of all APIs and their classifications are given under Data Sharing Policy document, which is developed for each department.]

Target Architecture – The Information and Service Classification

Information Classification

Information classification is the first step in moving towards a data sharing paradigm. Through this framework, the data elements are identified and classified based on the sensitivity and impact of the sharing of that information

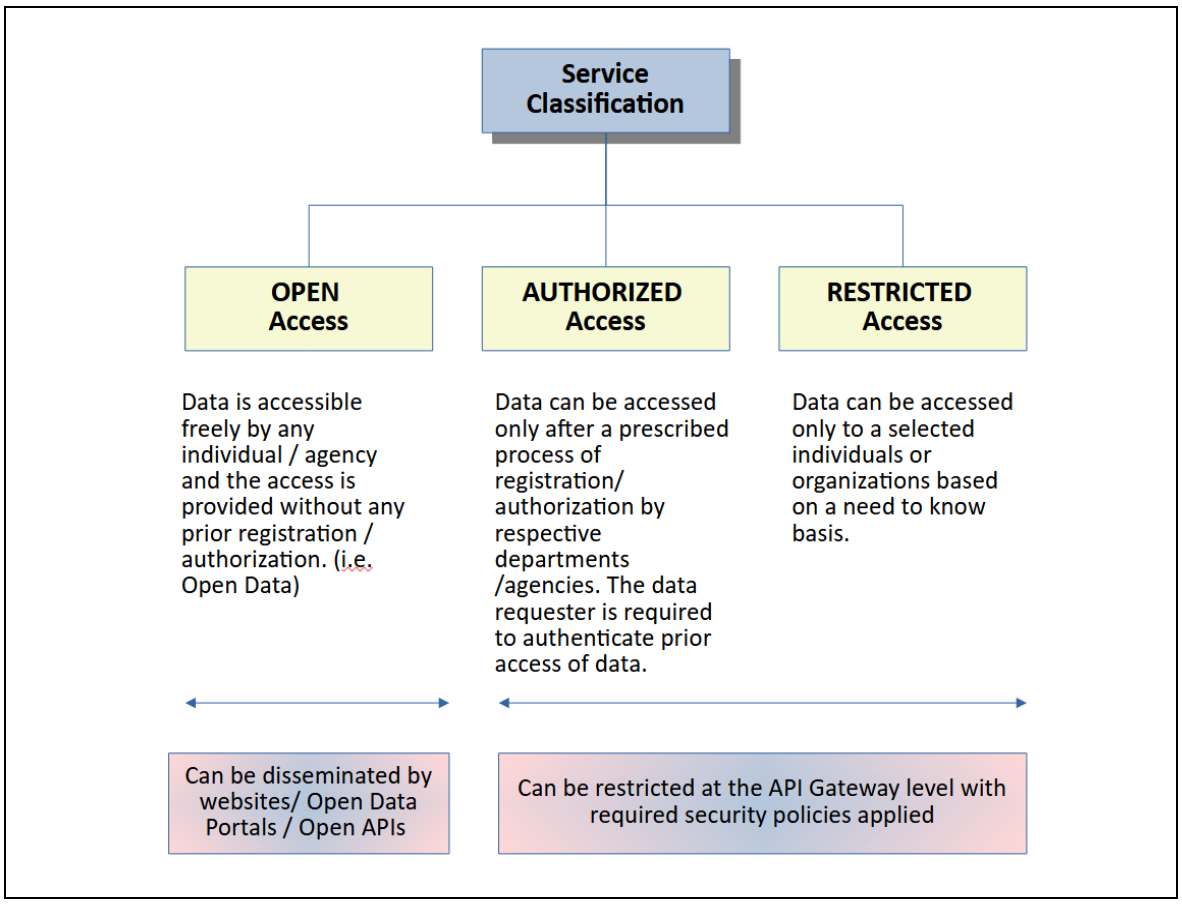
There are four (04) basic information classification levels (ICTA, 2013).



Information Classification Framework (ICTA, 2013)

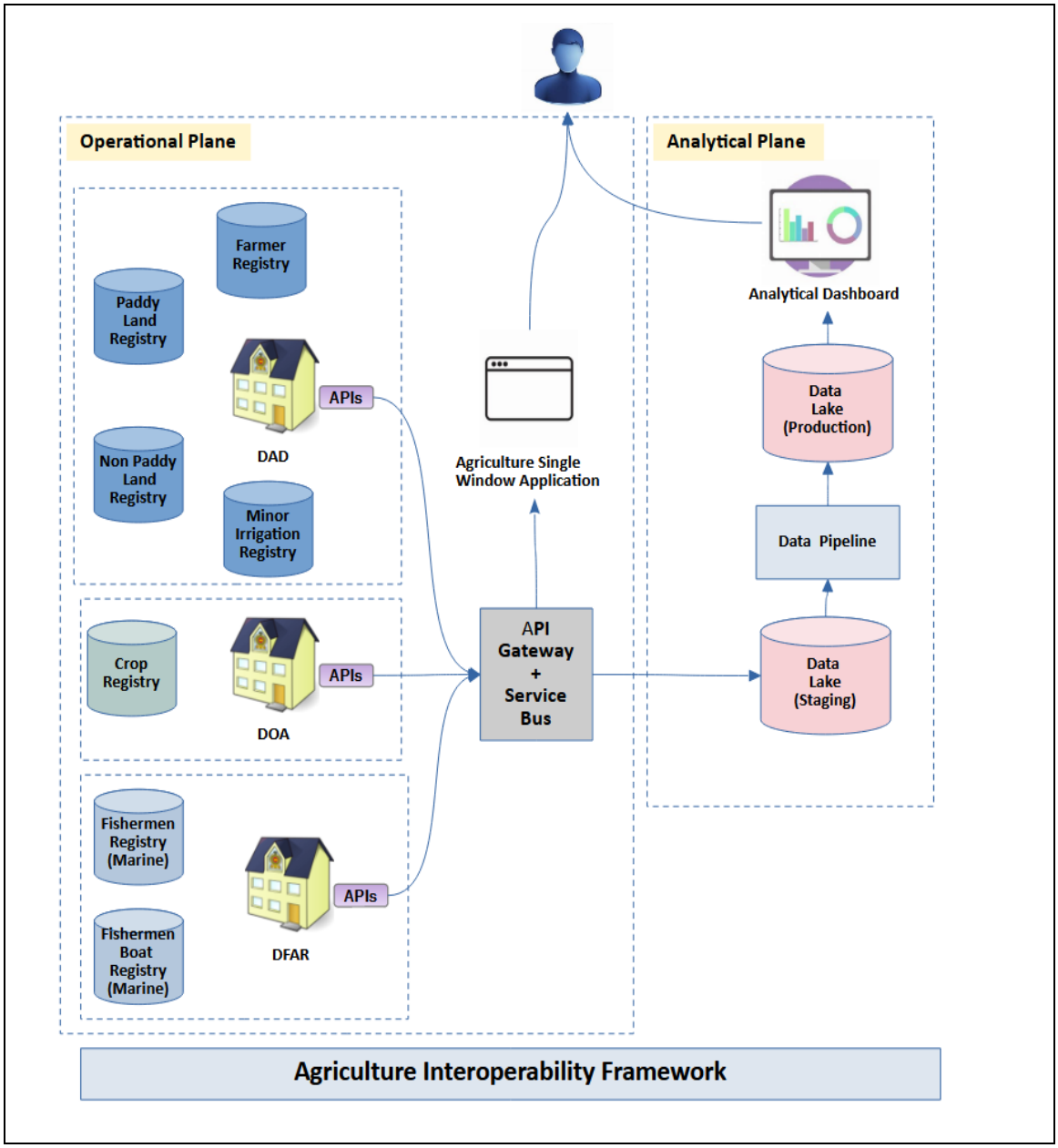
Service Classification

The sharing of data is done via services and therefore a separate service classification framework has been defined based on the information classification framework.



Service Classification Framework (ICTA, 2013)

Target Architecture – The Integrated Solution



The Target Architecture – The Integrated Solution

In this context, the target Architecture is implemented on two levels/ planes.

Plane	Description
Operational Plane	This is where the Master Data Management (MDM) happens. This layer is responsible for handling department level operational transactions (OLTP). The inter-department (horizontal) information sharing happens via **Application Program Interfaces (APIs)**.

Analytical Plane	The data generated at the Operational Plane is pushed to the Analytical Plane for analytical purposes (OLAP). A Data Lake / Lake House will be used as an analytical repository. From the Operational Plane to Analytical Plane, the data is pushed via APIs.

Out of these two planes, the Analytical Plane implementation is covered by the IDAT project (PWC, 2022), where it produces an analytical dashboard comprising a DSS. The Operational Plane tasks (Registry and API Development) will be carried out as a separate implementation effort.

Architecture Building Blocks (ABBs)

Architecture Building Block (ABB) is a high-level abstract representation, which is used to structure and implement an EA.

Based on the above Target Architecture,

The primary **ABBs** of the Operational Plane are:

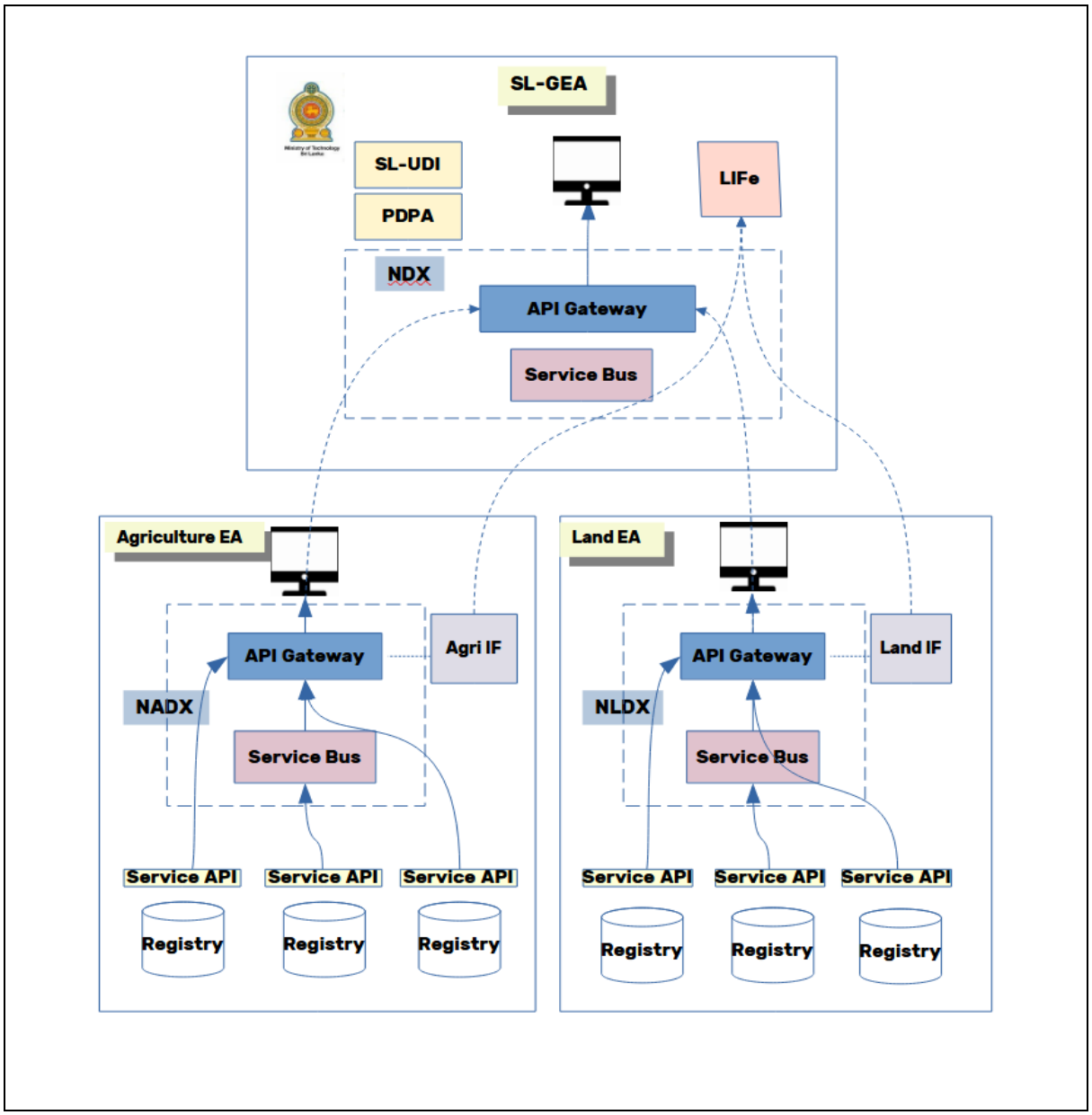
1. Electronic Registries (ECs)
2. Verifiable Credentials (VCs)
3. Application Program Interfaces (APIs)
4. Message Mediation Platforms (API Gateways, Service Buses, Message Brokers)
5. Identity Management Solution (IDMs)

The primary **ABBs** of the Analytical Plane are:

1. Data Lake / Data Lakehouse
2. Data Transformation Components (i.e. ETL)
3. Visualization Components (i.e. Dashboards)

Connecting with other Sectors in the Government

If any APIs which can be consumed by other Government Sectors or if any APIs, which can be consumed within Agriculture sector itself, then it is required to have inter-domain interaction or an integration. Such integrations can leverage the Sri Lanka Government **National Data Exchange (NDX)** platform, which is currently hosted by ICT Agency Sri Lanka.



Connecting with other Government domains via DPI

NDX can seamlessly and securely integrate inter-domain transactions, which are primarily connected through a private Government Network, which is known as the **Lanka Government Network (LGN)**. LGN is a powerful fiber private network, which is owned by the Sri Lanka Government currently has nearly 860 government organizations connected. Within NDX, there are multiple middleware components to support various technological and information transformations. These transformations are facilitated both synchronous and asynchronous manner depending on the integration requirements.

Annexure 1

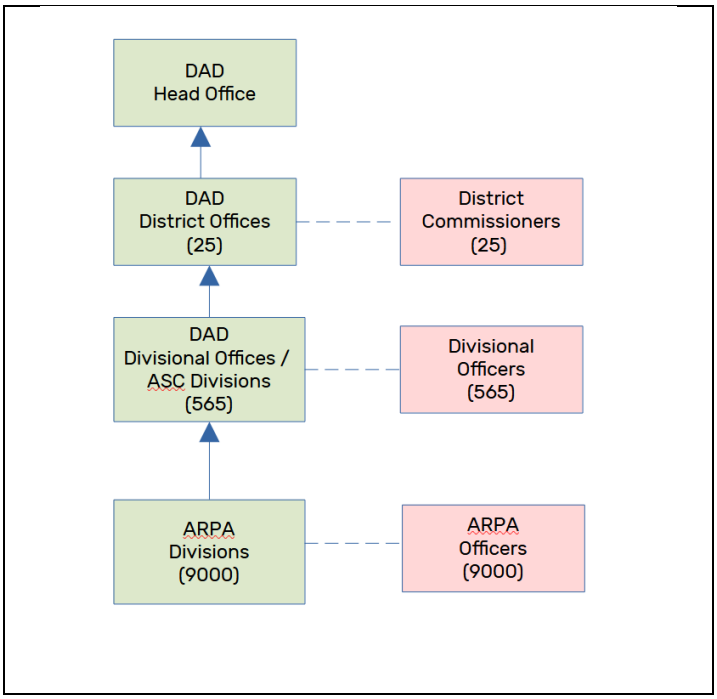
Case Study – Department of Agrarian Development (DAD)

The Agrarian Development Act No 46, 2000

This is an ACT TO PROVIDE FOR, MATTERS RELATING TO LANDLORDS AND TENANT CULTIVATORS OF PADDY LANDS, FOR THE UTILIZATION OF AGRICULTURAL LANDS IN ACCORDANCE WITH AGRICULTURAL POLICIES.

With this act, it will store only agriculture land (paddy and high land farming) cultivator (not owner) details, whereas the Land Registry maintains only the landowner details.

The Structure



DAD Organization Structure

Under DAD Head Office, there are 25 District Offices, which are headed by respective District Commissioner Officers.

Under each District Office, there are 565 Divisional Offices also known as Agrarian Service Centers (ASC), which are headed by Divisional Officers (565).

Under these Divisional Offices, there are more than 10,000 ARPA (Agriculture Research and Production Assistant) Officers representing around 14,000 GN divisions.

These ARPA Officers basically do the data collection for most of the required statistical initiatives and fertilizer subsidy distribution at village level. They collect field level data about farmers and land use. They do not conduct technical crop forecasting and production analysis.

Information Systems

There are mainly three applications used under DAD.

1. Geo Govia Smart Application
2. Agrarian Information System (Agrarian.lk)
3. Mini Irrigation Application

1.0 Geo Govia Application (geogovia.com)

A smart farming platform to assist the DAD for farmers and farm level monitoring and feedback system. This is currently the largest Agricultural Land Registry in Sri Lanka. The current version of the application is Version 1.0.

Phase 01 (Version 1.0)

The Geo Govia Application currently stores Farmer and Farmer Land (both Paddy and Non-Paddy) information. Hence, there are three main databases that are maintained at the moment.

1. Farmer Database – Store all farmer information.
2. Paddy Land Database – Store all Paddy Land information.
3. Non-Paddy Land Database – Store all Non-Paddy / High Land information.

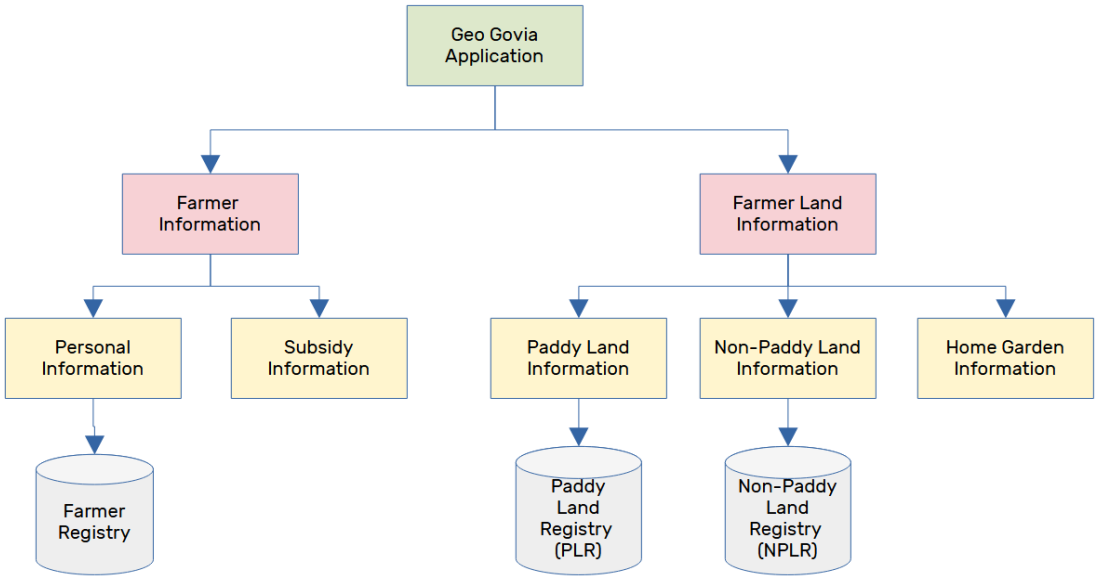
The farmer is currently identified by the NIC. However, the department is in the process of evaluating a unique Farmer ID for all farmers.

The application enables field staff or enumerators to collect the farmer / beneficiary data in real time. Geo fencing is used while capturing the farmer's land information. The KML plotting can be done manually or via Satellite or Terrain images.

There are about 1.3 million farmers and about 1.5 million farmer lands registered under the Geo Govia application.

Phase 02 (Version 2.0)

DAD is planning to have further improvements to the application as Phase 2 with crop yield forecasting for paddy plots, crop identification through satellite technologies, crop health monitoring, flood monitoring and ability to access crop damages.



Geo Govia Application

2.0 Agrarian Information System (agrarian.lk)

This internally developed application maintains a database to record the distribution of subsidies (fuel and fertilizer) among farmers.

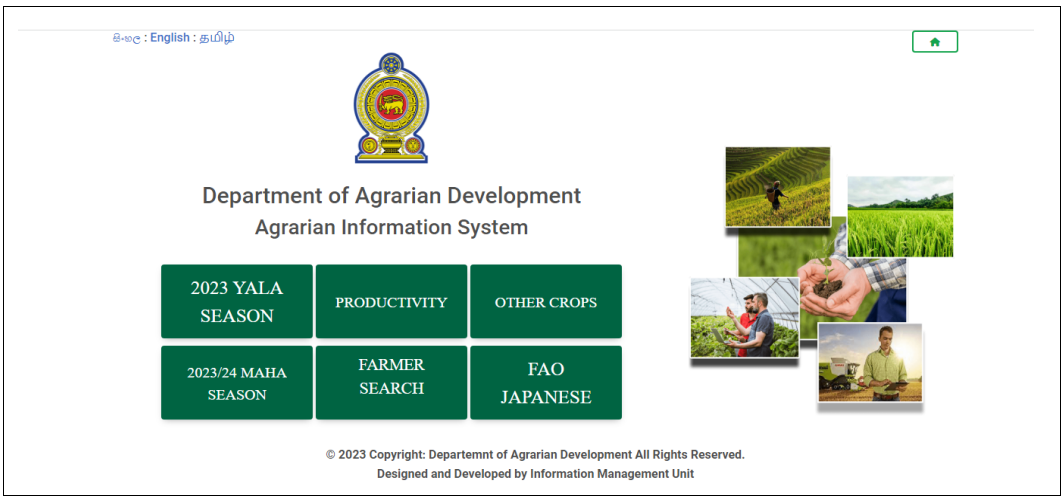
With this application the department can,

1. Minimize irregularities of subsidy distribution
2. Track subsidy details of farmers.
3. Distribute subsidies according to farmer's land size.

In addition to that, this application can be used to show:

1. The paddy cultivation schedule – From Department of Agriculture
2. Weather forecasts – From Windi.com
3. Seasonal wise cultivated area details
4. Seasonal wise harvest details
5. Amount of the crop damage
6. The extent of other crops.
7. Marketing information (annual and weekly) – From HARTI
8. Other important notices – From Department of Agriculture

ASC Officer Login



Farmer Login

Future Enhancements:

1. All island crop plant plan for all other crops (Recommendation given by Department of Agriculture)

2. Planning to introduce a proper Farmer ID to all farmers (a functional id)

3.0 Minor Irrigation Application

Minor irrigation tanks are under the purview of DAD. Hence, DAD maintains a database to,

1. Monitor all minor irrigation tanks (less than 400 acres) island-wide
2. Identify requirements for any renovation requirements of minor irrigation
3. Tracking the history of renovation activities of minor irrigation

Currently there is no link between the minor irrigation system with the total irrigation system in the country, which consists of the major irrigation schemes maintained by Mahaweli and the Department of Irrigation.

In 1991, the Agrarian Services Act No 59 was amended to establish Farmer Organizations (FOs) and to give legal authority to FOs to undertake any Minor Irrigation contracts.

Case Study – Agriculture and Agrarian Insurance Board (AAIB)

The department Is engaged in crop / animal insurance, farmer / fishermen pension and social security schemes.

There are two main acts available for AAIB.

1**. The Agricultural and Agrarian Insurance Act No 20, 1999**

2. **The Farmers Pension and Social Security Benefit Scheme Act No 12, 1987**

Information Systems

There are mainly three applications used under AAIB

1. Agricultural Information Management System (AIMS)
2. Farmer Pension Management System
3. Fisheries Pension Management System

Agriculture Information Management System (AIMS)

AIMS has been the core information management system, that has been running at AAIB since 2019 and maintaining its version 2.0 right now.

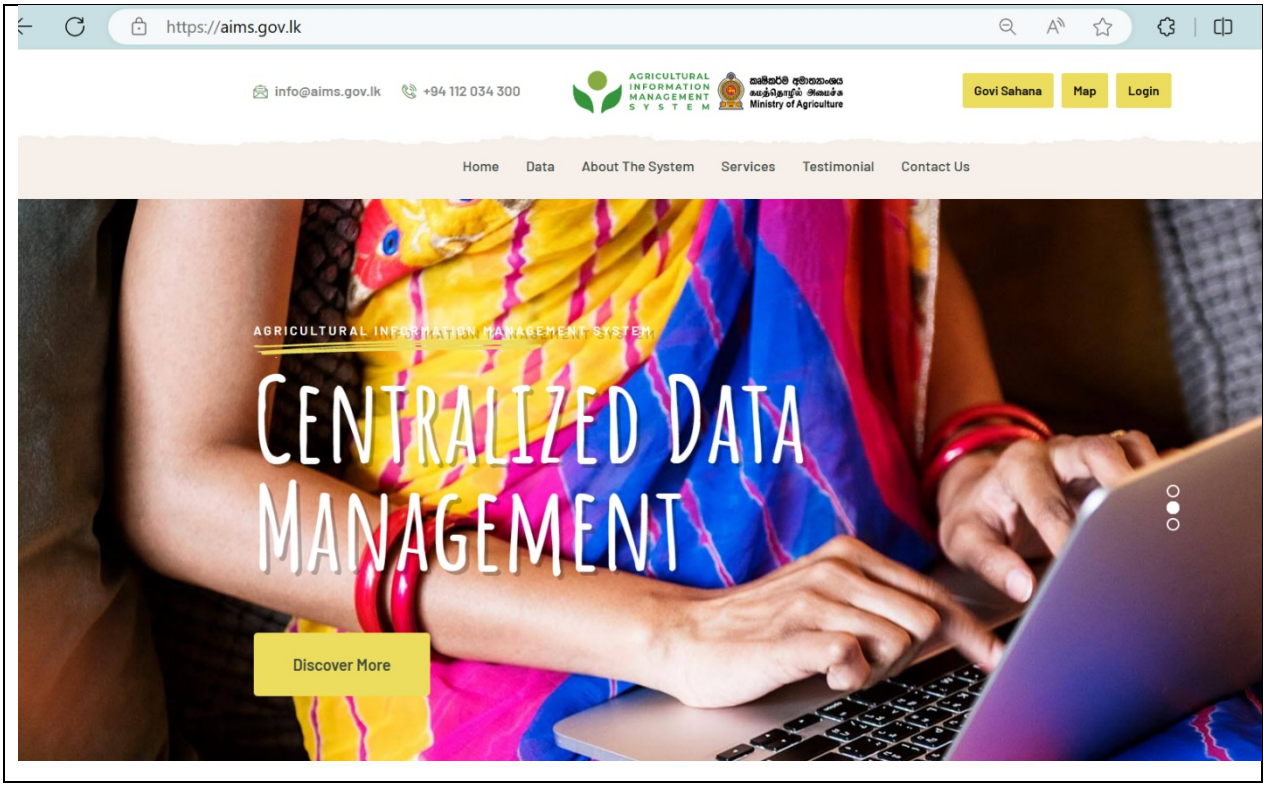
AIMS basically consists of four (04) key components.

1. **Farmer and Farm Plots / Land Identification**: In addition to farmers, farmer lands have been captured in various formats (Excel, KML, CVS, etc.).
2. **Monitoring:** Information such as cultivation details in each season, insurance details for each farmer, Index insurance value calculations are collected.
3. **Damages, Losses, and Assessments**: Along with Land information, crop damage details are also captured for the Insurance claim purposes.
4. **Claim Calculations and Payments**: With this the following are calculated.
    a. Claim calculations for Index Insurance Products. (area wise)
    b. Claim calculations for indemnity-based insurance products. (For each farmer)

c. Calculating the final paid insurance amounts.

d. Payment integrations with respective banks.

e. Payment reports.



Agriculture Information Management System (AIMS) – https://aims.gov.lk

Land Area Extent vs Cultivated Land Area Extent

AAIB currently collects data to the AIMS system using AAIB Area Officers, who were appointed by AAIB.

The main concern in the current process is not being able to find the exact cultivated land area extent of farmers, who have been registered in the system. The DAD ARPA personnel will capture only the initial Land area extent, which is initially shared to AAIB. However, this initial Land area extent does not reflect the cultivated area extent, which is an important input for AAIB.

Once the initial farmer land extent was taken from DAD, AAIB area officers will gather the cultivated area extent to the AAIB AIMS application, this will reflect the updated cultivated land details in the AIMS system.

Farmer Information

AAIB currently registers farmers who pay premium for their insurance in a separate farmer database. In addition to that, it has a database for all farmers, who are eligible for free insurance (no premium payments), which is given by the government for any damages. However, the farmers who do not pay

a premium do not have a separate registration with AAIB. All the farmer details, which are stored under AAIB has no link to DAD farmer database.

Farmer Land Information

AAIB also uses the same PLR number, which DAD adopts to store farmer land information. However, since the farmer information is not transferred to AAIB from DAD regularly, there are many data inconsistencies found in AAIB PLR related data.

Not only PLR numbers, other information such as ASC numbers, Yaya numbers are also not properly transferred to AAIB side to maintain uniformity between both sides.

Hence, it is important to have consistent updates from DAD to eliminate data inconsistencies.

Livestock Information

All livestock farmers are also eligible for AAIB insurance. However, unlike in crop farmer insurance, there is no insurance in livestock. All livestock farmers are registered with AAIB for their insurance activities. All livestock farmers with or without a registered farm under DAPH can register with AAIB at the moment. Currently, there is no API link to DAPH farm and related information and AAIB keep its own registered livestock database.

Farmer Agriculture related Vehicle Information

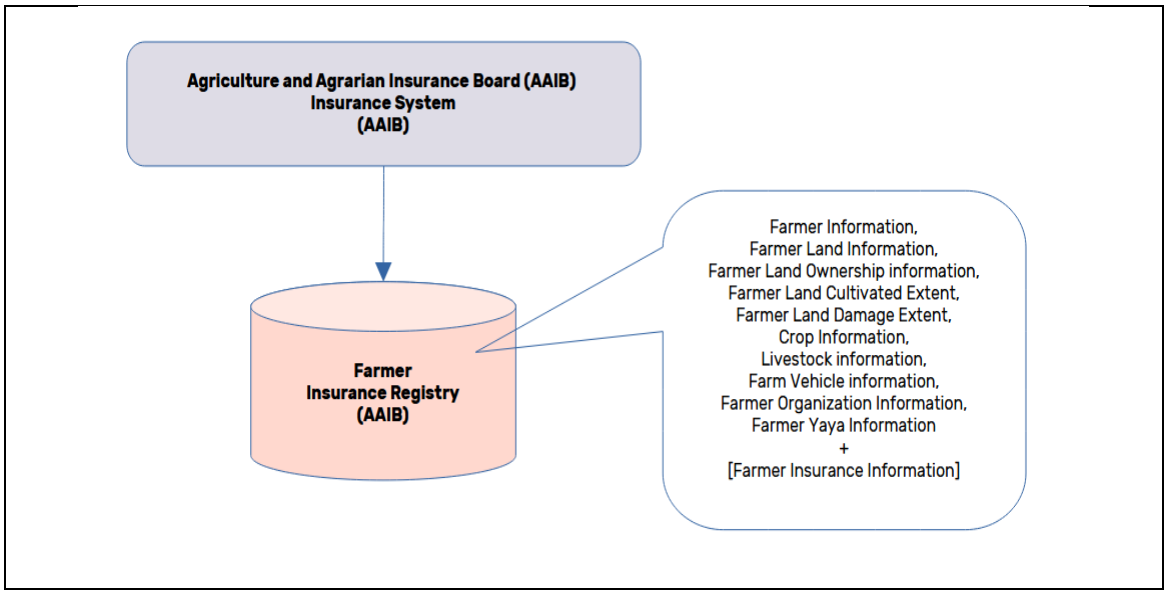
All agriculture related vehicles, which are owned by farmers can also be insured under AAIB. Hence AAIB needs to have a Vehicle information API from DMT in the future for any vehicle ownership validations. In addition to that, once the vehicle insurance application is developed it can develop an API to Vehicle Revenue License application, which is maintained by provincial governments.

Weather Data (Actual)

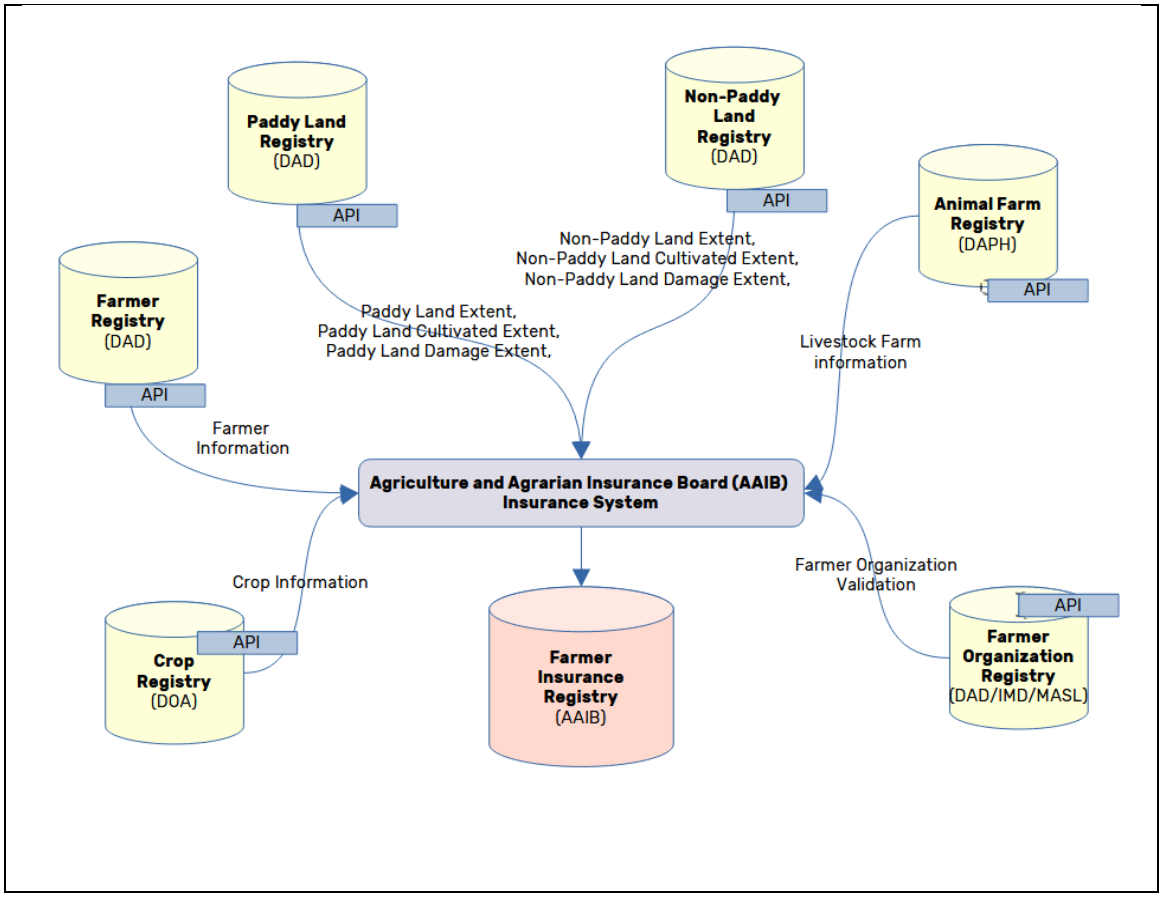
AAIB requires weather (actual) data from the Department of Meteorology (DOM) on a regular basis for the Farmer insurance payment calculations. Currently, AAIB carry out the process without having a proper update from DOM.

AAIB Current and Target Architectures

AAIB AIMS (Agricultural Information Management System) currently manages all farmer insurance related data. In addition to that, the system stores other information such as Farmer, Farmer Land, Farmer Land Cultivated Extent, Farmer Land Damage Extent, Crop, Farmer Organization, Farmer Yaya, etc. None of the additional information is taken from other data owners such as DAD, DOA, MASL, IMD, etc. Since there is no data sharing from external parties, AAIB is forced to maintain all the external data in their own database. All the external data was also collected from AAIB officers themselves. This clearly has resulted in duplicated and non-reliable datasets.



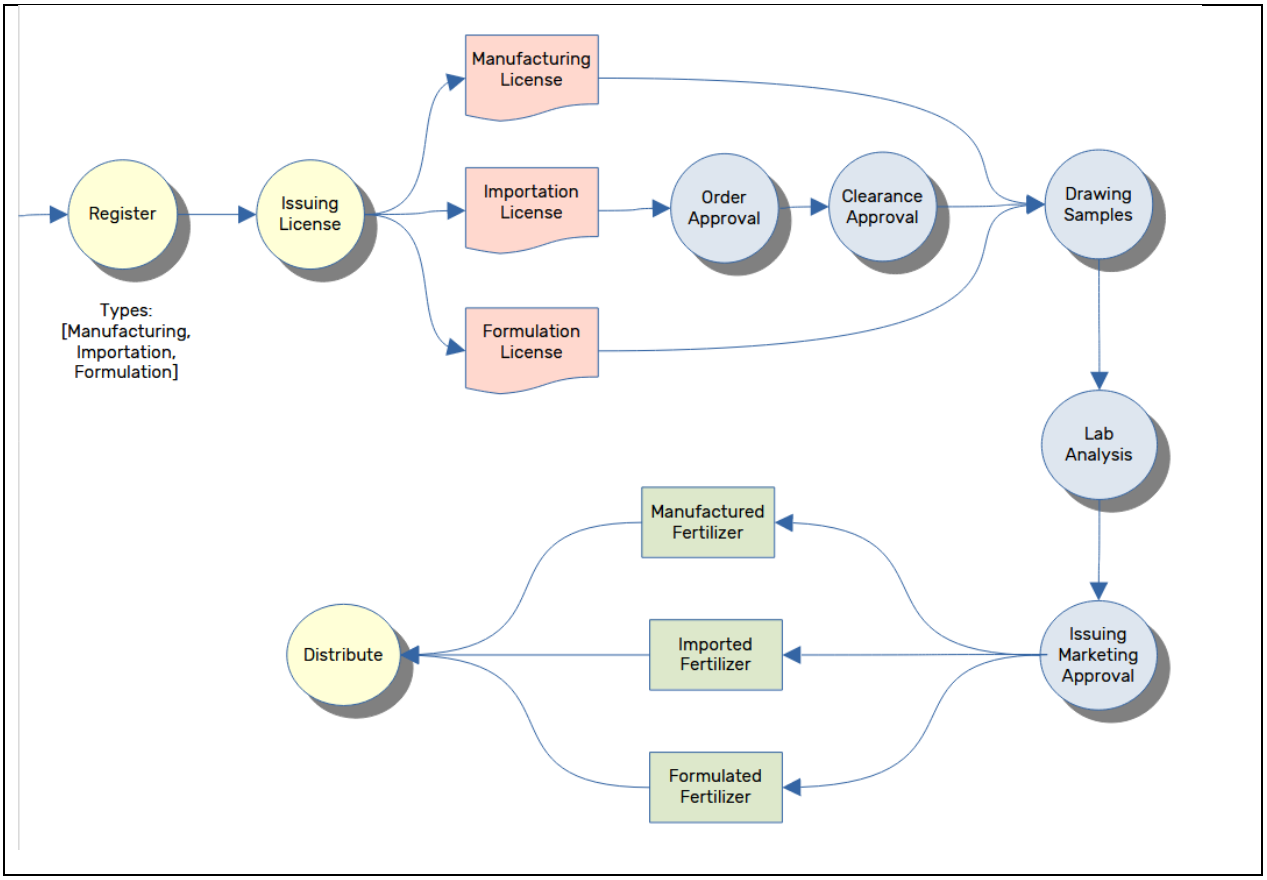
AAIB Current Architecture



AAIB Target Architecture

Case Study – National Fertilizer Secretariat (NFS)

The primary objective of NFS is to issue fertilizer licenses (Manufacturing, Importation and Formulation) to relevant stakeholders. The main information system, which is deployed at NFS is the NFS Management Information System (NFS), which handles the core functions of the department.



NFS Licensing Process

#	Information System	Description	Status
1	NFS Management Information System (NFS-MIS)	With the NFS act, it has the authority to issue licenses to import, manufacture and formulate fertilizer in Sri Lanka. The NFS-MIS is primarily developed to handle this complete workflow. By the time of our study, the system was in its first phase, and they have plans to extend it to a complete paperless workflow in the immediate future. The system monitors NFS's daily activities such as managing and facilitating fertilizer requirements around the country.	The first phase is in production. This project is completely funded by MOALLI and developed by a third-party vendor in Sri Lanka.

		It can help to issue primarily three types of licenses: 1. **Manufacturing Licenses** – Issuing licenses for fertilizer manufacturers. 2. **Importation Licenses** – Issuing licenses for fertilizer importers. 3. **Formulation Licenses** – Issuing licenses for fertilizer formulators. While issuing Manufacturing licenses, District Officers (DAD Officers), who are attached to NFS regional offices need to obtain relevant samples from the respective region, where the license is requested from. DAD officers can login to the NFS License mobile application, which has the geofencing feature to track the location should submit the sampling details to the system and then courier the sample to the NFS head office for the required lab testing. The DAD sample verification is a must to have an added verification to the system to be more reliable. The Import licenses can also be produced online by submitting multiple required documents. Once these submitted documents are verified by the NFS License division, the import license is issued to the importer. Upon receiving the import license, the importer can initiate the fertilizer importing process after making a request to the Director NFS. To obtain the Director approval, importers should submit ISO 17025 certified independent laboratory analysis certificates through a NFS laboratory via email. In the same time, manufacturer certificates also should be submitted to NFS. Once these documents have been verified each other, the pre-shipment approval (Order approval) is issued. When the ordered fertilizer reaches Colombo, the Colombo port clearance letter (Clearance Approval) is issued to Customs after verifying the Bill of Loading and relevant invoices. Once the goods are unloaded then again NFS will check the fertilizer sample before giving the marketing approval for any distribution activities in Sri Lanka. Both the local and importer lab reports	

		are attached to the final licensing process as well. **The fertilizer distribution aspect is not yet covered within the system** (as of Oct 2023). The distribution process is completely handled manually with spreadsheets and email facilities. Normally the government fertilizer distribution happens via government owned fertilizer distribution companies or via private companies. According to NFS senior officials, the system can get rid of all paper-based workflows, and it has been able to reduce the number of steps involved in the current manual business process. This has drastically removed the license issuance time from a month to 2-3 days. However, this system is still in its first phase and in subsequent phases, it will be able to reduce more steps involved in current business workflows. (By integrating testing centers, SL Customs integration, automating the distribution channels to the main system, etc.).	
2	Fertilizer Estimate Database for Crop Seasons	Maintains a small Access database to calculate and provide information to multiple entities such as DAD, Fertilizer Corporations, etc. As an input to this process, fertilizer recommendations for each crop are taken from DOA, and other relevant research institutes for every crop season. NFS is hoping to add this functionality as well to the NFS-MIS in the future.	In production
3	SL Paddy Fertilizer Mobile Application	This application gives fertilizer recommendations for paddy cultivation under Grama Niladhari divisions. After analyzing soil samples obtained from paddy fields in each Grama Niladhari division, the soil conditions of each paddy field will be tested, and the fertilizer recommendations will be given based on the results. You can find this on Google Play Store under the name “SL Paddy Fertilizer”	Though this went to production a few years back, the product seems to be having some issues now.

Integration with other Stakeholders:

NFS-MIS has multiple integrations with other external institutions such as:

1. **Testing Laboratories** (government accredited laboratories along with some reputed universities) – To test manufactured/ imported / formulated fertilizer samples. Currently these are working offline, and the department is intending to connect them electronically in the future. The laboratory report is required to get a license from the department for any fertilizer sample.

2. **Sri Lanka Customs** – Any fertilizer consignment, which needs a customs clearance required to get the NFS approval. These details will be communicated electronically to the Customs department. This is currently not yet available in the system but will be implemented in a future phase.

3. **Fertilizer Companies** – NFS gets information related to fertilizer distribution and stock related from all the government and private fertilizer companies available. All the fertilizer companies are legally bound to share all distribution and stock information to NFS at any given time. Currently this information is also taken offline and has the possibility to connect them to the system in the future. If any of the companies are not adhering to NFS guidelines and policies, NFS has the right to cancel their license with immediate effect,

4. **Agrarian Department and District Fertilizer Committees** – Both these entities are getting involved in setting targets for paddy fertilizer for a season. The Agrarian Department with their current land cultivation database, sends the required land requirement and NFS get fertilizer recommendation for a region from DOA to calculate the estimated fertilizer requirement for the coming season.

5. **Department of Agriculture and Research Institutes** – NFS gets fertilizer recommendations for Paddy (Urea, T.S.P, M.O.P.) from DOA with the help from Rice Research Institute (RRI). (https://doa.gov.lk/rrdi_fertilizerrecomendation/). The Rubber Research Institute, Tea Research Institute (TRI) and other research institutes are providing fertilizer recommendations for relevant crops to NFS as well.

6. **Statistics of Census and Statistics (DCS)** – NFS fertilizer related licensing and distribution statistics are shared with DCS and then DCS shares them with the Central Bank and even with the Presidential Secretariat. Hene there is no duplication of data from any other institution related to fertilizer master datasets.

Case Study – Socio Economic and Planning Center (SEPC)

Purpose:

SEPC is mandated to conduct socio economic research and policy analysis in relation to the production and marketing of DOA mandated food crops.

It is the primary advisory body to DOA in formulating agricultural policies and plans. Furthermore, it works as the agricultural information and socio information hub in the sector.

Primary objectives are:

1. Socio Economic Research – (Production Economics, Agriculture Marketing and Price Analysis, Agriculture Policy Analysis, Project Analysis and Planning, Rural Development, Research and International Trade)
2. Crop Forecasting
3. Cost of Cultivation Surveys
4. Agriculture Economic Data Management
5. International Trade and International Relations.

Information Systems:

#	Information System	Description	Status
1	Cost Of Cultivation (COC)	Publishes the "Cost of Cultivation (COC)" of Agricultural crops (Paddy, OFC, and Vegetables). This can help, - To decide the guaranteed prices of the crops. - To decide the insurance claim amounts when damage occurs to the cultivation. The collected data is analyzed and published by district level and Irrigation mode (Irrigated/ Rainfed). Frequency: Seasonal Data is collected by: *SEPC Field Officers*	Currently the data is in Excel formats. In the process of building an application.

2	Crop Enterprise Budget (CEB)	This publication provides basic technical information and enterprise budgets for selected fruits and floricultural crops on a single page allowing for easy readability and access. Frequency: Every 04 years. Data Collection: By *SEPC Field Officers*	Currently on Excel. In the process of building an application.
3	Crop Forecast (CF)	Publishes the "Crop Forecast (CF)" for Paddy, OFC, and Vegetables. This will basically help senior management at DOA to decide on the crop quantities to be imported whenever there is a need to do so. In addition to that, it can imply possible crop damage as well. Frequency: Monthly Data Collection: The initial data is collected by *ARPA (DAD)* and *Mahaweli Unit Officers* at the grass root level. Once the data is collected by ARPA (DAD) officials, they hand over the collected data to AI officers at ASCs. Then Deputy Director (DD) officers at Provincial DOAs (There are 24 offices) or Inter-Provincial DOAs (There are 6 offices) will enter the data to the CF database. Same as above, Mahaweli Unit officers' hand over data to Mahaweli Block offices and then hand them over to Mahaweli System (10) offices before adding them to the CF database.	Currently on Excel. Croplook.net is the application built on for this purpose.
4	Croplook.net (Crop Forecast Information System)	This application has automated the Crop Forecast (CF) business process and has been in operation for some time. This generates output every two weeks and is used as an input for the monthly CF publication. Frequency: Bi-Weekly	Currently a MySQL based web/ mobile application is available. Developed by NAICC.

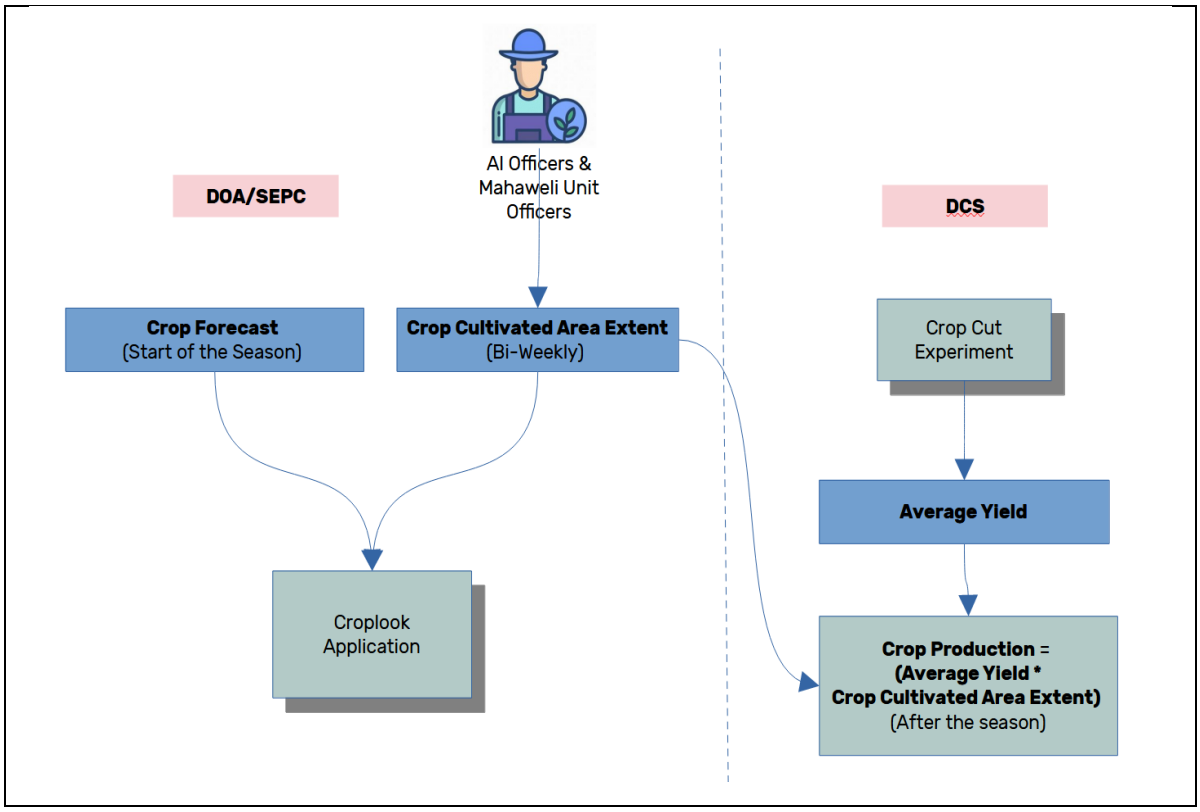
5	CROPIX (https://digital.doa.gov.lk/)	This is the latest application, which captures primarily the CF information. This will basically replace Croplook.net application, once the complete migration is completed.	Currently in testing stage. This will replace Croplook.net application. Supported by: FAO
6	On-Farm	To obtain accurate land area information for **OFC** and **vegetables**.	The project has been initiated but the project system development has not yet been started.
7	Agri-Look	To obtain accurate land area information and production forecast for **paddy** cultivation using satellite images. This is complete JICA funding including system development.	A pilot system is being developed for two (02) Kurunegala DSs and two (02) Anuradhapura DSs.
8	Crop Cutting Experiment (CCE)	A Crop Cutting Experiment (CCE) is a known scientific experiment determining the **average yield of a crop of an area**. The key objectives of CCE are: 1. To determine "average yield" of cropped area, which can represent the sample yield for a season. Having the "average yield" will help to get the **crop production**. **Crop Production = Average Yield * Cultivated Land Extent** **P. Note:** - The "Cultivated Land Extent" can be obtained from the *Croplook* application data. - The "Crop Production" is currently obtained a few months after the crop season is over, probably due to the CCE process. 2. The government can estimate whether there will be shortage or	System development is in progress.

		surplus in a particular year. **Paddy CCE**: This is currently done by DCS with the help from AI officers. DCS gets a random farmer sample of about 8,000 from the Agrarian farmer database and sends the list to AI officers to get the test done. **Other Crop CCE:** The CCE test for other crops has not been done properly by DCS due to the lack of accurate farmer databases for other crops. Due to this, the crop yields for other crops are a figure taken from AI officers, which could be an estimated or a forecasted figure purely based on the past information, or the current data captured from farmers. In order correct this, DOA started implementing CCE as a pilot project for nearly 12 OFCs.	

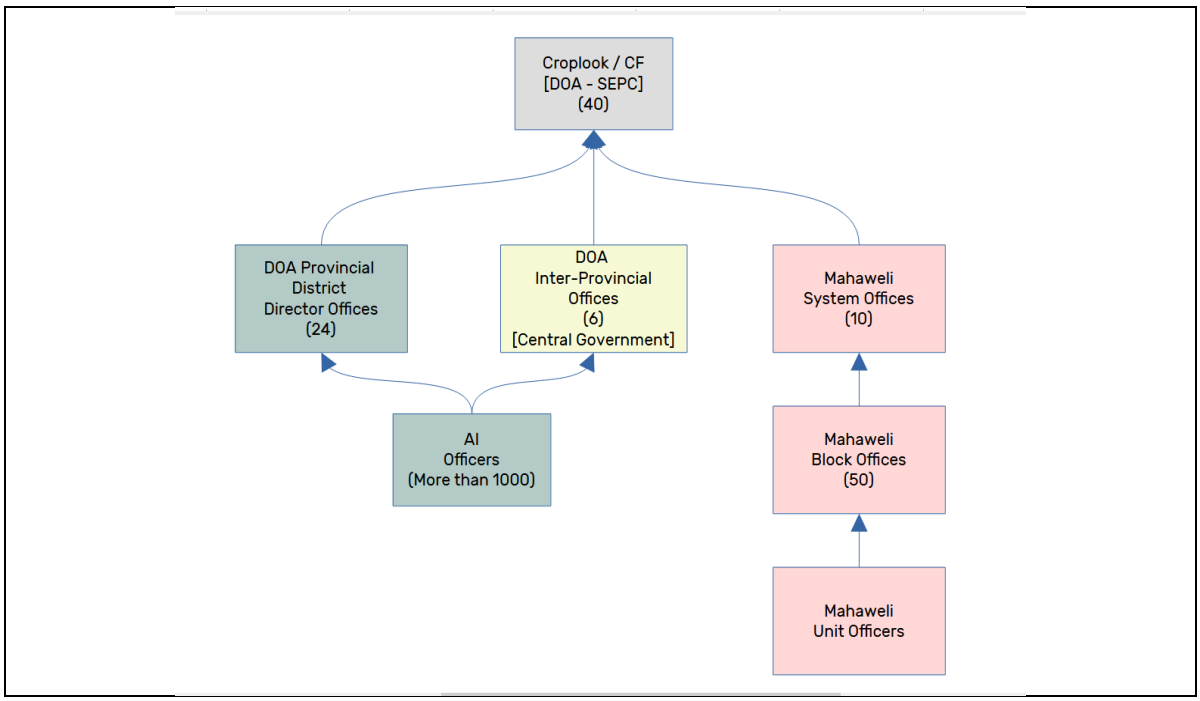
The Data Collection Process

SEPC currently utilizes the Provincial, Inter-Provincial, and Mahaweli structures (See diagram below) to collect data especially for Crop Production and Forecasting. This structure has been in place for most of the data collection and technology diffusion activities for projects and under DOA.

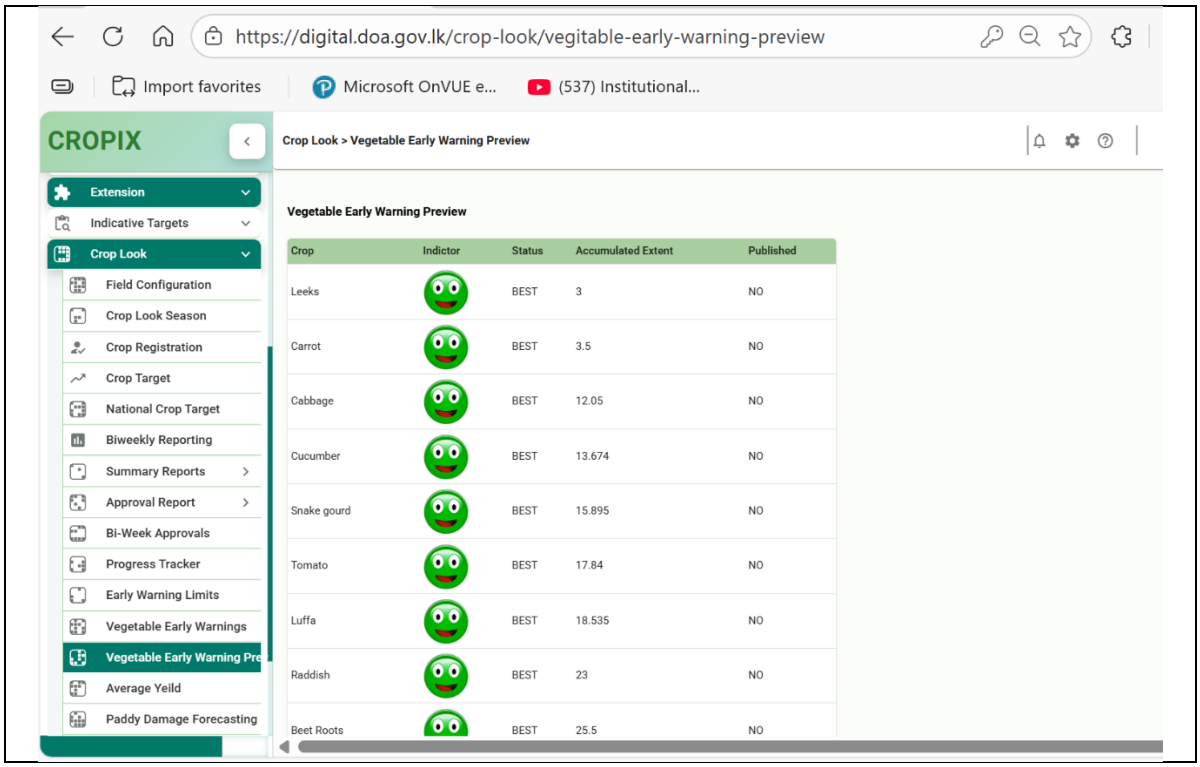
In this structure, there are more than 1000 AI officers, who are reporting to DOA Provincial District Director Offices (DDOA) and Inter-Provincial (IP) offices. Altogether, there are 24 DOA Provincial District Offices and 06 Inter-Provincial offices in the structure. In addition to that, there are 10 Mahaweli offices in each Mahaweli system area, which are managed by 50 block offices at the next level. Mahaweli Unit officers are carrying out the job, what AI officers are doing for the provincial and inter-provincial setup. Hence, all AI officers and Mahaweli Unit Officers are part of the data collection process.



Crop Forecast, Crop Area and Crop Production Calculations



The Data Collection Process



CROPIX Application

Case Study – Seed and Planting Material Development Center (SPMDC)

Purpose:

SPMDC is entrusted to produce a wide range of food crop seeds and planting materials to meet the national agricultural requirements.

The primary objectives are:

1. Produce seeds for Food Crops (Vegetable, OFC, Paddy, Potato) and Planting Materials.
2. Manage Seed Farms and Subunits
3. Seed Processing, Storage, Distribution, Marketing, and Coordination.

Governance Structure:

This department consists of:

- 16 Regional Deputy Director of Agriculture (DDA) Seed Offices.
- 29 Government Seed Farms (SPMDC Farms)
- 33 Sales Centers
- 03 Special Units

Current Business Process

SPMDC produces seeds at various stages in the business process. SPMDC "Farm Division" gets breeder seeds from various crop research institutes. As a policy, research institutes can only provide breeder seeds to SPMDC and do not sell them to any private seed producers in the process.

Furthermore, SPMDC does not produce breeder seeds at any stage of seed production and totally relies on the breeder seed updates from research institutes regularly. Generally, a single breeder seed is consumed by SPMDC maximum for about three (03) months.

From paddy/ OFC breeder seeds, it can produce the following seed classes:

1. Foundation Seeds
2. Register Seeds
3. Certified Seeds
4. Commercial Seeds – (If produced seeds are not enough for the season)

From vegetable seeds, it can produce the following seed classes:

1. Basic Seeds (Foundation, Registered and Certified)
2. Standard Seeds
3. Commercial Seeds (If produced seeds are not enough for the season)

(P.Note: Foundation, Registered and Certified Seed are also known as "Basic" Seeds)

Government Seed farms, which are registered under SPDMC generally produce "foundational" seeds. These "foundational" seeds are distributed to other seed producers as "registered" seeds. Those seed producers can then multiply and sell them as "certified" seeds.

Seed Receivers and Suppliers

The seed producers, who receive the seeds are known as "Seed Receivers". The seed producers who produce and sell them to other farmers are also known as "Seed Suppliers".

In each seed generation change ("Breeder" -> "Foundation", "Foundation" -> "Registered", "Registered" -> "Certified") the respective "lot" is sent by the respective Seed Farm to SCS as a "Certification Request" for the required certification.

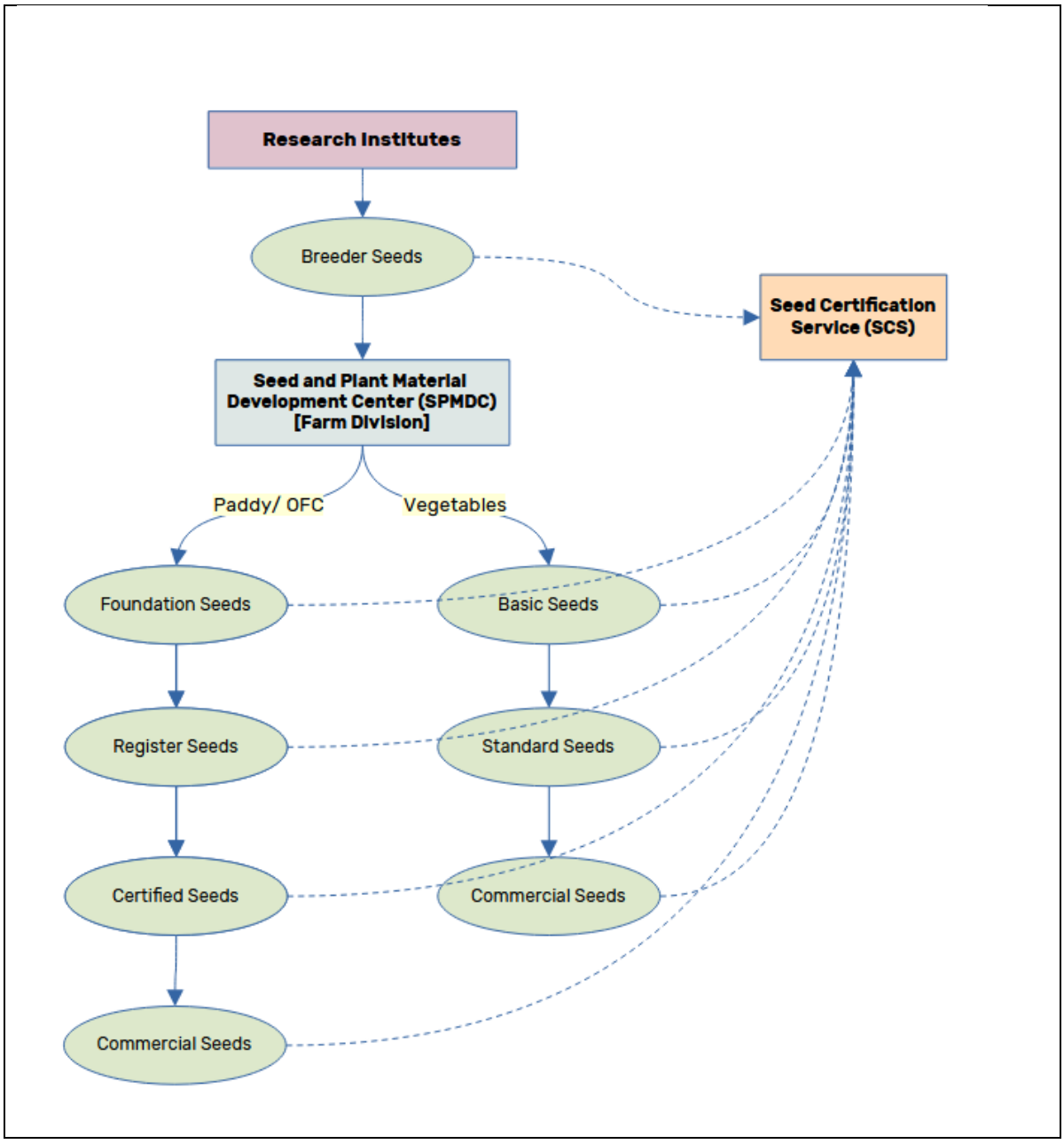
The seed production happens in both "Government" and "Private" seed farms. Though all Government farms are certifying their seeds through SCS, there is a very small percentage of seed certification happening via SCS for "Private" farms. Since this is not mandatory in the Seed Act, private farms do not use the SCS facilities and prefer to certify themselves. However, the Seed Act has provisions to allow the SCS to do random audits in the private sector to maintain the high-quality standards.

The validity of a seed certification issued by SCS is a maximum of three (03) months. Hence, it is required to re-certify the same “Seed lot” again for future use.

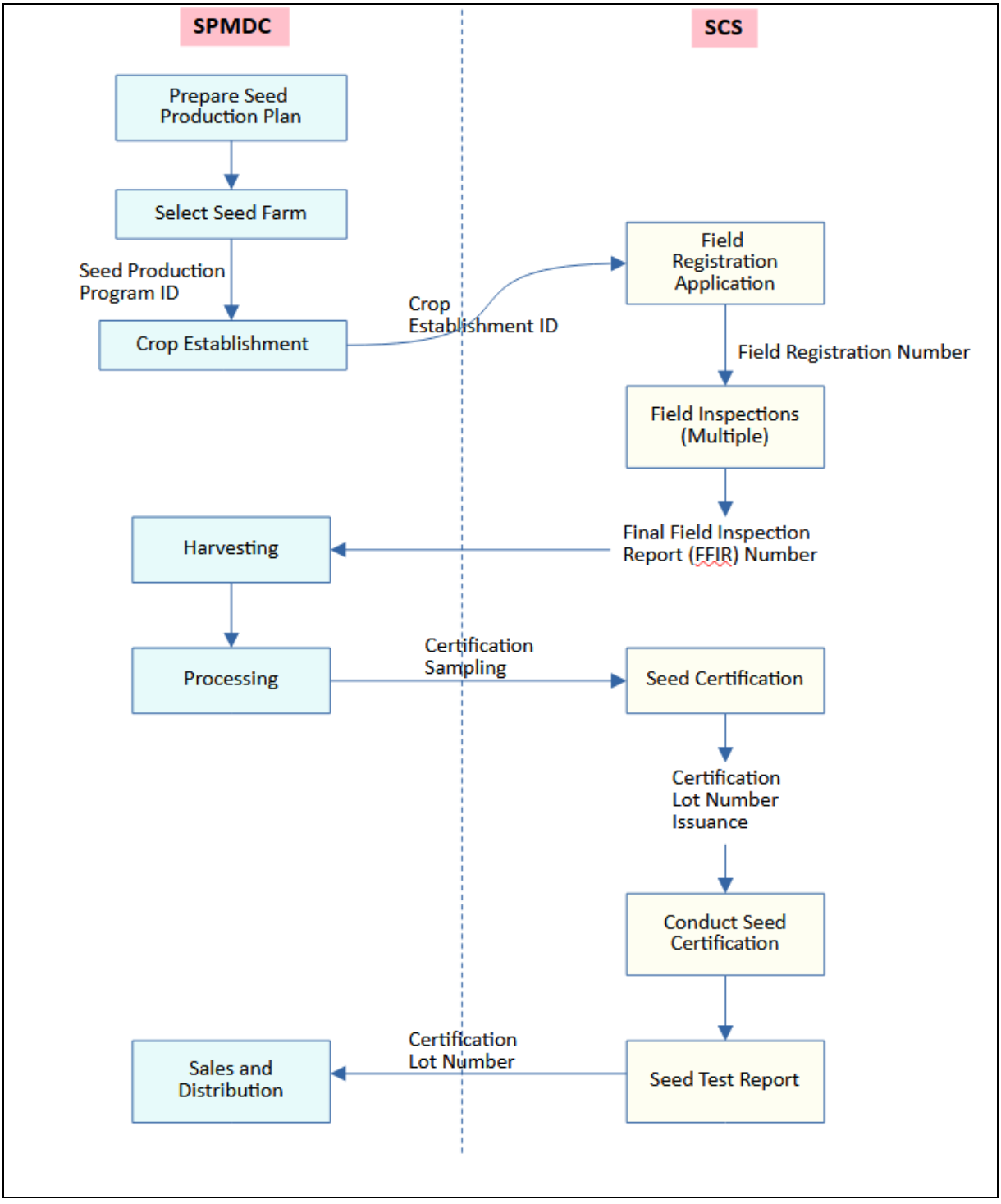
Seed Lot and Lot Number

“Seed Lot” means a definite quantity of seeds identified by a “lot number”, every portion or bag of which is uniform, within permitted tolerance, for the factors which appear on the label (Seed Act No 22, 2003).

The same “lot number” is being used in both SCS and SPMDC sides until it is dispatched to the seller. Currently the “lot numbers”, which are generated from the SCS side are entered manually to SPMDC systems, which can be erroneous at times.


Research Institutes
Breeder Seeds
Seed Certification Service (SCS)
Seed and Plant Material Development Center (SPMDC) [Farm Division]
Paddy/ OFC
Vegetables
Foundation Seeds
Basic Seeds
Register Seeds
Standard Seeds
Certified Seeds
Commercial Seeds
Commercial Seeds

Process Flow between SPMDC and SCS



Once the SPDMC completes the seed certification with SCS, seeds can either be sold to Government / private farms for further multiplication. Private sector farms can either sell them to crop farmers or can do the multiplication internally. However, most of the private sector seed certifications currently do not use SCS testing laboratories for certifications. They either do an internal self-certification or get

a third party to carry out a quality audit. However, this has created less visibility in terms of total seed production.

Information Systems:

Primarily, there are four (04) key systems maintained. In addition to that, there is a Contract Grower Application also maintained.

The details of each system are as follows:

#	Information System	Description	Status
1	Seed Stock Management System / Seed Inventory Management System	The main objectives are: - Stock management of all seed products. - Inventory management - with real-time stock availability, “receipts” and “issuing” patterns. - A detailed number tracking - for each crop variety for the total traceability. It is in the process of introducing of a “Batch Number” within a “Lot Number” to ensure more traceability. - Determination of seed prices. This system can be accessed and updated by all 16 Seed DDA offices.	In production. Implemented in the Google Cloud Platform along with Google App Scripts.
2	Seed Production Program and Progress System (SPPPS)	Manages seasonal seed program action plans and maintains real time information on SPDMC farms and regional DDA office crop activities along with their progress. Each program is identified by a “Program ID”. [“Program ID” is an identification maintained by SPMDC in this process to prepare Seed Targets for a given season – For a Crop and for a Farm] **Seasonal Program Action Plan**: The detailed plan for the seed production	In production. Implemented in the Google Cloud Platform along with Google App Scripts.

		program. **Monthly Progress Updates**: Regional offices will provide monthly progress reports on their activities, including crop establishments, and status. ["Crop Establishment" is the process that involves preparing the soil and planting the seeds to ensure successful germination and the growth of crops.]	
3	Seed Test Report Data System (STRDS)	This report is produced to maintain comprehensive information regarding all available seed stock by managing and utilizing all seed resources. In addition to seed stock levels, the report further shows vital parameters such as germination rates, moisture levels, and other relevant characteristics of the seed stock. By monitoring and updating this data regularly can ensure that SPMDC maintains a clear understanding of the condition of seed resources and can make informed decisions regarding their utilization, and distribution.	In production. This is **integrated** into the Seed Certification Service (SCS) and SCS owns the data.
4	Contract Grower Database	This system registers "contract growers" who are involved in the Seed Production. It has helped to streamline the process of onboarding, tracking, and maintain contract grower's records, fostering transparency and accountability. Once a contract grower is registered with SPMDC, those details are sent manually to SCS for their field level verifications.	In production. This is **integrated** into the Seed Certification Service (SCS-DOA) and SCS owns the data.

Case Study – Seed Certification Service (SCS)

Purpose:

The mission of SCS is to provide Seed and Planting material maintaining high-quality standards and protection of genetic and physical purity of the seed and planting material.

Its primary objectives are:

1. To provide certification for Seed Paddy, OFC, Vegetable, Seed Potato, Fruit plants and breeder seeds.
2. To provide Seed Handler Act Registration (under Seed Act No 22, 2003)
3. To provide Seed SL-GAP Certification
4. Imported seeds testing.
5. DUS testing (is a way of determining whether a newly bred variety differs from existing varieties within the same species)
6. Seed technology research
7. Seed health testing

Governance Structure:

The department consists of:

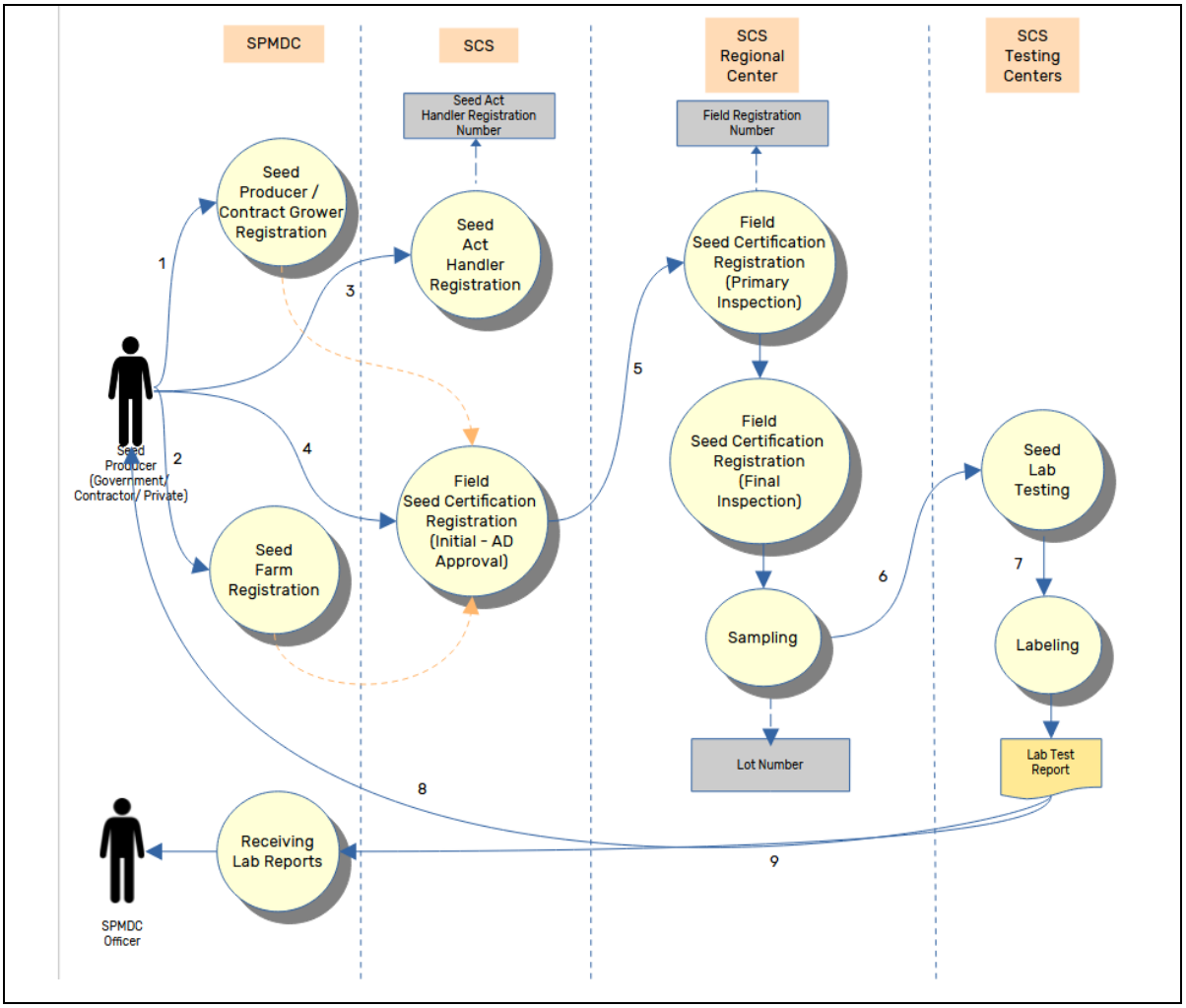
- 24 Regional Seed Certification Service (RSCS) Centers
- 05 Seed Testing Lab (STL) Centers
- 06 Post Control Units
- 01 Seed Health Testing Unit (SHTU)

Current Business Process (Seed Certification):

The following steps followed by the diagram will explain the basic flow of the Seed Certification process and SCS's interaction with SPMDC and the Seed Producer.

There are multiple documents exchanged between each party and all the documents are not shown or explained for brevity.

1. **Seed Producer / Farmer Registration** - There are three types of Seed Producers / Farmers handled by SPMDC now. (Government Farms, Contract Growers, Private Farms). However, SPMDC does not store Private Farmer information in their databases and solely rely on the SCS information provided to them later in the process. The rest of the seed producers (Government Farms and Contract Growers) are registered in SPMDC databases.
2. **Seed Farm Registration** - Along with Seed Producer details, the related Seed Farm details are also captured.
3. **Seed Act Handler Registration** - All stakeholders in the seed value chain (All crops including Tea, Rubber, Coconut, Export Crops, etc.) need to get registered with the Seed Act Handler System, which is hosted by SCS. This is part of the Seed Act compliance. Once registered the Seed Stakeholder is provided with a "Seed Act Handler Number", which is a prerequisite for any Seed related activity in SCS/ SPMDC.



Business Process (Seed Certification)

4. **Seed Certification (Initial – AD Approval)** - Seed Producers send their certification request to the SCS Head Office at Gannoruwa for the required AD approval with a copy to the Regional Office (RSCS).
5. **Seed Certification (Field Inspection)** – Once the AD approval is granted, the Seed Certification field inspection takes place at the RSCS level. During this stage, a "Seed Certification Registration Number" for the seed producer/ farmer and a "Lot Number" for the seed lot are generated. (Manual Process). In addition to that, a "Field Inspection Report" also generated with all the relevant inspection details.
6. **Seed Lab Testing** – If the "final" inspection was a success, a seed "sample" is forwarded to a SCS Lab Testing center for the lab test. There are three types of test samples (A-Test. B-Test and C-Test).

Test Type	Description
A-Test	Testing to identify whether the seed lot is suitable for processing
B-Test	Processed seeds are inconformity to the seed certification standards
C-Test	Labelled seeds are tested again before being issued from the store for SCS compatibility standards

7. **Seed Lab Test Labeling** – Once the Seed Lab Test is completed and passed, the relevant seed lot is marked with multiple seed labels based on the seed class, etc.
8. **Seed Lab Test Completion** – Once the labeling is completed, the "Final Seed Lab Test Report" is sent to the Seed Producer.
9. **Updating SPDMC** – At the same time, the same information is sent to SPMDC to update all Seed Stock Level information.

Current Business Process (Fruit Plant Material Certification):

Out of plant materials involved**, only fruit plants are certified** under SCS. Even under fruit plants, only 52 fruit plant varieties (only budded fruit plants), which have been recommended under DOA are certified. The "layered plants and seedlings" are not certified by SCS yet.

The following are the steps involved:

1. **Seed Act Handler Registration**: To request a fruit plant certification, it is required to obtain the Seed Act Handler Registration beforehand.

2. **Fruit Plant Certification Request**: The initial certification request comes to SCS head office with a copy to the SCS regional office. Once the SCS plant certification head approves the request, the rest of the process is continued. However, to complete the certification request, it is required to register the fruit plant nursery with SCS.

3. **Nursery Inspection**: There are two types of Nurseries for fruits. (Government and Private). Unlike Seed Certification, there are no Contract farmers/ growers here.

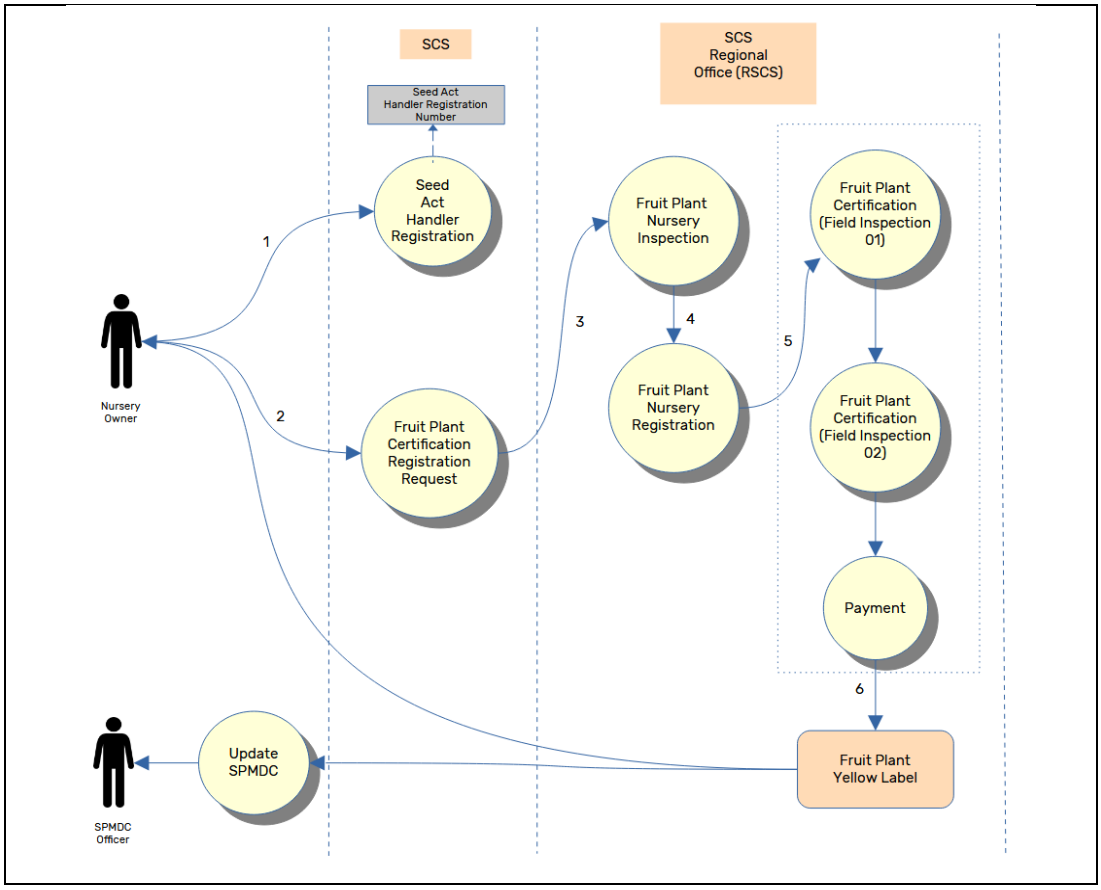
4. **Nursery Registration**: Once the nursery inspection is completed, the relevant fruit nurseries are registered. The registration is an annual process, and it needs to be renewed every year.

5. **Fruit Plant Certification**: Once the nursery registration is completed, the fruit plant certification is initiated.

   Prior to the certification, basically there are two inspections that happened by RSCS/ SCS. These two inspections do happen before the initial certification payment for the plant labeling. The first inspection happens at the seedling stage and the second happens just before the budded grafting. Once the payment is made and the final inspection happens during the period of plant hardening.

6. **Fruit Plant Labelling**: Each plant is given a separate yellow label, once the certification process is completed.

7. **Update SPMDC** – Like in the Seed Certification, SCS updates the Fruit Plant Certification information to SPMDC as well.



Business Process (Fruit Plant Certification)

Information Systems:

There are four (04) systems in operation along with an Excel file.

#	Information System	Description	Status
1	SCS Information System	This is the Seed Certification System for Paddy, OFC, Vegetables and Potatoes. The initial registration happens at the SCS head office and then the final registration is done at the regional level. Once the registration is approved at the regional level the details are sent back to head office to capture the laboratory details.	In production A Java based stand-alone application.
2	SCS Laboratory Data	Once the Seed Certification is issued for a	In production.

	System	particular seed, the seed certification details are forwarded to SCS Laboratory Data System to process the laboratory result details. Once they are entered, the results will be forwarded to SPMDC. URL: http://scsdoa.lk/index.php]	A PHP/MySQL Web application There is no apparent integration with SCS / SPMDC Information System(s) now. All the integration does happen manually.
3	Seed Act Handler System	Complying with the Seed Act No 22 in 2003, everyone who handles seeds needs to get registered (Both Agriculture and Plantation sectors) with this system. "Seed Handler" – means any person who as producer, importer, distributor, conditioner, repackage agent, or retailer who is responsible for causing a seed to be placed in the market in Sri Lanka. (Seed Act, No 12, 2003). Seed Act Handler Application (On-Line): https://scs.doa.gov.lk/scsseedact/index.php	In production An MS Access based database application.
4	Fruit Plant Certification	The Fruit Plant Certification information along with Fruit Plant Nurseries are captured here.	This process is handled by an Excel File and there is no application / database maintained for the moment.
5	SL-GAP Certification System		A new application development is in progress with the help of FAO.

Concerns:

1. Though there are multiple systems available for each business process, there is minimal integration among them. Whatever the output of one process is to be keyed in manually to the next process. This will lead to inaccuracy and reliability of the data.

   For example, there is a difficulty of getting the correct "Certified Quantity" of a crop at a given time, unless you combine both SCS Information Systems and the SCS Laboratory System. SCS Information can primarily give the "Land Extent", which was cultivated using a certified seed (e.g. The number of acres of paddy land cultivated using paddy seeds) and the SCS Laboratory System can extract details of the "Certified Seed Quantity" for a given crop.

2. Data normalization is not at an optimum level. All the systems under SCS should function as an integrated system with minimal data isolation.
3. Neither SPMDC nor SCS stores Private Sector Seed Producer details. Currently, only SCS does register them whenever they request their services, which is very rare among private seed producers. Therefore, lack of visibility on the private seed producers / farmers and their seed production capacity is a major shortcoming in the current process. It is always good to know the total seed production of the country, which is not possible due to this system/ process limitation.
4. There is no database maintained for Planting Materials.

Case Study – Plant Protection Service (PPS)

The Plant Protection Act No 35, 1999

This is AN Act TO MAKE PROVISION AGAINST THE INTRODUCTION INTO SRI LANKA AND THE SPREADING THEREIN, OF ANY ORGANISM HARMFUL TO, OR INJURIOUS TO, OR DESTRUTIVE OF, PLANTS, AND FOR THE SANITATION OF PLANTS IN SRI LANKA; FOR THE REPEAL OF THE PLANT PROTECTION ORDINANCE (CHAPTER 447); AND FOR MATTERS CONNECTED THEREWITH OR INCIDENTAL THERETO

The main activity is the implementation of Plant Protection Act No. 35 of 1999, through empowering of authorized officers and stakeholders on relevant provisions appointed island wide on the management of pest/disease outbreaks, implementation, monitoring and evaluation of field level Integrated Pest Management (IPM) programs in rice, vegetables, fruits, other field crops and home gardens, Mitigating the impact of aquatic weeds and other invasive flora on agricultural lands with training of officers and farmers, Conducting bio-efficacy trials for pesticides especially weedicides and termiticides in farmers' fields, and termite control activities in the DOA/Government building premises.

Furthermore, the Plant Protection Service is the coordinating center of the activities of the Permanent Crop Clinic Program (PCCP) with the collaboration of the Centre for Agricultural Bioscience International (CABI).

Other activities of PPS include rodent management in rice fields, pest management in places of national and historic importance, and implementing a pest surveillance system and advising through stakeholder networking.

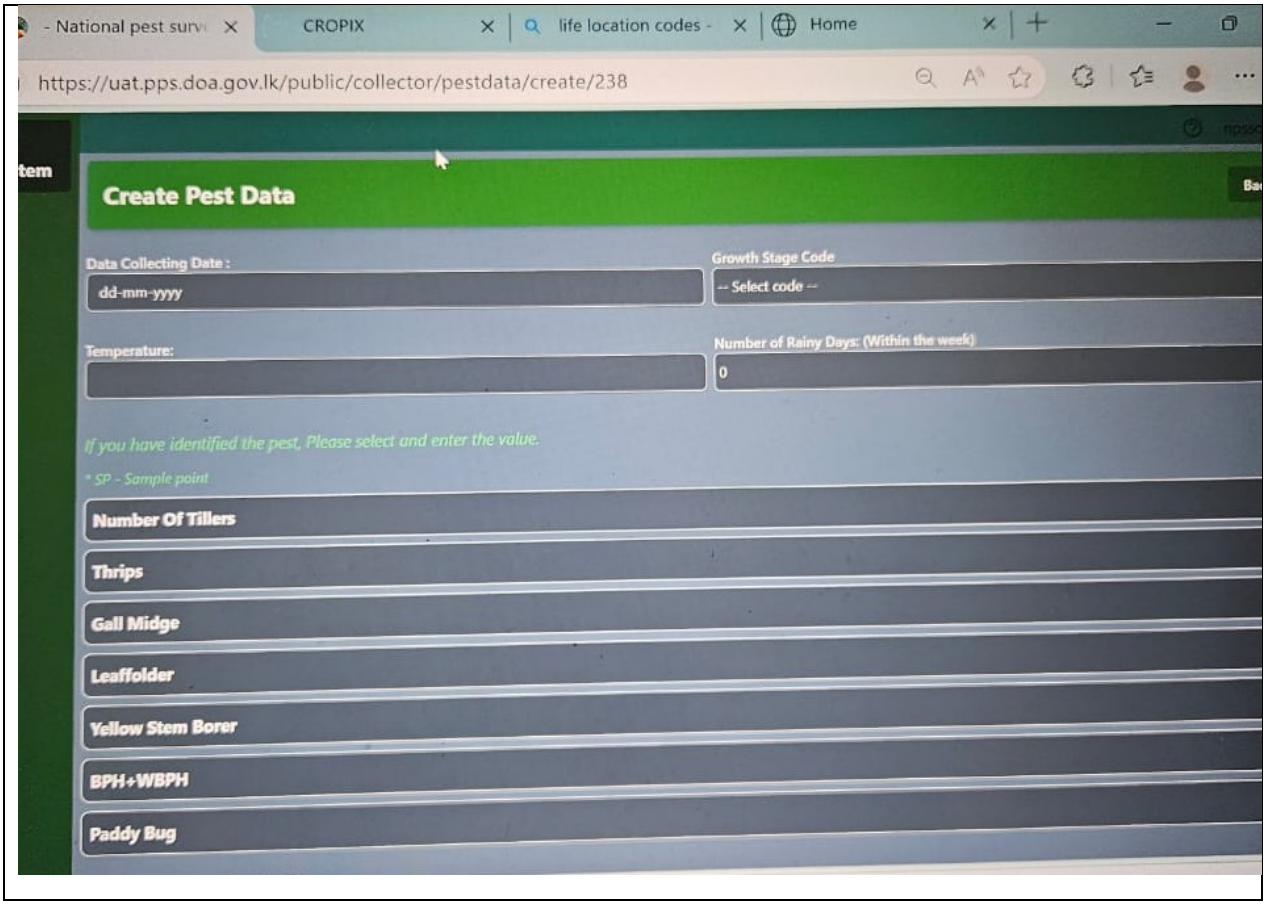
Regional Offices – 02 (two) - [Planning to have a regional office in each province in the future]

For current pest control activities, PPS gets the help of the DOA Extension department's AI staff's (Provincial and Inter-Provincial) to collect data from selected sites.

Information Systems:

#	Information System	Description	Status
1	National Pest Surveillance System (NPSS) https://uat.pps.doa.gov.lk	The main purpose of the system is to record the **density of targeted pests** (animal pests including inspects, pathogens, and weeds) or **damage severity** in the selected location throughout the cropping season on a regular basis. Furthermore, it can be used to identify pest outbreaks for a selected crop well in advance. However, this application is currently operational only for the paddy cultivation for six (06) identified pests. (Rice thrips, Rice Gall Midge, Leaffolder in Rice, Yellow Stem Borer, Brown Planthopper (BPH), White Backed Planthopper (WBPH), and Paddy Bug)	Currently in operation. Developed internally as a mobile web application allowing AI officers to access it at the AI range level. Data is collected weekly as ten (10) samples within a 500 square meter area. Since data collection is a manual process, the adoption has been at a low rate.
2	Invasive Alien Plant Species (IAPS) System https://scppc.doa.gov.lk/Pest/index.php	This is having a database of all IAPS, which are grown in Sri Lanka. [IAPS are animals and plants that are introduced accidentally or deliberately into a natural environment where they are not normally found, with serious negative consequences for their new environment.]	Currently only a database is available based on the distribution of species across the country. Geo mapping has not been done so far and the department is planning to get NRMC expertise on this.
3	Permanent Crop Clinic Program (PCCP)	Can be used to identify farmer level issues related to plant diseases. These are being	This system is hosted by CABI and the

		captured to PCCP system, which has been a collaboration with Centre for Agricultural Bioscience International (CABI). This has created a good knowledge base about farmer plant related issues and feedback.	department has the access to all the data history for their decision making.



Pest Data Capturing on the National Pest Surveillance System (NPSS)

Case Study – National Plant Quarantine Service (NPQS)

The department implements the **Plant Protection Act No 35, 1999.** It was set up to protect Sri Lanka's agriculture by mitigating risks associated with plant pests and diseases. It enhances Sri Lanka's phytosanitary infrastructure by developing new procedures and legal provision for pest surveillance and risk analysis aiming for consistent import and export regulations.

Key objectives are:

- Preventing the introduction, establishment, and spread of dangerous alien pests within Sri Lanka
- Development of treatment technologies to eradicate pests of quarantine importance.
- Promoting the export of healthy plants and plant products in compliance with International standards such as IPPC (International Plant Protection Convention).

Information Systems

#	Information System	Description	Status
1	Phytosanitary Certificate Issuance (Generic ePhyto National System (GeNS)**)**	ePhyto is the short term for "**electronic phytosanitary certificate**", which is the electronic version of the information contained in a phytosanitary certificate **ISPM (International Standard for Phytosanitary Measures) Standard 12** (ISPM, 2001). A phytosanitary certificate is a document, which states that the material is free from quarantine and other injurious pests, and that the importation agrees to the plant import rules of the importing country. Phytosanitary certificate issued by any country should conform to the model appended to **International Plant Protection Convention** (IPPC, 2024). IPPC has realized that paper based phytosanitary certificates (PSC) have many drawbacks. Therefore, they have	In production since 2022 March

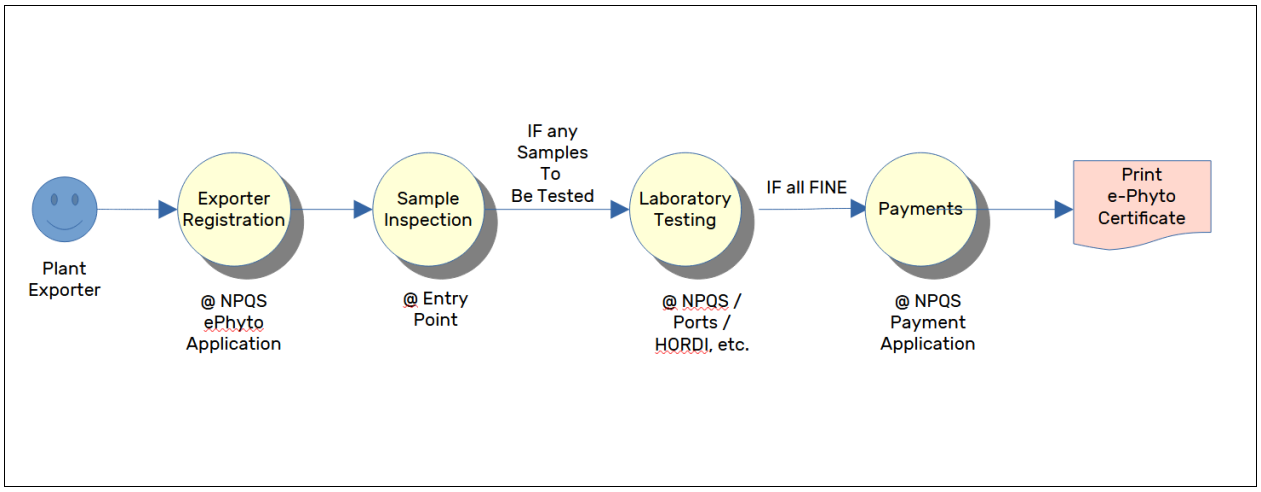
		introduced the ePhyto solution to the world for advancing and regulating the trade flows by enhancing the safety of plants and plant products throughout the world. This facilitates the exchange of phytosanitary certificates between NPQS and the countries, which have been introduced by IPPC. Sri Lanka was selected as one of the first 04 (four) countries, where GeNS pilot went live and was the first Asian country to do so. Currently there are 37 countries including 27 EU countries that have adopted this system (As of October 2023). The project provides much beneficious to several groups and key beneficiaries are **National Plant Protection Organization (NPPO)** staff and international business communication of plant and plant-based products in Sri Lanka.	
2	Import Permit Issuance for Plant and Plant Products https://scppc.doa.gov.lk/IPD/login.php	To import plants / plant related products to Sri Lanka, it is required to get an "**Import Permit License**" from NPQS. This was issued by the Additional Director of NPQS Katunayake for the DG of Agriculture.	An application is being developed.
3	Field Certification Module	Certain EU countries require certain plant standards to be maintained while exporting. Hence, certain plant cultivations are closely monitored by NPQS during the cultivation process. According to NPQS, the farmer and the plant field information are taken from the SPMDC / SCS databases as reports and keyed them again at NPQS documents before handing over the	Currently Manual. Conceptualized. Not implemented.

		list to field officers for monitoring. NPQS is planning to propose a mobile application to stop current paper-based usage to store some of the information. However, this seems like another duplicated farmer and farm database in the making. Lack of integrated farmer registry has been the cause of most of these ad-hoc applications in general.	
4	e-Payment Module for NPQS	A common e-Payment module is being developed to collect various payments within NPQS business process. Currently according to NPQS officials, there are about 40 payment types that will be included in this payment module. This is completely a decoupled application to the ePhyto or any other existing system.	The development was completed. Waiting for the legal clearance to go live.
5	PQIMS	An internal application to integrate NPQS internal processes. Currently it integrates all NPQS entry points (Airports, Sea Ports, Mail Exchange, etc). There are seven (07) entry points in total at the time of writing this report. As of March 2024, around 80% of the application development is completed and at the UAT stage. There is a need to integrate PQMIS to ePhyto system (Custom Module) and e-Payment modules but not yet completed.	In development. A Korean Koica grant. The developer is from Korea. NAICC helps for the software review process on behalf of NPQS.

e-Phyto Certificate Issuing Process (For Exports)

1. When an exporter needs to export any plant or plant-related product it is required to get the ePhyto Certificate from NPQS.
2. Firstly, the exporter needs to register with the ePhyto system as an exporter. The registration process is completely free for the moment,
3. Then it is required to go to an entry point and get a sample investigated.

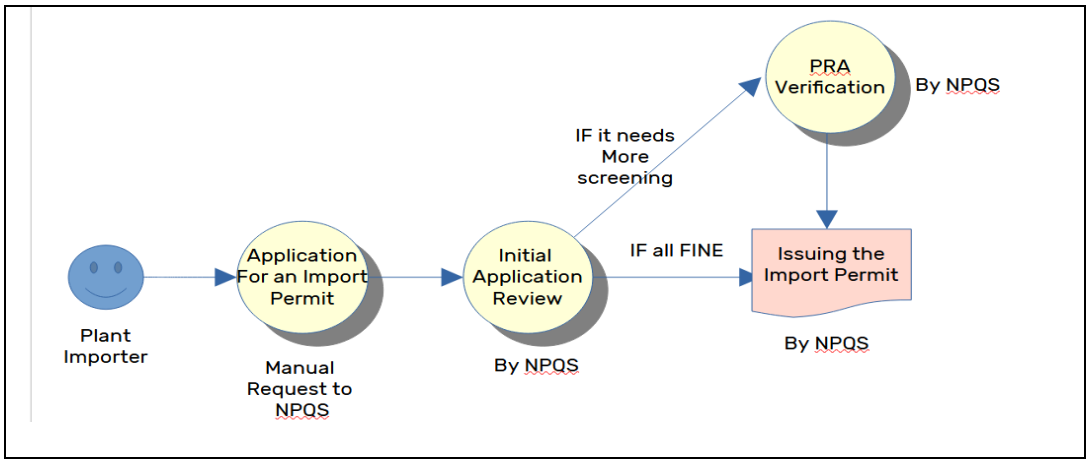
4. At the entry point, if the sample needs to be investigated further, it will be forwarded to a relevant laboratory recommended by NPQS.
5. Once the sample is cleared from the laboratory, the exporter can pay the required amount to complete the process. At the time of writing this report, the fee is SLR 162 for an export consignment. Once the e-Payment module is in production, this payment could be integrated into it.
6. Once all the above steps have been completed, the ePhyto certificate is issued to the exporter.



Issuing the e-Phyto Certificate for exporters

Import Permit Issuing Process (For Imports)

1. When an importer needs to import a plant or a plant material from overseas, he / she is required to get an import permit from NPQS
2. NPQS will receive the required information via email, by post or various other means (this process is not automated so far) from the importer for the initial verification.
3. The initial verification is done by NPQS and if all is okay, the import permit is issued.
4. If not, further assessment is done by following the PRA (Pest Risk Analysis) method and if all okay the import permit is issued under certain conditions.
5. The import permit does not have a fee for the moment.



Import Permit Issuing Process

External Integrations

1. Currently there is a login provided from the SL Customs ASICUDA application to the NPQS staff at entry ports basically to approve certain consignments before shipping.
2. There is a requirement to get "No objection letters" from some of the research institutes (i.e. Coconut Research Institute) for certain clarifications in terms of plant approvals. Currently this happens manually and takes a substantial amount of time. If this could be integrated to a certain extent in the future, certain approvals could be streamlined.
3. Field certification application needs an API to get required farmer and farm details, which are currently manually taken and processed.

Integrations with other departments:

1. Entry Points
2. NIC Validation
3. ROC Validation
4. DEA – NO objection Approval for any Plant
5. NFS – NO objection Approval
6. Botanical Garden – NO objection Approval
7. SPMDC/ SCS – NO Objection Approval
8. CRI/TRI/RRI – NO Objection Approval
9. HORDI – NO Objection Approval
10. Customs – CUSDEC Requirement
11. DAPH – NO Objection Approval
12. DAD (If any farmer registrations)

Concerns

1. Most of the systems have international development parties. That can create a risk in the future in terms of sustainability of the product.
2. There is minimum integration between developed systems. For example, there is no link between ePhyto and PQMIS systems so far. Having to manage international development

parties will add a risk for these changes unless the department or NAICC step into some of the integration matters.

Case Study – Registrar of Pesticides (ROP)

Control of Pesticides Act No 33. 1980

AN ACT TO PROVIDE FOR THE LICENSING OF PESTISIDES; TO REGULATE THE IMPORT, PACKING, LABELLING, STORAGE, FORMULATION, TRANSPORT, SALE AND USE THEREOF; FOR THE APPOINTMENT OF A LICENSING AUTHORITY FOR PESTICIDES; FOR THE ESTABLISHMENT OF A PESTICIDE FORMULARY COMMITTEE AND FOR MATTERS CONNECTED THEREWITH OR INCIDENTAL THERETO.

This act was further amended in 1994 and 2011 (**Act No 06 1994** and **Act No 31 2011** respectively).

The Business Process

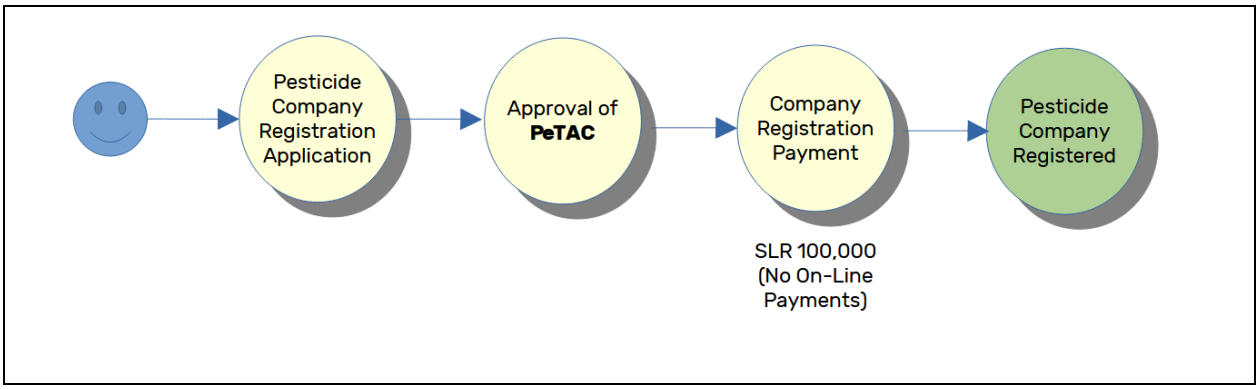
The ROP business process can be discussed in multiple steps. They are as follows:

1. Pesticide Company Registration
2. Pesticide Product Registration
3. License Issuance (including the Provisional Licenses)
4. Registering the Seller / Dealer details

Pesticide Company Registration

Currently almost all pesticides, which are being consumed in Sri Lanka for agricultural purposes are imported ones. According to the Act, all the companies which import pesticides need to get registered with ROP. Prior to the company registration, it must be approved by the **Pesticide Technical and Advisory Committee (PeTAC).**

Once it is approved by PeTAC, a fee of SLR 100,000 (As of Dec 2023) should be paid to ROP. Currently this is a bank transfer and online payment is still not available.



Pesticides Company Registration

Pesticide Product Registration

Once the company is registered with ROP, it is required to have a separate registration process for each pesticide product that is imported.

ROP enters the pesticide registration details to the **Pesticide Product Registration System** once it receives the correct information physically with the required documents/ manufacturer test reports, etc. This system could only be accessed internally and not open to the public.

Once the registration details are entered into the system, the review happens with a set of pre-conditions. If any of the pre-conditions are not met, this will be informed to the relevant importer.

These three conditions are as follows:

1. During the review process ROP evaluates the **pesticide toxicity class** (Recommended by WHO) for toxicity levels. Sri Lanka stopped accepting Category 1 since 1995, which is the highly toxic.

Toxicity Class/ Category	**Description**
Category 1	Highly Toxic
Category 2	Moderately Toxic
Category 3	Slightly Toxic
Category 4	Minimum Toxic

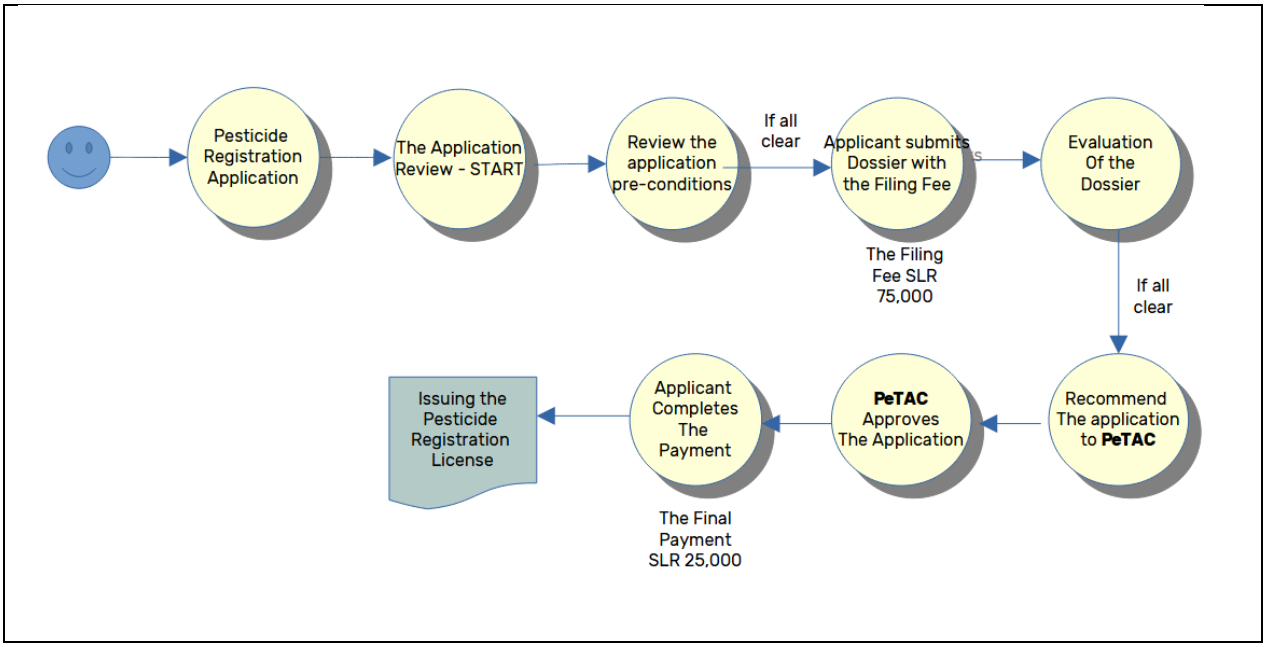
2. Sri Lanka should not be the first country to trial the pesticide. Minimum one country should have registered the pesticide before Sri Lanka.
3. The pesticide should be trialed for Sri Lankan conditions. For this, ROP will request for a sample, which then will be forwarded to the respective crop related research institute in Sri Lanka for multiple rounds of trial sessions, which would approximately take about one (01) year.

Once these three pre-conditions are met, ROP will inform the importer to pay the filing fee, which is SLR 75,000.

Once the payment is made, ROP will start reviewing the rest of documents submitted and will get more clarifications required from the importer. Once all is clear, ROP will recommend the pesticide to the **PeTAC** for approval. Once it is approved by the committee, the importer needs to pay another SLR 25,000 to complete the registration process.

Issuing the Pesticides Registration licenses

Once the final payment is completed, the **pesticides registration license** is produced. Sometimes, there are situations where a **provisional license** is issued to tackle any emergency situations. These issued licenses are generally valid for three (03) years and need to go for a re-registration process to renew it further. During this renewal process, ROP has the power to request for any further information pertaining to the pesticides if required.



Issuing the Pesticides Registration License

Registering Sellers / Dealers

ROP maintains a pesticide seller database for all imported pesticide items. However, this database does not store any stock-level details now and the stock-level information could only be obtained through sellers.

Information Systems:

#	Information System	Description	Status
1	Pesticide Product Registration and Pesticide Import Approvals System	This system can, - Issue licenses for registered pesticides. - Maintain the details of pesticides import approvals. - Generate reports.	In production. A web application developed using PHP. This is an internal application only.
2	Authorized dealer management system	This system can - Maintain authorized dealer details	In production. A MS-Access application This is an internal application only.

Concerns:

1. Both applications, which are running under ROP are being used internally to log applications and registration related basic master data. These applications need to be enhanced to allow a better user-oriented workflow to capture real-time information.

   For example, at any moment this application,

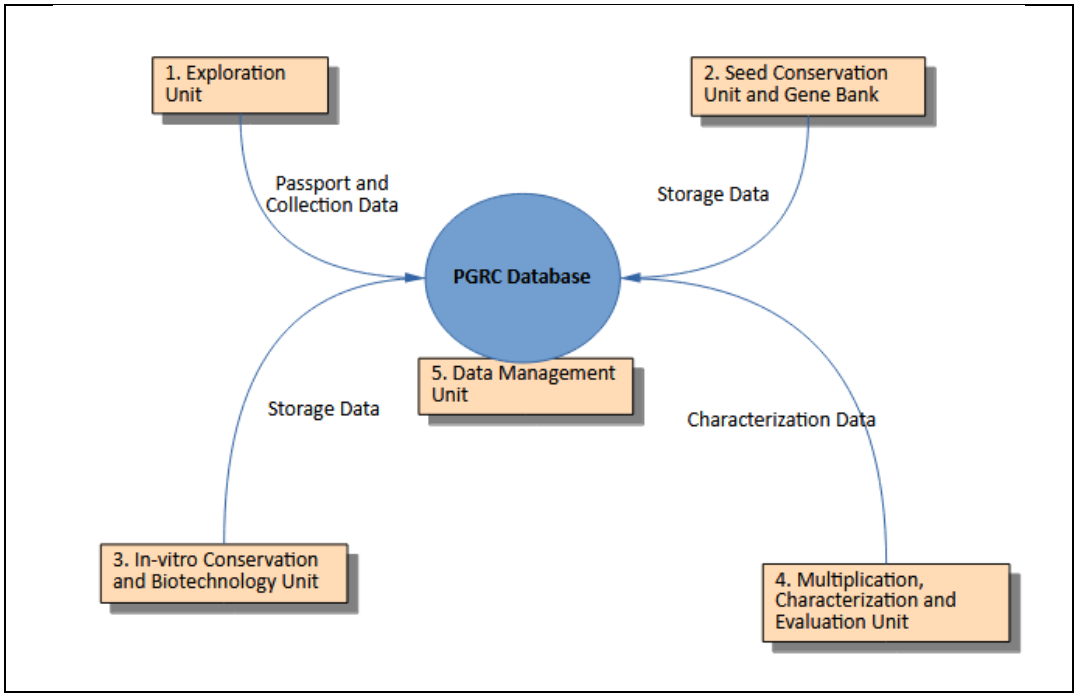
   - Cannot capture the status of a pesticide application at any given point.
   - Cannot capture pesticide market information (stock related). ROP relies on external seller databases to respond to these queries.
   - Company registrations and pesticide registrations need to be extended to importers directly to submit relevant documents via the Internet. Currently only the application forms can be downloaded by importers and the rest of the workflow is handled with physical paper documents.

Case Study – Plant Genetic Resource Centre (PGRC)

PGRC has the mandate to promote agriculture research and development through plant exploration, collection, introduction, evaluation, documentation and conservation of the genetic diversity of food crops and their wild relatives to ensure food security and increased agriculture promotion.

The Business Process

There are five technical subunits in PGRC.



PGRC subunits and Data Flows

1. **Exploration unit** – This unit is dispatching domestic exploration teams annually and collect genetic resources within Sri Lanka. These collected germplasms are handed over to the Gene Bank for long-term conservation if required after multiplication. The conservation happens for traditional crop varieties, economically important crops / wild relatives, and plant genetic resources.

2. **Seed conservation unit / Seed Gene bank** – Provides activities such as processing seed materials, maintaining and monitoring the seed viability, conservation and distribution of conserved germplasms.

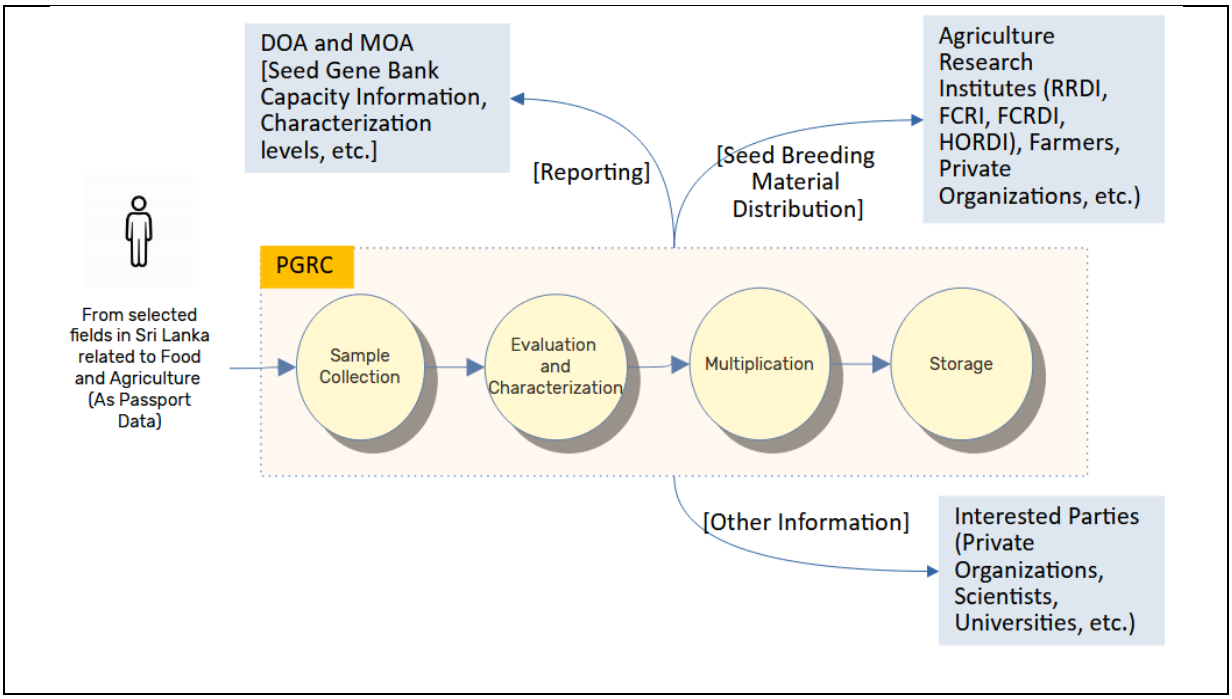
   PGRC seed gene bank has sixteen (16) cold storage modules (16 rooms). Out of it, there are four (04) 1C (base collection) and twelve (12) units of 5C (active collection).

   The number of registered items in the gene bank is around 17,000 by 2024, which has the total capacity of 25,000.

3. **In-vitro conservation and biotechnology unit** – In-vitro conservation unit does the conservation of germplasms by growing plants under aseptic conditions inside glass vessels. This is a slow growth technique which is mainly used to conserve plants which do not produce seeds which cannot be stored under normal seed conservation conditions.

4. **Multiplication, characterization and evaluation unit** – This does the seed multiplication and purity maintenance, characterization, preliminary evaluation, identification of unidentified accessions, pre-breeding activities, and the maintenance of perennial germplasm. The multiplication happens after collecting the samples. If the sample size is smaller, it is required to carry out multiplication prior sending those samples to the gene bank.

5. **Data management unit** – This unit has been helping PGRC to maintain and conserve plant genetic data since 1988 as passport, conservation and characterized data. These data are fed into PGRC database from exploration, conservation, evaluation, and characterization units regularly.



Basic Business Process of PGRC

Case Study – Progress Monitoring and Evaluation Unit (PMEU)

PMEU is the responsible project progress monitoring unit under DOA.

Reports / Publications Produced

PMEU is responsible for submitting the following key projects reports, which have been done by DOA. Reports are submitted on a monthly, quarterly, and annual basis depending on the type of report.

#	PMEU Report Name	Report Content
1	Annual Report of DOA (This is a public report)	The progress of the services offered by each institution The Annual budget Special achievements of the year The Plan for the upcoming year Staff details
2	Annual Performance Report of DOA (Submitted to the Parliament)	Institutional Profile/Executive Summary Progress and the Future Outlook Overall Financial Performance for the Year Performance indicators Performance of the achieving Sustainable Development Goals (SDG) Human Resource Profile Compliance Report
3	Approved Action Plan	Action plan for: Normal Capital votes, Special Projects under DOA votes, Foreign Funded small-scale projects, National Agriculture Research Policy (NARP) projects, Project under MOA votes, Other Foreign Funded projects, technical program of DOA
4	Approved Procurement Plan	Action plan for: Normal Capital vote, Special Projects under DOA votes, Foreign Funded small-scale projects, National Agriculture Research Policy (NARP) projects, Project under MOA votes, Other Foreign

		Funded projects
5	Progress Reports	Action plan for: Normal Capital votes, Special Projects under DOA votes, Foreign Funded small-scale projects, National Agriculture Research Policy (NARP) projects, Project under MOA votes, Other Foreign Funded projects, technical program of DOA
6	Compiled Report for the budget speech	
7	Compiled Report on Performance of DOA to the Central Bank	

Information Systems

Currently there are no internal information systems available. All the relevant report information are fed manually to the system and reports are produced manually.

Case Study – Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI)

It functions as a statutory body under the MOALLI, and it was established mainly for the promotion of policy-oriented research and training needs of the agrarian and rural sectors.

Information Systems:

#	Information System	Description	Status
1	Agricultural Market Information System (AMIS)	AMIS was established to monitor the agriculture market operations. The system can collect and analyze market information regularly and disseminate it to relevant stakeholders. Some of the primary objectives of this system are: 1. Price Transparency – Providing up-to-date information on commodity prices both at the wholesale and retail levels. 2. Market Trends – To monitor and analyze market trends such as supply and demand dynamics, production forecasts, and trade patterns based on the data that have been collected.	In production

		3. Risk Management – To assist stakeholders in identifying and managing market risks. 4. Policy Formulation – The existing collected data can be a goldmine for future policy making efforts. 5. Promotion of Fair Trade – By streamlining information between buyers and sellers it will help to prevent market price manipulation. 6. Improved Market Access 7. Improved Efficiency 8. Data Driven Decision Making – Having real-time data can have plethora of benefits to those who need it. 9. Capacity Building 10. Improved Food Security	

Data Collection with AMIS

Purposive Sampling technique is being used to collect price data. This is primarily done via interviews at various sites.

Once the data is collected from various locations, they are verified at a few centralized locations in Nuwara Eliya, Dambulla, Kegalle and Colombo. Once the verification is done at these locations, they are finally processed and analyzed before producing the final output by the **Food Systems and Data Management Division at HARTI**.

To further improve the data collection process, AMIS system is being upgraded to an automated data collection process in partnership with DOA.

Market Prices	**Data Collection Points**	**Frequency**
Retail Market Prices	Retail Markets in Colombo and Suburbs and Selected Locations at District Level. <u>Colombo and Suburbs:</u> (Kadawatha, Kiribathgoda, Thotalanga, Dematagoda, Narahenpita, Peliyagoda,	[Monday, Tuesday and Friday]

	Maharagama, Kirulapone, Nugegoda)	
Wholesale Market Prices	Wholesale Markets in Colombo and Suburbs, Economic Centers and Selected Locations at District Level. Economic Centers: (Pettah, Peliyagoda, Kandy, Dambulla, Meegoda, Veyangoda, Norochchole, Kappetipola, Thambuththegama, Nuwara Eliya) Colombo and Suburbs: (Peliyagoda 4th Cross Street)	Economic Centers – [Everyday] Colombo and Suburbs – [Tuesday and Friday]
Farm Gate Prices	Selected Locations at District Level	Frequency not specified

Market Prices maintained by HARTI (Source: HARTI)

Currently, there are around 109 food commodities covered by HARTI. (See below).

Food Commodity	Sub Items	Total Items
1. Rice (by varieties)	8	
2. Dried chillies (by varieties)	2	
3. Onion (by varieties)	5	
4. Potato (by varieties)	3	
5. Cereals (by varieties)	6	24
1. Vegetables	27	
2. Leafy Vegetables	3	
3. Coconut (Large & Small)	2	32
9. Fruits	20	20
10. Fish	10	
11. Eggs (white and brown)	2	12
12. Dried Fish	16	
13. Meat	5	21
Total No. of Food Commodities		109

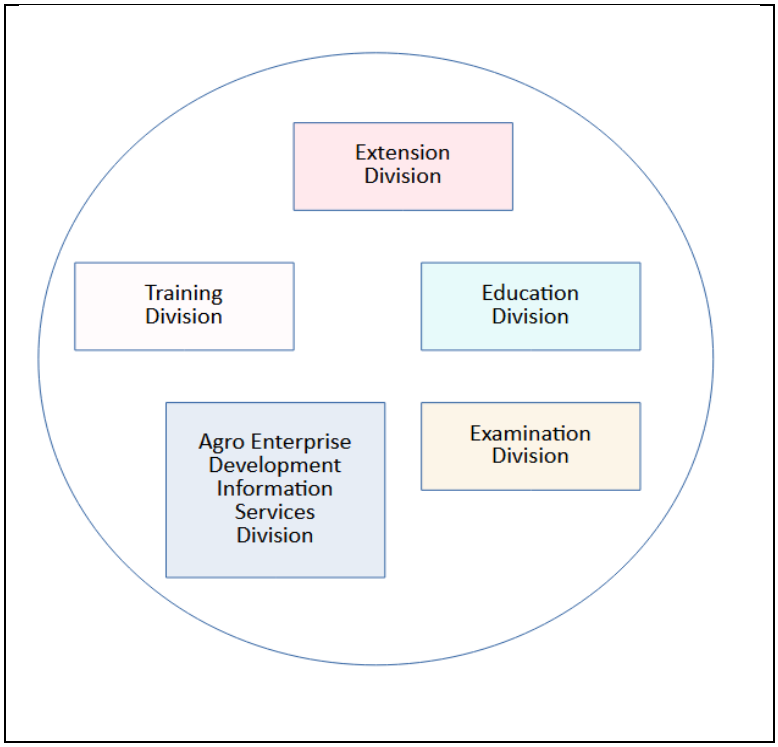
Major Food Commodities Covered by HARTI (Source: HARTI)

Case Study – Extension and Training Center (ETC)

ETC provides agricultural extension services to farmers. It conducts field demonstrations, training programs, advisory visits, modern farming techniques, crop diversification, pest management, etc.

Agriculture instructors (Ais) are attached to the Extension Division under ETC to carry out extension activities.

There are five key divisions under ETC.



ETC Divisions

#	Division	Tasks
1	Extension Division	Disseminates the agricultural technologies to all stakeholders related to agriculture through different extension approaches especially in six inter-province areas (Ampara, Anuradhapura, Hambanthota, Hasalaka, Monaragala and Polonnaruwa.) Agriculture Instructors (Ais) are attached to this division to carry out extensional service at the grass root level.
2	Training Division	Coordinates, monitors, and facilitates training programs

		conducted by the training institutes established island wide. Additionally, courses such as Nursery Development Assistant, Field Assistant (Agri), Landscape Development Assistant are also conducted by these division training centers.
3	Education Division	Eleven schools of Agriculture function under the Extension and Training Centre, and National vocational qualification level – 6 and level 05 (NVQ-6 and NVQ – 5) are conducted in 06 and 05 schools of Agriculture respectively
4	Examination Division	Examinations for Agriculture Diploma courses for Advanced Level Passed out students are carried out here. Entrance exams, semester exams, paper marking, results issuance, certificate preparations are some of the key tasks carried out by this division.
5	Agro Enterprise Development and Information Services (DOAgBiz)	The focal point of agri-business and agro entrepreneur development activities. Some of the important initiatives carried out are: 1. Enhancing the safety and quality of Agri food products by adopting GAP 2. Agribusiness promotional programs 3. Capacity building programs 4. Farm development and productivity enhancement and technical consultancy services

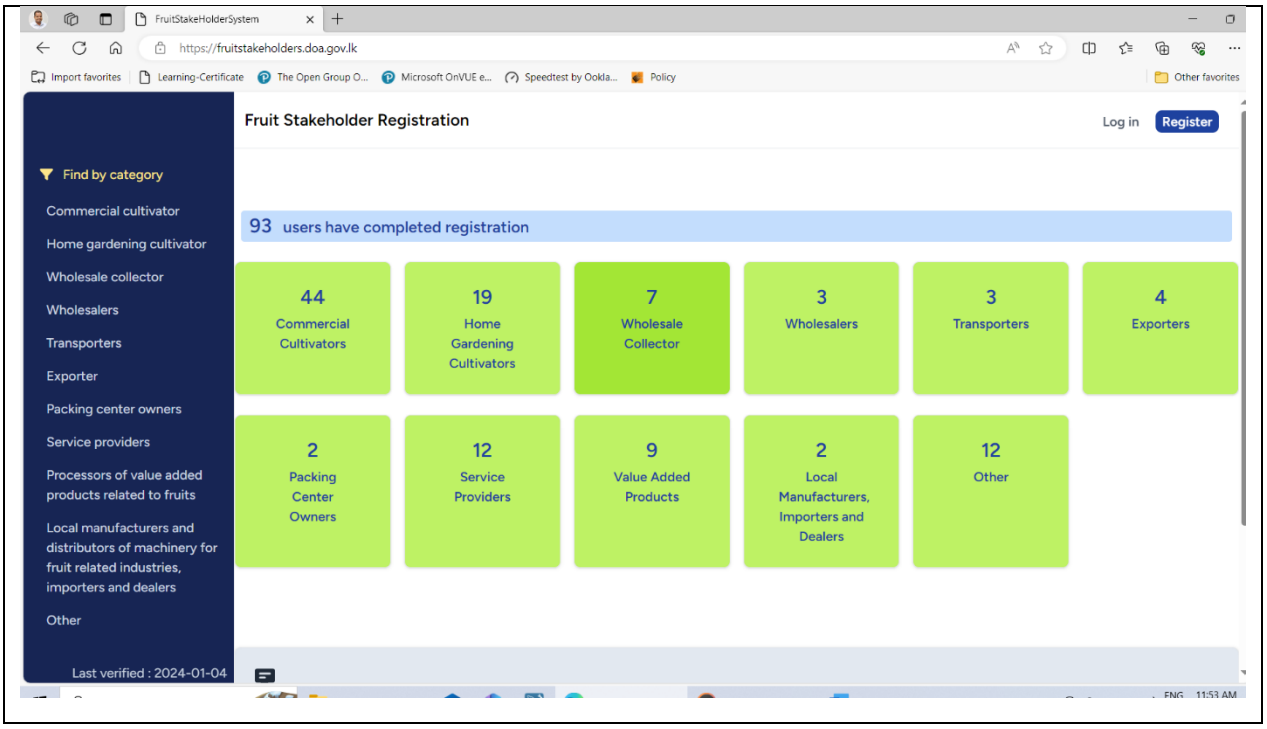
Information Systems:

#	Information System	Description	Status
1	Examination Management System	This web application can help ETC to manage Diploma and Higher Diploma courses handled by the department. This will completely automate the current examination process from the student registration, conducting examination, marking papers, issuing results to the certificate printing. Currently there are about 1000 students are enrolled to these examinations annually.	A pilot is in production. Nearing Completion (By end 2023). The development was done by NAICC.

2	GAP Certification System		In Development With the financial and development support of FAO
3	Fruit Stakeholder Database	This informative web application store information about Fruit Stakeholders. Managed by ETC Fruits section and planning to replicate to other crops as well. Primarily collects information about Fruit Commercial Cultivators, Home Gardening Cultivators, Wholesale Collectors, Wholesalers, Transporters, Exporters, Packing Center Owners, Service Providers, Value Added Products, Local Manufacturers, Local Importers, etc. URL: https://fruitstakeholders.doa.gov.lk/	In production. Fruit Stakeholder registrations have been commenced. The development was done by NAICC.

Concerns:

1. So far only a Fruit Stakeholder Database has been developed other than the Student Examination System, which has been in operation. Hence, very little automation has happened within ETC and there is a lot remaining.
2. The Fruit Stakeholder Database system is currently capturing all farmers' personal details as well, which is a common practice in the sector. The farmer personal details should be replaced by the Farmer API, which will be available in the future.
3. Other than the Fruit Stakeholder Database, there is no database developed for other crops within ETC. The ETC is planning to replicate the same to other crops as well in the future, with the help of NAICC software development expertise.



Fruit Stakeholder Registration System by ETC

Case Study – Paddy Marketing Board (PMB)

PMB plays a vital role in protecting farmers, paddy/rice market stabilization, and ensuring food availability to all Sri Lankans. PMB was established under the **Paddy Marketing Board Act No 14 of 1971**.

With this act, PMB can:

1. Regulate the paddy and rice market in Sri Lanka
2. Ensure fair prices for farmers by following the government to intervene in paddy purchasing, storage and distribution.
3. Empowered to buy paddy at guaranteed prices, store it, and release stocks to stabilize the market prices.
4. Ensure food security by maintaining buffer stocks.

Information Systems:

#	Information System	Description	Status

1	Rice Value Chain Traceability System	The proposed system will provide necessary value additions to the needs of each value chain actor. Some of the key actors are paddy farmers, paddy collectors, rice millers, brokers, by-product collectors, wholesalers and retailers.	The development is in progress. The development was initiated in late 2025 with external funding and expertise from Gates foundation and FAO.

Case Study – Sri Lanka Council for Agricultural Research Policy (SLCARP)

SLCARP has been actively engaged in research management, supporting agricultural research. Among its mandated functions, the primary responsibility was to develop policies and strategies to strengthen research and development (R&D) activities in the sector.

There are many institutes which are involved in research activities with SLCARP. These institutes are making an eco-system, which is known as NARS (National Agricultural Research System).

#	Information System	Description	Status
1	**INFORM** (Information for Agricultural Research Managers)	INFORM is a MIS, which puts various kinds of information required for research managers into a single system. Two types of data are managed. The first are the resources available for research managers. The second is the way these resources are being utilized for research projects and programs. Information on research personnel, research projects and recurrent research budget related to previous year, is collected annually in electronic form from the 13 Research Institutions including 19 sub institutions under DOA (Refer *Agriculture IF* for SLCARP <Research-Center-ID> for all research center ID details) The current INFORM application is a desktop application, which was developed using MS Access in the early 90s. SLCARP research staff send the MS Access software version via email to all research center coordinators to enter their respective research center data for a given year. Once all the research centers enter their information to each center version of the software, the final consolidation happens at the SLCARP head office. Currently, there are about 600+ research personal research work stored in the system. SLCARP has been using this system since 90s. The current INFORM application shows a	In production

		primitive / legacy design with less user friendliness. Hence it is recommended to develop a new web / mobile friendly application along with a Research Registry with better software architectural approach.	

Information-Outflows

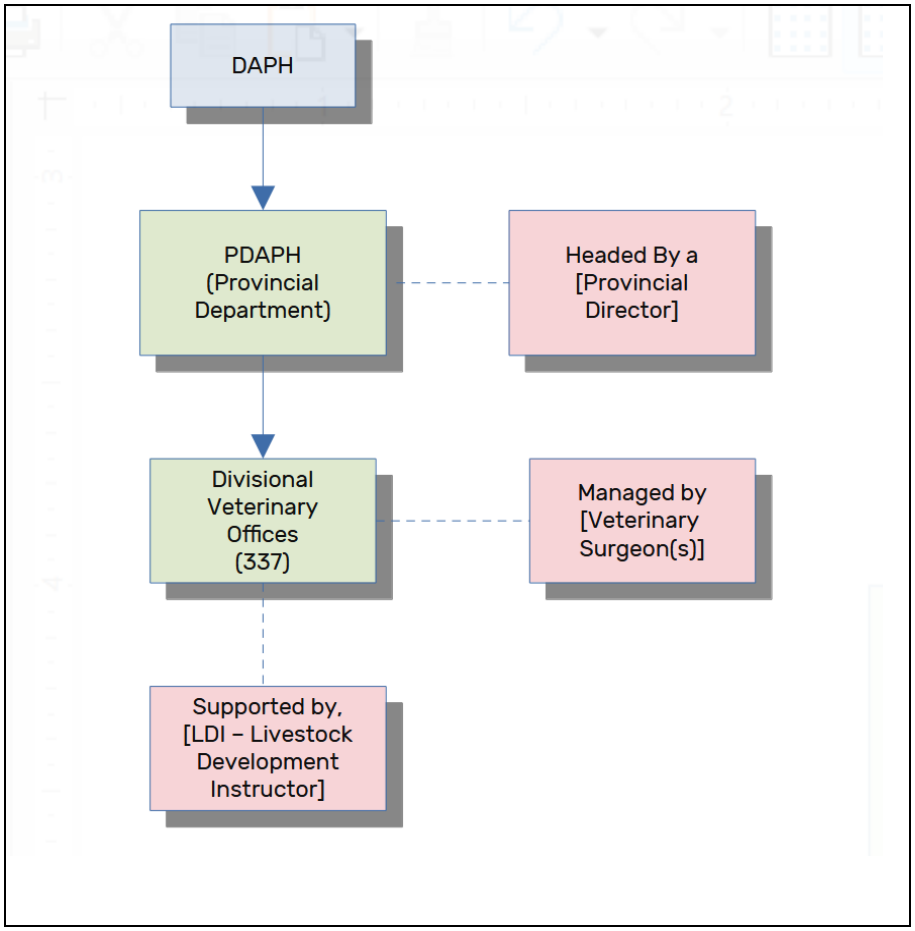
- All the research-related data, which are registered under SLCARP can be in the public domain. Currently, the department is willing to share the research related data to any party who request, except the researcher personal information. However, data sharing currently happens via published documents and for those who have access to INFORM. Hence, in the future, the INFORM application should be modified to have a separate API layer to disseminate required research related information to relevant parties.

Case Study – Department of Animal Production and Health (DAPH)

The Governance Structure

Most of the DAPH's field level functions have been delegated to nine (09) Provincial Departments of Animal Production (PDAPH) headed by the provincial directors. Currently there are 337 Divisional Veterinary Officers, which are maaged by **Veterinary Surgeons** (DAPH, 2022).

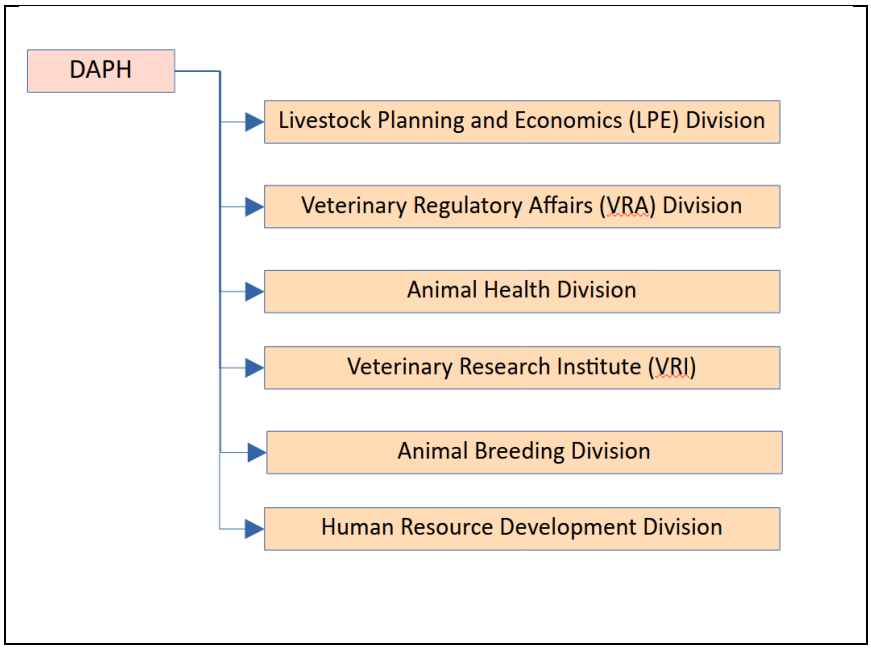
Each Divisional Veterinary office has at least one **LDI (Livestock Development Instructor)** attached to it. These LDI officers are responsible for executing most of the farmer level extension activities related to the department. They interact with Livestock farmers and their grievances daily.



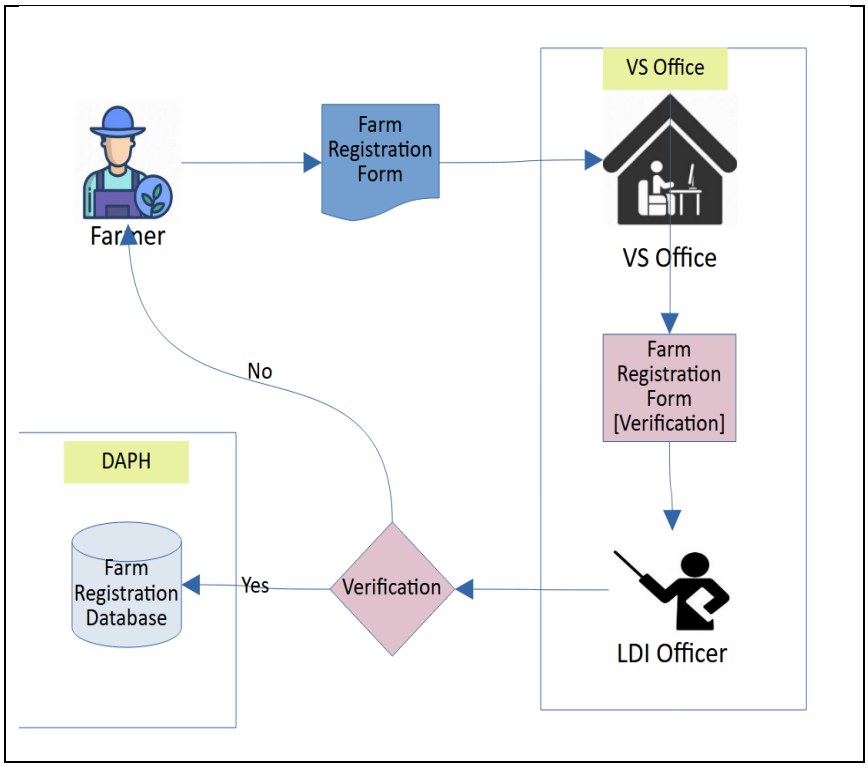
DAPH Governance Structure

Within DAPH, there are six (06) technical divisions (DAPH, 2022).

Out of these divisions, there are a few divisions, which cover most of the current business processes. However, out of these business processes, only a few of the business processes have been automated.



DAPH Divisions



Farm Registration System Process

Farm Registration Application

Livestock Planning and Economics (LPE) Division

This division is responsible for planning, monitoring and evaluation of livestock development programs and activities implemented by the department. This division has been maintaining a **Farm Registration System**, which has a substantial number of farms registered already.

Veterinary Regulatory Affairs (VRA) Division

The VRA division is responsible for implementing statutes made under the provisions of the *Animals Act, Animal Disease Act* and *Animal Feeds Act*. Furthermore, it strengthens the *Animal Quarantine Service* in Sri Lanka, trade facilitation of import and export of animals / animal products / animal pharmaceuticals, quality assurance of animal processed products, etc.

In the Animal or Animal Product import and export process, *Animal Health Certificates* are also issued by DAPH **Chief Animal Quarantine Officers** (CAQO) are complying to the International veterinary health standards.

Currently, all these business processes are handled manually by DAPH VRA subdivisions. However, the department is now in the process of automating the business processes and planning to start the total implementation later this year in 2024.

Animal Pharmaceuticals

The **Veterinary Drug Control Authority (VDCA)** was established under the provision of Section 32 of the Animal Disease Act No 59 of 1992. It is responsible for regulating, manufacturing, importing, re-packing, exporting, marketing and use of veterinary pharmaceuticals and biological products to safeguard animal health.

Any company which wishes to manufacture or import veterinary pharmaceuticals within the country should register with VDCA and shall obtain approval to make the product available to the market.

All the product approvals happen with the help of a **committee appointed by the ministry**. The approval is given by the committee after an evaluation done based on the samples, analysis reports, and related documents, which were submitted. Once the product is approved by the VDCA committee, the product is given a **VDCA Code**. All the approved VDCA codes are regularly published on the DAPH website.

However, for emergency purposes, **product user permits** are issued to certain products bypassing the VDCA code. In addition to that, it is only the animal feed products that are registered under VDCA for the moment. There is no separate registration process that has been introduced by VDCA for manufacturers, importers, and exporters so far. They are being captured under each animal pharmaceutical product.

Animal Feeds

In Sri Lanka annual Animal Feed Production is around 1.1 MT. Out of that 95% Animal Feed Production is for Poultry feeds, which Sri Lanka is self-sufficient. However, most of the feed production raw materials are imported from other countries.

The Animal Feed Act No 15 of 1986 was implemented to regulate, supervise, and control the manufacture, sale, distribution of animal feed and import of animal feed and feed ingredients.

In 2022, the **Animal Feed Advisory Committee** was formed for a period of three years under the provisions of the Animal Feeds Act. It comprises of representatives, who have technical knowledge and experience in animal nutrition and animal feed, and one feed industry representative.

With the Animal Feed Act, all feed manufacturers, feed exporters and feed importers should be registered with DAPH Animal Feeds Subdivision.

Animal Feed Importation

1. Feed importer fills out the application, which is published on the department web site and sends it back along with required documentation to DAPH.
2. Then a fee is charged for the initial application handling and then it is handed over to the *Animal Feed Advisory Committee* for the evaluation.
3. If the import is a meat originated product, then the advisory committee will ask for a *Health Clearance Certificate* related to the product (if not submitted), authorized by an Internationally recognized body.
4. When the importer goes through all the above steps, then the importer will get registered with DAPH under an **AAF Number (Approved Animal Feeds).** This has the number format of *<Year> F <Serial-No>*. (Refer Agriculture IF for more details). This needs to be renewed every year in accordance with the current Animal Feeds Act.
5. Once registered, the importer needs to get a **Pre-clearance Approval** from DAPH and multiple other entities such as SL Customs, Animal Quarantine, NPQS, and MOALLI for each consignment that they bring down to Sri Lanka. From the DAPH point of view, the importer is required to show the *Health Clearance Certificate* to DAPH just the way they did during the DAPH registration process. In addition to that, DAPH checks WOAH website (WOAH, 2024) for the latest information related to the import animal feeds for additional information. Once it is cleared from the DAPH side it sends out the recommendation or the clearance to all other entities for their reference. Currently, all these communications happen via email.

   As you can see, all the steps are manual, and the importer probably needs to physically be there at all places to get the final pre-clearance approval.

External Entities for the Pre-Clearance Process:

Entity	Reason
SL Customs Department	For Import Consignment Clearances
Animal Quarantine Department	For Animal related Clearances
NPQS	For Plant (Maize and Soya) related Clearances
MOALLI	For certain Tax Clearances

6. Finally, the Import and Export Control Department check all the recommendations from related entities and issue the import permit if everything is clear.

Animal Feed Manufacturing (Local)

1. The Feed manufacturer sends the application form with related supporting documentation.
2. DAPH starts its evaluation by sending a team of authorized officers to do the initial inspection. (Plant / Production Premises, Warehouse, Production Process, etc.)
3. If satisfied, DAPH then assigns an **AAF Number** to the Feed Product and its Production Premises. This has the number format of *<Year> M <Serial-No>* (Refer Agriculture IF for more details). This needs to be renewed every year in accordance with the current Animal Feeds Act.

Animal Feed Exportation

1. Only the Animal Feed manufacturers are allowed to export. Hence, the same **AAF numbers** will be used for exporters as well (*<Year> M <Serial-No>*).
2. Only **Animal Premixtures** (a blend of vitamins, minerals, supplements, and other nutritional ingredients) are allowed to be exported. No Animal Feeds are exported for the moment. In recent years, Vitamin and Mineral premixes, Vitamin E, and other feed additives were exported to some of the South Asian and African countries.
3. *Veterinary export certificates* are issued for all exporters by DAPH.

Animal Poultry, Poultry Products and Aquatic Animals

The same process, which is followed by Animal Feeds subdivision is followed here as well for both importation and exportation of Animal poultry, poultry products and aquatic animal products.

The **Health Protocol Advisory Committee** has been formed by this subdivision to evaluate the applications which are sent to VRA Animal Poultry division for importing purposes. If the committee finds any issue with Health Certificates or any other related supplementary document, the committee will advise importers to resend the required valid documents with valid ones.

Just like in Animal Feed production, the Import and Export Control Department requires the recommendation from DAPH and other related entities to issue **import permits** for importers.

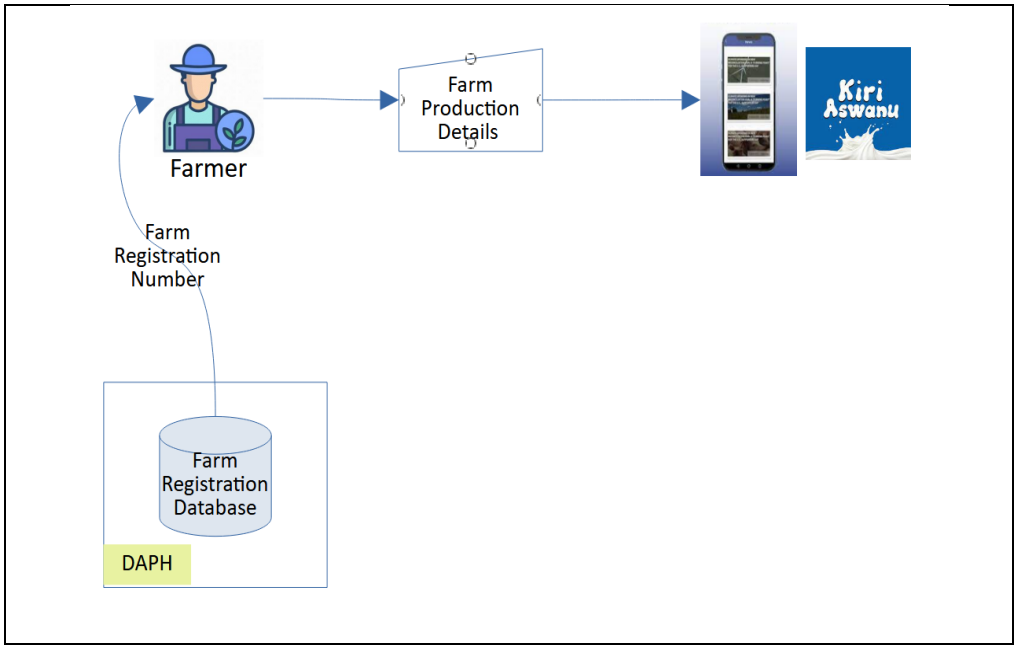
Information Systems:

There are many datasets produced under each DAPH division but only a few information systems are available.

#	Information System	Description	Status
1	**Farm Registration System**	Implemented by the Livestock Planning and Economics Division. Out of the information systems available, the primary system is the Farm Registration System, which captures farm-related data. However, the farmer registration happens at the VS level by the LDI officers. Once farmers hand over the registration forms to the VS officer, the LDI officers do the initial verification and use this system to enter the finalized information. There is no fee for the registration for the moment. Currently there are more than 55,000 farms registered in the system, which is probably around 20% of the total farm population. URL: Farm Registration (vri.gov.lk)	On-line MySQL Database
2	**Livestock Sector Database (Annual)**	This captures the following information: General information, Cattle population / herd / farms, Buffalo population / herd / farms, Goat population, Sheep population, Swine population, Milk production, Milk marketing, Pasture and fodder information, Poultry population	Currently in Excel.
3	**Master Return (Monthly)**	Master return in every month for the following information: Farm registrations, Animal identification and transportation, Treatment for animals, Health Certificate issuances, Training details, Credit program details, Livestock insurance details, Losses caused by natural	Currently in Excel. There had been an effort to develop a system in the past. But it is not yet there.

		disasters, Milk production, Milk collection, Average fresh milk price, Number of animals slaughtered, Breeding programs, Paster / fodder establishments, Infertility management	
4	**Poultry Sector Database**	Captures the information on the following: Chicken broiler, Layer meat, Parent meat production, Total chicken meat, Egg production, Meat based value added production, Average population of poultry, Poultry breeder population, Commercial chick production	Excel
5	**Poultry Sector Database (10 Years)**	Captures the information on the following: Poultry Population, Procurement of grandparent stock, Production of D/O stock, Broiler/ Layer production, Production of poultry feed, Chicken meat production, total domestic availability, exports, poultry meat quantity, etc.	Excel
6	**Animal Population Database**	Cattle, Buffaloes, Goat, Beef, Mutton, Pork, etc. -> [For the bulletin]	Excel
7	**Animal Health Databases**	Contagious Disease DB, Immunization DB, Veterinary Investigation DB, Zoonotic Diseases DB, etc.	Excel
8	**Veterinary Regulatory Databases**	Identification of cattle and buffaloes, Animal Transport, Export/ Import Clearance, Registration of export establishment, Animal feed registration DB, Pre-clearance approvals DB, Animal Feed Annual Renewal DB, Veterinary Drug Import DB, locally produced veterinary drug DB	Excel
9	**Veterinary Research Databases**	Central Veterinary Investigation Center DB, Animal Disease Investigation DB, Surveillance of Aquatic Disease DB, Vaccine Production DB, Microbiology Division DB, Pathology Division DB, Parasitology Division DB, Dairy Technology Lab DB, Animal Breeding Division DB, Animal Virology Division DB, Molecular Biology	Excel

		Division DB, Animal Nutrition Division DB, Ruminant Nutrition and Pasture DB, Research Projects DB	
10	**Animal Breeding and Fodder Cultivation Databases**	National AI Services DB, Pedigree and performance Recording Scheme for cattle DB, Natural Breeding DB, Goat Development DB, Feed Resource Development DB, Heifer Calf Rearing DB	Excel
11	**"Kiri Aswanu"" Mobile Application**	"Kiri Aswanu" is another "siloed" mobile application, which was launched by DAPH to collect farm level production details daily. To this system, farmers are encouraged to enter their daily production details daily. This application back-end has no link to the Farm Registration System and runs as a separate application and only linked by the *Farm Registration Number* for each farmer who enters the data. However, the adoption has been low so far in this application due to various practical problems in the setup.	On-line
12	**AIPD Carving Software**	AI Software developed by the subdivision	



"Kiri Aswanu" Mobile Application

Collects data on:

Livestock population, Livestock production, Livestock farms, Identify cattle and buffaloes, Livestock disease status, Animal transport data, Vaccines and other biological production, Artificial Insemination (AI) and breeding data, Feed resource development, Research projects, Export/ Import Clearance, Registration/ Renewals of poultry breeder farm/ Hatchery/ Processing Plants, Animal Feed registration/ renewals, Veterinary drug import/ local production.

Information needed from:

1. Farmland Information – (From DAD)
2. Crop and fish price information - (From HARTI)
3. Slaughter Information - (From Local Government)
4. Custom Import/export data - (From Customs)
5. Crop Requirements (Quantity) – (From DOA)

Concerns

1. The Farm Registration System is the only information system in operation within DAPH at the moment. All the other departmental business processes are using Excel for data storage.
2. There are no APIs currently being exposed from current information systems.
3. The department is struggling to get the Farm Registration done on-line to its full capacity due to operational issues at the ground level. Need more emphasis to empower LDIs, since they are the interacting point between the department and the farmers. Due to these ground level issues, it has been very hard to get proper data to current databases in order to carry out a proper analysis with the data that it has already gathered.

Case Study – Horticultural Crops Research and Development Institute (HORDI)

HORDI is a supporting arm for other Agriculture institutions. Hence it is not under an Act.

HORDI is vested with responsibility of technology development concerning vegetables, root, and tuber crops and horticulture. It focuses on the development of improved crop varieties, new propagation methods, post-harvest and food processing methods, the use of protected culture and ensuring better plant health with fever defendants on chemicals.

There are multiple divisions within HORDI -> Plant breeding division, Plant Pathology division, Agronomy division, Entomology division, Soil and plant nutrition division, Central analytical laboratory and Extension and Communication Division

Testing Types Carried Out by HORDI -> Soil, Compost, Fertilizer, Plant, Water

Information Systems:

#	Information System	Description	Status
1	Central Soil Testing Laboratory System	Implemented under **Soil and Plant Nutrition Division** This is the main system, which functions within HORDI at the moment. The primary objective is to have a central database for all soil testing efforts. Currently there are 32 soil testing centers across the country, out of them 20 are directly formed by HORDI and there 12 other testing centers, which are under different research institutes (i.e. RRDI – Bathalagoda, FCRDI – Mahailuppallama, FRDI - Horana). All these testing center databases are running in siloes and there is no integration among them. Due to this disconnection, the central entity who is responsible for soil testing efforts across the agriculture sector for all types of crops is finding it difficult to do any data analysis centrally. It is a web-based system, which can store farmer data, clients, companies as well as soil samples and their test results for the given parameters. It further can generate soil analysis reports, recommendation reports and additional management reports.	Developed by NAICC and in production since early 2022. Planning to use e-Payment platform, which was developed by NPQS as a common service for e-payments.
2	Insect Museum Information System	Implemented under **Entomology Division** Getting all insect details into a database	Under development Developed using PHP/ MySQL
3	Farmer Field Issues Database	Implemented under **Extension and Communication Division** The primary aim is to compile all information on farmer field issues that has been received from across the country via PTWG and other technical meetings	Under development Developed using Google Sheets

Other Integrations

1. HORDI supports other institutions such as NPQS by carrying out some of the lab testing from in the areas of plant pathology, entomology and agronomical.

Concerns

1. Other than the Soil Testing System, there are a few digitization efforts within the department.
2. The Soil system is still working only within HORDI main office. None of the other 32 testing stations are connected to it so far.
3. Like most of the other agricultural departments, the Soil system also keeps farmer information in the database.

Case Study – Hadabima Authority

Established under the **State Agricultural Corporation Act No 11, 1972** as the National Agricultural Crop Diversification and Settlement Authority.

The primary objectives of the authority are:

1. Agricultural Diversification Settlement Development and Management of catchment areas.
2. Conversation of environment and water resources to obtain the maximum productivity of the lands vested by the authority.
3. Produce process and the sale of agriculture produce.
4. Supply of equipment and machinery especially in agricultural diversification and settlement development.

Some of the **field extension activities** carried out under the key objectives are:

1. Composting
2. Water resource management
3. Poultry Farming
4. Soil conservation
5. Home gardening
6. Introducing the smart village concept

Currently it is operated in 12 Districts including 60 DS Divisions. Hadabima field officers have been deployed district-wise for data collection and verification purposes.

The farmer selection for all field extension facilities is caried out by **Hadabima field officers** for a given selection criteria with the final **verification and an approval from the DS office**.

In addition to field extension activities, the authority has been maintaining two farms at Pallekale and Kotmale, which have poultry, cattle, vegetable cultivation, perennial crops and a liquid fertilizer producing unit.

Information Systems:

#	Information System	Description	Status
1	Farm and Field Data Management (Current System)	Captures both Farm and Field (Farmer) data. Google Sheets, Google Drive and MS Excel have been used as tools for data collection and management	In production
2	Farm and Field Data Management (Future System)	Captures both Farm and Field (Farmer) data for two farms (Pallakele and Kundasale), which are under Hadabima's purview) Running a web / mobile application with a SQL back-end with geo-spatial data. Has a	Under development. Developed by a University in Sri Lanka.

		smart phone-based application for data mapping, data updating, etc. There are some APIs also disseminated to other institutions.	

Hadabima Information System (Future System)

Concerns:

1. Capturing farmer information again in the system. Currently the farmer ID is an incremental ID, which is captured in a traditional logbook. No specific format is defined so far.
2. Farmer land extent is measured again in the system with a “manual verification” from GN (Grama Niladhari) and DS (Divisional Secretariat) level approvals. This is like Agrarian Department land extent capturing method.
3. Role Duplication: Most of the field level activities such as chick distribution, soil protection, etc. are carried out by other departments in the agriculture sector as well. For example, chick distribution could be done by DAPH under the responsibilities given by the act. Hadabima also can carry out the same task with its powers in the act. So, there is a role duplication in the current setup in the sector.

Case Study – National Institute of Post Harvest Management (NIPHM)

The institute was initially established under the name of Institute of Post Harvest Technology on 19th June 2000 to carry out the post-harvest research and development on all agricultural crops. Then it was renamed as National Institute of Post Harvest Management (NIPHM) under the extraordinary gazette, 2093/26 of Democratic Socialist Republic of Sri Lanka on 27.10.2018 (NIPHM, 2021).

According to the mandate given in the gazette notification, NIPHM is supposed to work as the coordinating body to bring together to identify and prioritize research needs and development programs in the post-harvest technology in Sri Lanka. Furthermore, it should improve the national food security through efficient and effective post-harvest technology interventions to strengthen the supply and value chains of the agricultural produce and products with high quality to cater to the domestic and export markets at a competitive price.

Research Work

The research activities are initiated by the department after a stakeholder meeting for various post-harvest development requests. All the stakeholder requests are discussed by an **appointed advisory committee**, which comprises some of the key industry experts from the ministry, research institutes, relevant departments (HARTI, SLCARP, etc.), universities and industry.

Once the advisory committee approves any research work, they are either handed over to NIPHM **research officers** or university students as part of their research work. Once the research work has been completed, it is published and finally disseminated to relevant stakeholders by the Extension unit.

All data / information related to NIPHM research work are collected by the extension office research staff deployed by the department on the field.

Extension and Development Work

The extension and development activities are carried out by the **NIPHM extension unit officers**, who are attached to NIPHM regional offices around the country. Currently, there are seven (07) extension regional offices including the main office in Anuradhapura. The other six extension offices are in Mullaitivu, Kurunegala, Kandy, Ampara, Hambantota, and Colombo.

Apart from the research activities, there are a few development activities carried out by the department such as post-harvest loss minimization, post-harvest value addition, etc.

Some of the value addition activities provided are:

- Distributing plastic crates to selected farmers to minimize post-harvest losses.
- Funding spice crop farmers to build their own spice mills.
- Providing consultancy to build rice mills (for a fee)

- Development of entrepreneurs by providing training programs for various crop value additions.
- Connecting farmers with other suppliers in the value chain (distributors, sellers, etc.) to minimize the post-harvest loss.

Information out-flows

- Calculated post-harvest loss for each crop. This information is required by most of the other departments including the ministry.

Registries (Maintained Manually)

There are no enterprise level information systems / applications maintained. There are two registries maintained currently in manual form. However, none of these registries are part of their regulatory framework.

#	Manual Registry	Description	Status
1	Rice Mill Registry	Maintains a registry about all rice mill operators in the country in the districts of Monaragala, Ampara, Hambantota, Anuradhapura, and Polonnaruwa. This is not a regulatory requirement from the Ministry, but the Ministry currently relies on the NIPHM data.	In Excel form
2	Entrepreneur Registry	Maintains a small manual registry for all the entrepreneurs who are interacting with NIPHM for various initiatives and trainings.	In Excel form

Case Study – Rice Research and Development Institute (RRDI)

RRDI plays a key role in the country's rice sector. by releasing high demand, high yielding rice varieties, and by producing the initial rice breeder seeds.

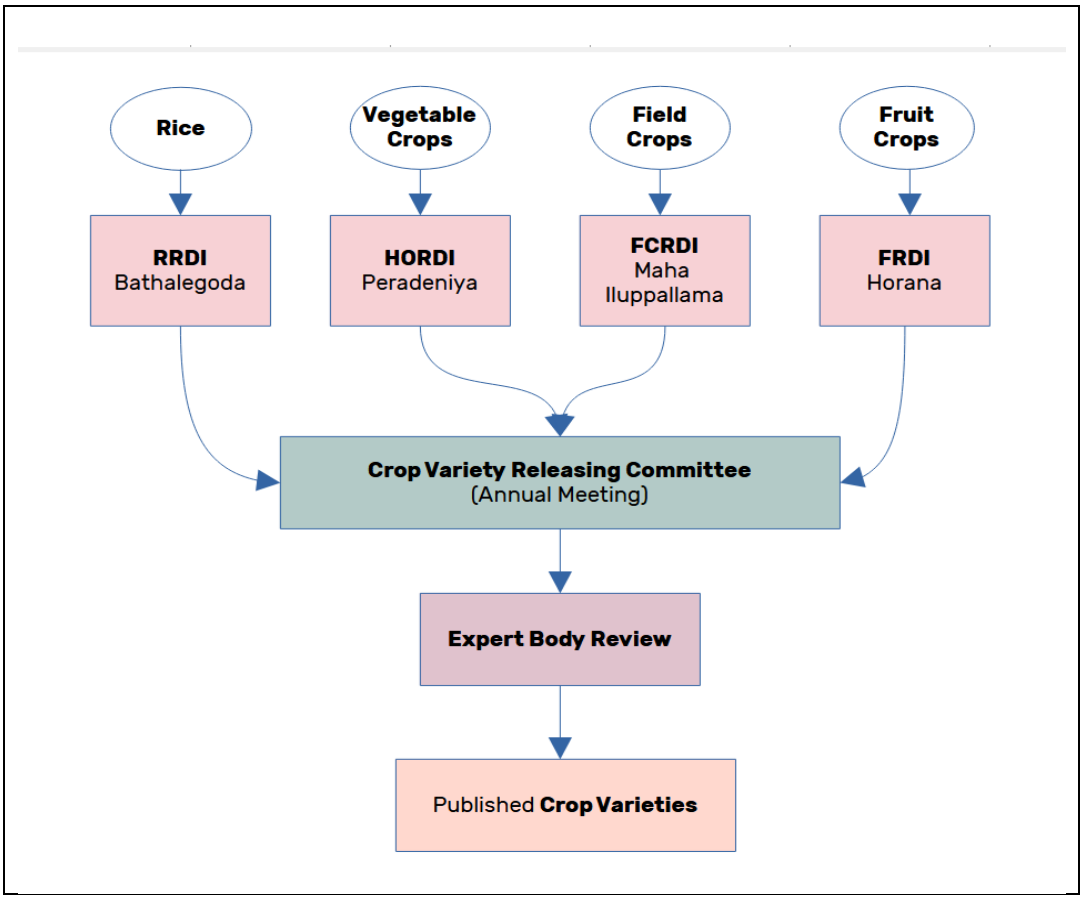
Its primary objectives are.

1. Releasing high demand, high yielding rice varieties,
2. Producing rice breeder seeds,
3. Conducting rice crop related technological advancements,
4. Developing packages for yield enhancements,
5. Conducting field demonstration activities,
6. Training/ Dissemination activities
7. Giving responses and alerts for recording issues in paddy cultivation.
8. Giving information for mechanization in rice cultivation.

Rice variety releases, technological advancements

Rice variety types are initiated by RRDI research experts and then forwarded to a **variety releasing committee** which is headed by the Director General (DG) of Agriculture at DOA. The DG Agriculture appoints this committee and other expert groups to finalize the recommendations.

The same applies to rice related technological research activities and rice related pesticide research activities as well. All these runs through a specific releasing committee, same as the variety releasing committee before publishing the results.



Crop variety releasing process under DOA

Currently, each crop variety, which is produced from the respective research institute under the Department of Agriculture (DOA) is forwarded to the **Crop Variety Releasing Committee** meeting, where the final decision is being made after an external consultation from another **expert body** appointed for the respective research area. Both the committee and the expert body is appointed by the Director General (DG) of Agriculture.

All the finalized crop varieties are published on the respective research institute's web site. There is no central repository / Crop registry made so far for the central access.

The published rice varieties could be accessed using the following URL:
https://doa.gov.lk/rrdi_rice_varities/

The breeder seed production

Furthermore, RRDI contributes to the breeder seeds production process by producing required seeds to government-maintained seed farms under SPDMC.

Currently DOA caters to 17% of the country's seed production. The rest is done by the private sector companies, farmer organizations and other informal groups. According to the experts at RRDI, it can go

up to 25% as the maximum capacity with the current resources at hand. However, they further emphasize the importance of the traceability of produced seeds in the whole rice market.

Information Systems:

Currently there are no specific enterprise level applications maintained. Only the research data are captured to various documents / processes, which are not sharable until they are published as a scientific report.

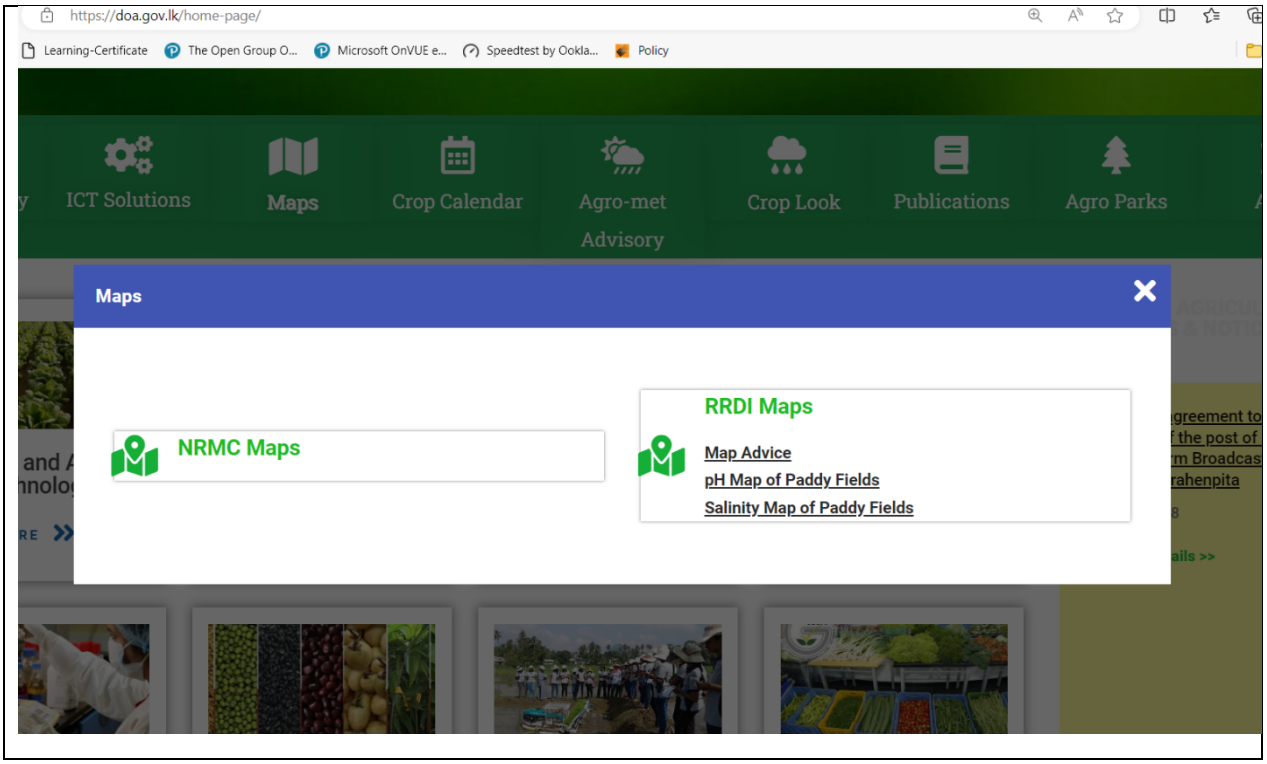
General information related to rice crop on the RRDI website

However, the general information on rice crop and cultivation practices such as recommended varieties, crop establishments, weed management, soil fertility management, disease management, insect pest management, and a few socio-economic aspects are currently published DOA RRDI web page.

Along with the above information, there are a few GIS maps related to rice crop also published on the department website.

1. pH Map for Paddy Fields
2. Salinity Map for Paddy Fields

(P,Note: You may download the KMZ file and open using *Google Earth Pro*, which was recommended by the department for viewing)



RRDI GIS Maps (https://doa.gov.lk/home-page/)

Here are some expected in-flows and out-flows from information systems.

Out-Flows:

1. Newly produced rice crop variety information to the sector
2. Breeder Seed quantities produced by RRDI to SPMDC for multiplications.

In-Flows:

1. Seed paddy stock level information from SPMDC (for a given paddy variety within an area specified). This is required for RRDI since it has connections to many paddy farmers.
2. Paddy crop damage information (From SEPC). This information would be helpful to estimate the seed production levels for the next season.
3. Weather Forecast information (From the Meteorological Department). This is again required to advise farmers to cultivate crops based on the weather patterns.
4. Farmer field emergency issues related to pests, diseases, nutrient deficiencies, physiological disorders, weeds, and abiotic stresses, etc., in paddy cultivation.
5. Access to farmer information from DAD.
6. Crop cut survey information as AI range wise from Department of Census and Statistics (DCS).
7. Surveillance data from Plant Protection Service (PPS).

8. Usage and availability of agro-chemical for rice cultivation from ROP

Concerns:

1. Not getting regular weather forecasts from the Meteorological department. A lot of farmers who have been engaged with RRDI are personally calling RRDI to get an idea about the crops that RRDI recommends to the area concerned based on the climate patterns that is predicted for the next season. Currently there is no real time weather forecast shared with RRDI to have a fair prediction for the farmers.

   If RRDI gets real time weather forecasts, it will be helpful for RRDI to carry out the seed production based on it. Currently, there is limited coordination between departments to make such decisions.

2. Paddy crop damage is not reflected properly to RRDI now. The data given by AAIB and DAD have substantial differences and that will affect the seed production level decisions from the RRDI side.

3. The government has no visibility of the seed production, which happens by government farms, private sector companies, farmer organizations and other informal groups. Government farm production is around 20% and the rest is around 80%. For now, the department has the visibility of government farm level seed production levels, but not the rest. Even the government seed production stock levels are not visible to other institutions such as RRDI.

4. Not having a proper seed distribution database at RRDI has given less visibility to RRDI. That means sometimes RRDI foundational seed paddy is consumed by the same farmer every season. This should not happen mainly because the foundational seeds are not generally used for consumption purposes. Since there is no proper system in place, there is no way to trace the farmer in such situations.

5. There is no proper system to do collaborative research data sharing with other institutes such as ITI, Atomic energy authority, Engineering research institute, universities, and SL Army etc.

6. Unavailability of research equipment, journal access, and data analysis software for carrying out research effectively.

Case Study – Field Crops Research and Development Institute (FCRDI)

FCRDI was established to conduct research and development programs on field crops aiming at developing new technologies and facilitating technology dissemination for the enhancement of production and productivity in the field crop sector.

Currently the department primarily carries research activities for thirteen (13) field crops. Some of them are:

- Condiments (chilies and onions),
- Grain legumes (mungbean, cowpea, blackgram, pigeon pea, chickpea),
- Seed crops (groundnut, soybean, sesame, sunflower), and
- Non-rice cereals (maize, sorghum, finger millet, and other millets).

Key Objectives

- Development and maintenance of new field crop varieties (Chili, Onion, Maze, Finger millet, Cowpea, Blackgram, Soybean, Mungbean, Groundnut, Sesame) through breeding programs. Usually, the variety building process takes about 7-8 years.
- Breeder seed production of recommended varieties and handing them over to SPMDC for multiplication.
- Providing hybrid seed production recommendations – Required technological recommendations and seeds of parental lines will be provided for those who are interested in hybrid seed production.
- Providing technical recommendations – Recommendations are provided to increase the yield of OFCs and suitable soil recommendations are provided to the farmers who are cultivating OFCs by testing the soil condition.
- Technology Dissemination – via publications, by providing practical knowledge to farmers, by conducting crop clinics, and selected training programs.

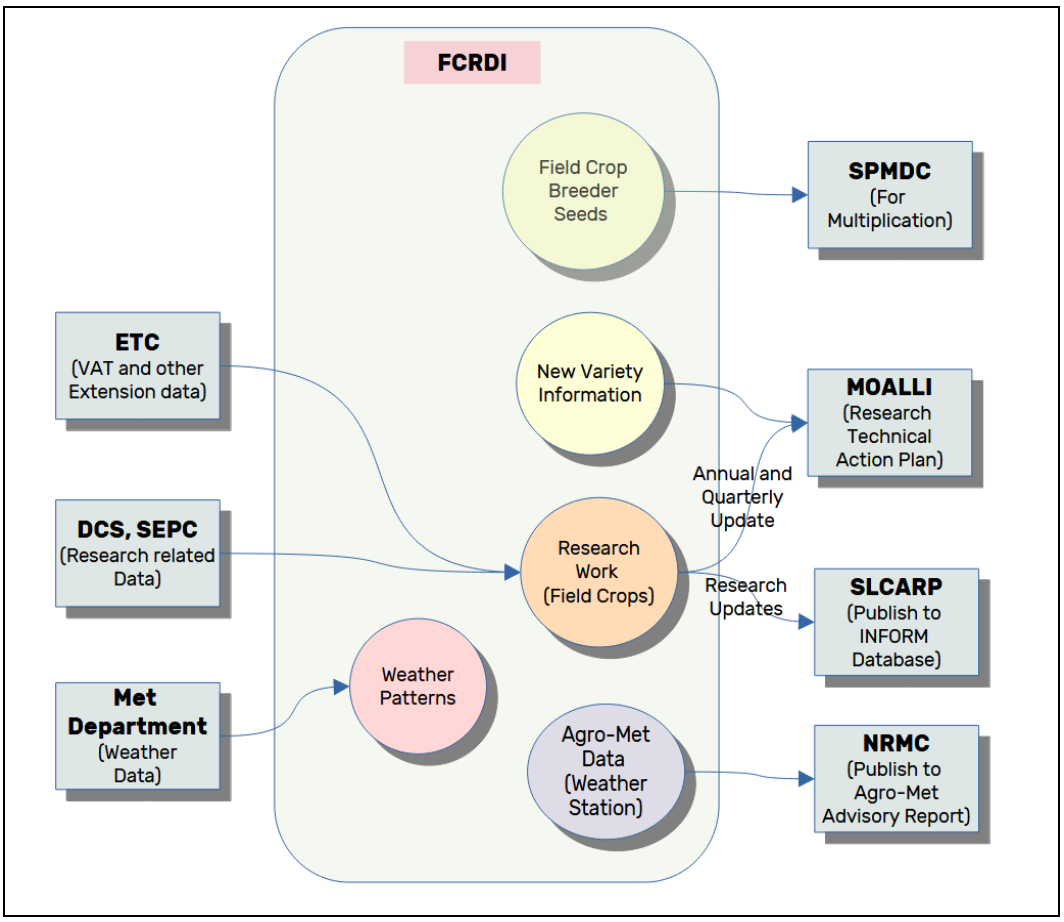
Information In-Flows

- Data / Information related to field crop research activities – For example, **VAT (Variety Adaptability Trial)** data taken from ETC with the help from ADAs and AIs. (P.Note: VAT is a part of the variety development process, which happens on the field level to make the adaptability in all conditions)
- Weather data information from the Met Department, especially for crop modelling
- Any research gaps or improvement information from the Extension Department (ETC)
- Final Crop Calendar information from DOA.

Information Out-flows

- Field crop breeder seeds to SPMDC
- Field crop variety information to **Variety Releasing Committee (VRC)**
- Field crop technical information to **Technical Releasing Committee (TRC)**
- Research work information to SLCARP

- Research Technical Action Plan (Annual) is sent to MOALLI in January every year including a quarterly update.
- Agro-Met data to NRMC from the weather station installed in the premises



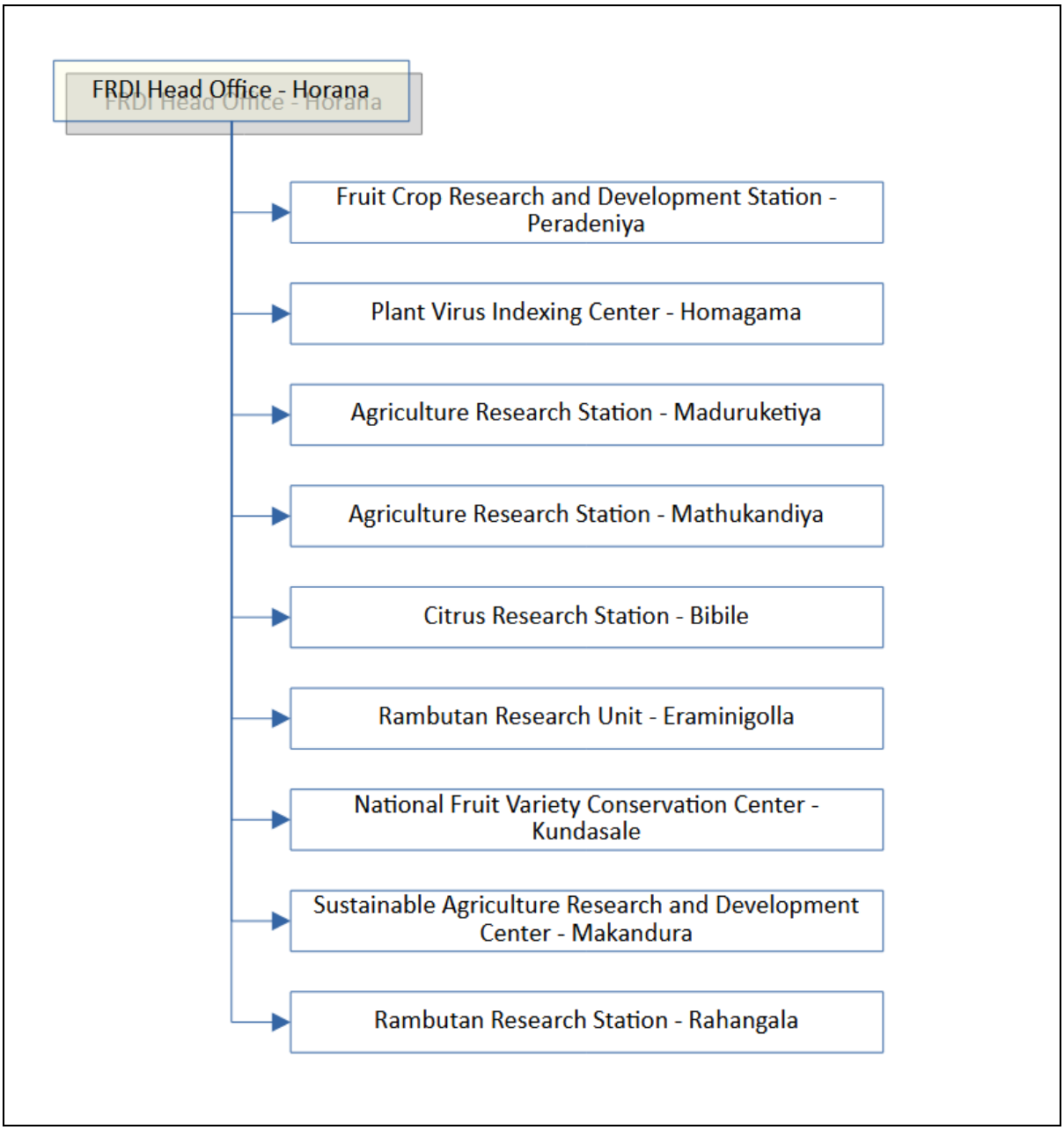
FCRDI Information In-flows and Out-flows

Concerns

- Extension information related to Variety Adoption Test (VAT) not captured real-time to FCRDI - Currently VAT information, which is reported from the ETC side is not delivered to FCRDI on real time basis due to non-availability of an information system. Currently they are being delivered to FCRDI on a paper form, which can be erroneous sometimes due to human errors.
- Research oriented information such as field crop cultivation area, production, etc., which are basically coming from DCS / SEPC can be erroneous due to ground level data capturing issues.

Case Study – Fruit Research and Development Institute (FRDI)

FRDI plays a key role in the country's fruits sector by releasing high demand, high yielding fruit varieties, the initial breeder seed production, and the related research and technological advancements. There are nine (09) substations attached to FRDI Head Office – Horana.



FRDI Organization Structure

Currently the breeding happens only for **Papaya** and **Passion Fruit seeds**. In addition to that, there are about **10-12 fruit planting materials** being bred.

Key Objectives

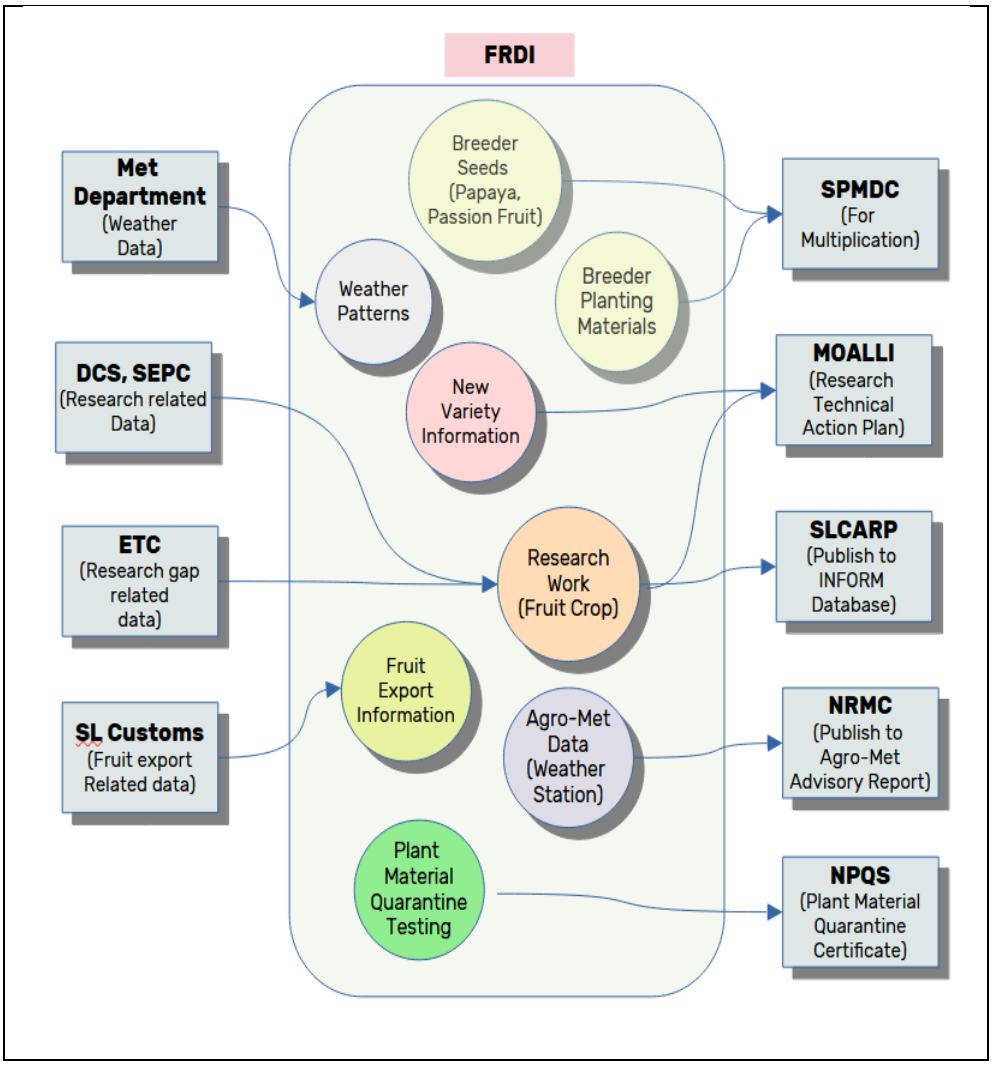
- Development of fruit crop varieties using both conventional and high-tech breeding methods.
- Supplying breeder seeds and planting materials to SPMDC.
- Carrying out research work related to fruit crops.
- Revisiting and fine-tuning existing technologies and generation of new technologies for fruit growing ecosystems, new plant protection, and new post-harvest value additions.
- Consultations and advisory services on fruit crop production technologies.
- Pest and disease diagnosis.
- Promotion of commercial level fruit orchards and encouraging cottage level fruit industries.

Information In-Flows

- Mostly the data related to fruit related activities are taken from DCS, SEPC and ETC, such as fruit cultivated extent, fruit production, fruit Cost of Cultivation, Crop Enterprise Budget, etc. DCS relies on data taken from ARPAs and SEPC, ETC relies on data from Agriculture Instructors (AIs).
- Weather data forecast information from the Met Department
- Any research gaps or improvement information from the Extension Department (ETC)
- Final Crop Calendar information from DOA.
- The fruit export data is taken from SL Customs.

Information Out-flows

- Fruit breeder seeds and plant material information to SPMDC
- Fruit crop variety information to **Variety Releasing Committee (VRC)** and then to DOA for the final publication
- Research work information to SLCARP
- Research Technical Action Plan (Annual) is sent to MOALLI in January every year including a quarterly update.
- Agro-Met data to NRMC from the weather station installed in the premises
- Plant Material Quarantine Certificate issuance to NPQS and to the related customer / company



FRDI Information In-flows and Out-flows

Concerns

- **Non-availability of a complete fruit crop databa**se - The accuracy of fruit crop-related data (i.e. cultivated land extent, crop age) for each fruit crop has been a concern since most of the data collection has been limited to commercial fruit lands. This is probably due to the fact the manpower involved at ARPA and AI levels are not sufficient.

- **Multiple data collection channels** - Most of the fruit crop extent data is taken from multiple channels. For example, generally fruit land extent data are taken from DCS and in some situations the same data is taken from the Agriculture Extension Department (ETC) for specific fruit varieties (e.g. TJC Mango cultivation information). Hence there is no single source of truth for some of the master data taken from the department level.

- **Lack of staff** – Currently only 40% of the required cadre is available. The recruitment has not happened for nearly 10 long years and it had really hindered the progress of the institution.

Case Study – National Resources Management Center (NRMC)

There are five (05) divisions under NRMC:

1. Soil Conservation Division – This division primarily gets involved in implementing the **Soil Conservation Act No 25 of 1951**. Currently, the act is implemented in three provinces (Central, Uwa and Sabaragamuwa).
2. Agro-Climotology and Climate Change Division
3. Land Use Planning and Geo Informatics Division
4. Soil and Water Resource Management Division
5. Knowledge Management Division

NRMC provides multiple services:

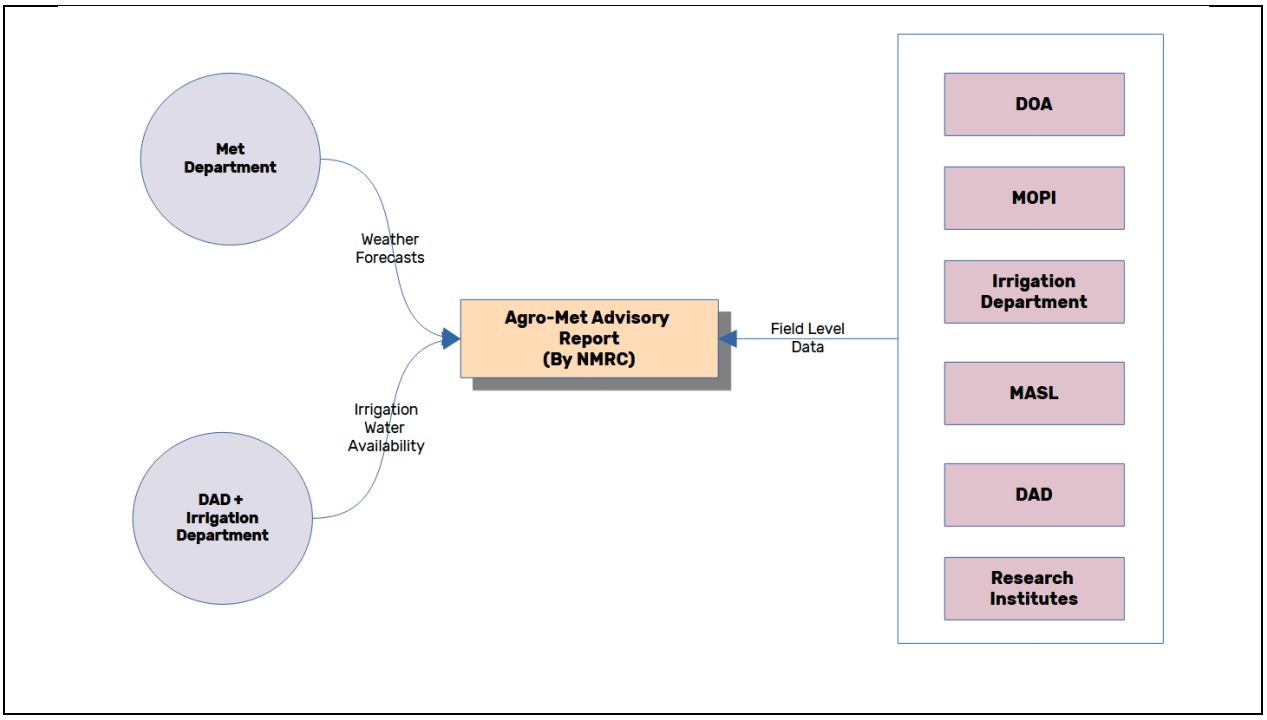
1. Technical Assistance to establish soil conservation structures in sloping agricultural lands, restoration of degrading agriculture lands, designing micro-irrigation systems, designing structures for protected agriculture, on-farm water management systems, land use planning at various scales, crop diversification of unproductive lands, establishment of water harvesting and irrigation structures.
2. Demarcation of contour lines for land development and establishment of soil conservation measures.
3. Providing agro-ecological data
4. Assistance for productivity enhancement in agricultural lands of different agro-ecological regions
5. Providing maps and other planning aids for other agricultural related development programs.
6. Conduct soil surveys and land suitability surveys to recommend suitable crops.
7. Conduct soil classification and land evaluation.
8. Find suitable locations for agro-well establishment using ground water availability observation techniques.
9. Assisting the mitigation of environmental impacts for implementation of various projects such as land blocking out projects for residential purposes, mini hydro power projects, and landscaping inquiries
10. Preparation of soil monolith and models of soil maps for exhibitions.
11. Conduct awareness sessions for Natural Resource Management for school children, university, students, technical staff, farmers etc.

Information Systems:

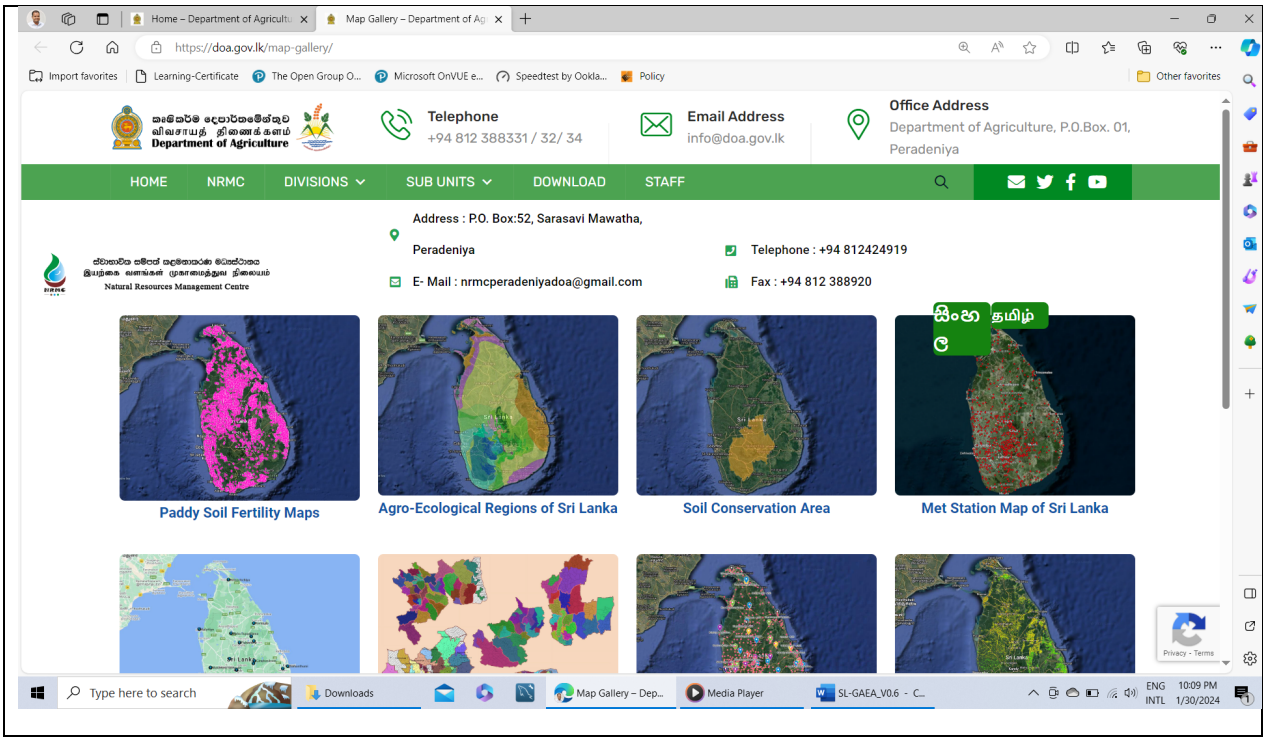
#	Information System	Description	Status
1	GIS Maps	There are multiple GIS Maps on the NRMC – DOA web site (https://doa.gov.lk/map-gallery/) These completed maps are part of the on-going research that is being conducted by the department. Some of the available maps are: 1. Paddy Soil Fertility Maps 2. Agro-Ecological Regions of Sri Lanka 3. Soil Conservation Area 4. Met Station Map of Sri Lanka 5. DOA Circuit Locations 6. AI Ranges in Sri Lanka 7. Institutes and Centers of DOA 8. pH Map 9. Electrical Conductivity Map	In Production
2	Agro-Met Advisory Committee Report	A working group has been formed to prepare this report under the direct supervision of NRMC. NRMC, Department of Meteorology, Irrigation Department, DAD, MASL, DOA and MOPI comprise this committee. They get together on the first week of every month to decide on an advisory forecast for the next three months. URL: https://doa.gov.lk/agro-met-advisory/	In Publication

Concerns:

1. Though there are multiple GIS based maps currently on the public domain, there are no public (G2C) or Government-to-Government (G2G) APIs available from them for possible re-use.
2. Currently, there is no specific GIS repository in the agriculture sector, who has the complete responsibility to disseminate GIS related data. NRMC, RRDI, CRI and Irrigation Department have their own GIS units to complete specific GIS needs within their scope. Even NRMC purchase their base maps for their research work from the Survey Department by paying a fee.



Agro-Met Advisory by NMRC



NRMC GIS Maps

Case Study – Sri Lanka Tea Board (SLTB)

Sri Lanka Tea Board was established under the **Sri Lanka Tea Board Act No 14 of 1975.**

There are seven (07) regional offices established under SLTB.

Primary tasks:

1. Manufacturing, Monitoring, Regulation and Development of all tea factories in the island (More than 700 up to now)
2. Managing tea lands, which are more than 10 to 50 acres. (less than 10 acres are managed by TSHDA and more than 50 acres by the State Plantations)

Information Systems:

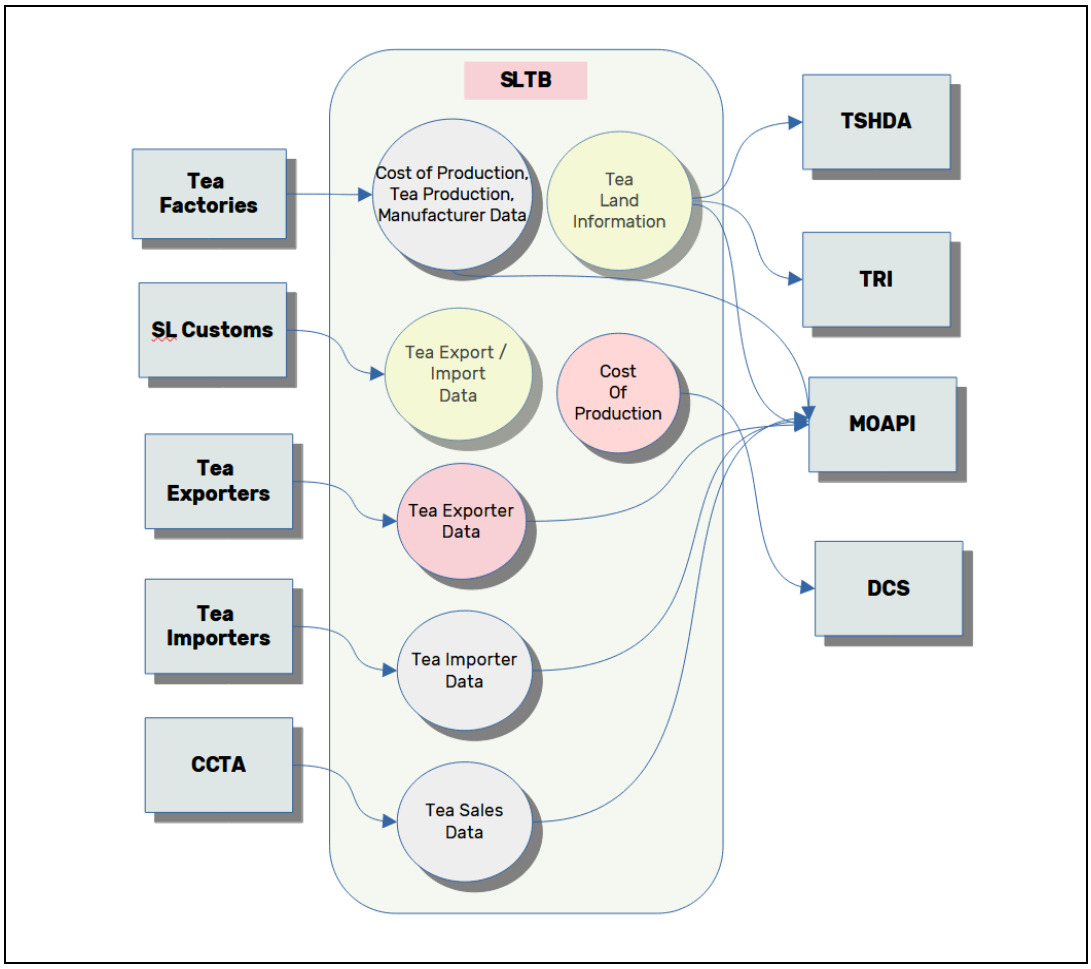
#	Information System	Description	Status
1	Tea System	The tea system encompasses the whole value chain under the purview of SLTB.	In Production Currently managed by a local software vendor. This is a legacy system, which has been there for some time. However, a new system is being built adopting the latest technology aspects.
2	Tea Land Registration System	This key registry basically holds all Tea land information irrespective of the size of the land extent. For example, the land details related to THSDA are also captured in this database. If any owner changes the tea land, that should be updated in the system upon the approval of GN (Grama Niladhari) of the area. They can even do the updating via SLTB regional offices. This updating is allowed only in December every year. The Primary Key for this database is the **Land Registration Number**. *(Refer Agriculture IF for details)* Additionally, the **Land Registration Number** has been shared with MOPI, TSHDA and TRI in the past but SLTB says that other	In Production. But slow adoption Currently managed by a local software vendor.

		institutions have not adopted this number system so far for any subsidy distributions related to the lands in relevance. According to SLTB, currently nearly 50% of team landowners have less than 1 acre of land extent. Even 30% have less than 40 perches of land extent. Currently there are about 50,000 tea land registrations within the system.	
3	Tea Auction System at CTTA	Tea auction process has been initially delegated to Sri Lanka Chamber of Commerce and now it has been again transferred to Colombo Tea Traders Association (CTTA). CTTA carries out the on-line Tea Auction in Sri Lanka. It is the second largest Tea auction in the world after Kenya. CTTA is having all tea export related data for Sri Lanka. Tea auction runs with a different application, which has offline integration to the SLTB main Tea System. SLTB planning to integration real-time with SLTB new Tea System in the future.	In production

Information In-flows:

- **Monthly Production (Kg) –** The monthly production is sent to SLTB regional offices monthly from all tea factories registered under SLTB. Tea Factories use TC5 Form to fill those details. Regional offices collect all TC5 forms every month from all tea factories and enter them to the SLTB Tea System.

- **The Total Cost of Production (COP) (per Kg)** – This is calculated annually based on the data received from each tea factory. Each tea factory is provided with a manual form to fill. Once they are filled with production cost details, they are forwarded to SLTB and then again forwarded to DCS for the final consolidation. The final calculation is then published on the DCS web site. (http://www.statistics.gov.lk/Agriculture/StaticalInformation/COP_tea)



SLTB Information In-Flows and Out-Flows

- **Tea Sales Data** – The sales component is basically handled by CCTA and send sales related data to SLTB and finally they are fed to SLTB Tea System.

- **Tea Exporter Data –** This is forwarded by SL Customs. The sheets provided by SL Customs are verified and uploaded to the current SLTB Tea System monthly. All exporters are registered separately with the SLTB Tea System.

- **Tea Importer Data** – There are tea importers who do value additions in the local market for later export. All these importers are registered with SLTB

- **Tea Factory Registration** – All tea factories should be registered under SLTB. There are more than 700 registered tea factories under SLTB.

- **Tea Warehouse Registration Data** – All Tea Warehouses should be registered under SLTB.

- **Tea Broker Registration Data** – All Tea brokers, who are basically interacting with CCTA should be registered under SLTB. Currently there are eight (08) tea brokers functioning under SLTB and CCTA.

Information Out-flows:

- Currently all tea land information is stored within SLTB Tea Land System. This land information is shared with MOPI, TSHDA and TRI at various stages. However, due to unavailability of real-time APIs this has not been done regularly.
- The total cost of production is shared with DCS.
- All the other registry information such as exporter, importer, factory, and sales information are shared with MOPI and Treasury regularly.

Concerns:

- **Lack of integration with external stakeholders** - The Tea System, which Is being used at the moment, has limited functionality to reflect the end-to-end value chain. With the introduction of the new Tea System, which is being developed now, can eliminate all the integration issues among other external parties, who are involved in the tea value chain process. Some of the integration points which will be added in the new system are:
    - Tea Factory to SLTB integration (Cost of Production, Tea Production)
    - CCTA to SLTB integration (Tea Sales)
    - SLTB to TSHDA, TRI and MOPCI integration (Tea Land Information)
    - SL Customs to SLTB integration (Tea Import/ Export Information)

- **No APIs** - There are no APIs built in the current system, which has hindered the integration among external stakeholders.

Case Study – Tea Small Holdings Development Authority (TSHDA)

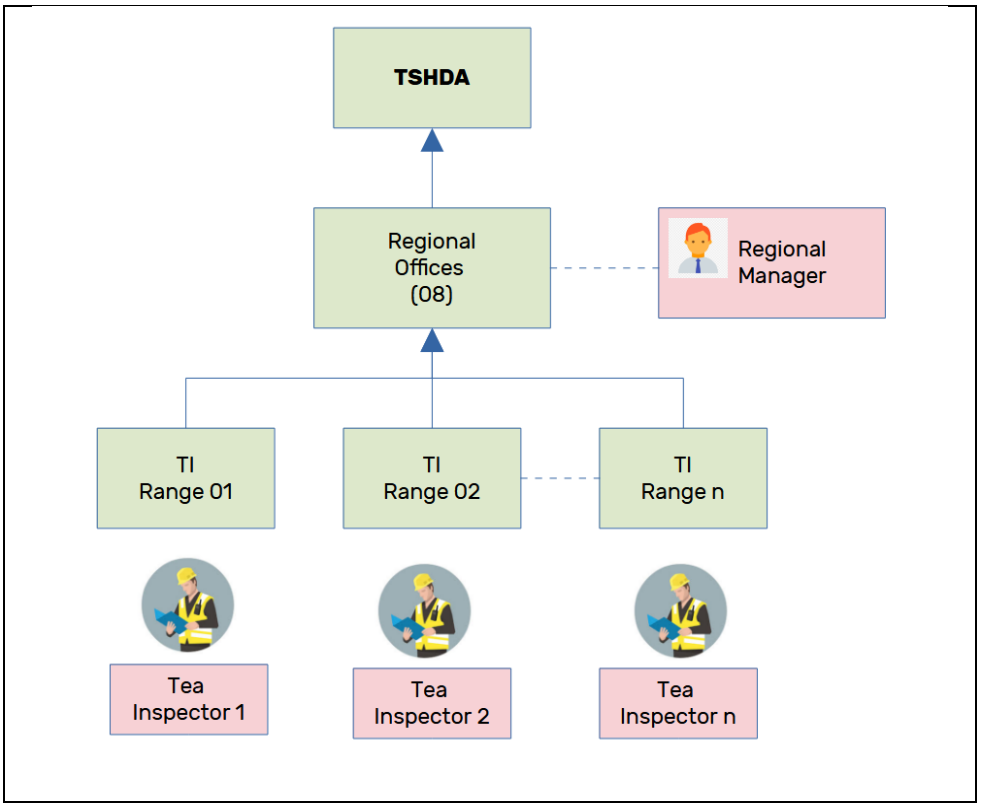
Tea Small Holding Development Authority (THSDA) was established under the **Tea Small Holding Development Act No 35 of 1975.**

The original act was further amended by Act No 36 of 1991 to establish and register the **Tea Small Holder Societies** and by Act No 21 of 1997 to grant legal status to these societies. Furthermore, act further amended by Act No 34 of 2003 with more legislative aspects.

Primary tasks:

1. To work as the main statutory body for tea small holdings in the country
2. THSDA's primary tasks are to develop activities for tea small holders such as subsidy programs and other extension activities such as technical training and awareness programs with the assistance from TRI.

TSHDA Governance Structure



TSHDA Governance Structure

TSHDA functions in eight (08) regions. (Galle, Matara, Ratnapura, Kalutara, Kegalle, Uva, Kandy, Nuwara Eliya)

Each region is managed by a regional manager and there are multiple **Tea Inspectors** (TI, who do the development and extension activities for Tea Small holders. Currently there are 144 Tea Inspectors attached. One TI represents one TI range. One TI range could be a collection of many GN divisions or sometime there can be two TI ranges in one GN division.

Information Systems:

#	Information System	Description	Status
1	Tea Small Holder Subsidy Application	Complying with the current Act, tea small holder land registrations should also be registered at the SLTB Land Registration System. However, due to API unavailability from the Tea Board system so far, THSDA has not been able to get real-time data of Tea Small holder land registration details. Therefore, THSDA has built its own tea small holder registration within the subsidy application and generates **subsidy permits** along with the registration. This permit contains a different land registration ID in a different format. These permits are primarily used for subsidy programs. This application was initially built in 2000 as an Oracle Developer Platform and continued using it with in-house IT support. All eight regions are connected now to a central database via a private VPN.	In Production. Completely developed by the in-house IT team
2	TI (Tea Inspector) Activity System	TI Inspector Activity system is a web-based tool, which was developed by the TSHDA internal IT department especially for TIs. It automates some of the “development” and “extension” activities / visits covered by TIs in their respective regions. TIs can access this application at field level from their mobile devices provided for their field visit activities. Some of the important features covered by this tool are: 1. Subsidy Permit holder details with	In Production. Completely developed by the inhouse IT team

		their subsidy payment history. 2. TI extension activity register in their respective regions. Each TI can keep track of their extension activities and record them on a real time basis. These activities are directly linked to TSHDA annual action plan items. 3. Generating management reports for TI development and extension activities.	

Case Study – Tea Research Institute of Sri Lanka (TRISL)

TRI was first established in 1925 as an arm of Planter's Association of Ceylon. The institute was first located in Nuwara Eliya and then was transferred to the present location in Thalawakelle in 1929.

Currently, TRISL is under the administration of the **Tea Research Board.**

TRI currently constitutes multiple regional centers / stations covering all tea grown areas.

Regional Center	**Region**	**Scope of Work**
Kandy	Mid Country region	Research, Advisory and Extension
Ratnapura	Low Country region	Research, Advisory and Extension
Passara	Uva region	Advisory and Extension
Galle (Kottawa)	Galle district	Advisory and Extension
Matara (Deniyaya)	Marara and Hambantota districts	Advisory and Extension
Kalutara (Matugama)	Kalutara district	Advisory and Extension

Out of these six (06) regional centers, Kandy and Ratnapura have been involved in Research, Advisory and Extension works, whereas other regional centers are only involved in Advisory and Extension activities.

Tea Extension Officers are deployed under each regional center to coordinate all extension activities.

All the technological advancements, tea variety introductions are happening through **Advisory Circulars**. Prior to that, a **technology / variety release committee** is appointed to access the suggested improvements before publishing them to all stakeholders. These release committees are appointed by the Tea Research Board.

Main Objectives:

The main objective of TRISL is to generate technologies related to Tea **cultivation**, **processing,** and the technology dissemination to its stakeholders (tea small holders, corporate estates / RPCs including government estates such as SPEC and JEDB).

[P.Note: TRISL considers Team Small Holders as the cultivator who has less than 25 acre Tea cultivated land]

Tea processing happens in Tea Factories. There are two types of Tea factories.

1. Estate Tea Factories (Factories with a Tea Estate)
2. Bought Leaf Tea Factories (Factories without a Tea Estate. They only buy leaves from the private sector Tea cultivators)

Furthermore, TRISL does soil and plant testing for any stakeholder.

Furthermore, TRISL has been an active member for some time abiding by the standards of the **FAO IGG (Inter Government Group) of Tea**.

Information Systems:

#	Information System	Description	Status
1	TRI-MIS	This is to manage the internal processes. (HRM, Procurement, Finance Management, Payroll, Store Management, Transport Management) The system recognizes all stakeholders who interact with the system as customers. These customers could be tea cultivators, or any other individual who interacts with TRI to acquire any service. There is no authentication happens for tea cultivators since it is not a must for TRI mandate. There are no APIs consumed from either SLTB or TSHDA for the moment.	Under development. Developed using PHP/MySQL and hosted at SLT/IDC.
2	Tea Advisor Mobile Application	An Android mobile application to provide all technical information to the public.	In production. Developed internally.

Case Study – Sri Lanka State Plantations Corporation (SLSPC)

SLSPC was established under the **Ceylon State Plantations Corporation Act No 4, 1958**. It was further amended in 1962 and 1979 by subsequent acts. (No 12 in 1962 and No 49 in 1979).

With the enactment of the Land Reforms Act in 1972, all profitable estates were taken over by the government for the better management and they were vested with two organizations namely Sri Lanka State Plantation Corporation (SLSPC) and the Janatha Estate Development Board (JEDB).

But later, with the Private Companies Act of 1992, a total of 450 estates which were managed by SLSPC and JEDB were given on lease to a set of RPC (Regional Plantation Companies). Out of 55 remaining estates 16 were kept under SLSPC. Out of these 16 estates 03 of them have Tea Factories. SLSPC is doing both borrowing and selling tea leaves. The Tea products of SLSPC are going under the brand name “Sanstha Tea”.

Information Systems:

#	Information System	Description	Status
1	No Systems involved: Daily production from all 16 estates is sent by estate superintendent via email/ Whatsup to SLSPC. Those production details are then shared with the Ministry whenever requested.		

Case Study – Janatha Estate Development Board (JEDB)

As indicated under the SLSPC Case Study, currently JEDB owns 17 estates (15 Tea estates, 2 Rubber estates) and 03 Tea factories. Both SLSPC and JEDB have the same business process with subtle differences.

Information Systems:

#	Information System	Description	Status
1	Crop Ledger	The estate level information (weekly tea production, etc) is captured and sent to the head office on a weekly basis (off-line). They are forwarded to the Plantation Ministry whenever requested. There is no tea cultivator / farmer involved in JEDB, because JEDB owns all 17 of its factories and they do not buy tea from external tea growers. There are minimal interactions with other stakeholders in the plantation sector.	In production
2	Tea Land Database (For Leased Tea estates)	As mentioned, there are about 160 leased tea estates. These tea land details are kept in a small database at JEDB.	In production

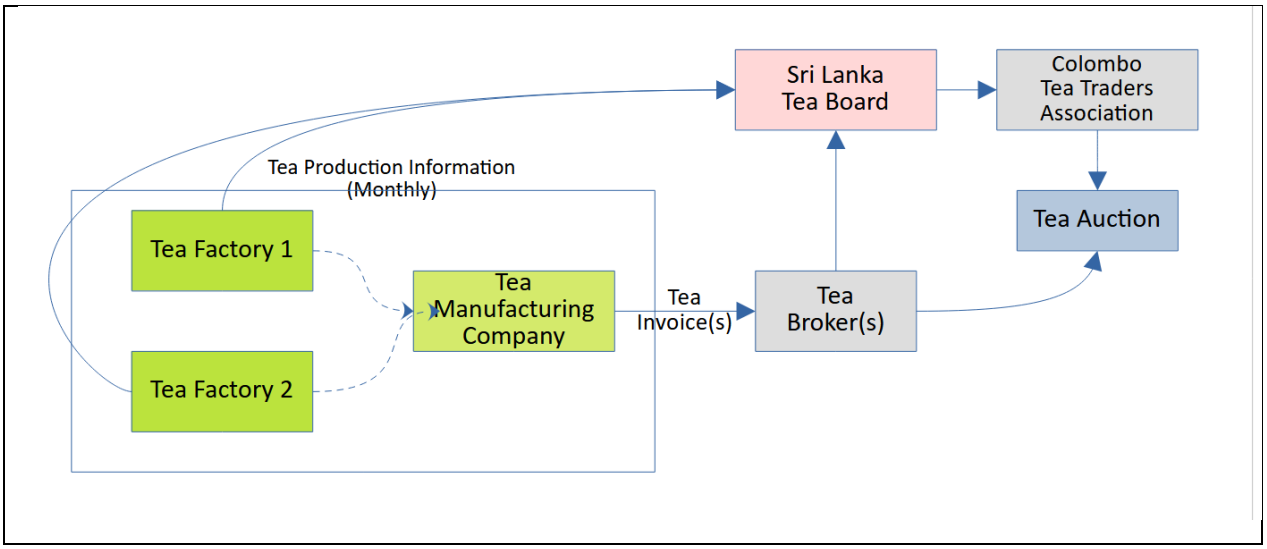
Case Study – Kalubowitiyana Tea Factory Ltd (KTFL)

KTFL is a limited liability company incorporated under the **Companies Act No; 17 of 1982** and re-registered under the new **Companies Act No; 07 of 2007**.

Business Process:

Currently there are 04 Tea Factories operated under Kalubowitiyana Group. Though they have Tea Factories they do not have estates. They generally borrow Tea leaves from Tea Small Holders around Tea factories and does the production. This is different to the model JEDB and SLSPC follow, where they have both Tea Factories and estates with them. In Kalubowitiyana, they are only into processing within their own Tea Factories.

Common Business Process:



The above explains the typical formation of data flows among institutes within the tea manufacturing.

All Tea factories are monitored monthly for their "Tea Production" by Tea Instructors (TI), who are under SLTB administration. They collect monthly production information using a fixed form (known as TC5 Form) and submit the details to SLTB.

The TC5 Form submits the information such as,

[Tea Leaf Quantity (Grade-wise), Tea Grower Information, Tea quantity that has been forwarded to the Tea Auction, The Refused Tea Quantity, The balance Tea Quantity in the factory, etc.]

The "Tea Selling" process is handled by the Tea Auction, which is managed by the CTTA under the supervision of the SLTB. Each Tea Manufacturer (i.e Kalubowitiyana) will send their Tea Invoices via

selected brokers to CTTA for the Tea Auction. Eventually this information also will be fed to SLTB systems.

Information Systems:

#	Information System	Description	Status
1	Tea Factory MIS and the Tea Grower Database	All Kalubowitiyana tea factories are equipped with this software. This system can capture tea leaf quantity at the collection point "Tea Weighing Scales" itself and then send that information to the core system for further processing. By EOD, all the tea factories send the daily production information to the Kalubowitiyana head office in Battaramulla. This system further registers all tea grower information. There are about 4000 small holder tea growers currently enrolled in this system in all 04 factories. Without this registration, tea growers are unable to hand over their daily harvest to any of these factories.	In production This is maintained by a third-party vendor.

Case Study – Rubber Development Department (RDD)

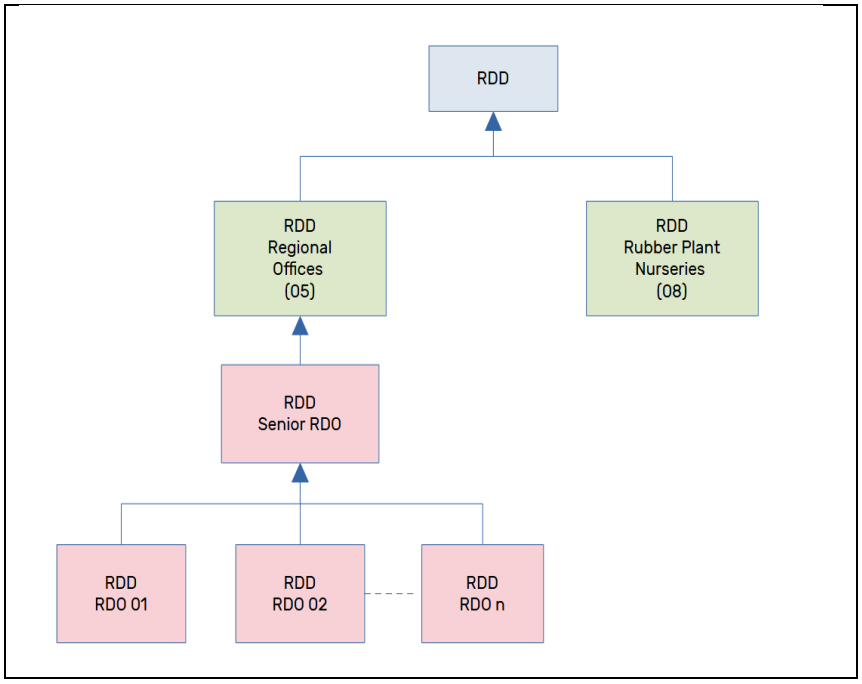
It was established to enforce legislative provisions of the **Rubber Control Act No.11 of 1956** and the **Rubber Replanting Subsidy Act No.36 of 1953**.

Starting on 12th April 1934 as the Rubber Control Department, on 1st July 1994 it was strengthened and renamed as the Rubber Development Department (RDD).

The primary task of RDD is to carry out activities related to development and extension services.

The Governance Structure

There are **five (05) regional offices** (Ratnapura, Kegalle, Kalutara, Galle, Monaragala) and **eight (08) rubber plant nurseries** under RDD.



RDD Governance Structure

The officer who provides the extension services to the grass root level is known as the **Rubber Development Officer (RDO).** There are 120 **Rubber Development Officer Regions** currently operating.

Rubber Land Types

Currently there are two types of rubber cultivators depending on the size of the cultivation land extent.

1. Rubber small land holders – Less than 10 acres (1600 perches) of Land
2. Estates/ RPC (Rubber Plantation Companies) – More than 10 acres (1600 perches) of Land. There are both private and government RPCs available.

Rubber Cultivation Permits

To carry out rubber cultivation in Sri Lanka, according to the Rubber Control Act, it is required to get a **permit** from RDD irrespective whether the cultivator is a small holder or a RPC. The permit is issued free of charge.

The minimum land extent for a permit is **0.25 acres** and currently about 95% of rubber cultivators have obtained permits from RDD. However, it is not illegal not to have a permit to cultivate rubber so far in Sri Lanka.

Permit holders are eligible for financial subsidies provided by the government and free rubber plant provided by RDD rubber plant nurseries.

Dealer Permits

According to the Rubber Control Act, all rubber dealers who purchase and store rubber need to get a permit from RDD. This is required to be renewed every year.

Information Systems:

#	Information System	Description	Status
1	Rubber Information System – Legacy system	This is the old system that the department has been maintaining since 1994. The system is a decentralized one where a separate database and an application runs at all five regions. It is primarily used for: 1. Rubber land registration 2. Rubber Cultivation Permit issuance 3. Rubber subsidy distribution process including the voucher payments.	In Production (Parallel to the new system – RMIS)
2	**RIMS** (Rubber Information	This is the newly developed web-based system. It has all old system features and the	In Production (From early 2024)

	Management System) – New Web based System	newly developed modules “Rubber Nursery Management” and the “Dealer Permit Issuance”. The new system process has been updated to have periodic rubber land inspection checks to keep a more up to date rubber land registry. **Land Registration Number:** In this system, Rubber Land Registration contains a Land Registration ID, which represents the District, GN Division, (Small Holder /Estates) and a serial number. The Small Holders are represented by “S” and the Estates are represented as “E”. (Refer Plantation Sector Interoperability Framework (IF) Document for details)	

APIs

1. Dealer stock level enquiries could be helpful to the public to see where to purchase rubber. This could be exposed via a public API.
2. RRI need information on land information could be exposed via an inter-department level API

Concerns:

1. The initial legacy system has been successfully collecting all relevant land information. However, it was not able to gather the updated rubber land information since the process has not been able to do so in a periodic manner unless the cultivator land is inspected for subsidies. The department is hoping to rectify this with more frequent updates to the rubber land registry with the introduction of the new web-based RIMS system.
2. Lack of RDOs – Currently there are not enough RDOs to cover the entire island.

Case Study – Rubber Research Institute (RRI)

RRI is the oldest rubber research institute in the world, which was established in 1909.

Primary Tasks:

1. It has the statutory responsibility for research and development on all aspects of rubber **cultivation** and **processing** activities.

Concerns:

1. **Land Used for the Rubber Cultivation** - RRI raised concerns on the Rubber Cultivation Land Use. They are under the view that the land extent provided by *Land Use Policy Planning Department (LUPPD)* is the correct figure compared to the figure given by RDD. Apparently according to the RRI officials they feel that LUPPD data are more updated than the RRD one.
2. **Lack of Rubber Cultivator / Farmer Information** – RRI needs farmer information for their research work.
3. **Lack of IT Staff within RRI**

Case Study – Coconut Cultivation Board (CCB)

CCB was established under the **Coconut Development Act No 46 of 1971**

Primary Tasks:

1. Registration of coconut cultivators
2. Providing subsidies
3. Providing materials, coconut seeds and coconut plants for a subsidized price.
4. Extension facilities – Training, Awareness, Technology advancements, etc.
5. Kapruka Loan Schemes – Providing loans under 10 different schemes.

CCB Governance Structure

There are 19 Regional offices, 39 Coconut Nurseries, 12 Model Gardens, 03 Training Centers and 10 Laboratories.

Coconut Development Officer (CDO) works as the main person who interacts with coconut cultivators at the grass root level. He mostly gets involved with extension activities. In addition to that he/ she gets involved with farmer registration activities, subsidy verification works, etc.

Information Systems:

There are quite a few databases and Excel sheets maintained for data collection work. The primary database is the Coconut Farmer Database.

#	Information System	Description	Status
1	Coconut Farmer Database	This is encouraged but not mandatory so far. Coconut cultivation of more than 0.25 acres are eligible to register. Around 100,000 already registered with the system (around 20%) Farmer ID is based on the CDO region. [CDO-Region/xx/xx/]	In Production
2	King Coconut Farmer Database	This is maintained separate to the Coconut Farmer Database.	In Production

Case Study – Coconut Development Authority (CDA)

CDA was established under the **Coconut Development Act No 46 of 1971** and subsequent amendment **Act No 40 of 1987**. With this act, it was given powers to be the apex body, which provides governance, guidelines and technology approvals for projects and programs. It is also given powers for direct operational functions and responsibilities of supervision, development and facilitation of the industrial processing that involves small, medium and large-scale industries.

Primary Tasks:

1. Coconut Products and Product improvement facilitation
2. Managing coconut exporters and manufacturers databases – It is mandatory for every exporter / manufacturer to register with CDA to do their business work.

Information Systems:

#	Information System	Description	Status
1	Coconut Manufacturer Registration Database	This system maintains coconut manufacturer registrations.	In Production On Google Forms
2	Coconut Marketing Exporter Database	This system maintains coconut exporter registrations. There are around 1000 exporters now. Exporter-related information is available on the web site, which is basically pulled from the current database. Integrated with Customs ASYCUDA system with the exporter registration number along with CUSDEC number. Currently EDB gets the exporter information from Customs and not from CDA.	In Production PHP/ MySQL System (Web application)
3	Desiccated Coconut (DC) Sample Processing Database	<TODO>	In Production On Google Forms

Case Study – Coconut Research Institute (CRI)

Provides multiple services.

1. Enhancing the national coconut production and land productivity through good agronomic practices, intercropping and livestock integration. (Agronomy Division)
2. Safeguarding the coconut industry through pest and disease management (Crop Protection Division)
3. Socio Economic knowledge towards globally viable coconut industry while fulfilling social corporate responsibility. (Agriculture Economics and Agribusiness Management Division)
4. Enhance the genetic potential of coconuts to fulfill the present needs and face future challenges. This includes a coconut seed **certification unit** as well. (Genetics and Plant Breeding Division)
5. Advancing knowledge on physiological and biochemical aspects of the coconut palm (Plant physiology division)
6. Research and technology innovation to increase income from the coconut industry through diversification and value addition (Coconut Processing Research Division)
7. Nutrient balancing in coconut palms to increase productivity of coconut plantations through improving (Soils and Plant Nutrition División)
8. Improving quality of planting material of coconut through in Vitra technologies (Tissue Culture Division)
9. Building interaction among stakeholders, researchers, and extension personnel to facilitate development, dissemination, and adoption of sustainable technologies. (Technology Transfer Division)

Primary Data:

The primary data available from CRI are:

1. Coconut Seed Varieties
2. Coconut Seed Certification information.

Concerns:

1. **Seed Certification** - Currently the seed certification is carried out by CRI at all coconut seed nurseries, which are managed by CCB. However, there is no specific database to store seed certification details. Since the seed certification is owned by CRI, they should maintain this database and open it up for relevant parties via APIs.

2. **Seed Stock Levels** – As indicated above, the seed nurseries are managed by CCB and hence, it is CCB's responsibility to open Seed stock levels to relevant parties via APIs.
3. **Pesticide Stock Levels** - It is important for growers, or anyone interested to know the pesticide stock availability at CCB. Currently all pesticides are imported by CRI and then distributed fully by CCB. Hence, it is CCB's responsibility to make these data available to relevant parties via APIs.

Case Study – Department of Export Agriculture (DEA)

Establishes the **Export Agriculture Crops Act No. 46 dated 22nd September 1992**,

Primary Tasks:

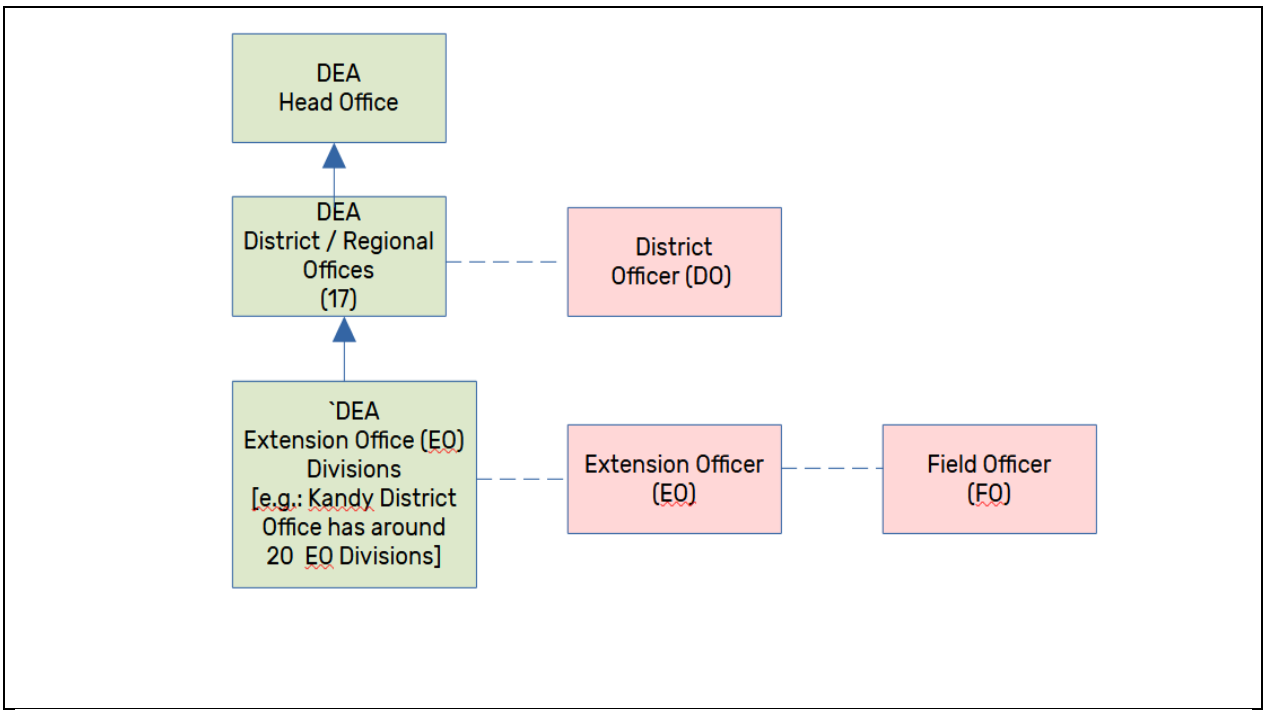
1. Organizing and promotion of cultivation and processing of Export Agricultural Crops (EACs).
2. Undertaking multidisciplinary research on crop improvement, crop husbandry, crop protection, post-harvest handling, and socioeconomics.
3. Production and supply of quality planting material
4. Implementation of EAC assistant schemes on crop production, productivity improvement, and quality improvement
5. Providing crop protection advisory services
6. Promotion of Integrated Pest Management
7. Promotion of Integrated Plant Nutrient Management
8. Promotion of Organic Farming
9. Dissemination of information on marketing, quality standards, and prices etc.
10. Control of importation of EAC products and planting materials etc.
11. Training of personals involved in EAC production, processing, and trading.
12. Providing advisory services for the promotion of EACs in the estate sector
13. Strengthening of the linkage among public and private organizations involved with EACs
14. The executive authority vested under the Export Agriculture Act No. 46 of 1992
15. Contributing towards EACs related policy matters in other governmental organizations
16. Maintenance of technological demonstrations

Governance Structure:

DEA has 17 regional/ district offices attached to the Kandy Head office, which supports around 17 Export Agricultural Crops (EACs). Each regional/ district office can have multiple EO ranges. Each EO range has its own EO (Extension Officer). For example, Kandy regional/ district office are having nearly 20 EO ranges.

Extension Officers (EO), who are attached to an EO range collect data on behalf of DEA at the grass root level. In addition to that, there are District Officers (DO)s attached to Regional/ District offices who are engaged in high level data collection and verification, which are provided by EO officers.

In addition to EO and DO officers, there are Field Officers (FO), who are responsible to collect EAC market prices on a weekly basis.



DEA Governance Structure

There are four (04) key divisions.

1. Development – Does Farmer Management, Plant Nursery Management, Plant Certifications, GAP Certifications

2. Research – Socio-Economic Research (EAC Prices, Crop Yield Forecasting, Market Surveys and Analysis). These research activities are carried out with the help of EO and DO officers. Key research stations are in Matale (Main research institute), Narammala, and Walpita

3. Administration

4. Accounts

EAC Certification Process

Only plant material EACs are going through the certification process. Once the plant nurseries are registered with DEA, they are basically given targets to produce plants on a regular basis. These targets are closely monitored by EOs in their respective divisions. Unlike in SCS in the Agriculture sector, there is no Plant Certification request goes through the current business process.

Information Systems:

#	Information System	Description	Status
1	Farmer Registrations	Application URL: http://admin.lkdea.com/ Due to the slowness of this application, the department started to maintain the farmer information via the old Excel Sheet, that they have been maintaining before.	In Production A web application – to handle registrations. A mobile application (Android) – For data entry at field level This system now not in a usable state due to slowness. Hosted on vendor servers.
2	GAP Certification Application	GAP System (Old) -> URL: http://exagri.info/ A new GAP System is being developed in collaboration with FAO.	In Production (old) A web application
3	Registration of Spice Processes, Collectors and Manufacturers	Application URL: https://exagri.info/spicereg/ A registration form for Spice Processes, Collectors, and Manufacturers.	In Production A web application
4	Farm Gate Market Information	Application URL: https://exagri.info/mkt/index.html This website shows producer prices for EACs. The web site is updated every week by DEA socio economic division. Every Tuesday, Field Officers (FO) from each Regional Office go to fields and the latest pricing details (EO officers are not part of this process. FO's primary task is to get this pricing information from the field). Those details are then handed over to DEA head office to prepare the Farm Gate pricing information.	In Production A web application. Developed internally. Hosted in a private vendor server space.
5	Cultivation Data (Division Wise)	EAC cultivation information	Excel File

6	DEA Progress	DEA program / project information maintenance	Excel File
7	Plant Nurseries	Maintains plant nursery information. There are two types of Plant Nurseries. 1. Government Nurseries 2. Private Nurseries	Excel File
8	Import/Export Data	EAC import/export information	Excel File
9	Crop Yield Forecasting	EAC yield forecasting. This is done by the DEA socio-economic division. Field level data gathering related to forecasting is carried out by EOs in their respective EO divisions. They get the quarterly forecasting figures and submit them to DEA head office for their central reporting. DEA finally collects the quarterly data to prepare annual reports on the same.	Excel File
10	Post Harvest Technology Assistant	Information related to post-harvest activities (grants, technology assistance, etc.) involved with farmers. Currently a separate Excel sheet is maintained to track those (especially cash grants). A unique registration number has been introduced by the department for those who are engaged with post-harvest grants.	Excel File

Case Study – Sri Lanka Cashew Corporation (SLCC)

Established under the **State Agricultural Corporation Act No 11 of 1972.**

There are seven (07) divisions in the organization. Out of these divisions, research and extensions, marketing, plantations and policy and planning divisions have a few information systems developed over the past few years. However, there are quite a few issues witnessed in most of the systems sustainability due to the lack of technical internal staff with SLCC.

Currently there are two cashew processing factories located in Puttalam and Ja-Ela. Every day the cashew harvest is transported to Rajagiriya Head Office stores for distribution. Then they are distributed to all its franchise outlets (78 approx.) around the country. Both factories carry out their operations without any proper information system.

The research and extension division basically reach out to cashew growers (whom are not part of SLCC cashew cultivations) for various subsidies and cashew plant distributions (free of charge).

There are 11 regional offices around the country. Cashew Development Officers (CDO) are attached to these regional offices to carry out the extension tasks.

There are 08 Plant Nurseries maintained by the Plantation Division, which can have the maximum capacity for nearly 265,000 plants annually. These plants are distributed free among the registered farmers at each regional office. Within these nurseries all the seed production details handled manually.

Information Systems:

#	Information System	Description	Status
1	Cashew Inventory System	This basically handled the cashew inventory process. Not connected to any of the production factory outlets for the moment. All the daily updates happened manually.	Legacy. Not in use. Functioned under the Marketing Division
2	Cashew Farmer Database	This was in operation until the subsidy scheme was in operation. After the subsidies were stopped in the recent past, the system has not been in use. However, maintaining this database is paramount in all production forecasts and all the other promotional activities done by SLCC.	Legacy. Not in use. Functioned under the Extension and Research Division

Concerns:

1. **No central Cashew Farmer Database** – As indicated above, the database which has been maintained while the subsidies were given is no longer being used. This needs to be activated again.
2. **No Integrated Solutions** – Both solutions discussed here are not integrated and the rest of the business processes are manually executed. Need to have a more seamless integrated system across its factories, regional offices, and plant nurseries to minimize errors.
3. **Legacy Systems** – Most of the systems under SLCC were developed by self-motivated internal staff with minimal IT supervision. Due to that, a lot of systems have seen their end of life with no future enhancement ability. Need to have a more strategic technical road map to overcome this situation.

Case Study – National Institute of Plantation Management (NIPM)

This was initially established under the **National Institute of Plantation Management Act No. 45 of 1979**. NIPM has been "the" training institute for plantation sector capacity development for nearly 45 years.

Primary Tasks:

1. Capacity building in the plantation sector by proving various professional courses (Small holders and RPCs)
2. Providing educational courses in the plantation sector by providing courses such as Diploma, Higher Diploma, Degree, etc. NIPM is the only organization empowered to award certificates for those who successfully complete training academic courses and confer Professional Membership to eligible plantation executives.

Information Systems:

#	Information System	Description	Status
1	Learning Management System	The internal learning management system for all students, who have been registered with the institute.	In Production.

Concerns:

1. **Lack of small holder farmer database** - There are multiple small holder farmer capacity building programs happening at NIPM. For these, any small holder farmer can apply and attend. Since there is no farmer API in the plantation industry, it is hard to validate the attendees for these programs. Sometimes, the same farmer attends every year since NIPM has no mechanism to validate them.

Case Study – Department of Fisheries and Aquatic Resources (DFAR)

Sri Lanka possesses a territorial sea of 21,500 km2 and an Exclusive Economic Zone (EEZ) of up to 200 nautical miles (370 km) from the coastal line an extent of 517,000 km2. This entitles Sri Lanka to an oceanic surface extent 7.89 times larger than its land surface area of 65,268 km2 (Amarasinghe. I., 2022), which is quite remarkable.

DFAR was established by the **Fisheries and Aquatic Resources Act No 2 of 1996.**

Main Functions of department are:

1. Formulation and implementation of Fisheries Operations, Management, and Aquaculture Regulations.
2. Registration of fishing vessels
3. Issuance of fishing operation licenses.
4. Issuance of permits for live fish exports.
5. Issuance of fish landing permits for foreign fishing vessels.
6. Registration, regulation and supervision of boat building companies, fisheries input suppliers, and fish processing establishments.
7. Collection of fisheries related data.
8. Quality inspection of export fish.
9. Vessel Monitoring System (VMS) installation in multiday fishing boats.
10. Providing radio communication facilities between fishing vessels and land.
11. Providing daily weather reports weather advisories.
12. Implementing fishermen's insurance and pension schemes.
13. Capacity building programs for the staff in the department.

The above functions have been centered around nine (09) divisions in DFAR.

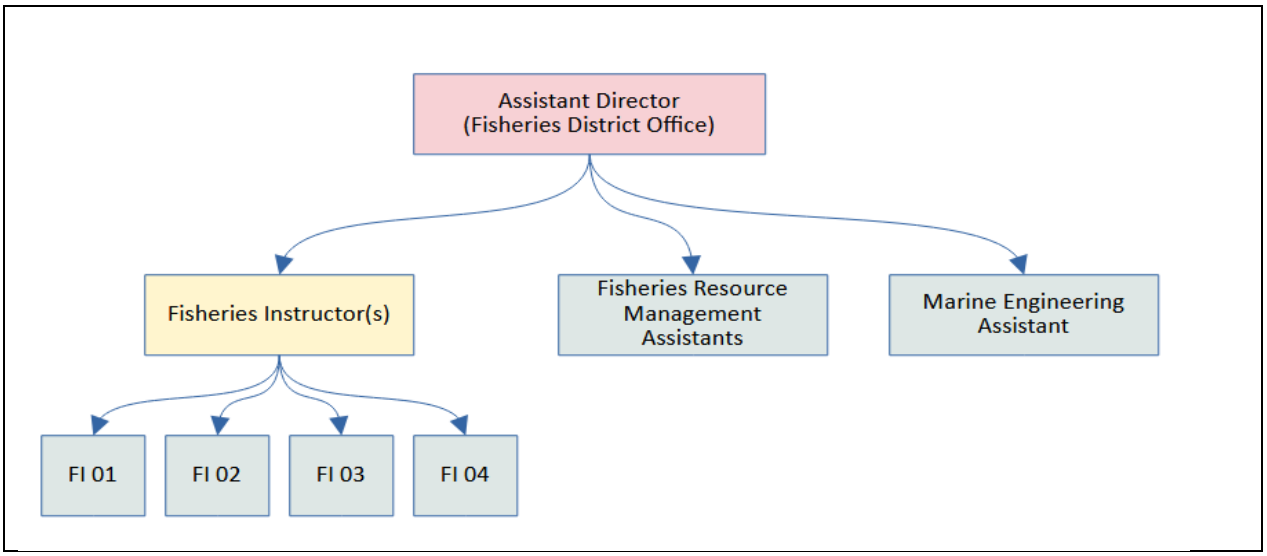
1. Fisheries Management Division
2. Fisheries Industries (FI) Division
3. Fisheries Products Quality Control Division
4. Monitoring, Controlling and Surveillance Division
5. Operation Division
6. Information Technology Division
7. Administration Division
8. Finance Division
9. Internal Audit Division

DFAR Governance Structure

DFAR administrative structure consists of fifteen (15) District Offices.

Each District Office is headed by an *Assistant Director*, and it can consist of one or more *Fisheries Inspector (FI) Divisions*. Altogether there are 149 *Fisheries Inspector Divisions* established to cover all the coastal areas on the island.

Each of the *Fisheries Inspector Division* consists of *Fisheries Inspectors (FIs)*, *Fisheries Resource Management Assistants*, and a *Marine Engineering Assistant* attached to it,



Fisheries District Office and its composition

Fisheries Harbors

There are 24 Fisheries harbors located in 07 districts in the island. The officials including the FIs of the department are attached to them to carry out following activities:

1. Inspection of vessels departing the fishery harbors day and night,
2. Registration of and permitting the departure,
3. Obtaining log entries pertaining to the trip of boats arriving at the harbor,
4. Checking fish production accordingly,
5. Preparation of reports for the fish ready for export and providing them to the buyers,
6. Taking statements in case illegal, unreported, and unregulated fishing has occurred,
7. Delivering the log entries and statements taken to the Head Office via Fax or E-mail
8. Preparation of alternative monitoring reports.

There have been twenty (20) regional monitoring centers established in the vicinity of fishing harbors island wide and radio officers have been attached to such centers for day and night duties.

Monitoring of all multi-day fishing vessels departing for fishing in international waters by means of satellite technology is an integral part of international laws and regulations. Since 2015, only the vessels having licenses to operate in international waters are monitored by a Vessel Monitoring System (VMS), but according to the above international rules and the requirement of fish export, there was a need to cover all multi-day vessels by VMS.

Accordingly, a traditional vessel monitoring system consisting of 4200 VMS units to fulfill the above requirement was established in the Department as a grant from the Australian Government. The new VMS system is accessible through all the harbor offices and centrally managed on a 24x7 basis. by the Fisheries Monitoring Center (FMC) located at the Head Office premises.

This center can be made use of identifying vessels at risk of illegal activities such as illegal fishing, human trafficking, drug trafficking and illegal border crossing. This system can also be used to provide facilities. for fishing vessels in emergency situations. The FMC has also been equipped with all modern technology and thus it can be considered as one of the most advanced Monitoring Centers in Asia at present.

VMS tracking records with the position information of the entire fishing trip of every multi-day vessel arriving at land is sent to the High Seas Fisheries Unit by the Vessel Monitoring Division at MFAR. Thereafter the log page of that vessel is checked and only if the same is compared with the VMS data the verification officer will issue a verification report signed by the Assistant Director (High Seas) to the effect that the vessel has legally caught fish without engaging in any illegal fishing activities, to enable them to export the said fish stock.

Only after this verification report is forwarded to the airport Quality Control Unit located at Katunayake, the officials there will issue the Catch Certificate required for the export of the fish related to the said trip of the vessel. This fish information verification process is implemented by the officers who are working on a roster basis through 24 hours a day, seven days a week on a (24x7) basis at 21 Harbor Operations Offices, Vessel Monitoring Unit at Colombo Head Office, High Seas Fisheries Unit as well as Quality Control Unit at Katunayake Bandaranaike Airport. As a result of this process, there will be an opportunity to direct the legal fish stocks brought to the Island by multiday fishing boats for export by guaranteeing the same to have been caught with proper records and licenses.

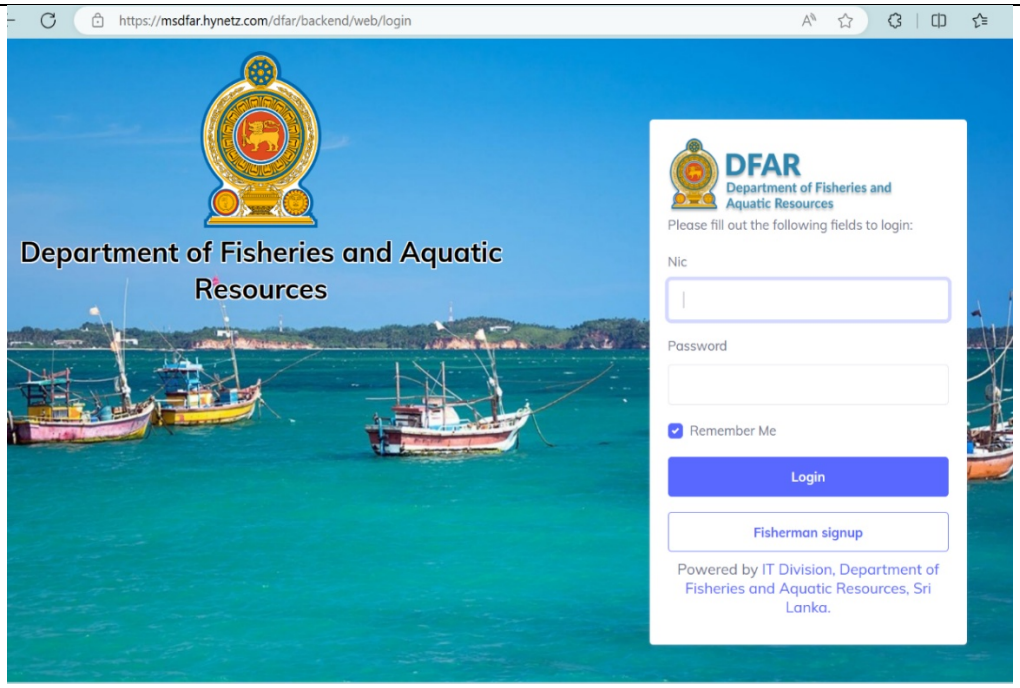
Information Systems:

All the information systems, except the VMS system, are currently maintained by the DFAR IT Division staff.

#	Information System	Description	Status
1	**MS-DFAR** (Management System for the Department of Fisheries and Aquatic Resources)	This is Responsible for providing key DFAR services such as Fishermen Registration, Fishermen ID Card generation, Fishermen Operation License and renewal, Boat Registration and renewal, Boat Number Issuance, Export License Issuance, Boat Yard Registration, Skipper Registration, etc. Fisherman Registration is happening via MS-DFAR mobile application by a Fisheries Inspector (FI) attached to the area of the Fisherman, FI collects the data via MS-DFAR mobile application including a photograph taken using the same application. Fisherman data is captured and initially verified by the FI at the time of the registration. Then it will be submitted for further approval via Additional Director of the District Office and then to higher approvals at DFAR. Once all approvals	In production

		are done, the Fisherman ID is issued. Currently there is no NIC validation happens, and the authentication of the Fisherman is solely based on the ground level FI recommendation and other higher approvals. RPD NIC APIs are not consumed for this application. Operation License is required for fishermen to carry out fishing activities in the ocean. All fisherman irrespective of the boat type (Single-day/ multi-day boat) should obtain the operation license using MS-DFAR. This was developed by an outsourced party.	
2	**Departure Approval System (Later added to MS-DFAR)**	This is an in-house developed module, which was added later to MS-DFAR as a separate module sharing the same MS-DFAR database. Fishermen (who have Multiday boats, which are operated via Harbors) can request for a departure approval 2-3 days prior to the departure through this system. Generally used for Multiday boats, which depart from Fishing Harbors. Once the departure approval request was sent via this system, authorities can confirm the approval based on the information provided. Once the approval was granted, the fisherman can enter the departure details with all on-board details prior to the departure date. This information will be analyzed at the Harbor terminal before departing the vessel.	In production
3	**E-Log System**	This is mandatory for fishermen, who catch fish for the export market (IOTC / European Regulations). In this process it can obtain fish catch quantity, fishing area information, etc. The E-log mobile application is used to gather these information (GIS coordinates, etc.) by the fishermen during the catching time. Full fish catch quantity (including other fish landing sites) is obtained by a sampling system carried out by DFAR with the help of NARA annually to get a rough figure.	In production

4	**Payment Module**	A separate payment module is developed by the department to handle export/import license fees, VMS fees, etc. This will be linked to MS-DFAR application later.	In production
5	**VMS (Vessel Monitoring System)**	This has been one of the successful projects which MFAR has initiated. This captures boat moments in and out of our sea areas. It can capture the vessel's movements in real time with GPS satellite links. There are links given to coastal guard division and the Sri Lanka Navy for further monitoring. In addition to that, there is an API given to MS-DFAR system on boat movement for other system verifications.	In production



MS-DFAR Application

APIs

There are no APIs exposed by MS_DFAR to any other external entity. All the stakeholders log into MS-DFAR via public Internet. Currently an API has been provided by VMS to MS-DFAR to capture boat movements at a given time interval.

The transport level security with HTTPS has been deployed to manage transport level security and the message level security is handled via a simple username/ password.

Case Study – National Aquaculture Development Authority (NAQDA)

NAQDA is responsible for the sustainable development and management of aquaculture and inland fisheries to ensure food security and to improve the quality of life of the people. This further improves the socio-economic conditions of rural societies through alleviation of poverty by increasing freshwater and brackish water fish production by introducing new technologies for small, medium, and large-scale enterprises.

Works according to the **National Aquaculture Development Authority Act No 53 in 1998.**

NAQDA Governance Structure

There are three (03) technical divisions within NAQDA.

1. Freshwater Aquaculture Development Centers (AQDCs) – There are ten (10) freshwater centers operating now.
2. District Aquaculture Extension Centers (AQECs) - There are 21 District offices under NAQDA. Each District Office has department Extension Officers (EO) to carry out NAQDA duties. EO reports to [DAEO – District Aquaculture Extension Officer]
3. Coastal Aquaculture Development Centers (ADCs) – Under this unit, Ornamental fish breeding centers and Coastal aquaculture monitoring and extension units are functioning.

Aquaculture Development Centers (ADCs)

Some of the available ADCs are:

Udawalawa (Carp), Udawalawa (Thilapiya), Inginiyagala, Dambulla, Iranamadu, Muruthawela, Sevanapitiya, Kalawewa, and Nuwara Eliya.

Information Systems:

#	Information System	Description	Status
1	**OMSA** (Online Management System for Aquaculture)	This system is primarily used by the freshwater Aquaculture Development Centers (AQDC). Officers in each development center are given a target to enter data related to seed harvest, water quality of freshwater tanks, etc. This application is built on Google Sheets and now the department is in the process of migrating the functionality to their main system which is AQUA MIS for NAQDA.	In production

2	**AQUA MIS for NAQDA**	This system manages the production related data. In addition to that, it will hold data related to fishermen, aquaculture farmers, etc. Currently a fishermen id is generated by the system, which is a verifiable credential completely decoupled to MS-DFAR fisherman id. The aquaculture farmers will not be taken as fishermen and there is no separate identity generated for them. The Fisherman id is the only id within NAQDA systems now. They are being verified by NAQDA extension officers before registering them with the system. Fishermen boats are currently registered by MS-DFAR system before being registered at NAQDA system. The boat id generation happens at the MS-DFAR side. However, this could be changed in the future allowing them to have a separate boat id for inland fisheries with the proposed Act changes.	In production

APIs

There are no internal / external APIs exposed by NAQDA.

Concerns

1. There are two farmer registries maintained with two different fisherman IDs for both Marine Fishermen and Inland Fishermen. *(Please refer Fisheries IF for more details)*
2. There are two fishing district coding systems maintained for both marine and inland fisheries by DFAR and NAQDA respectively. *(Please refer Fisheries IF for more details)*

Case Study – National Aquatic Resources Research and Development Agency (NARA)

NARA is the apex institute vested with the responsibility of carrying out and consolidating research, development, and management activities about aquatic resources in Sri Lanka. It has eight (08) technical divisions.

Established under the **National Aquatic Resources Act No. 54 of 1981** and amended. subsequently by **National Aquatic Resources Research and Development Agency Act No. 32 of 1996.**

There are multiple divisions within NARA. Out of them, some of the key divisions are:

1. Marine Biological Resources Division (MBRD)
2. Inland aquatic resources and aquaculture division
3. Institute of post-harvest technology
4. National institute of oceanography and marine sciences
5. Environmental studies division
6. Fishing technology division
7. Socio-economic and marketing division
8. National hydrographic division

There are multiple applications being deployed by NARA divisions for various data collection activities.

Information Systems:

#	Information System	Description	Status
1	**MS Access Databases for Small and Large size Fish Quantities**	NARA MBRD has been maintaining two key databases (MS Access) to determine the catching quantities of small and large marine fish varieties respectively.	In production
2	**The Scientific Application (Sri Lanka Norway Bilateral Project)**	NARA MBRD recently introduced a scientific application collects data as samples from multiple landing sites across the coastal belts in Sri Lanka. There are about seventy (70) data collectors / enumerators deployed both from DFAR and NARA for this task. However, this application is not yet linked with the DFAR e-Log system, which captures multi-day vessel fish catch quantities daily. If both e-Log and Scientific application data are merged based on the vessel identification, that will be able to give more balanced accurate data to the ministry.	In production
3	**The Fish Abundance / Density Survey by Saggarika Vessel**	In 2018-9 period NARA deployed the Saggarika vessel in the sea to get an abundance/ density details of fish species. However, due to the economic crisis and COVID situation, this has not been functioning for more than 2 years.	In production

4	**The Meta-Data Repository / Catalog with GeoNetwork**	A separate Meta-Data repository is developed with the help from the University of Saba-ragamuwa. This repository captures all meta-data details from all the projects carried out withing the department. With all the research in the future will be able to access this portal to get any research-oriented data elements by a single application rather browsing all research-oriented documents. However, these data are not in the public domain for the moment and will only be used for research purposes. Once the data classification is completed for most of the data sets, the selected data set could be exposed to the public domain. This repository application uses an Open-Source Software Framework called GeoNetwork (https://geonetwork-opensource.org/).	In production

Case Study – Ceylon Fisheries Corporation (CFC)

CFC primarily does fish purchasing, selling, and distribution. Furthermore, CFC helps to have competitive fish price in the market while making sure to have a continuous flow of fish to citizens as well.

Currently, there are no enterprise applications / systems running in the department. All the regional offices (21 in total) send data to the head office manually. This manual process has created many inefficiencies, and losses to the department over the years. Hence, the department desperately needs a working ERP (Enterprise Resource Plan) application to streamline the current business process. As the first step, CFC is intending to start with the "Finance Module". Currently the finances of the organization are not centrally managed, and the regional officers do not send sales information regularly to the head office. Due to this, there is no proper visibility to the head office and the senior management about the finances of the organization. Therefore, having a central ERP with a finance module is the highest priority for the organization now.

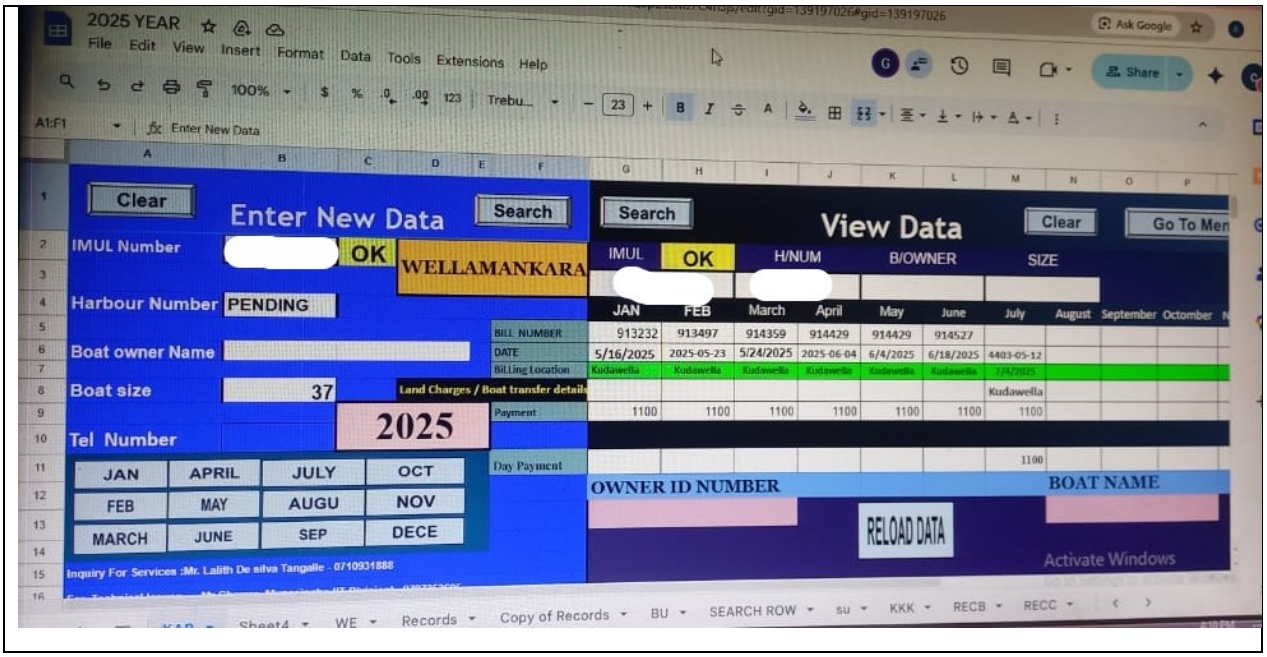
Some of the key master data generated by the organization are:

1. **The wholesale fish prices (daily)** are determined with the help of selected fish market prices taken early morning (Galle, Trinco, Beruwala, Peliyagoda). There are CFC officials assigned daily to this task. Once the wholesale price has been decided, it is informed to all regional fish stalls maintained by CFC.
2. **The retail fish prices (daily)** are determined by the wholesale price, which was decided by CFC. The retail price could vary based on respective regions.

Case Study – Ceylon Fishery Harbor Corporation (CFHC)

This department manages the main fishing harbors in the country (there are 24 fishing harbors on the island).

Currently there are no enterprise level applications running within the department. There is a boat berthing application running across fisheries harbors using Google Forms to track boat berthing payments. However, this application lacks required scalability and agility due to its technological limitations. Due to the unavailability of any enterprise level system to handle the current business process, there is no inter-agency data exchange happening electronically.



CFHC Boat berthing application

However, some of the harbor related master data are captured daily by the DFAR such as daily fish catch from each harbor, boats operated in/out from each harbor, etc. These data are forwarded to CFHC by harbor officials daily.

APIs

Though there are no APIs being consumed now, MS-DFAR can expose some of the APIs to extract some of the information related to harbor (boat movements, fish catch from each harbor, etc.) daily basis to CFHC. Currently, as explained, all the above information is sent directly to CFHC manually by officials attached to each harbor.

Case Study – Cey-Nor Foundation

Manufacturing fishing equipment and boats for the sector. Currently a self-funded entity under the government.

Manufacturers boats, which have width more than 55 feet. Has expertise in manufacturing fiber glass boats. Competes with many private sector manufacturing companies.

Runs a few systems with minimal interactions with any other institutions in the sector.

1. **Costing System** – This handles the day-to-day manufacturing process.
2. **Quick Book (QB) System** – To manage the internal financial process.

The company needs more marketing information from the Ministry to carry out the marketing campaigns for their products.

Once a boat is manufactured, it must be quality assured by a Marine Engineer (ME), who is a DFAR employee attached under an Additional Director. Once ME assured the boat, he/ she will produce the ME Certificate, which will be a mandatory requirement for the boat registration at DFAR.

APIs
There are no APIs exposed via current systems. The existing systems are managed solely by a third-party vendor.

Case Study – Irrigation Department (ID)

Irrigation Department (ID) is the main organization, which is responsible for the water resource development in Sri Lanka. It carries out planning, designing and construction of water resource related infrastructure. The department currently consists of 14 Regional / Director Offices and 54 Divisional Irrigational Offices.

With the constitutional changes that happened in the 1980s under the Ministry of Irrigation, all the irrigation projects which were handled by the Irrigation Department were taken over by three institutions.

1. **Irrigation projects more than 200 acres** (Major Irrigation Projects) – There are 357 Major irrigation projects, and they were initially under the management of the Irrigation Department.

   Later, out of these 357 irrigation projects, 73 of them, which have been identified as projects, with the land extent more than 2,000 acres have been taken under the management of Ministry of Irrigation leaving the rest of the major irrigation projects to the Irrigation Department.

   Then, out of these 73 larger irrigation projects, the management of 54 irrigation projects, have been taken under the management of IMD, which is an institute under the Ministry of Irrigation. However, all the operational and maintenance activities are still carried out by the Irrigation Department for all the 357 irrigation projects.

2. **Irrigation projects, which are in Mahaweli Areas and Walawe South Areas** – These are handled by MASL.

3. **Irrigation projects, which are less than 200 acres** (Medium and Minor Irrigation Projects) – There are more than 12,000 minor irrigation projects – Handled by DAD under the provincial system.

Irrigation Schemes

An *Irrigation Scheme* indicates a land area where the considered water resource is consumed. A single *water resource* could be one either a reservoir, anicut, canal, etc. Each of this *Irrigation Scheme* is managed by a Divisional Irrigation Office.

Currently the Irrigation Department (ID) manages 387 *irrigation schemes* including reservoirs and a few other water resources such as anicuts, canals, etc. (ID, 2022). Around these irrigation schemes, there are about 800,200 acres of paddy and other crop land cultivation available. The crop cultivation details are sent to DOA by the *Divisional Irrigation Engineers*, who are attached to Divisional Irrigation Offices.

Key Stakeholders

1. Mahaweli Authority
2. Irrigation Management Division (IMD)
3. Agriculture Department
4. Land Registry
5. Agrarian Department
6. Fisheries (Inland) Department
7. Met Department
8. Water Board
9. Electricity Board

Information Systems

#	Information System	Description	Status
1	**GIS Applications Data Portal** - (https://slirrigation.maps.arcgis.com)	This portal provides information related to irrigation sector with the help of a GIS mapping data portal. Currently this runs on ArcGIS Enterprise platform. There are a few GIS services / applications developed on this portal. - **Real time water levels in major rivers** – This shows details of hydrology stations and the water levels in major rivers. - **Reservoir status** - This shows daily water levels and storage of 73 major reservoirs. - **Daily rainfall data**	In production
2	**Irrigation e-Repository** (http://repo.irrigation.gov.lk/)	An open data portal with some im-portant irrigation related data.	In production

3	**HMIS (Hydro Meteorological Information System)**	HMIS has been implemented under the **CRIP (Climate Resilience Improvement Project)** - (https://riverbasins.irrigation.gov.lk/) This system has 42 permanent gauging stations, and 106 automated stations installed, supervised, and maintained under the **Hydrology and Disaster Management Division** of the Irrigation Department. The system is hosted within the Hydrology and Disaster Management Division and has given links to many other external institutions including MASL for continuous monitoring. The data is transmitted automatically, and Engineers and Technical Staff of the division visit those stations regularly to maintain the stations and assure the quality of the data. These stations are installed such that they cover most of the critical and important locations of major river systems of the country. The data is transmitted to the system every 10 minutes. These data play a significant role during flood events and are very useful in running hydrological models for forecasting purposes. However, considering the security and the capacity of the system, access to the system is permitted only for authorized parties. However, due to some hardware devise failures, and not being able to replace those with proper devices have basically hindered the progression of this system. Hence, a proper plan is required to sustain this system for some time in the future. Parallel to HMIS, the department has been running a manual system to moni-	In production

		tor the reservoir details for some time as a backup plan.	
4	**Climate Resilience Improvement Project (CRIP)** **URL:** https://riverbasins.irrigation.gov.lk/	This reduces the vulnerability of exposed community and properties to climate risks and to improve the government's capacity to respond efficiently to climate disaster. With this it can adopt flood and drought and risk communication and visualization tools to enable stakeholders to interactively use the hazards. Vulnerability datasets created under the Development of Basin Investment Plans (DBP) to tailor risk information for their own purposes.	In Production

APIs

Currently there are no APIs deployed in any of the systems.

Case Study – Mahaweli Authority of Sri Lanka (MASL)

MASL was established under **Mahaweli Authority of Sri Lanka Act No 23 of 1979**.

AN ACT TO ESTABLISH THE MAHAWELI AUTHORITY OF SRI LANKA WHICH SHALL BE THE AUTHORITY RESPONSIBLE FOR THE IMPLEMENTATION OF THE MAHAWELI GANGA DEVELOPMENT SCHEME, TO PROVIDE FOR THE ESTABLISHMENT OF CORPORATIONS TO ASSIST IN SUCH IMPLEMENTATION, AND TO PROVIDE FOR MATTERS CONNECTED THEREWITH OR INCIDENTAL THERETO.

Purpose

Mahaweli Ganga Development program has been the largest integrated rural development program ever undertaken in Sri Lanka. It is based on the water resources of Mahaweli and allied river basins. The main objective of this program was to increase agricultural production, hydro-power generation, settlement of landless families, opening new employment opportunities, and regional development.

The initial target was to develop about 365,000 ha of irrigable lands in the dry zone and to generate about 508 MW of hydropower. The implementation of the initial plan began in 1970 and in 1977 the Government decided to accelerate the program by developing five (05) major dams and hydropower plants in Mahaweli Systems B, C, H and G (MASL, 2022).

MASL information:

Item	Amount
Districts	15
Systems	10
Blocks	50
Units	238
Town Centers	24
Area Centers	31
Farmer Organizations	1079
Farms	17
Nurseries	13
Reservoirs and Dams	20
Tanks	717

Source: Statistical Handbook. 2022, (Source: (MASL, 2022))

#	System	Districts	Blocks	Units	Town Centers	Area Centers	FOs	Farms	Nurseries
1	B	Polonnaruwa, Batticaloa	8	48	3	7	134	1	2
2	C	Ampara, Badulla, Polonnaruwa	7	31	2	6	200	1	2
3	D	Trincomalee, Polonnaruwa	3	13	0	1	29	1	1
4	G (Moragahakanda)	Polonnaruwa, Matale	4	17	2	5	64	2	1
5	H	Anuradhapura, Kurunegala	7	26	5	3	225	2	1
6	L	Mullaitivu, Anuradhapura, Vavuniya	3	16	1	2	33	2	1
7	Huruluwewa (HU)	Anuradhapura, Matale	5	13	3	0	82	0	1
8	Udawalawa (UW)	Ratnapura, Hambantota, Monaragala	6	39	3	4	298	7	1
9	E (Victoria)	Kandy, Matale, Nuwara Eliya	4	15	3	3	0	0	2
10	Rambakenoya (RO)	Ampara, Badulla	3	20	2	0	14	1	1
Total			**50**	**238**	**24**	**31**	**1079**	**17**	**13**

Source: Statistical Handbook. 2022, (Source: (MASL, 2022))

Reservoirs and Dams:

#	Reservoir	#	Reservoir
1	Victoria	11	Kalawewa
2	Randenigala	12	Minipe Anicut
3	Rantambe	13	Loggaloya
4	Kotmale	14	`Heppolaoya
5	Polgolla	15	Diyabanaoya
6	Bowatenna	16	Chandrikawewa
7	Ulhiriya/ Rathkanda	17	Udawalawe

8	Maduru Oya	18	Moragahakanda Main Dam
9	Dambulu Oya	19	Kalu Ganga Main Dam
10	Kandalama	20	NDK

Source: Statistical Handbook. 2022 (Source: (MASL, 2022))

MASL Governance Structure

There are four (04) key divisions within MASL related to Agriculture.

1. Agriculture Division
2. Livestock and Fish Division
3. Water Management Secretariat (WMS) Division
4. Land Division

Each division captures the data primarily in Excel formats and some efforts have been made to automate some of the data capturing.

Agricultural Statistics (as of 2022):

Cultivated Extent	**Ha**
- Paddy	176,895
- OFC	33,888
- Fruits	12,387
- Other Perennial Crops	8,896
- **Total**	**232,064**
Production	**Mt**
- Paddy	680,704
- OFC	247,825
- Fruits	160,078
- Other Perennial Crops	32,394
- **Total**	**1,121,001**

Statistical Handbook. 2022 (Source: (MASL, 2022))

Livestock and Inland Fish Statistics as of 2022:

Milk Production (Ltr/Mn)	48
Egg Production (Eggs Mn)	60
Inland Fish Production (Mt)	14,398
Prawns (Mt)	35
Ornamental Fish (Mn Pairs)	43

Statistical Handbook. 2022 (Source: (MASL, 2022))

Out of all Macro and Irrigation Systems, which are getting water from the Mahaweli system, some are owned by Irrigation Department (ID) and Ceylon Electricity Board (CEB).

Macro System		**MASL**	**ID**	**CEB**
Mahaweli	Polgolla	Yes		
	Kotmale	Yes		
	Victoria	Yes		
	Bowatanna	Yes		
	Moragahakanda	Yes		
Kelani	Castleewigh			Yes
	Moussakale			Yes
Walawe	Samanalawewa			Yes
	Uda Walawe	Yes		

Irrigation System		**MASL**	**ID**	**CEB**
System H	Dambulu Oya	Yes		
	Kandalama	Yes		
	Kalawewa	Yes		
	Rajangana		Yes	
	Nachchduwa		Yes	
	Nuwarawewa		Yes	

	Tisawewa		Yes	
	Huruluwewa		Yes	
System D, G	Giritale		Yes	
	Minneriya		Yes	
	Kantale		Yes	
	Venderasan		Yes	
	Kaudulla		Yes	
	Parakrama Samudraya		Yes	
System E, B, C	Ulhitiya/ Ratkinda	Yes		
	Maduru Oya	Yes		

Information Systems:

#	Division	Information System	Description	Status
1	Agriculture	**Mahaweli Farmer Registrations [Excel]**	Daily updated Mahaweli farmer details.	In production
2	Agriculture	**Mahaweli Farmer Cultivation Cost [Excel]**	Added on the daily basis for each crop cultivated. Information collected by field officers at Mahaweli Systems is later transferred to MASL head office.	In production
3	Agriculture	**Crop Cultivation Details [Excel]**	Provides Crop Cultivation Extent Details in each Mahaweli System for every season. This stores details such as Year, Season, Mahaweli System, Crop Type, Cultivated Extent, Average Yield, Production. This data is primarily collected by *Mahaweli Unit Officers* and sent to DOA for their monthly reporting.	In production
4	Agriculture	**Cropin Pilot Application**	Currently MASL uses Cropin Application to monitor the cultivation extent for each season (Yala and Maha). This satellite-based application uses MASL cultivation areas to complete one of their initial pilots. Considering the success of this initiative, the vendor	In production

			probably will scale the product to other agri-cultural areas as well.	
5	Livestock	**Mahaweli Livestock Farmer and Production Details [Excel]**	This captures all Livestock farmer registrations and animal production for all Mahaweli Systems. Livestock farmer registrations are updated annually, and production is captured monthly. Information collected by field officers at Mahaweli Systems is later transferred to MASL head office.	In production
6	Livestock	**Inland Fish Production Details [Excel]**	Captures all inland fish production information. Information collected by field officers at Mahaweli Systems is later transferred to MASL head office.	In production
7	Water Management	**Water Management [Excel and Online]**	This captures Mahaweli Water Reservoir Details: [Date, Storage, Water Level, Spill level, etc.] Currently reservoir water level details are published daily on the Mahaweli web site as a PDF file. All the reservoir water level details in this report are published based on the water level captured at the respective reservoir field officers. Those officers send those daily figures via WhatsApp to the head office to prepare the daily report. The HMIS system water level meter readings are not being used by MASL at the moment.	In production
8	Land Use Planning Division	**Mahaweli Farmer Land Information [Excel]**	In the current business process, Mahaweli system area offices do have up-to-date land information, which is then transferred periodically to the head office. However, these land information neither at head office nor at system area offices in a digitized format.	

APIs

Currently there are no APIs deployed in any of the systems. Most of the divisions run their current business processes manually and need complete automation with relevant APIs.

Concerns

1. Mahaweli Team has been given access to HMIS system, which is deployed at ID for reservoir water level real time updates. However, the Mahaweli team is not 100% relying on this due to system issues faced now.
2. There is no coding system used for administrative units such as Systems, Blocks, Units, Town Centers, Area Centers, FOs, Reservoirs, Tanks, etc.

Case Study – Irrigation Management Division (IMD)

IMD was established in 1984, plays a crucial role in implementing the **Integrated Management of Agriculture Settlement (INMAS)** across 54 major irrigation projects, which are more than 2000 acres of land extent. The primary objective of IMD is to build a self-reliant farming community in the irrigation areas. Currently these 54 large irrigation projects are managed by IMD's thirty-seven (37) RPM (Resident Project Manager) offices in 12 districts.

Primary Objectives:

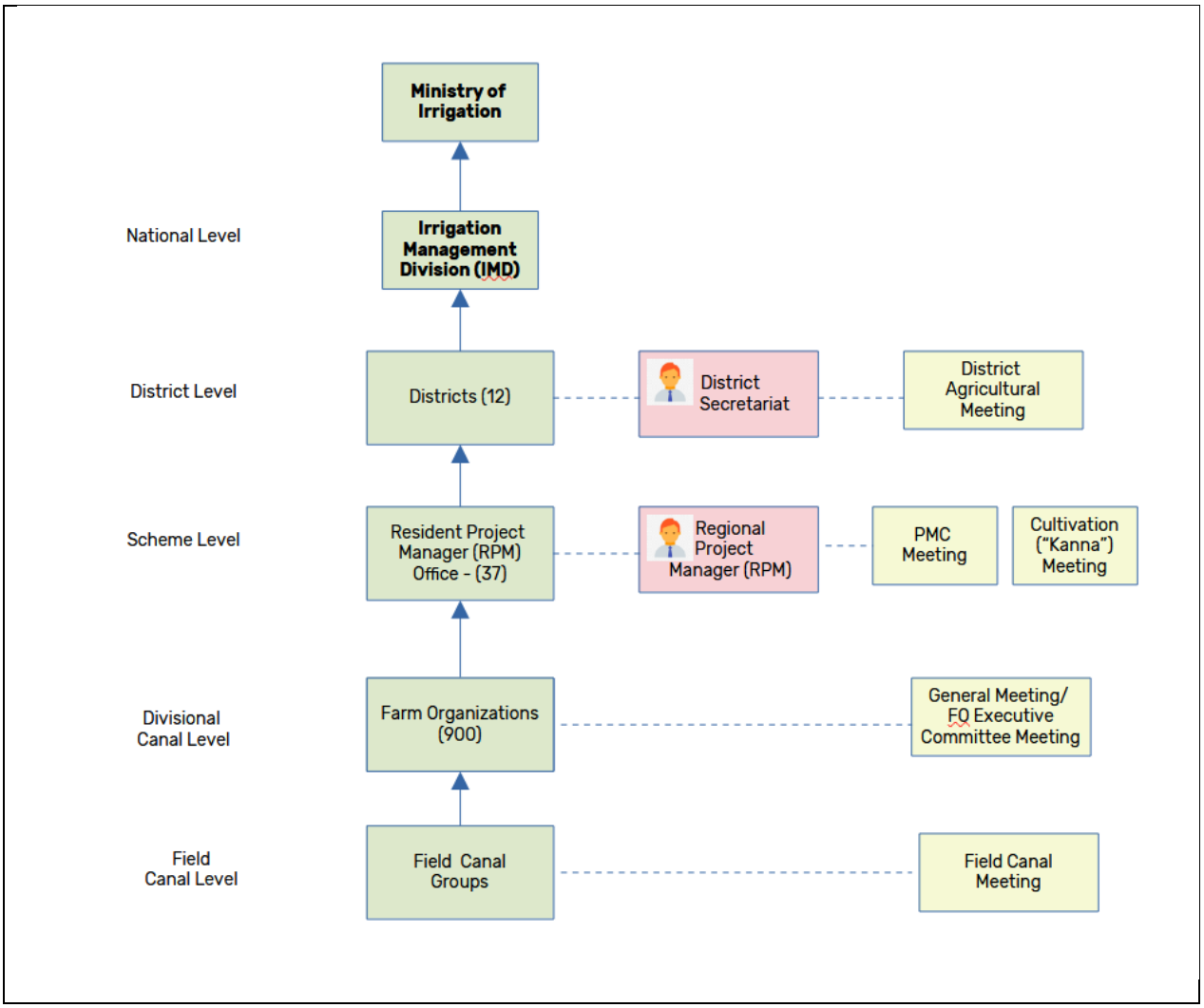
1. Resources management around the irrigation area by getting farmers / farmer organizations involved.
2. Managing the water distribution among farmers.
3. Helping and getting advice to improve farmer productivity and finally making profits.
4. Improve the farming knowledge of farmers by carrying out many knowledge improvement / extension activities.

Governance Structure:

Each RPM office is responsible for the farmer development and the farmer extension activities in their respective regions. Furthermore, RPM is responsible and heads the Project Management Committee (PMC), which was formed under the **Irrigation (Amendment) Act in 1994**.

Major Irrigation Projects (Handed by IMD)	54
Districts Covered	12
Resident Project Manager (RPM) Offices	37
Project Management Committees (PMC)	39
Total Irrigated Land Extent (Ha)	166, 816
Farmer Families	208,170
Farmer Organizations (FO)	900
System Level Farmer Organizations	43
District Level Farmer Organizations	10
National Level Farmer Organizations	01

IMD Governance Structure (Source: IMD)



IMD Governance Structure Mapping (Source: IMD)

Information Systems:

#	Division	Information System	Description	Status
1	There are no information systems available within the department at the moment. The only information dissemination point is the department web site. The Irrigation project list updates are shown on the web site. The lack of funding and the scarcity of IT resources have hindered the progress of automating the current business processes in the department. In the current business process, each RPM office is responsible to maintain RPM region related data and periodically (monthly) transfer them to IMD head office for further processing. IMD head office prepares monthly / annual reports periodically based on the RPM information and finally hand them over to the ministry.			

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