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Agriculture Modernization Project



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## FEASIBILITY STUDY ON HYBRID MAIZE SEED PRODUCTION

August 2022

Agriculture Sector Modernization Project

Ministry of Agriculture

# Table of Contents

<b>EXECUTIVE SUMMARY .....</b>	<b>7</b>
<b>CHAPTER 1: PROJECT DESCRIPTION.....</b>	<b>11</b>
1.1 Background.....	11
1.2 Scope of the Work.....	13
1.3 Geographic Scope of the Work.....	14
1.4 Objective of the Feasibility Report .....	14
<b>CHAPTER 2: APPROACH AND METHODOLOGY.....</b>	<b>15</b>
2.1 Maize Variety Improvement in Sri Lanka .....	15
2.2 Introduction to Maize Cultivation.....	16
2.3 Market-led identification of crops and value adding .....	19
2.4 Methodology for Agronomic Feasibility Studies .....	20
2.5 Value chain methodology .....	24
2.6 Feasibility study: methodological approach .....	25
2.7 Technological methodology .....	33
2.8 Methodology adopted in Economical Assessment.....	34
2.9 Methodology of Spatial Database Development .....	35
2.10 Methodology adopted in Environmental and Social Assessment .....	37
2.11 Overview of Environmental Legislation.....	38
2.12 Detail Review of Key Environmental and Social Services Related Legislation.....	38
<b>CHAPTER 3: DISTRICT PROFILES .....</b>	<b>43</b>
3.1 Kilinochchi District .....	43
3.2 Vavuniya District.....	48
3.3 Badulla District .....	53
3.4 Ampara District.....	62
3.4.1 Physical Environment .....	63
3.4.2 Demographic structure.....	65
<b>CHAPTER 4: ASSESSMENTS OF THE SITUATION AND KEY ISSUES .....</b>	<b>67</b>
4.1 History of the Maize seeds production.....	67
4.2 Kilinochchi District .....	67
4.2.1 Agricultural Analysis .....	67
4.3 Vavuniya District.....	69
4.3.1 Agricultural Analysis .....	69
4.4 Badulla District .....	69
4.4.1 Agricultural Analysis .....	69
4.5 Ampara district .....	70
4.5.1 Agricultural analysis.....	70
4.6 Rationale .....	71
4.6.1 Rationale for the selection of the crops / technologies / best practices &, integrating vegetable seeds .....	71
4.7 Cluster Development Outline.....	74
4.8 Crop Calendar for Maize Seed Cultivation.....	75
4.9 Feasibility analysis of the Badulla, Vavuniya, Ampara and Kilinochchi Districts .....	76
4.10 Value Chain Analysis.....	83
4.10.1 Conceptualization on value chain development of hybrid maize seeds.....	83

4.10.2	Value chain suitability .....	84
4.10.3	Value chain map.....	85
4.11	Technological Analysis .....	89
4.11.1	Mechanization in Sri Lankan Maize Seed Production .....	89
4.11.2	Land Preparations .....	91
4.11.3	Field Maintenance .....	93
4.11.4	Processing .....	95
4.12	Analysis on physical infrastructure.....	100
4.12.1	Access Roads .....	100
4.12.2	Water Irrigation System .....	100
4.12.3	Processing Centre .....	101
4.13	Economic Data Analysis and Findings.....	107
4.13.1	Preliminary Findings .....	107
4.13.2	SWOT Analysis .....	108
4.13.3	Financial Analysis.....	109
4.13.4	Sensitivity Analysis .....	115
4.13.5	Qualitative Analysis .....	118
4.14	Geographical Suitability Assessment based GIS .....	120
<b>CHAPTER 5: ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACTS AND IMPACT MANAGEMENT FRAMEWORK .....</b>		<b>130</b>
5.1	Preliminary assessment of environmental and social impacts of ASMP.....	130
5.2	Negative Impacts with Severity by each district .....	132
5.3	Potential issues that require specific guidelines .....	139
5.4	Impact Management Framework .....	139
	5.4.1 Environmental Assessment.....	139
	5.4.2 Social Assessment.....	139
5.5	Mitigation of potential impacts .....	140
	5.5.1 Health and Safety Guidelines.....	140
5.6	District Level Feasibility for Maize Seed Production.....	141
	5.6.1 Badulla District.....	141
	5.6.2 Vavuniya District .....	142
	5.6.3 Ampara District .....	142
	5.6.4 Kilinochchi District.....	142
<b>CHAPTER 6: CONCLUSION AND RECOMMENDATIONS .....</b>		<b>144</b>
6.1	<b>Conclusion.....</b>	<b>144</b>
6.2	<b>Recommendations .....</b>	<b>149</b>
	6.2.1 Agronomy .....	149
	6.2.2 Agribusiness and Value chain perspectives .....	153
	6.2.3 Technology .....	154
	6.2.4 Economical Recommendations.....	157
	6.2.5 Environmental and Social Safeguards .....	158
	6.2.6 Geo-Information.....	159
<b>REFERENCES .....</b>		<b>161</b>

## List of Figures

Figure 1: Production of maize from 2010 to 2021 .....	16
Figure 2: Maize Production in Maha Season in Badulla, Kilinochchi, Ampara and Vavuniya Districts.....	17
Figure 3 Maize Production in Yala Season in Badulla, Kilinochchi, Ampara and Vavuniya Districts.....	17
Figure 4 Maize imports (MT)                      Figure 4 Maize seed imports (MT).....	18
Figure 5: Agronomic Feasibility Process .....	23
Figure 6 Feasibility analysis framework.....	28
Figure 7 Seed market analysis: Maize and paddy seed yield (K) 2017 – 2020.....	30
Figure 8 Seed market analysis, top 5 players of the Sri Lankan seed market.....	31
Figure 9 Diversity of the local hybrid maize seed market.....	33
Figure 10: 5-point qualitative scale (O'Brien <i>et al.</i> , 2018) .....	34
Figure 11: Kilinochchi DSD .....	44
Figure 12: Waterbodies in Kilinochchi district.....	45
Figure 13: Forest Conservation Areas in Kilinochchi.....	46
Figure 14: Vavuniya District Map .....	48
Figure 15: Soil Types in Vavuniya.....	49
Figure 16: Surface Waterbodies in Vavuniya .....	51
Figure 17: Protected areas in Vavuniya District.....	52
Figure 18: Badulla District map with DSDs.....	55
Figure 19: Soil Types in Badulla.....	56
Figure 20: Landuse in Badulla District.....	58
Figure 21: Surface waterbodies in Badulla District .....	59
Figure 22: Land Use of Ampara (Source: LUPPD, 2016) .....	65
Figure 23: Content analysis of the published research on maize value chain: a. Research objectives b. Key research findings c. Conclusions d. Recommendations .....	84
Figure 24: Value chain analysis: suitability of hybrid maize seed production .....	85
Figure 25: Hybrid maize value chain explain the enabling environment and service providers..	87
Figure 26: Economic analysis of hybrid maize value chain of Sri Lanka .....	88
Figure 27: Water management.....	93
Figure 28: Seeding.....	94
Figure 29: Weed management.....	94
Figure 30: Harvesting.....	95
Figure 31: Shelling .....	96
Figure 32: Drying .....	97
<b>Figure 33: Seed Cleaning and Grading .....</b>	<b>98</b>
Figure 34: Effect of packing material on storability of maize seed stored at the Kundasale. (PS - Poly-sack, WP - White polythene, CP - Clear polythene, M -Moisture).....	99
Figure 35: Flow Diagram of Processing Maize Seeds .....	101
Figure 36: Potential Locations for Processing in Kandaketiya .....	103
Figure 37: Potential Locations for Processing in Karachchi.....	104
Figure 38: Potential Locations for Processing in Padiyathalawa.....	105
Figure 39: Potential Locations for Processing in Vavuniya .....	106
Figure 40: Components of Cost of Production.....	110
Figure 41 Vavuniya District Suitability Map .....	121
Figure 42 Kilinochchi District Suitability Map .....	123
Figure 43: Badulla District Suitability Map .....	126
Figure 44: Ampara District Suitability Map.....	129

<b>Figure 45: Recommended mechanization and technologies for Maize seed producing and processing</b> .....	155
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## List of Tables

Table 1: Criteria and dimensions used .....	35
Table 2 Important Services in Agriculture Sector .....	40
Table 3: DS Divisions and extents in Kilinochchi District .....	43
Table 4: Forest Reserves in Kilinochchi District .....	46
Table 5: Population Details by DSD .....	47
Table 6: Forest Reserves in Vavuniya.....	51
Table 7: Population in Vavuniya by Gender .....	53
Table 8: Land Area in Badulla .....	54
Table 9: Population by Gender in Badulla .....	60
Table 10: DS Division with Land Extent .....	62
Table 11: The facts to be considered in addition to the Soil types .....	71
Table 12: Area suitability according to the different agronomical factors .....	71
Table 13: Maize seeds cultivation during Maha seasons.....	73
Table 14: Vegetable seeds cultivation during Yala seasons.....	73
Table 15: Agriculture practice and gaps identified.....	74
Table 16: Crop calendar for Maize seeds cultivation (Maha) – 2022/2023 .....	75
Table 17: Crop calendar for Maize seeds cultivation (Yala) – 2023.....	76
Table 18: Results of the feasibility study of the Badulla, Vavuniya, Ampara and Kilinochchi Districts.....	77
Table 19: Economic analysis of variety wise hybrid maize value chain .....	88
Table 20: Power sources used for selected operations in Maize production in Monaragala District.....	90
Table 21: Machinery Usage by Maize farmers in Anuradhapura and Monaragala Districts .....	90
Table 22: Labor Deployment in Maize Production in Anuradhapura and Monaragala Districts ..	91
<b>Table 23:</b> Costs and Returns of hybrid seed production .....	111
Table 24: Financial Analysis with and without extra income .....	113
Table 25: Financial Analysis with and without project.....	113
Table 26: Financial Analysis with and without project and extra income.....	114
Table 27: Financial Analysis with and without project assuming that the farmers sell seeds directly in the market.....	115
Table 28: Scenario I – 10% change in farm gate price .....	116
Table 29: Scenario II – 10% change in cost of production.....	116
Table 30: Scenario III – 10% change in market price of seeds.....	117
Table 31: Scenario IV – 10% reduction in quality seeds.....	117
Table 32: Results of the qualitative analysis.....	118
Table 33 Vavuniya District Suitability Outcomes .....	120
Table 34 Kilinochchi District Suitability Outcomes .....	121
Table 35 Badulla District Suitability Outcomes .....	123
Table 36: Ampara District Suitability Outcomes .....	127
Table 37 Impact Matrix with Severity at each district.....	132
Table 38: Suitability chart.....	147
Table 39: District Wise Comparative Assessment - Available Infrastructure & Processing Facilities for Maize Seed Production .....	148

## **List of Annexes**

**Annex 1** - Report on virtual interactive platform (Stakeholder Workshop)

**Annex 2** - Report on online focus group discussions with DoA experts

**Annex 3** – Focus Group Guide

**Annex 4** – Photos of Field Works

**Annex 5** - Detailed review of environmental and social legal framework

**Annex 6** – GIS Mapping Outcomes

**Annex 7** – Machinery Requirement for Maize Seed Production

## **ABBREVIATIONS AND ACRONYMS**

<b>APHs</b>	Agro Processing Hubs
<b>ASMP</b>	Agriculture Sector Modernization Project
<b>ATDPs</b>	Agriculture Technology Parks
<b>CABI</b>	Agricultural Bioscience International
<b>CCAC</b>	Coast Conservation Advisory Council
<b>CCCRMD</b>	Coast Conservation and Coastal Resources Management Department
<b>CEA</b>	Central Environmental Authority
<b>EPL</b>	Environment Protection License
<b>FBS</b>	Farmer Business School
<b>FCs</b>	Farmer Companies
<b>GND</b>	Grama Niladari Divisions
<b>IPM</b>	Integrated Pest Management
<b>LA</b>	Local Authorities
<b>LAA</b>	Land Acquisition Act
<b>MC</b>	Municipal Council
<b>MOA</b>	Ministry of Agriculture
<b>MOPI</b>	Ministry of Plantation Industries
<b>MRLs</b>	Maximum Residue Limits
<b>NEA</b>	National Environmental Act
<b>NIRP</b>	National Involuntary Resettlement Policy
<b>NLRC</b>	National Review Committee
<b>NPQS</b>	National Plant Quarantine Service
<b>NWPC</b>	North Western Provincial Council
<b>PCCP</b>	Permanent Crop Clinic Programs
<b>PGRC</b>	Plant Genetic Resources Centre
<b>PMU</b>	Project Management Unit
<b>POP</b>	Persistent Organic Pollutant
<b>PPMUs</b>	Provincial Project Management Units
<b>ROP</b>	Registrar of Pesticides
<b>UC</b>	Urban Council
<b>UMCs</b>	Urban Marketing Centers
<b>VC</b>	Value Chain

## EXECUTIVE SUMMARY

Maize second main important cereal crop which mainly provide essential ingredient to animal feed processing industry while catering to the countable number of value-added human food. Food and nutrition security of the country, especially protein market of the country heavily depends on availability of maize as key feed ingredient. Extent of cultivation and volume production trend shows positive increasing trend over the last decades. Entire industry collapsed due to the recent government policy on organic agriculture along with import ban of fertilizer and agro-chemicals. On the other hand, restrict maize imports as a fiscal management policy badly affected on animal feed production industry of the country. Therefore, re-establish the crippled maize production industry is essential to cater the crying need of the animal feed industry.

Our approach aimed to conduct feasibility studies of the 3 districts; Badulla, Vavuniya, Ampara and Kilinochchi, under the purview of EU-World Bank Agriculture Modernization project. Case study approach along with participatory tools was instrumental in collecting both qualitative and quantitative data across the various stakeholders. Study findings were based on key thematic areas; agronomy, agribusiness and value chain, economic, technology and infrastructure, geo-information and environmental and social safeguards. Findings highlighted the essential intervention strategies of each specialty area considered and detailed analysis and recommendations are included in the report.

From the agronomy point of view considering different aspects such as soil types, rainfall and experience and willingness of farmers, select most suitable areas and farmers for the cultivation. In addition to that identify all gaps in awareness and knowledge of farmers, the technology currently uses and potential for using. Then decide the way of filling those gaps and closely monitor all aspects of implementing.

Hybrid maize value chain model is a combination of several short length function specific value chains embedded in a value network. Value network exchanges both tangible and intangible values. Supplier value chains, 3 initiated the value network for hybrid maize



seeds. Agriculture input, Hybrid seed production/research and parental line supply. Three enabling value chains derived the seed production or multiplication value chain. Multiplication value chain linked into the Distributor/ retailer VC. Final link, buyer/farmer VC represents the downstream of the hybrid maize seed value chain. Highest value-added share claimed by collector/distributor node.

Primary production, market, structure, stakeholder and enabling environment feasibility reveals that Ampara, Badulla and Vavuniya districts are best fit locations for hybrid maize seed production where Kilinochchi district is categorized as not suitable location. Being second largest maize producer of the country, Ampara showed the highest potential compared to Badulla and Vavuniya. Effective farmer training on certified hybrid maize seed production is vital for the establishment of the farmers' clusters along with necessary appropriate technology.

Maize is a very important cereal crop cultivated in many districts in Sri Lanka. Due to its high yield potential and variety of uses, it has become popular among farmers. It has further gained its popularity due to availability of hybrid seeds which produce higher yield than other cereals. Maize occupies around 6% of cereal cropped area in Sri Lanka. As a result of hybrid maize varieties, the total area under maize has increased by 73% while its production has increased by 258%. Maize is considered to be one of the most important inputs in poultry industry in Sri Lanka while it is used for producing food items such as Samaphosha and Thriposha. Boiled popcorn and fried popcorn also have been popular among Sri Lankans. Sri Lanka requires about 500000 - 600000 Metric Tons of maize per year. Maize seed requirement of Sri Lanka is largely fulfilled by the imports. Approximately, 98 to 99 percent of the hybrid maize seeds widely used by farmers for cultivation are imported. Sri Lanka imports more than 1600 metric tons of maize seeds per year. Therefore, Sri Lanka should now turn to import substitution and save the foreign exchange through local hybrid seed production. Although the Department of Agriculture has already developed four local hybrids of which characters and yield parameters are comparable with imported hybrids, the use of local hybrid seeds among farmers are low as a result of the non-availability of local hybrid seed materials in required quantities in

the local markets. If hybrid maize seed production is to be implemented in districts such as Badulla, Vavuniya and Ampara, the implementation must be financially feasible and economically viable. Hence, a financial analysis was done to check the feasibility of hybrid maize seeds production and results show that maize hybrid seed production is financially feasible in farmers' perspective and market perspective. To sustain in the seed industry through Public Unlisted Companies, farmers' bargaining power should be improved through collectivism and direct marketing should be promoted as much as possible by shortening the supply chain.

Technological advances in maize seed production contains maize seed farm mechanization and novel maize seed processing technologies. Available productive local machineries that can be used with four-wheel tractors are recommended for land preparations which includes initial ploughing, secondary tillage and making furrows. Mechanical seeder with four rows and engine powered weeder machine is selected for seeding and weed management respectively. Height adjustable sprinkler irrigation method arranged in 5m x 5m distance with a flow rate of 600 – 750 ml/h at 1.5 – 2 bar pressure is highly recommended.

Farm mechanization in maize seed production has its limitation due to qualitative aspects that determine seed characteristics and economy of scale. The fertilizer application and harvesting are to be undertaken manually. Cobs are to be dried in a polytunnel dryer with controlled temperature and relative humidity. Cobs dried up to 12 – 13% moisture are to be Shelled by using a sheller machine. A seed dryer is recommended for reducing seed moisture below 8% prior to packing. Seeds are to be graded by using a mechanical grader. A waterproof poly bags (polythene) is to be used as packing material that extends shelf life of maize seeds. A state of art maize seed processing centre with proper storing facilities is going to be constructed. Suggestions i.e., generating solar electricity, producing bio diesel for cluster operations by using Jatropha seeds, making compost and biogas from empty cobs are made to sustain the maize seed production farmer clusters meeting triple bottom line of sustainability.

In general, the proposed Maize Seed Production in Badulla, Vavuniya, Ampara and Kilinochchi Districts will have a significant positive impact on rural agriculture communities by enhancing their economic conditions and prosperity while it has an influence on national economy at the national level which outweigh the potential negative impacts. Environmentally and socially, establishing Maize Seed Production Cluster in the above districts is feasible subjected to the conditions laid down in chapter 5.6 and 6.2.5.

Furthermore, in general Wild animal issues specially elephant threat on the cultivation will be matters in every district as mostly the potential areas are closer to forest or wildlife protected areas. In addition, water scarcity will be a serious concern for Ampara, Vavuniya and Kilinochchi whereas soil erosion will be highly concerned in Badulla and Ampara.

Transparent farmer selection and possess of legal ownership for lands will mostly reduce social issues.

## CHAPTER 1: PROJECT DESCRIPTION

### 1.1 Background

The Agriculture Sector Modernization Project (ASMP) is comprised of three components. The Component-1, Agriculture Value Chain Development, seeks to promote commercial and export-oriented agriculture and this component is implemented by the Ministry of Plantation Industries (MOPI). The Component-2, Productivity Enhancement and Diversification Demonstration (this particular assignment relates to the Component-2) is implemented by the Ministry of Agriculture (MOA). The Component-2 aims to support smallholder farmers to produce competitive and marketable commodities, improve their ability to respond to market requirements and move towards increase commercialization. The Component-3 focuses on human resource management, and capacity building, logistic requirements, monitoring and evaluation, communication, and coordination of the overall Project.

The listed below are the sub-components of the Component-2 of the ASMP implemented under the MOA:

- a. **Farmer Training and Capacity Building:** Under this Sub-component, all the non-technical farmer trainings (mainly through *Farmer Business School – FBS*) are provided to all the member farmers of the *Farmer Companies (FCs)* as well as to the selected non-member farmers living around the cluster areas with the aim of improving their soft skills (referring farming as a business), carry out related awareness and exposure visits (local as well as foreign), empowering Farmer Companies providing the related trainings to the lead farmers as well as to the potential second generation young farmers, and providing all the assets needed to operate the Farmer Companies.

All related institutional capacity building activities are carried out under this sub-component in order to establish and empower the Farmer Companies.

- b. **Modern Agriculture Technology Parks (ATDPs):** This is the main Sub-component the Component-2 of ASMP. All the crop cluster selection, design, establishment, and continuity of crop clusters is ensured under this sub-component. Each individual member farmer of the FC will receive a technology

package as a grant under this Sub-component. In addition, farming related collective assets, cluster specific common **Agro Processing Hubs - APHs** (mostly one per each cluster), and common **Urban Marketing Centers - UMCs** (mostly one per each District), certain technical exposure visits, trainings and awareness, specific technical consultancies will be delivered under this Sub-component.

- c. **Production and Market Infrastructure:** Under this Sub-component, Cluster / ATDP specific market infrastructures (Eg. Common APHs, UMCs, **Compost Making Units - CMUs**), required irrigation infrastructures, identified market access roads and any other specific supportive infrastructures will be established. In addition, the consultancy assignments related to Engineering Designing and Establishments will be carried out under this sub-component.
- d. **Analytical and Policy Advisory Support:** Related Policy Studies as well as required Analytical Studies are carried out under this particular Sub-component. In addition, conducting certain related assessments / evaluations, organizing **Techno Forums, Policy Forums**, formulation Policy / Strategy briefs / guidelines are carried out.

**Project Management Unit (PMU)** of the ASMP together with the **Provincial Project Management Units (PPMUs)** implement the project activities with the support and the guidance of the Ministry of Agriculture mainly through its Project Management Unit, the Provincial Ministries of Agriculture and other relevant stakeholders.

The Project is technically steered, and monitored by the **National Project Steering Committee** headed by the Secretary to the MOA and the respective **Provincial Steering Committees** headed by the Chief Secretary of the Province.

The Democratic Socialist Republic of Sri Lanka has obtained a Credit of US\$ 58.63 Million from the World Bank through the International Development Association (IDA) and received Grant of US\$ 26 Million from the European Union (EU) for the ASMP of the Ministry of Agriculture.

## 1.2 Scope of the Work

Through conducting overall district level feasibility studies with the aim of establishing ATDPs, the Team of Consultants should basically identify the followings, but shall not be limited to:

- What high value crops (main crops as well as the crops for inter / rotational cropping) suitable for the districts based on the existing geo-climatic conditions & patterns, resource availability (Water, land, and etc.).
- What modern technologies as well as best practice applications feasible for small holder farmers in the districts to do their farming & post-harvest operations; mainly on farm value additions.
- Market sustainability of the respective crop clusters / ATDPs with the special reference to the sustainability of the Farmer Companies need to be established.
- Ultimately the combination of crops, technologies, and best practices recommended by the Team of Consultants should ensure achieving the Project outcomes for target farmer communities during the project period, and ultimately the sustaining outcomes and impact for the Country as a whole.

The Feasibility Studies should be conducted within the following high-level framework which needs to be further elaborated meaningfully by the Team of Consultants and agree with the ASMP:

1. Feasible main high value crops and other crops (high value inter crops & rotational crops)
2. Geo-climatic feasibility
3. Technological feasibility (feasibility of farming / production technologies & other potential innovations, feasibility of post-harvest value additions, and all other technologies related to the ATDP establishments & operations)
4. Market feasibility
5. Economic / Financial feasibility
6. Socio-cultural feasibility
7. Resource / input feasibility

8. Environmental feasibility
9. Institutional / stakeholder analysis & feasibility
10. Social & Environmental Safeguards Reports as attachments

### **1.3 Geographic Scope of the Work**

ASMP currently works in five provinces namely Northern Province, North Central Province, Uva Province, Eastern Province and Central Province in the implementation of the Component-2. Twelve districts have been selected to implement the Agriculture Technology Demonstration Park concept namely Ampara, Anuradhapura, Badulla, Batticaloa, Jaffna, Kandy, Kilinochchi, Matale, Monaragala, Mullativu, Polonnaruwa, and Vavuniya.

Out of the above 12 Districts, this particular assignment relates only to the new ASMP Districts, namely Ampara, Badulla, Kandy, Kilinochchi, and Vavuniya Districts.

### **1.4 Objective of the Feasibility Report**

The main objective of this feasibility report is to assess the agronomical, agri-business, economical, technological, environmental and social feasibility of implementing a comprehensive modern Maize Seed Production Clusters in Badulla, Vavuniya and Kilinochchi Districts.

#### **Specific Objectives**

1. To identify most feasible areas in Badulla, Vavuniya and Kilinochchi Districts for Maize Seed Production
2. To identify Farmers' willingness, capabilities, resources availability, availability of extension services, availability of water supply, status of technical know-how of the farmers', etc in particular to the districts mentioned

### 2.1 Maize Variety Improvement in Sri Lanka

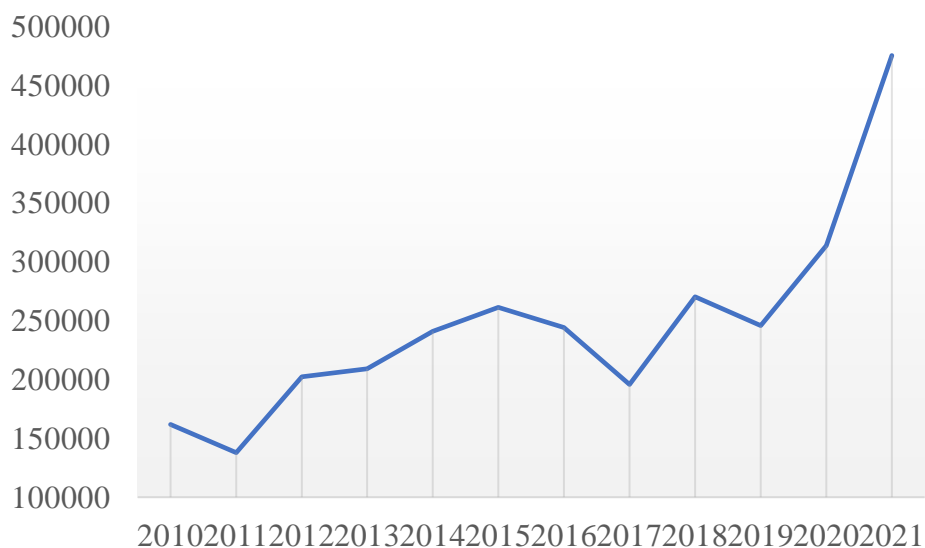
Maize has been described as one of the most diverse plants in the world and this diversity occurs at both the phenotypic and molecular levels. There are about 65000 accessions of maize in major germplasm banks of the world, of which more than 90% are *Z. mays*. Most of the diversity in maize remains undescribed, poorly understood and underutilized in modern crop improvement programs largely, because of the difficulty of identifying useful genetic variants hidden in the background of low yielding local varieties and landraces (Tanksley et al. 1997). It is estimated that only around 2% of the maize germplasm is utilized in breeding programs and an important fraction is cultivated and conserved by small landholder farmers. Most of the genetic variability is represented within and between landraces maintained by the traditional family farming systems.

Open pollinated maize varieties are still popular and commonly used by Sri Lankan farmers (Karunarathna, 2002). Initially, maize breeding programs were concentrated on developing open pollinated varieties. Open pollinated varieties are not performing high production capacity like hybrid varieties, although they have three major characters which cannot be expected from hybrids (Jayasooriya et al. 2021). They are; easy to produce, simple and low-cost seed production process, and farmers can get seeds from their previous cultivation (Karunarathna, 2001). There are various methods to develop open pollinated varieties via population improvement. High productivity, demand and requirement, height of plant, resistance to pest and diseases, avoid lodging, good combining ability, uniform growth and low variability are important characters considered in open pollinated varieties. Department Of Agriculture recommended four open pollinated varieties, Bhadra, Ruwan, Aruna and Muthu introduced in 1977, 1990 and 1992 respectively [16]. However, later variety Muthu was withdrawn from the recommendation list. Sampath is the only locally developed hybrid variety in the recommendation list (Karunarathna, 2001). Imported hybrid varieties such as Pacific II, Pacific 628, and Pacific 984 are commonly utilized by local farmers along those Open Pollinated Varieties (OPV).



## 2.2 Introduction to Maize Cultivation

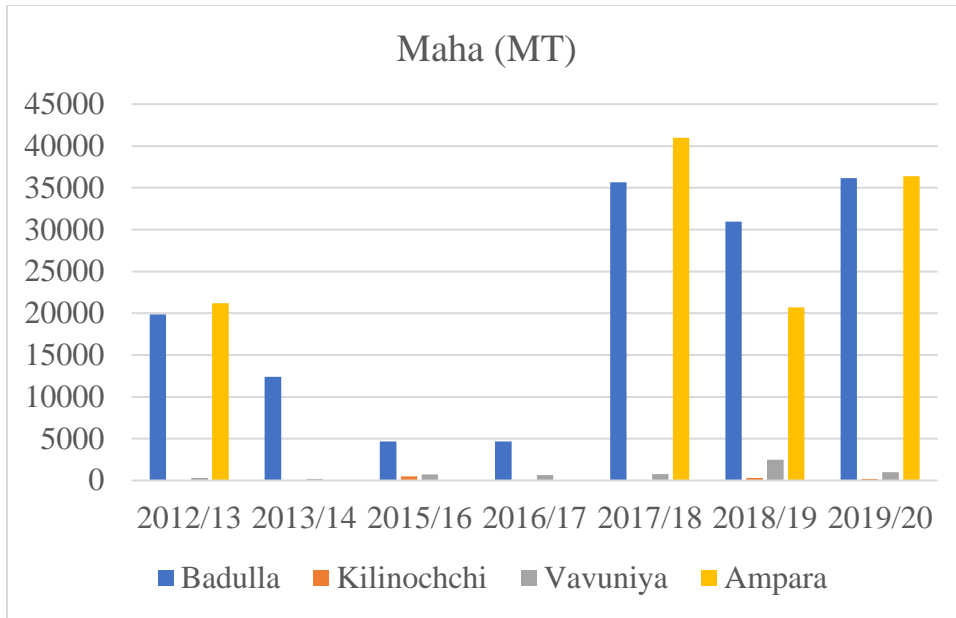
Maize is a very important cereal crop cultivated in many districts in Sri Lanka. Due to its high yield potential and variety of uses, it has become popular among farmers. It has further gained its popularity due to availability of hybrid seeds which produce higher yield than other cereals. Maize occupies around 6% of cereal cropped area in Sri Lanka. As a result of hybrid maize varieties, the total area under maize has increased by 73% while its production has increased by 258% (FAOSTAT, 2014). Maize is considered to be one of the most important inputs in poultry industry in Sri Lanka while it is used for producing food items such as Samaphosha and Thriposha. Boiled popcorn and fried popcorn also have been popular among Sri Lankans. Sri Lanka requires about 500000 - 600000 Metric Tons (MT) of maize per year and in 2021, 475000 MT have been produced.



**Figure 1: Production of maize from 2010 to 2021**

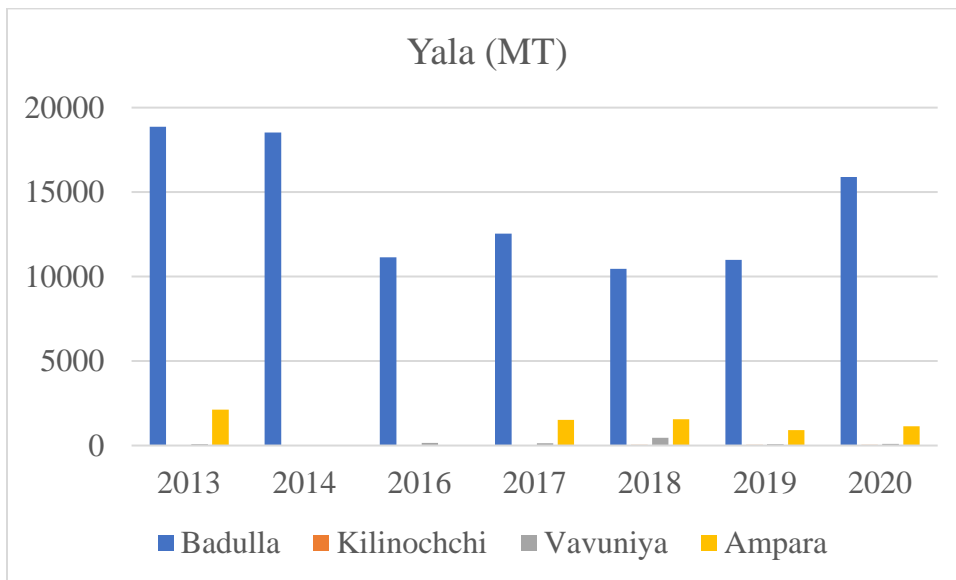
Source: Dept. of Census and Statistics

When maize production in Badulla, Vavuniya, Ampara and Kilinochchi districts are considered, the Badulla and Ampara districts have recorded higher yield than that of other two districts in Yala and Maha seasons. Maize production in Vavuniya and Kilinochchi districts is not very popular and they cultivate other crops instead of maize.



**Figure 2:** Maize Production in Maha Season in Badulla, Kilinochchi, Ampara and Vavuniya Districts

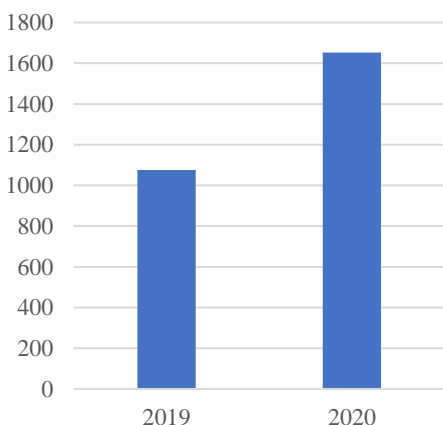
Source: Dept. of Census and Statistics



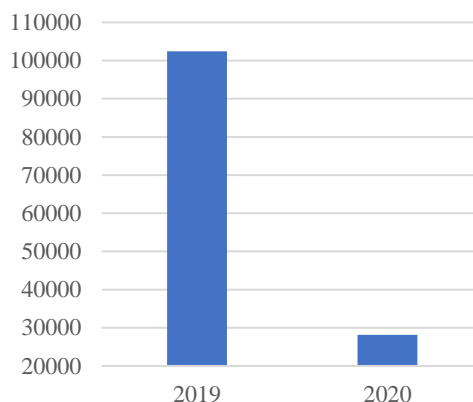
**Figure 3** Maize Production in Yala Season in Badulla, Kilinochchi, Ampara and Vavuniya Districts

Source: Dept. of Census and Statistics

Maize seed requirement of Sri Lanka is largely fulfilled by the imports. Apart from seed imports, maize and related products are also imported to Sri Lanka. Although Sri Lanka imports more than 100000 MT of maize in 2019, it has sharply dropped to 28000 tons in 2020. Surprisingly, in 2020, Sri Lanka allowed importing wheat grains for animal feed and introduced it as an import quota of 185,000 MT of wheat grains. This initiative was made by the government to compensate the local corn production shortfall eventually filling 170,000 MT of the authorized quota volume. Sri Lanka also authorized subsequently an additional import quota of 100,000 MT for the April 15 through July 31, 2021, period. Import quota for wheat grains was said to be introduced as domestic corn production is unlikely to increase quickly enough in the short-term to meet the animal feed milling industry’s demand.



**Figure 4** Maize imports (MT)



**Figure 4** Maize seed imports (MT)

Source: Industry Capability Report, EDB 2021

According to FAO (2021), annual growth rate of maize is around 16.73 percent. However, the overall productivity of maize is not in a satisfactory condition and has not been adequate to meet the increasing local demand. As a result, maize imports have been taking place. FAO (2021) further shows that approximately 98 to 99 percent of the hybrid maize seeds widely used by farmers for cultivation are imported. Although the Department of Agriculture (DoA) has already developed four local hybrids of which characters and yield parameters are comparable with imported hybrids, the use of local hybrid seeds among farmers are low as a result of the non-availability of local hybrid seed materials in required quantities in the local markets. The yield of local hybrid varieties is

in par with those of imported varieties and average yield is around 5.5-6.5 metric tons per hectare. And the potential yield has been estimated to be 7.5-8.5 metric tons per hectare. Those hybrid varieties have been named as MI (III), MI (IV) and MI (V). In 2020, Sri Lanka has imported more than 1600 metric tons of maize seeds. Therefore, country like Sri Lanka should now turn to import substitution and save the foreign exchange. In this process, local hybrid seed production has important implications towards Sri Lankan economy. As a result, the Agriculture Sector Modernization Project intends to introduce hybrid maize seed production choosing 150 farmers from Badulla, Vavuniya, and Kilinochchi. Through this initiative above 150 acres of land are to be allocated for seed production. The expected seed yield from 150 farmers would be about 100 metric tons. Therefore, ASMP expects to check the feasibility of seed production in these 3 districts through data collected from the relevant stakeholders and secondary sources.

### **2.3 Market-led identification of crops and value adding**

The project approach on selection of high value crops, value creation and value addition to the agriculture produce based on participatory approaches. Market-led identification of best beds or most suitable crops for value addition and export orientation was first identified through virtual interactive platform. Participants were 3 main groups, key Agri-Food exporters, Agri-Food processors and policy makers/institutional leads. Results of the virtual interactive platform gave strong recommendations towards to best crop combinations for each project district along with potential value creations and value adding options (annex 01: report on virtual interactive platform). Second level of intervention was made through the two virtual interactive discussions with scientists/crops experts of the DoA and focus groups discussion were aimed to explore the possibility of select identified crop types, availability of planting materials, practical issues on agriculture input supply, especially on fertilizer and agro-chemicals, pest and disease problems, IPM interventions, available appropriate technology, etc. (annex 02: report on online focus group discussions with DoA experts. Our final approach, interactive participatory discussions with farmers and farmer society members of project districts and the discussions based on focus group guide (annex 03: focus group guide). Further, each project district we were able to conduct in-depth meetings with regional project staff

(ASMP) and DoA on validation of the outcomes of farmer meetings and plan the project work (annex 04: photos of filed visits). Outcomes of the feasibility report based on the results of the participatory work conducted in 5 project districts.



## 2.4 Methodology for Agronomic Feasibility Studies

a. ASMP is based upon market-led approach. Hence agronomist review literature published by DOA and ISP reports on inception, CDP planning and implementation to understand the major high value crops produced in the selected districts (Ampara, Badulla, Kandy, Kilinochchi and Vavuniya). From those reports and statistics, he identifies the crops which have greatest potential to add value and he further verify its suitability and adaptability in consultation with provincial DOA staff, AIs of the area, PPMU, PMU, department of Agrarian service personnel, Project managers of relevant areas Private companies working in this area, different collectors in that area and farmers. From this review he will be able to understand the land area under these selected crops, potential area for further expansion (scaling up), access to irrigation water and the quality of water, timely availability and the quantities of inputs like seeds pesticide etc., and possible technology and possible practices to be used.

To assess the above things the agronomist has to study the successes as well as the failures of the International Service Providers (ISP) plans and implementations. In addition to those informal discussions with nearby non-ASMP farmers, relevant Agriculture Instructors, Agrarian service personnel, Irrigation engineers and ASMP farmers.

Furthermore, there will be a necessary to Expand (scaling up) the Pilot projects i.e. Jumbo Peanut, Soursop and Chili. To assess the applicability and the affordability of earlier

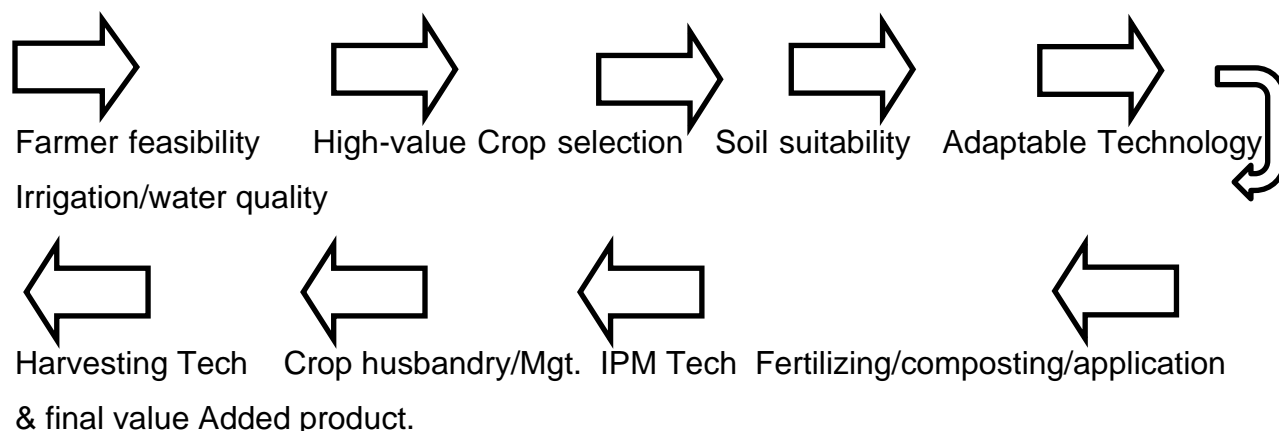
technology and possibilities the agronomist has to conduct rapid appraisal meetings with existing farmers. From these discussions agronomist will be able to add or delete items in the existing package and recommend possible and average technology package and the best practices to be adopted.

b. Next, identifies the factors affecting the agronomic feasibility of the crop production in the selected area. According to these factors following feasibility studies will be carried out.

Feasibility Criteria	Methodology/indicators			Specific Methods for the Indicator
	Indicators to be used in agronomic feasibility			
Farmer-feasibility	Age/health/Family/preference/willingness/Demographic characteristics.	Duration of experience/ type of crops grown.	Other farming activities/Animal husbandry.	Pre-tested Questionnaire /face to face interviews /Rapid rural appraisal/
High-value crop selection /Seed types	ASMP recommendation/ highbred/traditional Value adding potential/market demand.	Yield potential for the area/Possible niches (e.g., natural variations) for higher yields.	Prices /local /Export /consumer	ASMP recommendations , Focus group discussions with the AIs and FO of the area/Consultation with marketing expert/GAP officials.
Land feasibility/Rain fall	Soil fertility/texture/ depth and drainage.	Fertility retention capacity.	Land preparation method/Implementations.	Literature review (i.e., ISP reports)/soil tests by DOA/Review of rainfall data.
Seeding, planting	Seed-selection Hybrid/traditional	Seed types and viability.	Planting method/distances	Recruit an expert for GAP. Review of current

				practices and recommendations of the DOA/ISP
Fertilizer Incorporation/ Technology	Mineral fertilizer/Compost, Nutrient content/composition of compost	Method and frequency of application/ Basal / growth stage/flowering stage	Facilities for compost making/availability of green/minerals (i.e. dolomite)	DOA fertilizer recommends. on compost, Focus group discussions with farmers and AIs of the area
Irrigation/Technology	Water quality/quantity available, Machinery to be used	Method, drip / surface / sprinkle irrigation	Frequency of irrigation	DOA recommends. /Water quality tests/Focus group discussions with farmers and Irrigation Officials
Pest and Disease Controlling Technology.	<b>IPM</b> /identifying natural enemies/planting practices/crop sanitation practices	Chemical control incorporation/ Available pesticides	Indigenous method	Field observation /farmer consultations for Identifying natural enemies of pests/ crop sanitation methods/ traditional methods
Harvesting and Drying Technology.	Method: Machine/Manual	Availability of manpower/machines	Focus group discussions with farmers/DOA officials/National Review Committee Feed	Harvesting and Drying Technology.

			backs/weather forecast	
Processing: peeling off, cutting, chopping, dehydration/storage and cold storage technology.	Manual/ Machinery (locally made and user friendly).	Storage type/ packaging designs/ packaging material availability	Discussions with farmers and Agribusiness partners/Cost-benefit analysis with Economist	Processing: peeling off, cutting, chopping, dehydration/storage and cold storage technology.



**Figure 5: Agronomic Feasibility Process**

c. Next step is to identify the agribusiness partners (ABP) in the area. From the ISP report there are seven agribusiness partners including Sathosa) Keells b) Cargills c) MD (Lanka Canneries Pvt Ltd) d) Ruhunu products e) Wijaya products f) MAs spices. Then it is needed to link between these entities and Farmer organization and how these links are operated.

d. Having identified the ABPs, the next step is to identify the number of farmer organizations operated in each district and their membership. Farmers' crop preferences about the recommended crop (i.e. jumbo peanuts) should be obtained from the ABPs, farmers and Farmer organizations.

e. Awareness among farmers about of GAP, export markets, incentives extended by Export Development Board should be noted after visiting the respective areas.



## **2.5 Value chain methodology**

Value chain analysis is an internal assessment of competitive advantage. Value chain analysis will be conducted on each selected agribusiness/crop establishment in order to identify the competitive advantage. A cluster or farming community is in essence a collection of activities that are performed to produce, market, deliver and support its products. Goal is to produce the products in such a way that they have a greater value to customers than the original cost of creating these products. The added value can be considered the profits and is often indicated as 'margin'. A systematic way of examining all of these internal activities and how they interact is necessary when analyzing the sources of competitive advantage. Cluster or community gains competitive advantage by performing strategically important activities more cheaply or better than its competitors. Michael Porter's (1985) value chain helps disaggregating a group of actors into its strategically relevant activities, thereby creating a clear overview of the system.

VC analysis consists of a scoring methodology that presents a comprehensive and resource-effective way of assisting clusters with the selection of its target agricultural value chains. It can serve as the basis for ASMPs strategic plan, by assisting them in prioritizing the highest potential for impact value chains, as well as visualizing and highlighting the strengths and weaknesses of each value chain. The selection of the most promising agricultural commodities value chains has been based on objective and subjective criteria that are the basis to the recommendations to target sectors. The objective criteria assessed the product markets, unmet demand, growth potential, market trends and competitiveness. As well as identifying sub-sector constraints and opportunities (e.g. finance, infrastructure, policy). The subjective criteria assessed the competitive factors, the distribution of benefits to various actors, and the bottlenecks to sub-sector expansion (including costs, regulations). The scoring methodology consisted of analyzing the following sixteen criteria of each commodity. Scores were given for each criterion from one to five (five representing the most favourable and one representing the least favourable agricultural commodity value chain to engage). Overall sums were calculated out of a possible perfect score of 80. Value chain selection criteria

varies as follows; 16 - 47 = less favourable, 48 – 63 = moderately favourable and 64 – 80 = highly favourable.

***Objective criteria:***

- Market growth – local, regional and International
- Market competition - National vs. Imported products
- Job creation potential
- Self-sustainability
- Proof of concept (realization of a certain method or idea in order to demonstrate its feasibility)
- Import substitution
- Consumption trends

***Subjective Criteria***

- Food security
- Likelihood of intervention success
- Priority of the country
- Farmer skill suitability
- Impact per intervention dollar
- Transportation
- Impact on ASMP success

**2.6 Feasibility study: methodological approach**

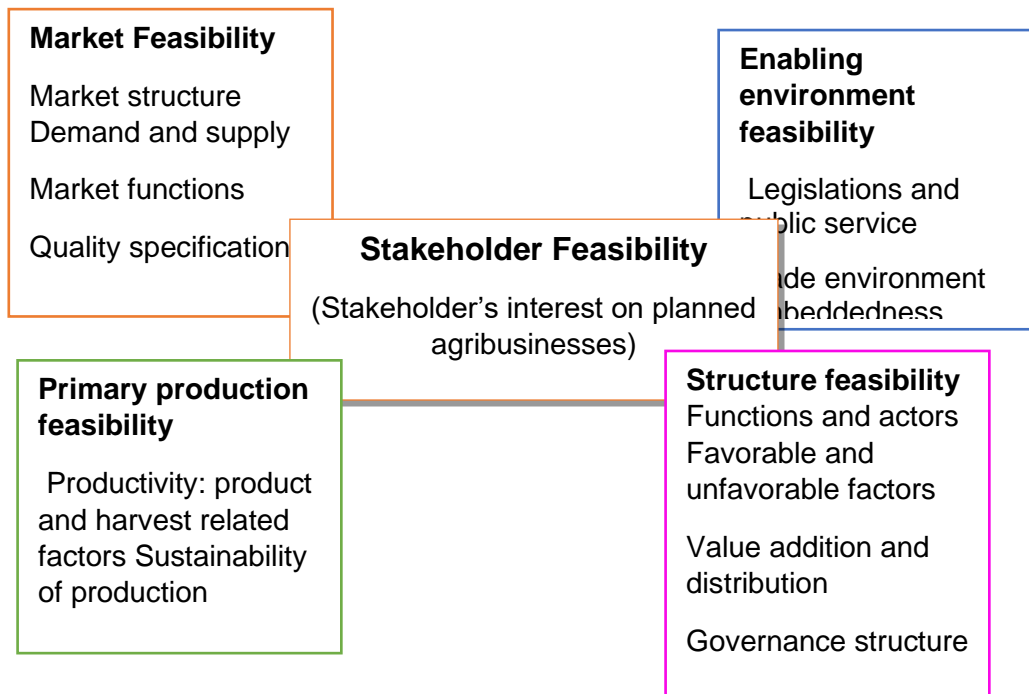
The essential elements of a VC establishment justify a need to consider five feasibilities: stakeholder, market, primary production, structure and enabling environment (Figure 25). Analysis of these different feasibilities and their interactions constitutes a strategic planning process to identify roadblocks, gather information for designing the chain's structure, attract and plan equity investment and inform (public) actors' decision-making on the VC establishment. Figure 6 presents a stepwise holistic framework used in feasibility analyses.

The stakeholder feasibility explores actors and their interests in the VC establishment. Understanding existing interests allows averring if (claimed) goals can be achieved. Balanced representation of relevant actors in identifying conditions and constraints for VC support and participation is a key condition to uncover sustainability from different perspectives. The market feasibility provides understanding of market demand and requirements for products to be successfully produced and marketed in the chain. Market orientation and knowledge are conditional to market access (Grunert et al., 2005; Trienekens, 2011). Thus, market feasibility focusses on investigating market segmentation, demand and supply, pricing, specifications, barriers to entry and market options. The primary production feasibility aims at understanding primary products and production-related factors to create a sustainable production system (Herman and Thai, 2020). Byerlee et al. (2009) argued that a sustainable production system presents economic, social and ecological aspects for achieving viability, equity and environmental sustainability within the system (Roy, 2012). Hence the production feasibility emphasizes characteristics of primary resources required for production, environmental consequences of their exploitation, primary productivity, potential incomes generated for primary producers and factors facilitating and inhibiting the production. The structure feasibility investigates the chain's functions, potential actors' roles and relevant knowledge and experience, value addition and distribution and governance to determine how to organize the chain.

Studying VC structure allows understanding how value is generated and captured by different functions, thus highlighting the role of VC governance to enhance the fairness of value distribution among actors involved. VC governance is the process of organizing activities with the purpose of achieving a certain functional division of labour along the chain, resulting in specific allocations of resources and distributions of gains (Ponte and Gibbon, 2005). The process involves various actors and their actions to define terms and conditions for their participation in the chain, implementation of value-adding activities and obtainment of corresponding benefits (Ponte and Gibbon, 2005; Bolwig et al., 2010). VC governance can be categorized as rules for product quality control (Keane, 2012), rules for vertical integration (Gereffi et al., 2005; Bolwig et al., 2010), rules for horizontal

integration (Bolwig et al., 2010) and rules for vertical–horizontal integration for actors within the same function to acquire additional roles or functions in the chain (Trienekens, 2011). Analysing governance can identify different mechanisms by which diverse actors involved can gain and maintain benefits when participating in the chain. The enabling environment feasibility investigates local, national, and international contextual factors influencing VC structure, functions, and markets. Enabling environment is a set of policies, informal institutions, support services and other conditions that create and improve a general operational environment, bringing together VC actors in a cooperative manner (Trienekens, 2011).

This feasibility focusses on environment, land use and trade legislations and their enforcement in practice, public capacities and services and informal functioning rules in the socio-cultural embeddedness. These factors set boundaries to VC establishment and determine whether setting up the chain is feasible from an institutional and social perspective. Finally, the overall feasibility assessment screens the five feasibility analyses and relates the analyses to each other to question sustainability and feasibility of the to be established VC (Herman and Thai, 2020). A reflecting mechanism is employed in order to move back and forth between the different feasibilities. Interactions between different feasibility elements within the five feasibilities are identified, followed by distinguishing synergies, causal relations, and discord between the elements. Conclusions on how those interactions affect overall feasibility are drawn.



**Figure 6** Feasibility analysis framework

### Market Overview: Hybrid maize seeds

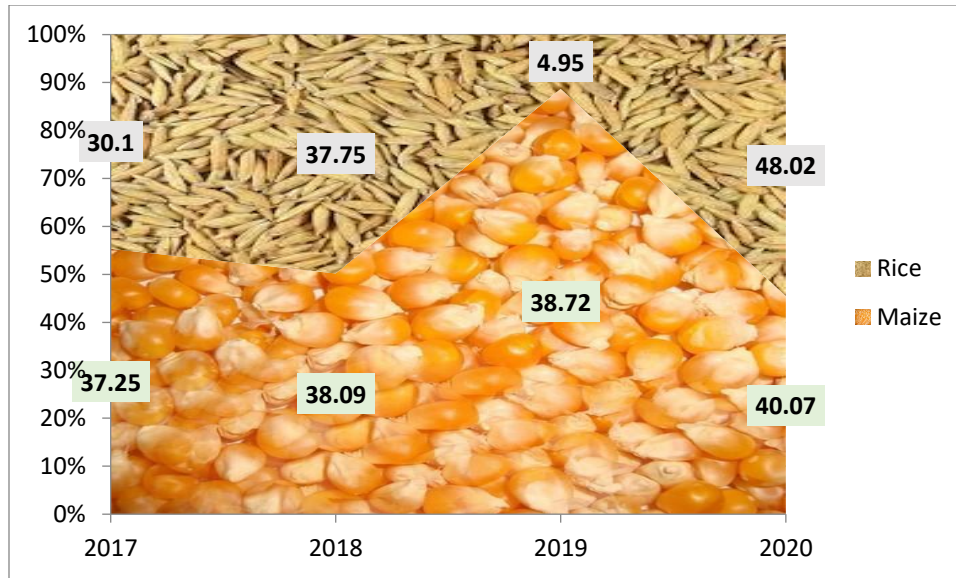
The government's organic agriculture policy associated with the ban of imports of fertilizer and agro chemicals crippled the country's seed production industry. COVID-19 pandemic has induced the effects on production, certification, distribution, and cost of seeds, which developed obstacles in agricultural sectors and food system in economic recession. Seed production of both public sector and private farms were declined sharply with the unavailability of fertilizer, application of poor-quality organic fertilizer as well as non-availability of agro-chemicals to control the pest and disease problems. Moreover, the industry suffered from severe labor crisis due to restricted movements which impacted the production, supply crunches due to limited transportation which affected the distribution, and a contraction in the market for plants and seeds created problems in terms of the production of seed for international trade, as well as access to high-quality seed of modern varieties for domestic agriculture.

Seed production activities are dominated by the public sector, notably the Department of Agriculture's Seed and Planting Material Development Centre. The country has opted for

a sui generis system for the protection of plant varieties. Most of the quality seed in the country is imported and distributed to farmers by the private sector. As Sri Lanka is dependent to a large extent on imported seed, in 2017 the Department of Agriculture and Lal Teer Seed of Bangladesh implemented a project to increase vegetable seed production in the country. There is an increasing need to introduce suitable legislation protecting plant breeders' rights, which would encourage greater involvement by private sector companies. The country's grain and vegetable production declined significantly due to the fertilizer and agro chemical issues as well as non-availability of quality seeds. This created the demand for quality seeds for production. Variability in the production of cereals and vegetables necessitating the requirement of quality seed for consistent production and to increase productivity. With Sri Lanka being a large community of farmers, Rice and curry are the main food consumed thus creating the need for increased production to meet the domestic consumption requirement.

The Sri Lanka Seed Market is Segmented by Product Type (Hybrid (Transgenic and Non-Transgenic) and Open Pollinated), and Crop Type (Grains and Cereals (Rice, Maize, Soybean and Other Crop Types) and Vegetables (Tomatoes, Pumpkin, Squash and Gourd, Chillies and Peppers and Other Vegetables). Maize is the second most common food crop grown in Sri Lanka. According to Food and Agriculture Organisation (FAO) in 2020, maize production for Sri Lanka was 40,067 thousand ton. In order to increase the production and productivity of the rice, quality seeds are required which implicates the demand for the seed market in Sri Lanka.

Sri Lanka produces about 250,000 metric tonnes of maize and has a national requirement of 600,000MT. According to reports the poultry feed requirement is around 400,000 metric tonnes, the dairy sector consumes another 200,000 metric tonnes of maize as cattle feed.



**Figure 7** Seed market analysis: Maize and paddy seed yield (K) 2017 – 2020

**Source:** FAOSTAT (2020)

The country was importing the balance mainly from India and Ukraine. Amid all this the country has a huge armyworm infestation issue. Sri Lanka's maize crop has been hit by fall armyworm from around 2019 and several mitigation procedures have been followed.

Sri Lanka's egg production took a huge hit last year when farmers couldn't feed their chicken.

### **Competitive Landscape**

The Sri Lankan seed market is fragmented, because of the presence of a large number of local players marketing certified seeds. The major players in the market are Tropical Seeds/OPEX Holdings, CIC Agri-Business, Hayleys Agriculture, Plantchem Pvt Ltd (Plant Seeds Private Limited), and Advanta Seeds. These major players are investing in new products and improvisation of products, expansions, and acquisitions for business expansions. Another major area of investment is the focus on R&D to launch new products at lower prices.



**Figure 8** Seed market analysis, top 5 players of the Sri Lankan seed market

### **Brand landscape of maize seeds**

Ruwan, Bhadra, parental lines of hybrid variety Samapth are the common local hybrids. Breeder seeds are produced and handover to Seed and Planting Material Division. Seeds of parental lines of maize hybrid variety “Samapth” can be obtained by private companies and any government seed farms who are interested in producing hybrid seeds.







## 2.7 Technological methodology

Machineries and technologies used in maize seed production were identified by undertaking field visits, having discussions with the consultant team and industrial experts, studying on past implementations in local and global context.

Prior to bring new farming and processing technologies, it was vital to have an understanding and gain a basic knowledge on maize seed production process, labor involvements, existing level of mechanizations, required standards and processing parameters. Then, it was easier to relate existing technologies with maize seed production. Past studies, researches and technical publications were useful to gain the required knowledge.

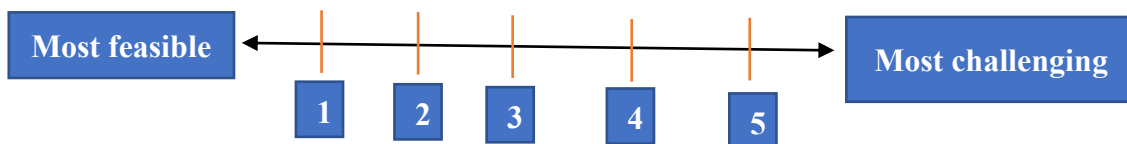
Field visits and discussions with district level officials were used to ascertain the infrastructure requirements. Used my engineering knowledge and experience to understand the existing technical gaps and come up with new technical measures, designs and innovations in line with the maize value chain assessment. The sustainability of maize seed clusters and potential opportunities were elaborated. Providing a better working environment for farmers while ensuring higher productivity was the key element in recommending machineries and processing technologies.

## 2.8 Methodology adopted in Economical Assessment

In checking the feasibility of hybrid maize seed production as an import substitution, several steps were adopted. First, data were collected through focused groups discussions and secondary data sources. The focused groups comprised of officials of Department of Agriculture (DoA), private sector companies and most importantly farmers from Badulla, Vavuniya, Ampara and Kilinochchi districts. Primary data were collected from August 3, 2022 to August 5, 2022 through focused group discussions and field visit. In analyzing the data, Benefit Cost ratio, Net Present Value (NPV), Internal Rate of Return (IRR), breakeven yield, per unit cost and gross margins were calculated. Outcomes are evaluated under different scenarios such as “with project” and “without project scenarios”. SWOT analysis of Maize Seed Production was also conducted.

Apart from the quantitative approach mentioned, a qualitative approach proposed by O'Brien *et al.* (2018) in their study related to Sri Lanka was also adopted. O'Brien *et al.* (2018) proposed 17 dimensions taken for feasibility. Those 17 dimensions are listed under six broad criteria. The dimensions include the facts from cultivation to processing to marketing. They also include costs, skills and other barriers involved with it. However, in the maize seed production only 5 criteria with 13 dimensions were adopted as 4 other dimensions are related to export-oriented crop production.

In analyzing the data, a five-point qualitative scoring scale is used. The two extremes of the scale are having the score of 1 for most feasible and 5 for most difficult or challenging. For example, if the score is low, it implies that it is feasible while the high score denotes least feasible or challenging or difficult crop.



**Figure 10:** 5-point qualitative scale (O'Brien *et al.*, 2018)

Eg: Low Scoring product/ crop → very easy to cultivate

High Scoring Product/ crop → very difficult to cultivate

**Table 1:** Criteria and dimensions used

CRITERIA	DIMENSIONS
<p><b><u>Criteria 01</u></b> Cultivation costs (Skills, money, technology)</p>	<ul style="list-style-type: none"> <li>• Skills, special knowledge needed</li> <li>• Equipment/ technology needed</li> <li>• Labor needs for cultivation</li> </ul>
<p><b><u>Criteria 02</u></b> Cultivation quality (difficulties for high quality cultivation)</p>	<ul style="list-style-type: none"> <li>• Difficulty to get inputs for cultivation</li> <li>• Difficulty reaching adequate quality by farmers (including vulnerability to damage during cultivation)</li> </ul>
<p><b><u>Criteria 03</u></b> Processing costs (Skills, money, technology needed for processing)</p>	<ul style="list-style-type: none"> <li>• Skills for processing</li> <li>• Money needed for processing</li> <li>• Technology needed for processing</li> </ul>
<p><b><u>Criteria 04</u></b> Scaling up (difficulty getting high quality supply)</p>	<ul style="list-style-type: none"> <li>• Difficulty for processors get enough supply</li> <li>• Difficulty of reaching adequate quality by processors and exporters</li> </ul>
<p><b><u>Criteria 05</u></b> Infrastructure costs (assets needed across entire value chain)</p>	<ul style="list-style-type: none"> <li>• Water</li> <li>• Electricity</li> <li>• Transport infrastructure</li> </ul>

## 2.9 Methodology of Spatial Database Development

- a) Maize seed production crop clusters has to be select and identify suitable lands from DSDs in Kilinochchi, Vavuniya and Badulla Districts.
- b) Existing data layers such as Land use, Soil, Agro ecology, Wildlife, forest, Rainfall and temperature data layers used for identification of suitable lands from the above districts and suitable areas should be identified with a help from consultant team and later carry out field work in order to collect spatial data, field verifications and monthly updates.
- c) Develop the spatial database of the project districts and complete Geo database of the project clusters with the support of the project field staff for attribute data collection.

- d) Contribute for the Feasibility Study and demarcation of crop clusters by providing required input for the other consultants (Agronomist, Value Chain Specialist, Engineer, Agricultural Economist and Institutional Development Specialist).
- e) Digitize/create new thematic layers to fill gaps in required data, using scanned maps, satellite images and GIS data, in accordance with the structure and coding system.
- f) Contribute for Cluster Development Plans for each crop cluster by having farmland located within project clusters should be done by GPS and/or Drone technology and all the spatial data should be collected.
- g) Database structure should be decided jointly with the PMU staff and in consultation with the other Consultants to facilitate spatial data analysis requirement of all disciplines. This will include how to update and maintain GIS database (catalogue, inventory, metadata creation, backup, linkages to other databases);
- h) Ensure that the database should be in the form of a Multi-user Geodatabase.
- i) Data Processing and Reporting:
  - Perform spatial analysis for producing geographic statistics required by the project for planning, implementation, monitoring and progress reporting in relation to major sub components of the project.
  - Produce location specific GIS maps with summary statistics in accordance with the design and criteria defined by the Consultants and the ASMP.
  - Ensure all data backups and perform all other GIS-related activities useful for the project.
  - Establish data collection process to update the Geo database monthly within the project period and beyond.
  - Consultant should present monthly progress jointly with other consultants and contribute for the deliverables of the assignment.
- j) Submit a final report to the PMU& MOA on how to continue, update and expand the Geo Database for the activities of the ASMP and future activities of the Ministry of Agriculture. Provide GIS training on designing, development & update of the ASMP-GIS and geospatial analysis & preparation of thematic maps as per the user requirement, for selected staff of ASMP & MOA (2-3) as nominated by the ASMP. Training should be started from the early stages of the assignment.

Select land use types such as Paddy, home Garden, Seasonal crops and other selected land use types from Land use layer, Soil, Agro ecology, Wildlife, forest, Rainfall and temperature data layers used for identification of suitable lands for Maize seed production.

## **2.10 Methodology adopted in Environmental and Social Assessment**

The proposed methodology for this safeguards assessment is based on the ToR and it should be customized to meet the requirements and overcome the challenges according to the ground situation.

Available published and unpublished literature relevant to the project will be reviewed and socio-economic and environmental data available from local authorities will be collected. The feasibility study team will be made aware of the potential impacts associated with different options and recommended mitigation measures; and all field data and information collected by the feasibility study team will be reviewed.

This informal scoping task will bring the expert's team to a one flat form while improving & understanding the Terms of References issued by ASMP. The information collected in this exercise will be used in identifying the major types and distribution of terrestrial, aquatic habitats, eco-systems including Protected Areas, forest reserves and conservation areas, existing land use patterns, existing natural & man-made vegetation and other structures, spatial distribution of habitats and ecosystems, natural and anthropogenic impacts to environment in the project area etc.

In addition, all the existing maps (land use, hydrology, vegetation etc.) of the study area will be collected during this assignment.

In order to address above main key areas of the scope of services, it is proposed that the physical, biological and socio-economic environment of the project area and its surrounding will be assessed in detail under each sub categories in specific sub methodologies under each sub sections of ToR.

Primary Data	Secondary Data
Direct Observation	Published Data
Focus Group Discussions	Unpublished Data
Key Informant Interviews	Maps

## 2.11 Overview of Environmental Legislation

The constitution of the Democratic Socialist Republic of Sri Lanka under chapter VI Directive Principles of State policy and Fundamental duties in section 27-14 and in section 28-f proclaim “The state shall protect, preserve and improve the environment for the benefit of the community”, “The duty and obligation of every person in Sri Lanka to protect nature and conserve its riches” thus showing the commitment by the state and obligations of the citizens.

The following section outlines the broad legal and institutional framework in Sri Lanka for environmental management and World Bank’s environmental safeguards requirements, which will be relevant to the proposed project. A detailed review of environmental and social legal framework is given Annex 5.

## 2.12 Detail Review of Key Environmental and Social Services Related Legislation

**The National Environmental Act. No. 47 of 1980 & its amendments:** As per the initial screening, majority of project’s activities are not yet finalized and considering the proposed components, project might be fallen under the prescribed categories. Considering the low impacts of project already identified and the present assessment carried out in compliance with WB’s Safeguards policies would be sufficient with continuous monitoring during the construction, operation & maintenance phases. However, considering the complexity of the project activities, project might require an environmental assessment. During next phase of the assessment, project will submit the proposal to the CEA and CEA recommendation will be implemented accordingly. Any project activity which will be coming under Prescribed activities, EIA/IEE process will have

to be followed. In addition, any industrial activity coming under Technological Improvements such as Processing Hubs should obtain EPL for its operations and should comply with CEA regulations related Air quality, Noise, Vibration and Waste Management.

**Pesticides Act No. 33 of 1980, as amended by the Act No. 06 of 1994 & the Act No. 31 of 2011):** Project has prepared a comprehensive Pest Management Action Plan in complying with the above enactment and the WB's Pest Management Plan. All agronomical practices which are to be undertaken under ASMP should be in-line with Integrated Pest Management Plan. IPM is triggered policy under WB's Operational Policies related to ASMP and from land preparation up to marketing, IPM should be implemented as practicable as possible.

**Plant Protection Act No.35 of 1999:** Project has prepared a comprehensive Pest Management Action Plan in complying with the above enactment and the WB's Pest Management Plan. All agronomical practices which are to be undertaken under ASMP should be in-line with Integrated Pest Management Plan. IPM is triggered policy under WB's Operational Policies related to ASMP and any activity propose under agronomical practices should be in complying with these requirements stipulated.

**The Fauna & Flora Protection Ordinance Act No. 49 of 1993 & its amendments:** Kilinochchi, Vavuniya, and Badulla districts as a whole have several important Wildlife designated areas namely Protected Areas (National Parks, Sanctuaries, Reserves, etc). Any cultivation or development related activity falling in or around such areas should be consented by the DWLC. Specially in Badulla, Kandaketiya, Mahiyanganaya, Welimada, and Demodara are boarded to Wildlife protected areas.

**Local Authorities Acts:** The infrastructure improvement activities funded under ASMP through the LAs comprise of the basic services they ought to render to the public in line with these acts. Subsequently, maintaining this infrastructure would be the prime duty of the local authorities. In addition, majorly, management of solid waste should be in-line



with LAs mandate.

**Water Resources Board Act No. 29 of 1964:** Use of ground water in cultivation or infrastructure development should be seek recommendations from WRB in advance with a proper yield test.

**Forest Ordinance including Amendments:** Project interventions especially lands within the purview of Forest Department, should be obtained approval from Forest Department prior to implement the activities. This requires specially when removing trees within the proposed site. Badulla is consist of 11 forest types where Kandaketiya, Mahiyanganaya, Rideemaliyadda, Haldummulla, Welimada, etc are very rich in forest areas. In addition, Badulla nearly 40%, Vavuniya 49% (101811ha) and Kilinochchi 30% (31047ha) are under forest

**The Irrigation Ordinance (Chapter 453):** Any activity relevant to ID's command areas should be consented by the ID. Badulla (Badulu Oya and Bathmedilla), Vavuniya and Kilinochchi (Iranamadu, Kalmadu, etc)

**Women Charter of Sri Lanka:** Inclusion of minimum of 40% female

**Seed Act No. 22 of 2003:** As there will be seed production activities under ASMP, the entire process of seed production should be in complying the regulations stipulated under this act. Process should be coming under proper Seed Certification programme and any planting material proposed under this programme should be complying with its regulation.

**Table 2** Important Services in Agriculture Sector

Name of unit	Mandated Functions
National Plant Quarantine Service (NPQS),	Facilitate the import and export of pest free plants and plant products, for the development of agriculture and related industries in the country.

Plant Genetic Resources Centre (PGRC).	Explore, collect conserve, introduce, evaluate and utilize the diversity of crop genetic resources
--	--

**Agrarian Development Act. No. 46 of 2000:** Conversion of paddy lands including abandoned paddy land to any other land use should be as per the approval of the Commissioner, Agrarian Development Department. Specially in Badulla, proposed areas are paddy cultivated areas where during yala used for Maize cultivation.

**World Bank Safeguard Policies:** Projects and programs funded by IDA resources need to comply with the World Bank’s operational policies. Therefore, all sub-projects eligible for funding under this project will be required to satisfy the requirements of the safeguard policies of the World Bank, in addition to conformity with national environmental regulations. The Agriculture Sector Modernization Project undertakes several cultivation, and infrastructure subprojects and they have to be screened and impacts have to be identified. The World Bank OP4.01 discusses the environment assessment process to be followed.

The main environmental safeguard policy to be triggered under this project will be OP/BP/GP 4.01 on Environmental Assessment. The other three environmental safeguard policies namely, OP/BP/GP 4.36 and 4.04 on forestry and natural habitats respectively, have been identified as there will be activities inside such habitats and will be considered to ensure minimal adverse environmental impacts due to the project.

**World Bank safeguards policies triggered by the project**

<b>Safeguard Policies Triggered by the Project</b>	<b>Yes</b>	<b>No</b>
Environmental Assessment (OP/BP/GP 4.01)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Natural Habitats (OP/BP 4.04)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pest Management (OP 4.09)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Physical Cultural Resources (OP 4.11)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Involuntary Resettlement (OP/BP 4.12)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Indigenous Peoples (OD 4.20, being revised as OP)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Forests (OP/BP 4.36)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Safety of Dams (OP/BP4.37)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Projects in Disputed Areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Projects on International Waterways (OP/BP/GP)	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## **Project Categorization**

When OP 4.01 is triggered, the World Bank classifies proposed projects in to one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

Proposed project is classified as **Category B** if its potential adverse environmental impacts on human populations or environmentally important areas including wetlands, forests, grasslands and other natural habitats are less adverse than those of Category A projects. These impacts are site specific; few if any are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. The scope of an EA for Category B projects may vary from project to project, but it is narrower in scope when compared with Category A projects.

## CHAPTER 3: DISTRICT PROFILES

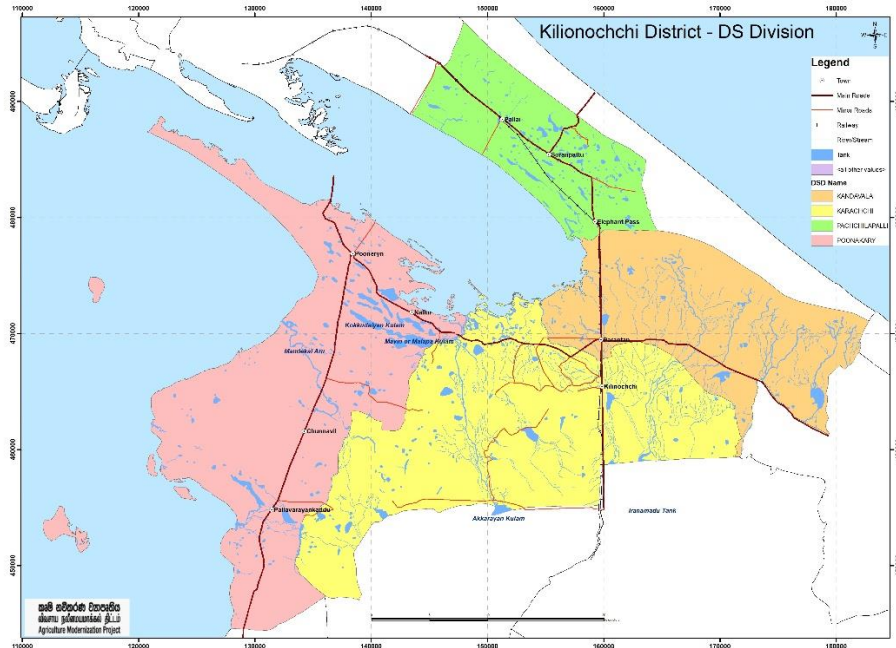
### 3.1 Kilinochchi District

Kilinochchi District is divided into 4 Divisional Secretary's Divisions (DS Divisions), namely Kandavalai, Karachchi, Pachchilaipalli and Poonakary. The DS Divisions are further subdivided into several Grama Niladhari Divisions (GNDs). The total number of GNDs is 95. Grama Niladhari each GND consists of several villages. Kilinochchi District has three local authorities (Pradeshiya Sabhas) namely Karachchi, Poonakari and Pachchilaipalli (LUPPD, 2016).

**Table 3:** DS Divisions and extents in Kilinochchi District

<b>DSD</b>	<b>Area (sq.km)</b>
Karachchi	438.0
Kandawalai	263.0
Poonakary	454.8
Pachchilaipalli	177.2
<b>Total</b>	<b>1333.0</b>

Geographically Kilinochchi District could be categorized as flat with less than 10% slope. There are 4 major, 5 medium and 394 minor tanks all over the district connected to conserve rain water. The Topography of the district is flat to slightly undulating. The elevation is varying from 0-250 m MSL. However, the elevation of the majority of the area is less than 10 m MSL (LUPPD, 2016).



**Figure 11: Kilinochchi DSD**

According to the LUPPD (2016), The dominant soil group (approximately 36.36% of the total extent of land) in the district is Red yellow latosols. The next dominant soil group is Soladized solonistz & solo check in flat terrain. It occupies about 27.27% of the total land area. The soil of the district is fertile and having enough minerals for the better growth of many crops.

### **Land resources**

When the total extent of Kilinochchi District is considered, 97.4% consists of land area while 2.6% is internal reservoirs. 50.6% of the total extent of the district comprise of cultivated land, 24.4 of uncultivated land and 25% forest cover.

### **Water resources**

Kilinochchi District is being largely an agricultural District; Agriculture is particularly paddy mostly depends on the irrigation network for its development. The total land area of the of district is 133,000ha and extent of the water bodies is 4430 ha. The district has 7 river basins, about 359 Natural ponds, 4 Major tanks and 5 Minor tanks. The major and medium

tanks come under the purview of Irrigation Department, while minor tanks and ponds under the Agrarian Development Department (LUPPD, 2016).



**Figure 12:** Waterbodies in Kilinochchi district

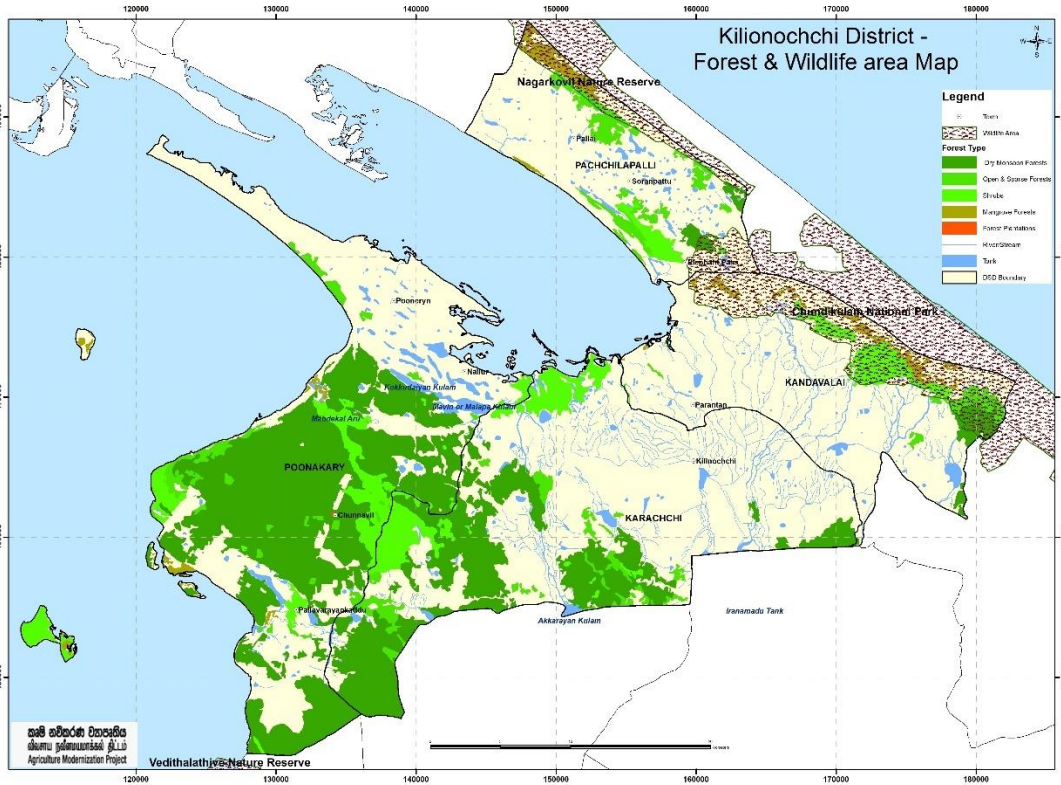
### Forest cover and biodiversity

Out of total land area of 132,499 ha in Kilinochchi District, 32149.2 ha is covered by Dry Monsoon Forest, while 5026.6 ha and 424.0 ha are under sparse forests and mangrove according to forest cover assessment of the Forest Department in 1999 (Forest Department, 2016). The coverage under forests is 37599.8 ha (28.4%) of total land area. Wildlife protected areas are managed by DWC under the Flora and Fauna Protection Ordinance (FFPO). There are two wildlife protected areas in Kilinochchi District under two different conservation statuses namely; National Parks and Nature Reserves (LUPPD, 2016).

**Table 4: Forest Reserves in Kilinochchi District**

#	Forest Reserve	DSD	Extent Ha
1	Iranaimadhu	Karachchi	9628.78
2	Akkarayan		
3	Kilinochchi		
4	Teravil	Kandawalai	1091.51
5	Chunnivil	Poonakari	19670.55
6	Mandakall Aru		
7	Nagapunduva		
8	Pallai Reserve	Palai	656.16

Source: LUPPD



**Figure 13: Forest Conservation Areas in Kilinochchi**

## Socio-economic environment of proposed project locations

### District's Demographic profile

In the district, 146,072 population recorded in the 4 DSDs in which 46,852 families included. Male-female recorded in the district is 49:51. In addition, the detailed population by DSD is given below:

**Table 5: Population Details by DSD**

#	DSD	# of Families	Total Pop	Male	Female
1	Karachchi	25699	78564	37996	40568
2	Kandawalai	8756	26726	12920	13806
3	Poonakari	7872	26488	13148	13340
4	Pachchilapalli	4525	14294	6994	7300
		<b>46,852</b>	<b>146,072</b>	<b>71,058</b>	<b>75,014</b>

**Source:** LUPPD

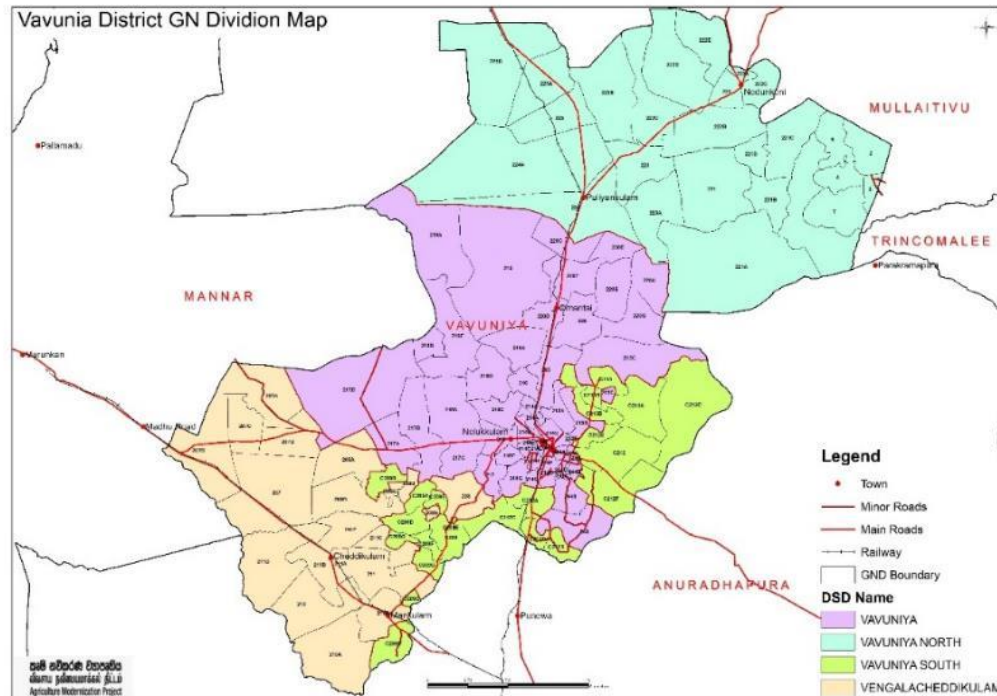
The vast majority of economically active population is employed in agriculture and fishery. It is about 62 %. The second and third higher proportions of employed persons are occupied in the Government and Private sectors.

### Economic status of the irrigated farming communities

As per LUPPD (2016), Kilinochchi District is predominantly an agriculture economy depending mainly on tanks and irrigation network. The soil condition in certain parts of the district is more suitable for cultivation of vegetables and other field crops, high value cash crops and fruit crops. The development policy objective is to break away from subsistence agriculture by promoting high value crops under intensive and commercially oriented agriculture system since it will increase production, incomes and provide greater employment and higher standards of living. According the statistic of the Annual Labour Force Survey Report of 2016, employment by main industry of the population over the age of 15 illustrates that from the total household population of the age 15 years and above of 80,217, 36,212 is considered as the labour force which is equivalent to 45.1%. From the eligible labour force, 93.7% which is equivalent to 33,926 is employed. According to the survey statistics 9,167 (27%) is engaged in agriculture industry, 8,623 (25.4%) in industries and 16,135 (47.6%) in service industry.



### 3.2 Vavuniya District



**Figure 14:** Vavuniya District Map

The Vavuniya District falls within the Northern Province and administratively this District has divided into four Divisional Secretary Divisions namely Vavuniya, Vavuniya North Vavuniya South and Vengalcheddikulam. It covers 1938 Sq.km, approximately 3% of the total land area of the country. According to the administration regulations the district is also divided into 102 Grama Niladhari Divisions and there are 550 villages in the district. This district is divided into five administration bodies including one Urban Council and four Pradeshiya Sabhas namely Vavuniya Urban Council, Vavuniya Tamil Pradeshiya Sabha, Vavuniya North Pradeshiya Sabha, Vavuniya South Sinhala Pradeshiya Sabha, and Vengalcheddikulam Pradeshiya Sabha.

Geographically the Vavuniya District falls within the Northern lowlands. Commonly the topography pattern of the district consists of gently sloping (0-8%) and undulating terrain types. The elevation varies from 100 – 300 feet from the Mean Sea Level and this district can be called as a plateau. Slope goes towards, Mannar plains to West and Mullaitivu

narrow plains to East. The South East part of the district forms by the ridge of the mountain which separates the Northern Province. This part has the highest elevation, 300 feet from the Mean Sea Level. It is the highest elevation in the North of Sri Lanka. The rest part of the district is a gently sloping plain. The slope is between 0 – 8%. Topography of the plains is undulating. From the South East plateaus, the rivers flow towards West and North. These river systems form narrow valleys- typical land forms, as a network over the district.

The major soil types and their distribution in the district are shown in the Figure 15. The soil types of the district are Reddish Brown Earths, Low humic gley and alluvial soils. There are concave valleys and bottom lands with Red yellow latasols found in the Northern part of the district and that area is more fertile and has better ground water potential. In the other part of the district, there are hard crystalline rocks with limited ground water.

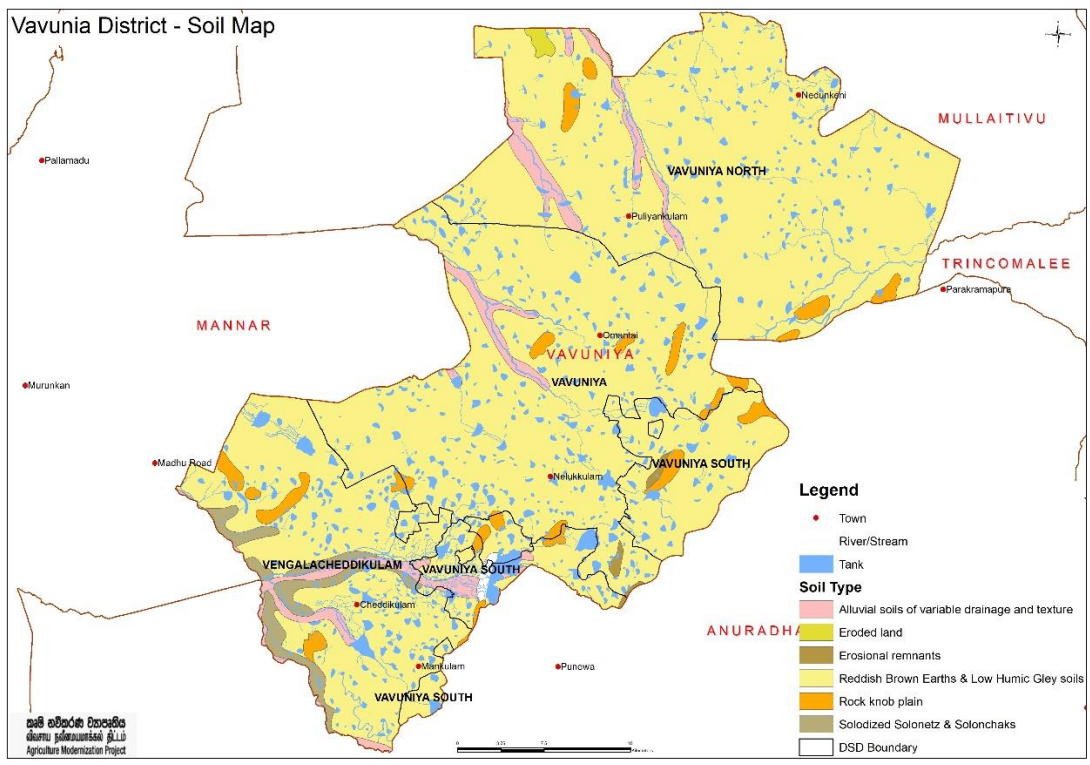


Figure 15: Soil Types in Vavuniya

## **Land resources**

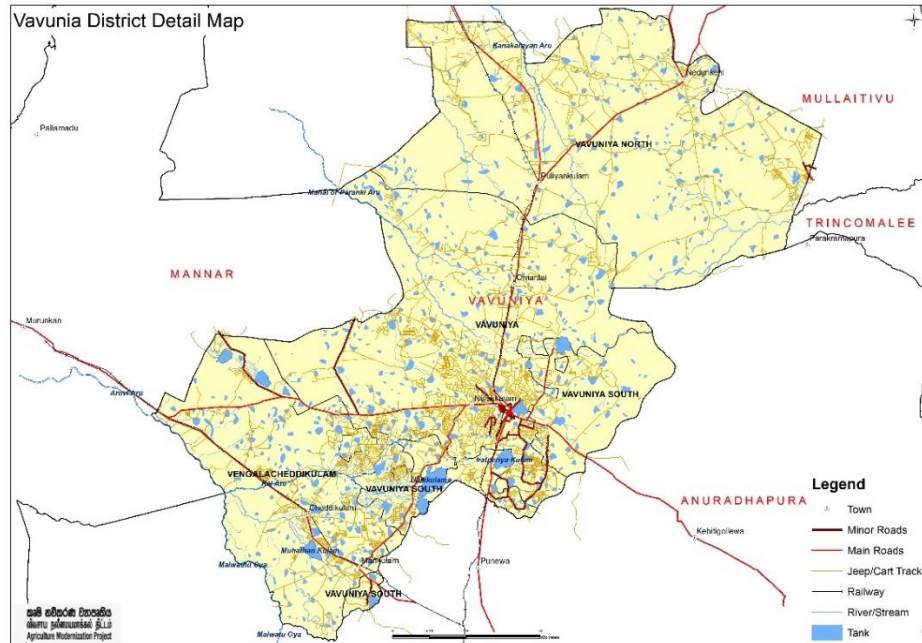
The Vavuniya district falls within the Northern Low land, it covers an area of 193831.8 ha in extent. The Land Use and Land Cover of the district has been developed since ancient time by the people through early settlement and traditional Agricultural systems, after the European period developed the Land Use system through road and infrastructure facilities.

Forest (49.0%), homesteads (15.4%), paddy (14.3%), field crops (7.6%), water bodies (6.2%) and scrub lands (6.0%) are the major Land Use types in Vavuniya District.

## **Water resources**

The water resources of the district are mostly determined by climatological conditions and the terrain. The surface water resources are influenced by the annual rainfall and more than 51% from the available surface water escape to the sea as run off annually. The irrigation of this district, is mainly based on irrigation Tanks, there is one major tank, 22 medium tanks and 674 minor irrigation tanks functioning in the district. Nearly 16,875ha of paddy lands are irrigated by the major, medium and minor irrigation tanks, 4125ha of paddy lands cultivated under the rain- fed system. There are no perennial rivers in the district; all are seasonal rivers during the rainy season, the river system out let to run off waters from the district. The Waterbodies in the district are shown in Figure 16. The irrigation tanks serve the ground water level in the district. During the dry season, 95.0% of domestic water uses depend on the ground water in the district. The upland irrigated agriculture uses the ground water resources in the district.

There are no major aquifers in the Vavuniya region and ground water is available only in local and discontinuous moderate to low yielding aquifers in fractured rocks. According to the Water Resources Board and the Groundwater Atlas of Sri Lanka deep wells in this area do not a) Provide good yields, and most of the 540 tube wells are shallow and do not penetrate beyond the bedrock. B).



**Figure 16:** Surface Waterbodies in Vavuniya

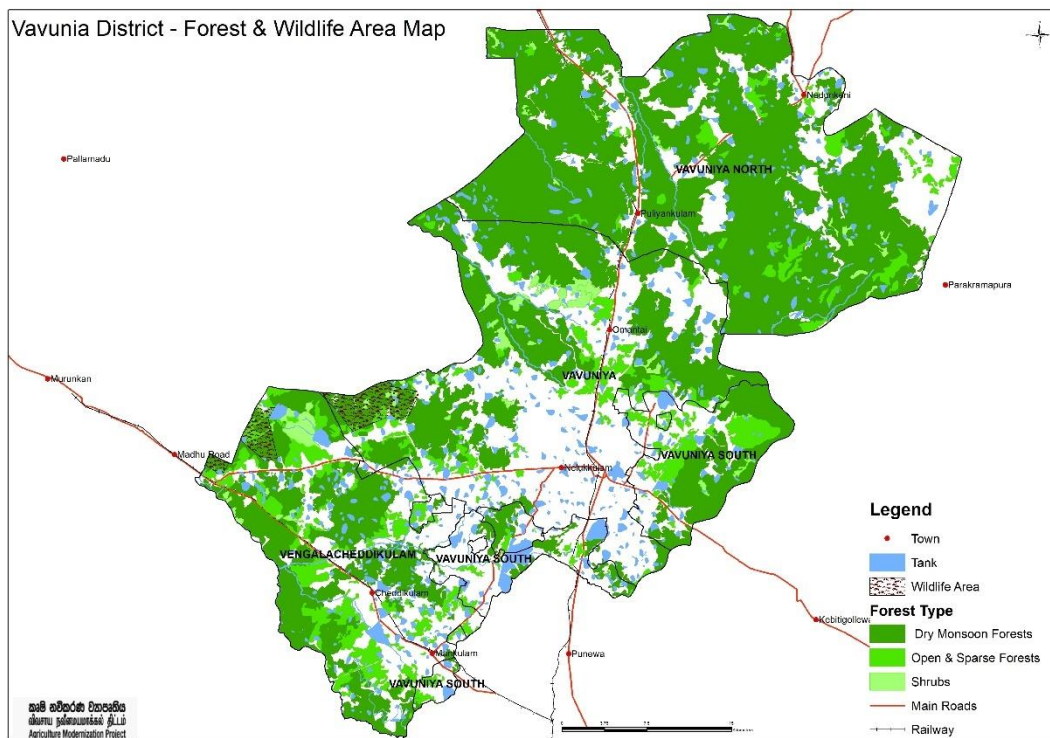
### Forest cover and biodiversity

According to LUPPD, it covers an area of 49.09% from the total land area of the district. The dense forest and open forest cover 95043.5ha and forest plantations cover an area of 122.3 ha in extent. The agricultural lands are the second largest land use cover of the district. It covers an area of 37.5% from the total land area of the district and the agricultural land uses include homesteads 29917.8ha, paddy lands 27778.2ha field crops 14911.5ha, and other perennial crops 56.3ha. Range lands cover an area of 11851.5 ha and it includes scrub lands (11823.6ha) and grass lands (27.9ha). Scrub lands include abandoned Chena cultivation lands and abandoned highland crops and abandoned settlement areas.

**Table 6:** Forest Reserves in Vavuniya

#	DSD	Extent Ha
1	Vavuniya	22445.0
2	Vavuniya North	55104.0
3	Vavuniya South	6013.0
4	Vengalacheddikulam	18249.0
	<b>Total</b>	<b>101811.0</b>

The forested areas are of more ecological value, and are generally located some distance from inhabitation. Administratively there are three types of forest: state forests; forest plantations; and forest reserves. Depending on their size, location and the extent of disturbance by logging and other activities, these areas may contain a variety of the mammals and other species that are typical of forest habitats in Sri Lanka, including elephant, deer, toque macaques and other monkeys, wild boar, and a variety of birds, reptiles and insects.



**Figure 17: Protected areas in Vavuniya District**

## **Socio-economic environment of proposed project locations**

### **District's Demographic profile**

The population of Vavuniya District was 195629 according to census data. The population of the district is mostly Sri Lankan Tamils. After 2009 total population has been increased due to the internal migration from the other parts of the Northern Province. Density of the population is 99 persons /sq.km in Vavuniya District. High density is recorded in Vavuniya Urban council area and it is 223 person/sq.km. Population Density is given in table 7.

Vavuniya spans a land area of 1938 sq.km and the district as a whole is sparsely populated. In urban areas lives 26.7% of Vavuniya's population. Other 73.2 % live in rural areas. Male population is 48.9 % and female population is 51.1 %. The population distribution of the district is unequal in terms of geography. The total labour force of this District is around 111,200.

**Table 7: Population in Vavuniya by Gender**

#	DSD	Total Pop	Male	Female	Density per sq km
1	Vavuniya	117,153	57302	59851	199
2	Vavuniya North	11518	6016	5502	16
3	Vavuniya South	13070	6464	6606	56
4	Vengadachettikulam	29770	15064	14706	76
		<b>171,511</b>	<b>84,846</b>	<b>86,665</b>	<b>88</b>

**Source:** LUPPD

The labour force of Vavuniya District is engaged in different sectors, such as agriculture, business, services, inland fisheries, small industries, construction sector and other sectors. More than 75% of labour force is engaged in Agriculture Sector, which is the major occupation of the district. The agriculture includes the paddy cultivation, commercial crop cultivation and other field crop cultivation. The educated professionals are mostly engaged in government service sector such as education, health, administration, engineering, technical sector, transport, electricity and construction services.

### **3.3 Badulla District**

The extent of Badulla District is 286,100 ha, of which only 3,400 ha are covered by inland water bodies. The total population is approximately 886,000. The Divisional Secretariats of Badulla district, 15 in number, and further divided into 567 Grama Niladhari Divisions (GNDs), directly fall under the purview of the District Secretary. There are 1,991 villages found under the administration of these GNDs.

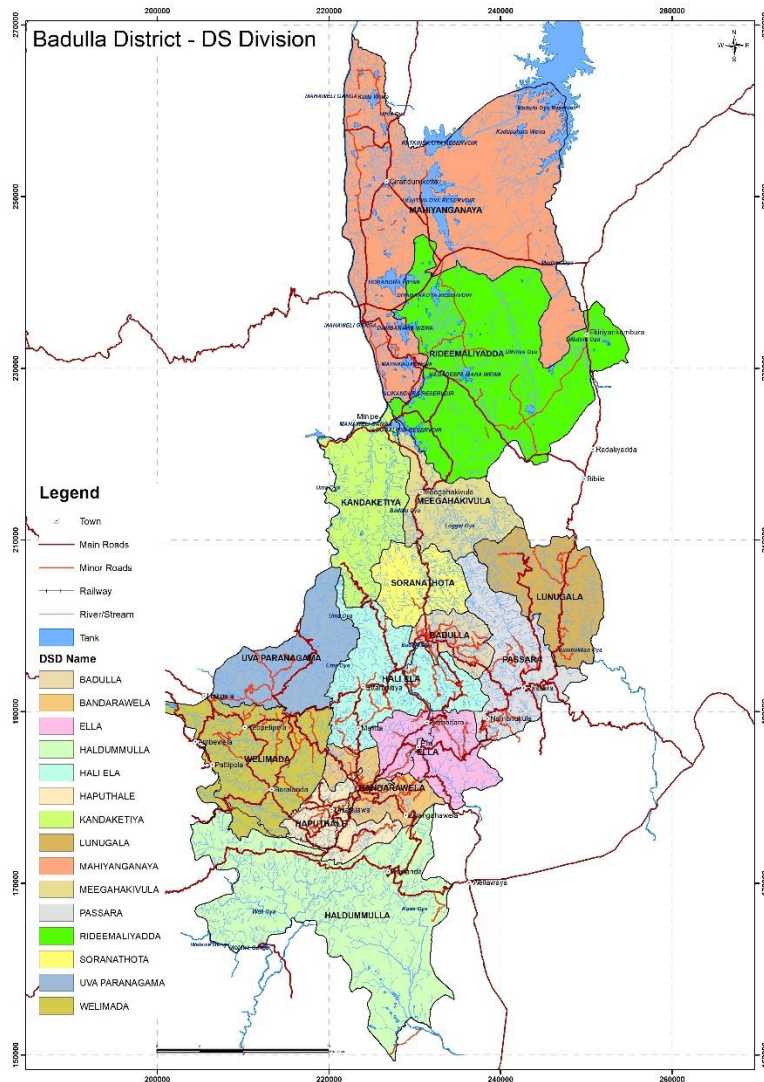
**Table 8: Land Area in Badulla**

<b>DSD</b>	<b>Extent Ha</b>
Mahiyanganaya	60100
Rideemaliyadda	43100
Haldummulla	41200
Welimada	18800
Haliela	16500
Kandaketiya	15700
Passara	13600
Uvaparanagama	13800
Lunugala	14400
Ella	11100
Meegahakiwula	10500
Bandarawela	7100
Soranathota	7900
Haputhale	7200
Badulla	5100
<b>Total</b>	<b>286100</b>

**Source:** LUPPD

Physiographically, it is a complex region with mountain ranges, dissected plateaus, escarpments and narrow valleys covering a greater proportion of the district. This Eastern range has an elevation ranging from 1200-1800 metres. To the East is the North-South aligned Namunukula range beyond which are located a section of Lunugala ridges that rise to over 1200 metres. The terrain of these ridges is rugged. At the extreme South of the district separated from the Eastern range by a steep escarpment is a section of the Koslanda plateau, with an elevation ranging from 300-1000 metres. Encircled on three sides by the Central highlands, the Eastern and Namunakula ranges and Lunugala ridges, is the distinctive and clearly demarcated Uva Basin (elevation below 1200 metres). The rim of the Basin and the Uva highlands located in its centre are highly dissected by the Northward flowing Uma, Badulu, Loggal Oyas and their tributaries. Their valley bottoms have undulating floors while the flanking hills rise sometimes to a height of 900

metres. The Badulu Oya, for example, flows in a deep valley and its lateral tributaries too have carved up deep valleys on either side. To the West of the Basin rises the Welimada plateau whose general elevation varies between 1000-1200 metres. In this region land slopes from West to East; with slopes ranging in gradient from 8-25 percent. On the whole the general gradient of a large part of the district is Northwards to the valley of the Mahaweli ganga. Several headstreams of the Mahaweli ganga, Walawe ganga, Kirindi, Kumbukkan and Gal Oya rise in the mountain ranges within the district and flow North, South and Eastwards across the district.

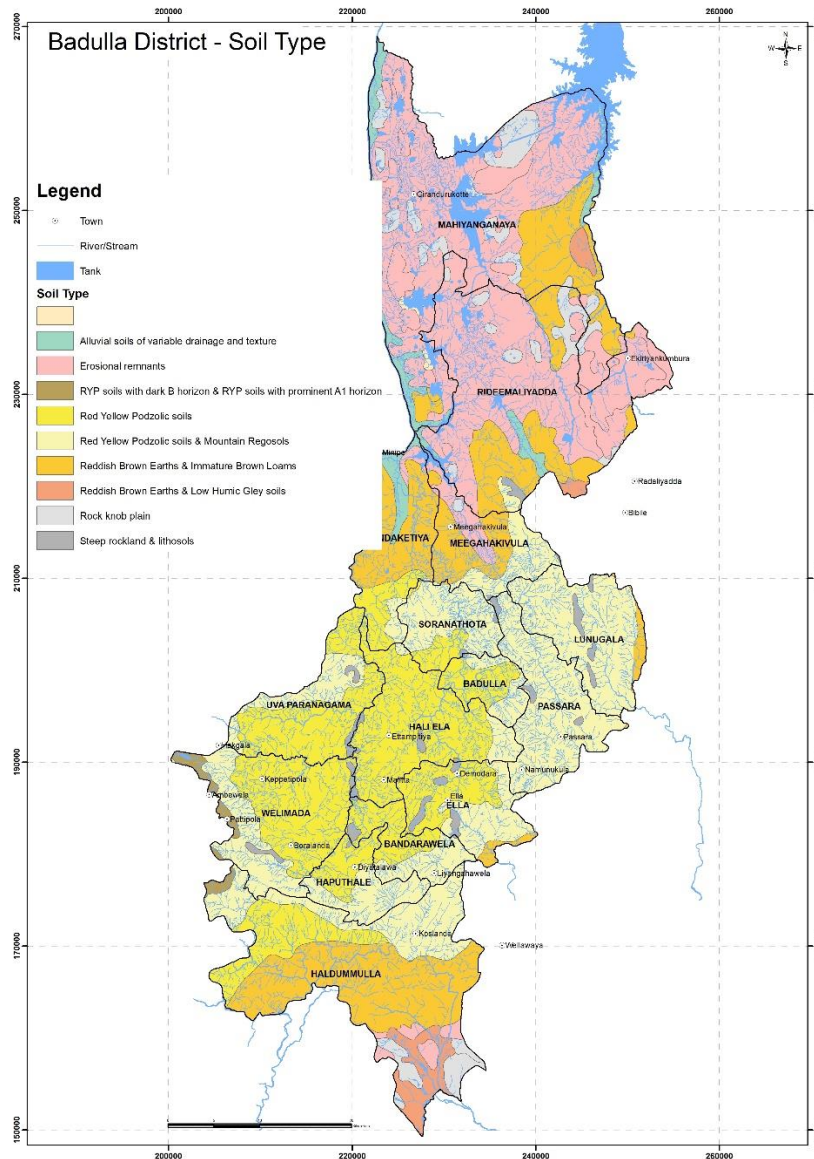


**Figure 18:** Badulla District map with DSDs



## Land resources

Soil type distribution in the Badulla district is shown in Fig. 19. Major soil types found in the Northern part of the district are RBE and LHG. Immature Brown Loam (IBL) soil is found in the middle part of the district. Southern upcountry area of the district is covered mostly by Red Yellow Podzolic soils (RYP).

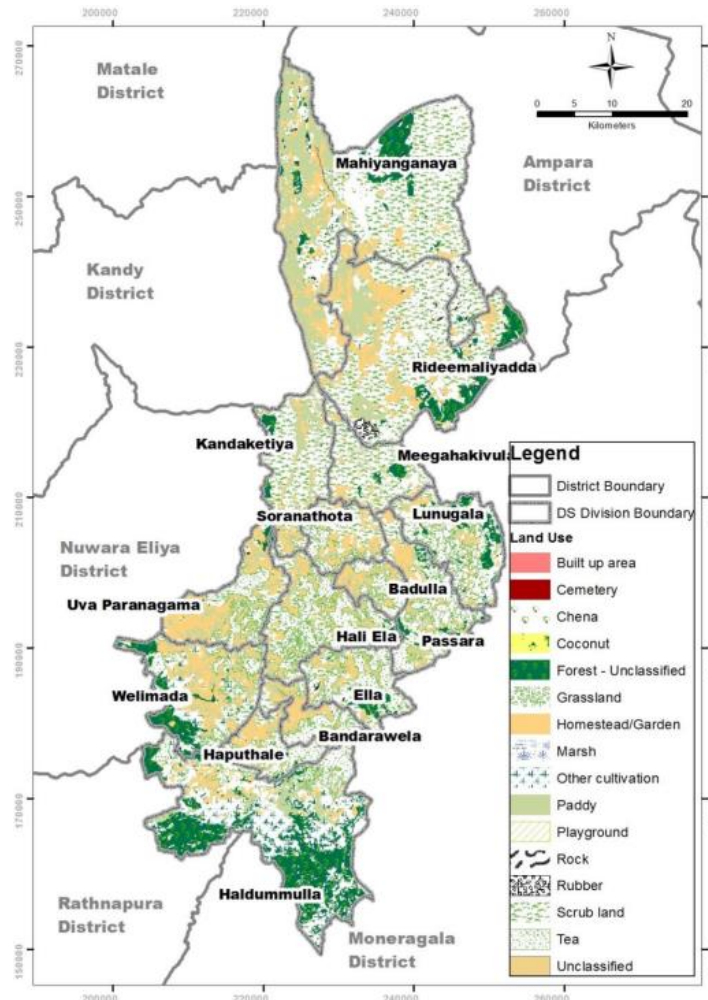


**Figure 19: Soil Types in Badulla**

The area used for chena cultivation and home gardening is about 67,745 hectares and the total land under cultivation exceeds 165,075 hectares. Natural forest cover has decreased to 16 % due to pressure on the use of land. Land use distribution of the Badulla District is shown in Fig. 20. The district of Badulla is predominantly characterized by plantation agriculture and rural economics, consequently increasing the number of low-income people in the area.

In Sri Lanka, major contributors to land degradation are soil erosion and soil fertility decline. Over exploitation of ground water, salinization, water logging and water pollution are also becoming important contributors to land degradation. According to the Global Assessment of Soil Degradation (GLASOD), about 50 percent of land in Sri Lanka is degraded. The area affected by soil fertility decline is 61 percent of the total agricultural land. The more important manifestations are heavy soil losses; high sediment yields; soil fertility decline and reduction in crop yields; marginalization of agricultural land; salinization; landslides and deforestation and forest degradation. It has been estimated that in Badulla District 54.8 % of the total extent is subjected to soil erosion. Severe erosion takes place in the hill country on sloping lands under market gardens (vegetables and potatoes), tobacco, poorly managed seedling tea and chena cultivation. Soil erosion is also considered a threat to agricultural production in the rain-fed farming areas in the Dry Zone. Relatively high erosivity values are reported from Badulla, Meegahakiula, Kandaketiya and Ridimaaliyadda DS Divisions. Low erosivity values are reported from Soronathota, Hali Ela, Ella, Bandarawela, Haputhale, Haldumulla and Welimada DS Divisions.

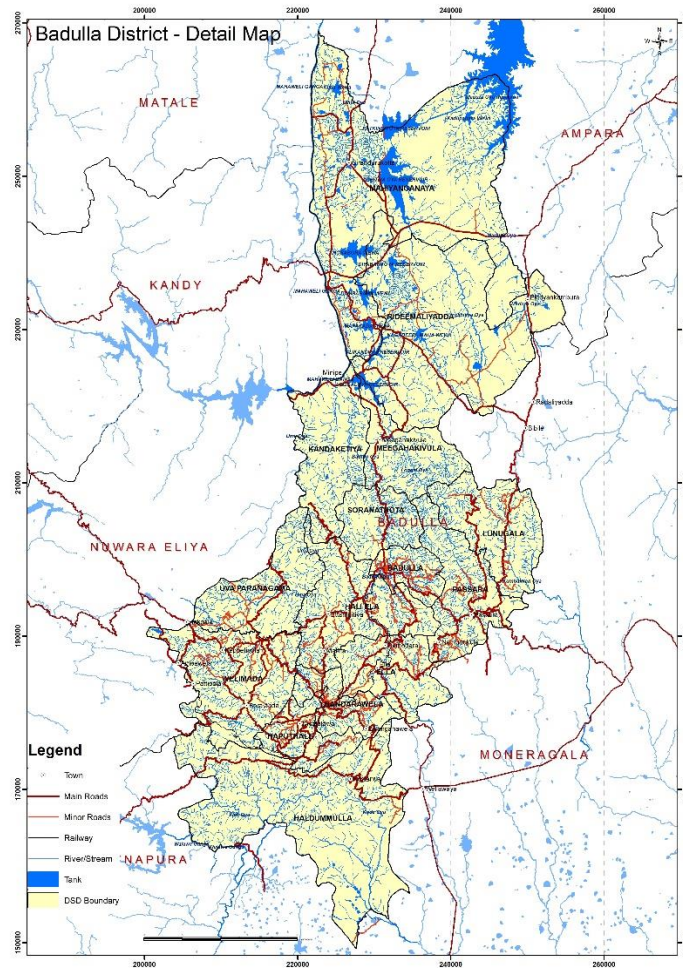
A part of the soil that is removed is transported by rivers and streams leading to sedimentation of reservoirs, downstream floods etc., commonly referred to as the off-site effects of soil erosion. Some recent studies undertaken in upper watershed areas have shown high rates of sediment yield in some rivers.



**Figure 20:** Landuse in Badulla District

## Water resources

Streams and reservoirs in the geographical area of the district are shown in Fig. 21. Uma Oya river, the main branch of Mahaweli river, irrigates the crops and vegetation throughout its journey to the banks of river Mahaweli. Badulu Oya and Uma Oya too provide irrigation water for cropping lands of this area. Main reservoirs within the district are Rathkinda, Ulhitiya, Sorabora, Mapakada and Loggal Oya. There are about 390 minor tanks and 3,700 anicuts providing water for 61,515 farm families to cultivate their paddy fields.



**Figure 21:** Surface waterbodies in Badulla District

### **Forest cover and biodiversity**

The natural vegetation of the district consists of non-productive Wet-Zone forests, non-productive Intermediate Zone Forest, scrubland and grasslands. The dense and open forest lands mentioned above comprise only 19.6 percent of the land area and covers 55,450 hectares. Forest plantations cover 12,890 or 4.6% of the district. There are 10,230 hectares under dry patana grassland especially in the crests and upper slopes of hills in Passara, Ella, Haldumulla and Migahakivula where soils are shallow. The 14,240 hectares of scrubland are concentrated predominantly in Mahiyangana and Ridimaliyadda. These scrublands are the result of the abandoning of chena lands after constant cultivation.

Considerable percentage of the district is covered by forest with different types including Montane, Sub Montane, Moist Monsoon and Dry Monsoon forests. The total forest cover has been estimated as 54,271 ha, out of which the dense and open forestlands comprise 19.6% and forest plantations cover 4.6%. Dry pathana grasslands can be seen especially in the crests and upper slopes of hills in Passara, Ella, Haldummulla and Migahakivula and covers around 10,230 ha. Scrubland are concentrated predominantly in Mahiyangana and Ridimahaliyadda (14,240 ha) and are result of the abandoning of chena lands after constant cultivation.

Ravana Ella Sanctuary, Badulu Oya river basin and Gallanda Oya are the main ecologically important sites in the district. About 1,932 ha of Ravana Ella Sanctuary is located around Ravana Ella falls. Hakgala Mipilimana Forest Reserve and Thangamale Sanctuary, Namunukula forest reserve are other important ecosystems in Badulla district. Part of the Maduruoya National Park also lies towards the Eastern border of district and it is important elephant habitat distributed in the area. Different habitats of the park provided refuge for large number of terrestrial and aquatic species of wildlife including a variety of endemic species.

## **Socio-economic environment of proposed project locations**

### **District's Demographic profile**

Gender wise, 49.6 % of the total amount is represented by males and the rest 50.4% by the females. The minors below the age of 18 are 350,612 in number. The district is predominantly Sinhalese (72.5%) with a significant portion (18.2%) of Indian Tamils concentrated in the estate sector. Muslim and Sri Lankan Tamil constitute the remaining 10%. The district is home to the indigenous Veddah community (nearly 350 families or 1,800 persons) living in the Maduru Oya forest reserve.

**Table 9:** Population by Gender in Badulla

<b>DSD</b>	<b>No of Males</b>	<b>No of Female</b>	<b>Total Pop</b>	<b>No of Families</b>
Mahiyanganaya	40244	41566	81810	25640
Rideemaliyadda	27167	28562	55729	18313

Haldummulla	19565	20984	40549	13066
Welimada	52913	55923	108836	29175
Haliela	46343	51440	97784	29552
Kandaketiya	12079	12834	24913	8571
Passara	24869	27824	52694	15745
Uvaparagama	40726	43483	84209	25021
Lunugala	15904	17976	33880	11068
Ella	23714	25065	48779	15054
Meegahakiwula	10290	10999	21289	7346
Bandarawela	33584	37134	70718	20663
Soranathota	11547	12822	24368	8091
Haputhale	26234	27530	53764	17096
Badulla	37980	43038	81018	24178

**Source:** District Statistics, Badulla

Economy of the district is mainly based on agriculture, livestock and tourism. Agriculture of the district is dominated by tea, paddy and vegetable farming. Badulla district is divided into two portions as upper region and lower region according to climatic and geographical characteristics.

The Badulla District has been recognized as one of the districts in which the higher poverty levels exist. According to June 2014 figures the district has the poverty line (Minimum Expenditure per person per month to fulfill the basic needs) of Rs. 3,847, whereas the national line is Rs. 3,886. About 25% Of the district population lives below the official poverty line. This situation arises the question whether the projects implemented so far in the purpose of poverty eradication had anyhow achieved their expected development targets. The high percentage of dependency and the low level of per capita income had adversely affected the rural economy. The majority of the labour force has been engaged in agricultural industries, and on the contrary a noticeable number of them are not in a position even to satisfy the basic needs of their lives. Under the Samurdhi” programme, nearly 62,242 persons have been benefited.

### 3.4 Ampara District

According to Land Use Policy Planning Report, the district is subdivided into 20 Divisional Secretary Divisions (DSDs). Each DSD is subdivided into several Gram Niladari Divisions (GNDs). The total number of GNDs is 503. There are 828 villages in the district. In addition to the above divisions there are several local authorities comprising two Municipal Councils in Kalmunai and Akkaraipaththu, an Urban Council in Ampara and seventeen Pradeshiya Sabas.

**Table 10: DS Division with Land Extent**

DSD	GND	Extent Ha
Addalachchenai	32	5696
Akkaraipattu	28	6041
Alayadiwembu	22	8259
Ampara	22	13927
Damana	33	44414
Dehiattakandiya	13	40131
Eragama	12	6665
Kalmunai (Muslim and Tamil Divisions)	58	1966
Karaithivu	17	894
Lahugala	12	92330
Mahaoya	17	68070
Navithanveli	20	6986
Ninthavur	25	3630
Padiyathalawa	20	38693
Potuvil	27	27183
Sainthamaruthu	17	303
Samanthurai	51	12301
Thirukkovil	22	18708
Uhana	55	53355
<b>Total</b>	<b>503</b>	<b>449552</b>

Source: LUPPD

### 3.4.1 Physical Environment

#### Topography

The topography of the district varies from flat to undulating. The elevation ranges from sea level to 500 m. There are also some erosional remnants that rise up to 700m.

#### Soils

The dominant soil group (approximately 38% of the total extent of land) in the district is the Reddish Brown Earth (RBE) with other soil groups as soil associations mainly in undulating terrain. The next dominant soil group is alluvial soils; it occupies about 16% of the total land area. Rest of the area of the district covers with Regosols, Solodized Solonetz & Solonchanks, Inselbergs and Rock Knob Plains. The physical and chemical properties of most of the RBE associations are generally suitable for agriculture. However, the major constraint to crop production in the district is the low available water rather than the limitations of the soils (LUPPD, 2016).

#### Climate

**Rainfall:** Ampara district receives a mean annual rainfall of 1750 mm. Much of this rainfall is received between November and February during the period of the North-East Monsoon (NEM). Most of the agricultural lands including paddy are cultivated during this season referred as “Maha” season. Some rain is also received during the first inter monsoon (FIM) period from March to early May (LUPPD, 2016).

**Temperature:** The mean annual temperature varies from 25<sup>0</sup> C to 27<sup>0</sup> C. The maximum temperature is recorded in March/ April and the minimum temperature in November/ January.

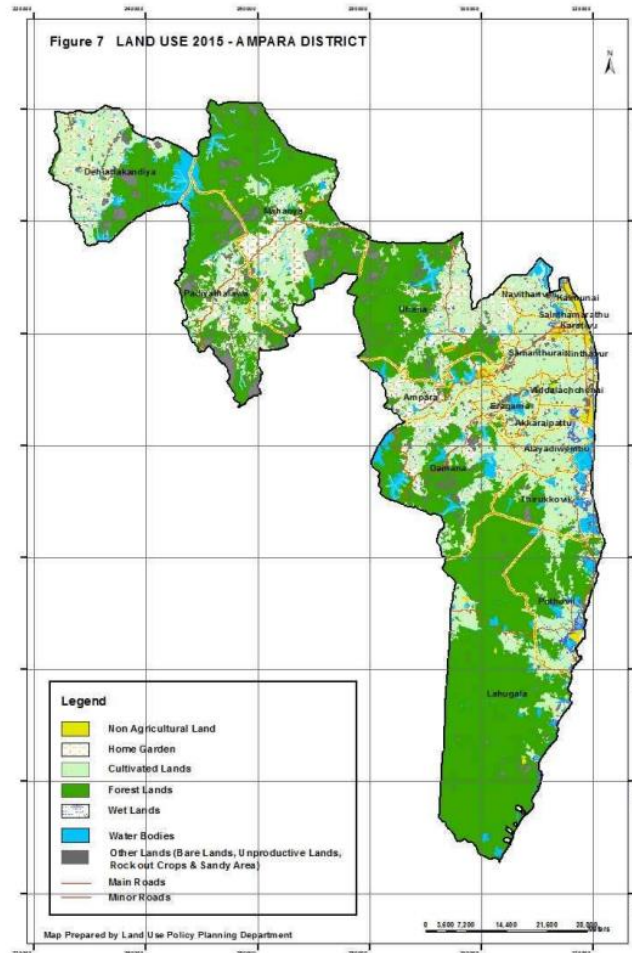
**Agro-Ecology:** Based on a combination of the characteristics of climate, soil and relief the district has been subdivided into a number of agro-ecological regions. The two major agro-ecological regions in the district are Low Country Dry Zone (DL) and Low Country Intermediate Zone (IL). DL region is covering an area of approximately 80% of the district sub divided into five sub regions. These sub regions are DL1b, DL1c, DL2a, DL2b, and



DL5. The Low Country Intermediate Zone in the district is categorized as IL2 (LUPPD, 2016).

**Water:** There are several water bodies including reservoirs, major and minor tanks, lagoons, rivers and streams in the district. Some of the main rivers that flow across the district are Maduru Oya, Mangala Watawan Aru, Gal Oya, Hada Oya and Kanchikudichchi Aru. Senanayaka Samudraya the largest reservoirs located in Monaragala district and its command area is in Ampara district. It supplies water to paddy, sugarcane and field crop cultivation (LUPPD, 2016).

**Land Use:** Major land uses and land cover in the district are forests, scrub, agriculture, home gardens and water bodies. Forest and scrub cover 34% and 12% of the total land area in the district respectively. Among the agricultural uses the dominant use is paddy that covers about 22% of the total land area. Six percent (6%) of the total land area is covered by water bodies (LUPPD, 2016).



**Figure 22:** Land Use of Ampara (Source: LUPPD, 2016)

### 3.4.2 Demographic structure

#### Population

The total population of the district in 2012 was 649,402 of which 314,352 are males and 335,050 are females. The lowest population density (i.e. below 150 people per sq.km) is recorded in Mahaoya, Padiyathalawa and Lahugala DS Divisions while highest density (i.e. more than 4000 people per sq.km) is recorded in Sainthamaruthu and Kalmunai DS Divisions. According to the estimate there were 328,000 males and 349,000 females (LUPPD, 2016).

## **Labour Force**

This population comprising 450,137 persons consists of two groups namely “economically active” and “economically inactive”. The economically active population also referred to as the labour force comprises all persons of working age either “employed” or “unemployed” during the reference period. Economically inactive group includes persons who were neither working nor available or looking for work. They are classified as “not in the labour force” because they include full time engaged in household work; full – time students; retired; old age; infirmed; disabled; or not interested in working for one reason or another. The economically active population comprises 74.6% males and 25.4% females (LUPPD, 2016).

The majority of the population (47.8%) is engaged in the service sector. The agricultural sector comprises 33.3% and the industry sector 18.8%.

## **Sea and Air Ports**

**Oluvil Harbour:** There is a commercial and fishery harbour located in Oluvil in Ampara district. It covers a land area of 60 ha in the first stage and 105 ha in the second stage. The harbour basin covers an area of 16 ha of the sea and spreads 1.2 km along the coast line. Its depth is enough to handle ships up to 5,000 mt and fishery harbour has capacity to anchor more than 250 fishing boats (LUPPD, 2016).

**Ampara Air Port (Domestic):** Ampara Air Port also known as Gal-Oya Air Port is a domestic Air Port located in Ampara District. It was built in 1950s by the Gal Oya Development Board. It is also used as a military air base situated about 8.1 km North West of the town of Ampara (LUPPD, 2016).

### 4.1 History of the Maize seeds production

History of the Maize seeds production goes to late 1960s and only 8 local selections one check variety Bhadra 1 were available (Local1 – Mahiyangana, Local2 – Walapane, Local3 – Nildandahinna, Local4 – Mapakada, Local5 – Thabbowa, Local 6 – Monaragala, Local 7 – Masspanna, Local 8 – Anuradhapura. In 1968 Thai composite formed by combining 36 varieties was introduced from Thailand. Thai Composite first tested in Mahailuppallama in 1971 and one selection came out and named as T – 48. Later in 1977 this T – 48 named as Bhadra – 1 (Ranaweera, N. F. C. et al., 1988).

Then more selections, Waruna Muthu, Ruwan came up from the Thai Composite and Waruna and Muthu was not popular due to the whitish colour of endosperm. Animal feed producers prefer seeds with yellowish color endosperm. Ultimately the Maize HY 01 came up.

### 4.2 Kilinochchi District

#### 4.2.1 Agricultural Analysis

Most of the people live in this area (especially in remote villages) are highly depend on farming. Although the majority of them are farmers, their farming is not methodical at all, do farming on scattered manner. No focus or target for any proper market, just they cultivate for their own consumption and sale for outsiders is very limited. In 2015 Kilinochchi District had 11,734 Samurdhi recipients (Samurdhi Annual Report, 2016). Karachchi is one of DS divisions In Kilinochchi with 42 Grama Niladari Divisions (GND) and, 364 families registered on the electoral roll in 2020. Families in 27 GNDs are living on crop production and out of 42 GN Divisions 37 and 22 divisions, respectively, are subjected to drought and wild animal disasters. All 42 GNDs and 39 GNDs respectively are affected by alcohol and drug menace according to the reports of the Department of Census and Statistics (DCS, 2020). Karachchi division has two agro-product purchasing centres, nine fertilizer selling centres, and five agricultural equipment selling centres.

Other than crop production ten GNDs are living on livestock and wood and jewellery crafts.

Some common problems could be notified as follows.

- a. Young generation not involves in agriculture.
- b. Always they suffer the capital investment.
- c. Not any new or appropriate technology adopt.
- d. Not proper trainings are given methodically, only ad hock trainings.
- e. Crop selection for cultivation also not methodical, just from tradition or influence of peer farmers.
- f. Due to the crop selection is not rational, at the harvesting time market get flood and ultimately farmers get very low prices.
- g. Land, labour and irrigation water are not use in productive manner and the ultimate results are very poor and their living standards are stagnated.
- h. Marketing system is very primitive, at the harvesting time local collectors are coming and collect the entire harvest at dirt cheap prices. These poor farmers have no alternative option and always they depend on them.
- i. Vulnerability for drought is very high.
- j. No machinery uses for any activity other than basic land preparation.
- k. They have not heard about Value chain process or farmer companies.
- l. Family labour availability is significantly high and at least addition two heads are there in addition to the farmer.

### **Agro - Ecology**

Total area comes under the Low country Dry Zone (DL) and agro – ecological regions of DL1f, DL3 and DL4. Annual Rainfalls getting this area is 750 - 900 mm only. Only main two soil types are there and table 02 describes that.

### **Irrigation system**

Only one major irrigation scheme is available and the volume of water is not sufficient for both seasons. This reservoir covers only 8,455 ha and all other farmers have to depend on other sources of irrigation water. Maha seasons water availability is high and rain fed paddy cultivation also they do. In addition to that a few very small-scale tanks also there

and can be utilized only for Maha season. Reliable water source for most farmers is agro wells.

### **4.3 Vavuniya District**

#### **4.3.1 Agricultural Analysis**

Agricultural analysis part same as the Kilinochchi district.

#### **Agro - Ecology**

Total area of the Vavuniya district also come under Low country Dry Zone (DL) and Agro – ecological regions of DL1b, DL1e, DL1f. Annual rain fall getting this area is 900 – 1,000 mm only. Only main three soil types are there and table 02 describes that.

#### **Irrigation system**

Although major irrigation schemes are not available, few small tanks are there. Only Maha rains fill these small tanks and small volumes of water enough for the same season only. Most of the farmers highly depend on agro wells.

### **4.4 Badulla District**

#### **4.4.1 Agricultural Analysis**

Although the Agricultural analysis part same as the Kilinochchi district, few more additional things available. According to DCS (2013) Badulla is the poorest district having a 37 percent in headcount ratio index (HIES). In other words, 37 percent of the population in Badulla District is living under the official poverty line (USD 1.5 per day). In 2015, there were 56,520 Samurdhi recipients (Samurdhi Annual Report, 2015).

Kandaketiya DS division is consisted of 26 Grama Niladari Divisions (GND) and 8762 families were registered for election roll in 2020. All Families in these GNDs are living on crop production and out of 26 GN Divisions, 18 and 19 divisions are subjected to elephants and wild animal disasters respectively. Four GND and 10 GND respectively are affected by drug and alcohol menace (DCS, 2020).

#### **Agro – Ecology**

Total area of Badulla district comes under 3 main zones namely Intermediate low country, intermediate mid country and Intermediate up country (IL, IM, and IU) and agro ecological

regions of IL2, IM1a, IM1c, IU3e, IU2. Annual rain fall getting this area is 1,000 – 2,000 mm only. Only main five soil types are there and table 02 describes that.

### **Irrigation system**

Three major irrigation schemes are in this area namely, Baduluoya, Bathmadilla and Komarica. Therefore, the irrigation water is not a limiting factor for this area. Both Yala and Maha seasons they can engage in farming. Only a few areas have irrigation problem during Yala seasons, but they have good option to use lift irrigation facility.

## **4.5 Ampara district**

### **4.5.1 Agricultural analysis**

Padiyathalawa DS division is consisted of 20 Grama Niladari Divisions (GND) and 6,674 families were registered for election roll in 2020. All Families in these GNDs are living on crop production and out of 20 GN Divisions, 10 and 12 divisions are subjected to elephants and wild animal disasters respectively. Prevalence of Alcohol as a menace in two GN divisions out of 20 (DCS, 2020).

### **Agro ecology**

Total area of Ampara district comes under 3 main zones namely Intermediate low country, and Dry zone low country (IL, DL) and agro ecological regions of IL2, DL1e. Annual rain fall getting this area is 900 – 1,600 mm only. Only main three soil types.

### **Irrigation system**

Although the area belongs to Mahaweli Rambakanoya, there is no proper irrigation system and use lift irrigation system. Famous Maduru oya is the main source of irrigation water.

## 4.6 Rationale

### 4.6.1 Rationale for the selection of the crops / technologies / best practices &, integrating vegetable seeds

Maize, it is mainly cultivated for animal feed. However, young cobs also have a good market in many parts of the Island. Maize is a three and half - month crop which requires about 0.3 Acre-feet water and survives on very low levels of supplementary fertilizer dosage. Maize grows in wide variety of soil types but the predominant soil type is well-drained RBC. DOA has recommended maize cultivation in LHG, grumusol, reddish yellow latosols, and regosols, RB latasolic, Immature brown soils. Army Worm had been a threat for the crop in other parts of Sri Lanka but the selected areas had never been threatened by armyworm. In addition to the Soil types DOA has recommended different technical aspects to be considered when implementing Maize cultivation for pure line seeds production.

**Table 11:** The facts to be considered in addition to the Soil types

<b>Agronomical factor</b>	<b>Most suitable range</b>
Rain fall - mm	500-1000
Temperature - Celsius	21- 27
Relative Humidity	55 -65%
Soil pH	6 - 7

**Table 12:** Area suitability according to the different agronomical factors

<b>DS division</b>	<b>Agro ecological region</b>	<b>Soil types</b>	<b>Rainfall mm</b>	<b>Relative humidity %</b>	<b>Suitability</b>
Kandaketiya	IL2, IM1a, IM1c, IU3e	RBE, LHG, RYP, IBL	1000 - 1600	55	Most suitable
Meegahakivula	IL2, IM1a, IM1c, IU2	RBE, LHG, RYP, IBL, MR	1000 - 2000	55	Suitable
Vavuniya	DL1b, DL1e, DL1f	RBE, LHG, Grumusol	900 - 1000	65	Most suitable
Vavuniya south	DL1b, DL1e	RBE, LHG	900 - 1000	65	Most suitable



Karachchi	DL1f, DL3, DL4	RYL, Regosols	750 - 900	70	Less suitable
Padiyathalawa	DL1c, IL2	RBE, LHG, RBLatasolic	900 < 1600<	55 65	Most suitable

Source: Rainfall and Agro ecological regions in Sri Lanka, DOA publication: Dr.B.V.R. Punyawardana

Soil types and the rainfall available in those areas (Table 12) Kandaketiya, Vavuniya, Vavuniya south are the most suitable areas while Meegahakivula Suitable and Karachchi has less suitability. From the land availability (Table 13) point of view all most all the areas except Karachchi are suitable for Maize seeds cultivation. Although the experience of farmers is critical factor, their willingness to the job is very positive. Only Vavuniya farmers have experience on seeds production. Others have experience in Commercial Maize production, not in Seeds production.

#### 1. Pure-line seed production

This project is about the production of pure-line maize seeds to fulfil the DOA annual requirement. It is anticipated to produce 97,500 Kg of maize seeds from these 150 acres which may fulfil the part of DOA, national requirement of 1,350,000Kg. Output of this project can be completed only the 7.2% of DOA requirement, and huge potential is there to be expanded up to 2000 acres. That means there is huge potential for expanding and sustenance of the project.

As first phase of this project, select three different areas from Ampara Badulla and Vavuniya. Cultivate pure line seeds (from DOA) for F1 seeds production in 50 acres in each district scale up to 500 acres with imported pure line seeds as well as the DOA pure lines.

During the first phase, acreage should be limited to 150 because the limitation of pure line seeds.

**Table 13:** Maize seeds cultivation during Maha seasons

District	Phase 1 acreage - Maha	Phase 2 acreage - Maha	Phase 3 acreage - Maha
Ampara	50	200	300
Badulla	50	150	300
Vavuniya	50	150	150
<b>Total</b>	<b>150</b>	<b>500</b>	<b>750</b>

## 2. Risk reduction strategy: Cultivation of vegetable seeds

Maize is the 110 - 120 days crop that necessarily needs lengthy dry spell during maturing phase. If not, the seeds lot will be rejected due poor keeping quality as well as the poor vigorous of seeds. To overcome the risk only Maha seasons more suitable to cultivate. Yala season most suitable for commercial Maize cultivation. If we cultivate in Yala seasons harvesting should be done little bit early (100 days of age) and those seeds must be seeded in following Maha season. On the other hand, to ensure the farmers income during Yala seasons vegetable seeds production can be introduced. Most suitable vegetables are Pumpkin, Bitter gourd, Snake gourd, Okra and Capsicum. This is good for crop rotation also.

**Table 14:** Vegetable seeds cultivation during Yala seasons

District	Phase 1 acreage - Yala	Phase 2 acreage - Yala	Phase 3 acreage - Yala
Ampara	100	200	200
Badulla	100	200	200
Vavuniya	100	200	200
<b>Total</b>	<b>300</b>	<b>600</b>	<b>600</b>

3. All crop debris can be used to manufacture compost in same cluster.

4. IPM practices can be easily practiced because all most all farmers are in adjoining fields.

## 4.7 Cluster Development Outline

Rapid discussions and meetings had with relevant officers and farmers in those areas some gaps in agricultural technology observed. Those gaps, directly influence to the productivity, quantity as well as the quality of the product.

**Table 15:** Agriculture practice and gaps identified

Agriculture practice	Gaps identified	
Ploughing depth	Some farmers are aware	Not proper plough
Levelling	Awareness also very low.	Not proper tools to use
Proper bed preparation	Some have idea, negligence also there.	Not proper trainings.
Irrigation	Mainly flood irrigation, even lift irrigation not proper control.	Water availability on time also a problem, not enough materials.
Fertigation	Big gap in awareness.	Capital to invest and availability also a negative thing.
Weed management	More than 30% of yield reduction due to poor weed management. Awareness is the main issue.	Proper weedicides also not available. Usage of machinery for weeding is very limited.
Pest and disease management	Awareness is the main issue. Not correct vision on IPM technology.	Availability of suitable Pesticide in correct time.
Harvesting	Machineries available only for Paddy harvesting. That also not sufficient.	Huge gap is there to be filled.
Post harvesting	Applying Post harvesting technology is very rare.	Even for drying they use very primitive methods.
Value addition	Awareness, nothing regarding value addition.	Proper training and relevant simple machinery needed.
Storing	Just fill to Poly bags and store in a room.	Awareness and facilities to be given.

Marketing	Very simple, collectors are coming at harvesting time and collect.	Establish companies and link to the firm organizations with relevant agreements.
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All most all these gaps should be filled during the implementing period for the sustenance of the farmer company as well as their products.

#### 4.8 Crop Calendar for Maize Seed Cultivation

This calendar expresses each activity and the time to be completed. Thoroughly sticking on to this may very useful for the success.

**Table 16:** Crop calendar for Maize seeds cultivation (Maha) – 2022/2023

Month	August				September				October				November				December				January				February							
	weeks				weeks				weeks				weeks				weeks				weeks											
Soil sampling				Y	Y	Y																										
Land preparation							Y	Y	Y	Y																						
Basal fertilizer										Y	Y	Y																				
Seeding										Y	Y	Y																				
Weeding (mech.)													Y	Y	Y																	
Top dressing one													Y	Y	Y																	
Top dressing two																	Y	Y	Y													
Folio application																	Y	Y	Y	Y	Y	Y	Y	Y								
Pest and disease									Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y													



**Table 18:** Results of the feasibility study of the Badulla, Vavuniya, Ampara and Kilinochchi Districts

Feasibility	Ampara	Badulla	Vavuniya	Kilinochchi	Remarks
<b>1. Primary Production Feasibility</b>					
Natural resource variability	Green	Green	Green	Yellow	Second largest maize producer of the country. Suitable Climate, soil, rainfall
Availability of parental lines	Yellow	Yellow	Yellow	Yellow	DoA parental seeds and human resources
Knowledge about hybrid maize seed morphology and renewal	Yellow	Yellow	Red	Red	Both Ampara and Badulla farmers are experience hybrid maize producers but not seeds
Clear economic attractiveness to producer	Yellow	Yellow	Red	Red	Recent import ban of maize for industrial purposes, high price volatility of hybrid seeds (6000-18000LKR), high demand, etc
Familiarity with hybrid maize seed production for market	Red	Red	Red	Red	Only DoA and few local producers currently engaged in hybrid seed production but it is not commercial scale and not a competitive venture
Isolated land slots to establish seed farms	Green	Green	Yellow	Red	Padiyathalawa DS division of Ampara district, Kandeketiya DS division and Vavuniya south can be considered as best fit locations
Farmers exposure and experience in certified seed production & marketing	Red	Red	Green	Red	Framer's experience is rich on maize production for consumption purposes, especially for poultry feed industry but not for certified seed production. Only the farmers of Vavuniya have rich experience on certified seed production (paddy, black gram, ground nut, etc).

DoA & ASMP district level officers' experience and exposure on certified hybrid seed production	Green	Yellow	Green	Yellow	Exposure and experience of local staff on certified seed production is a strength
<b>2. Enabling Environment Feasibility</b>					
Embedded constraints to reliable supply	Yellow	Yellow	Yellow	Red	Seed multiplication capacity depends on availability of parental lines from the DoA. High royalty cost of imported parental lines
Capacity building for to guarantee compliance of legal framework on access to lands	Green	Yellow	Green	Yellow	Clearing lands, soil erosion, need of careful soil conservation mechanism,
Trade barriers to market	Yellow	Yellow	Yellow	Red	Competition with imported maize seeds
Available subsidy for VC development	Green	Green	Green	Green	ASMP-EU program funds
Potential long-term conflicts over land use	Yellow	Green	Green	Yellow	<p>Potential conflicts on land selection (isolated land slots) for hybrid maize seed production. Especially farmer selection would be tough task due to competition among farmers to join the program.</p> <p>Farmer recommendation: rotate beneficiaries based on Keth Ela system</p> <p>Best location, isolation found in Padiyathalawa Ds division, but land tenure issues need to be settled</p>

					through formal channels between ASMP/DoA/Mahaweli authority
<b>3. Market Feasibility</b>					
Reliability of supply is key for market participation					DoA guaranteed certified seeds Both Ampara and Vavuniya seed certification units, testing labs will strengthen the venture. Further, market infrastructure facilities of Ampara district is promising for the sustainable hybrid maize seed venture
Standard specifications apply to products					DoA Seed certification
Increased supply might negatively affect pricing					Huge local demand on hybrid maize seeds due to import ban. But in the long run there may be competition with imported seeds if import restrictions lift. Seed production in North need to find the market access since maize is not popular crop in North and none of the animal feed mills based in North.
Recognized buyer is interested					DoA, market under the new brand of proposed farmer company. Logistic issues, especially transport issues negatively affect on market success
Potential supply of hybrid maize seed from other sources					If import ban lifts there would be high potential of imports by leading seed importing companies



High demand of hybrid maize seed versus limited supply					Present scenario due to import ban Local production will remove high import dependency, and secure expenditure on imports
<b>4. Structure Feasibility</b>					
Possibility to make use of external supports					ASMP-EU program, DoA – Contribution of experts (crop leaders, seed certification division), regional DoA officers, private sector agri-input suppliers
Well-organized producer associations as a necessary condition for effective participation					Farmer organizations – 11 farmer organizations based on 2 irrigation schemes (Badulu Oya, and Bathmedilla) and proposed farmer companies of clusters VASPO (Vavuniya Seed Paddy Producer Organization), well organized certified seed paddy producer Maize producer farmers organizations and commonly use labour sharing system for farming
Adequate post-harvest chain management as a necessary condition to control quality					Essentially need to establish postharvest chain management system for hybrid seeds. Seed viability and shelf-life deterioration is common in current system. Beyond seed certification, seed treatments, especially protecting from fungal infections, storage, packaging is essential for sustainable seed supply

					Infrastructure for postharvest chain management is well established in Ampara district (storage, processing, etc) and establish private sector operations will strengthen the seed business
Necessary to establish a management system to control quality and sustainable exploitation					Capacity building of Proposed farmer companies: Hybrid seed production technology, pest & disease management, harvesting and postharvest management, seed certification, branding and marketing  Involvement of educated youth and female members of farm clusters and empower them through knowledge and skills is essential to establish sustainable seed business
<b>5. Stakeholder Feasibility</b>					
Exploring new products and diversifying supply of hybrid seeds					Joint research and development work with ASMP-EU project experts, DoA and farmers clusters: initiate cluster innovations hub
Promoting and opening market for hybrid seeds products					Cater the demand of local market  Maize is starting node input of several economically important value chains of the country
Increasing job opportunities and income for women and youth,					Attractive farm business for youth, chances for women

Valorising (increase in the value of capital assets through the application of value forming labour in production) lands	Good	Good	Good	Moderate	Subsistence level farmers and their limited risk-taking ability will not support the risky investment on hybrid seed production
Promoting renewable resources related economic activities	Moderate	Moderate	Moderate	Moderate	Solar powered drying (solar heat), bio-fuels (jatropa)
Sustainable resource exploitation	Moderate	Moderate	Moderate	Moderate	Enhance land productivity through high value crop, utilize appropriate modern technology
Generating fair employment benefits	Good	Good	Good	Moderate	
Strengthening domestic hybrid seed production sector	Good	Good	Good	Moderate	
Optimizing use of existing processing facilities	Good	Moderate	Good	Poor	Limited capacity of threshing, grading, storage, etc need to establish regional certified seed processing centers

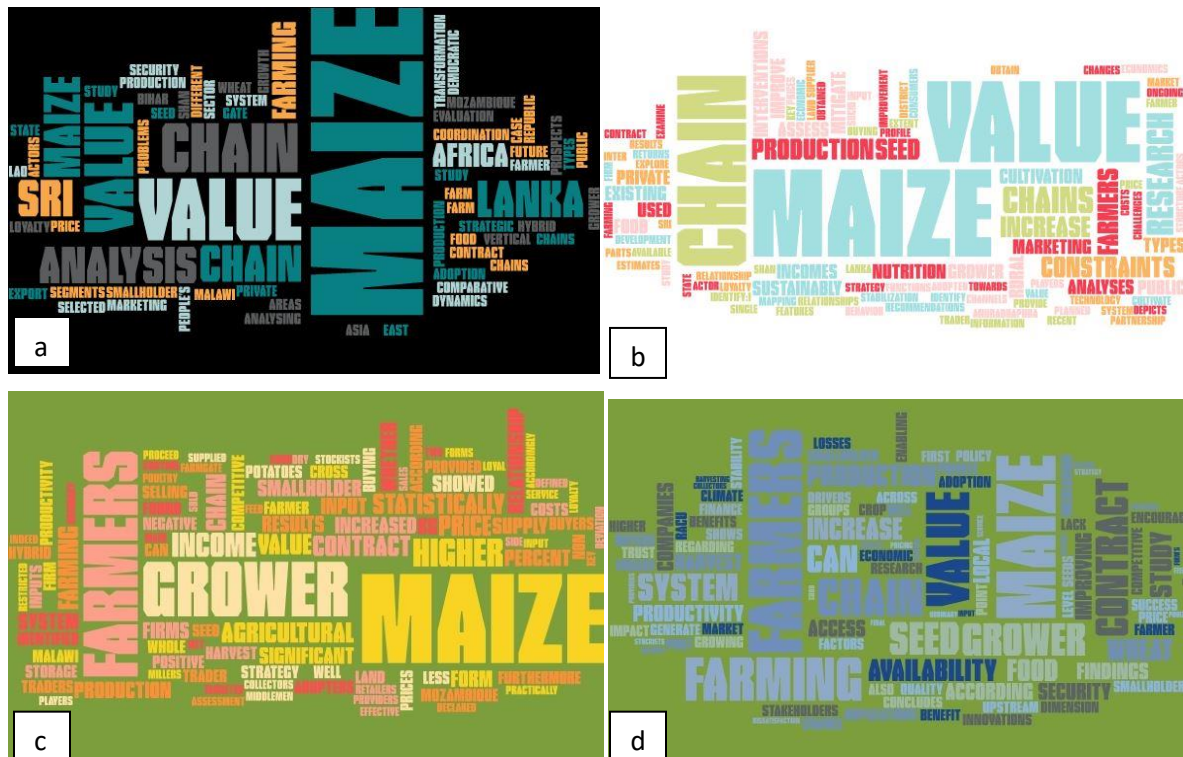
**Legend**

<b>Good</b>	<b>Moderate</b>	<b>Poor</b>

## **4.10 Value Chain Analysis**

### **4.10.1 Conceptualization on value chain development of hybrid maize seeds**

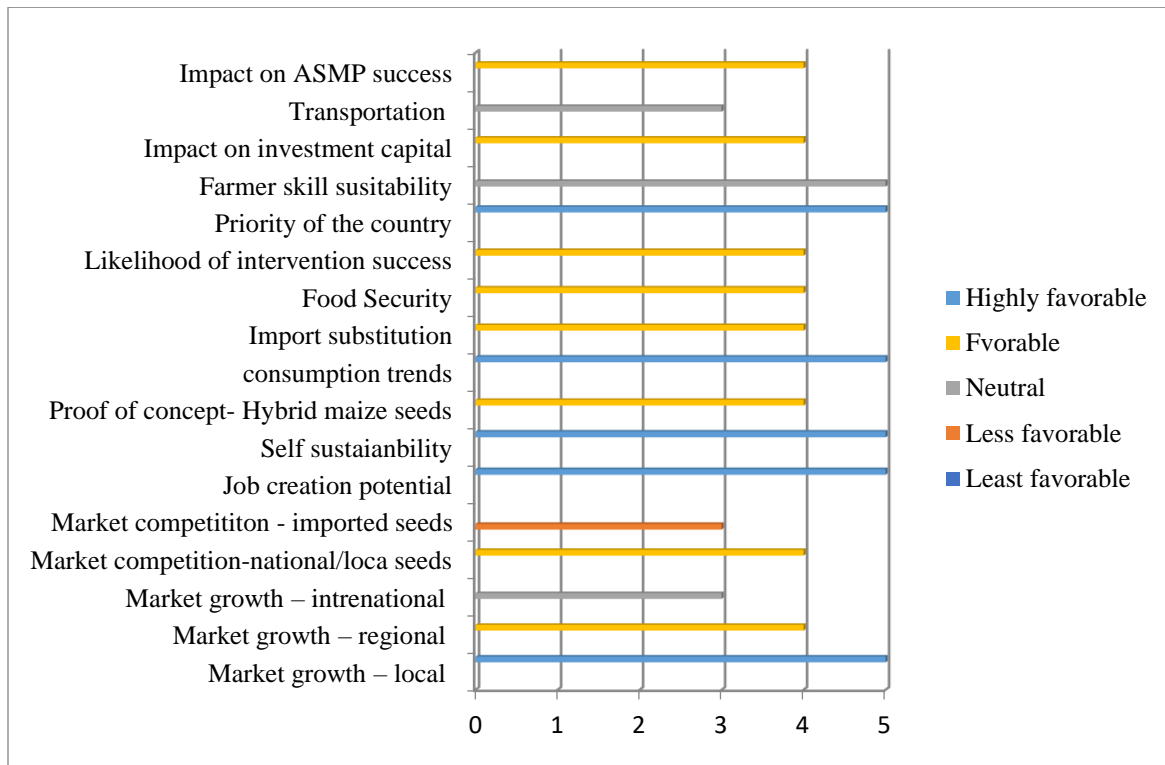
Maize seeds constitute the critical determinant of value chain productivity and drive all the investment and crop management practices. Seeds make up one of the most crucial inputs in agriculture; its growth is directly related to the quality and quantity of supply of seeds (Kulkarni et al., 2019). Maize has become an increasingly important feed ingredient for various human and animal feed processing industry in recent decades. Maize production is dominated by high-yield potential, proprietary hybrids from large and small private seed companies (Morris, Singh, and Pal 1998; Spielman et al., 2011), developed principally to meet the needs of an expanding feed market. The major driver of the feed market is the poultry sector, which itself is driven by consumer behavior, travel and tourism industry and urbanization trends. In traditional maize-growing districts (Moneragala, Badulla, Ampara, Anuradhapura, and Kandy), maize is most commonly grown in rotation with rice in Maha season. Figure 23 present the results of content analysis on objectives, key findings, conclusions and recommendations of published research. Frequency of the key words of the published research was used to develop and word cloud.



**Figure 23:** Content analysis of the published research on maize value chain: a. Research objectives b. Key research findings c. Conclusions d. Recommendations

#### 4.10.2 Value chain suitability

Value chain suitability was measured through the scoring methodology and the analysis based on sixteen criterions of the commodity. Figure 24 brings the results of the value chain suitability and results highlighted that market competition of imported maize hybrids will less favorable for the hybrid maize value chain.



**Figure 24:** Value chain analysis: suitability of hybrid maize seed production

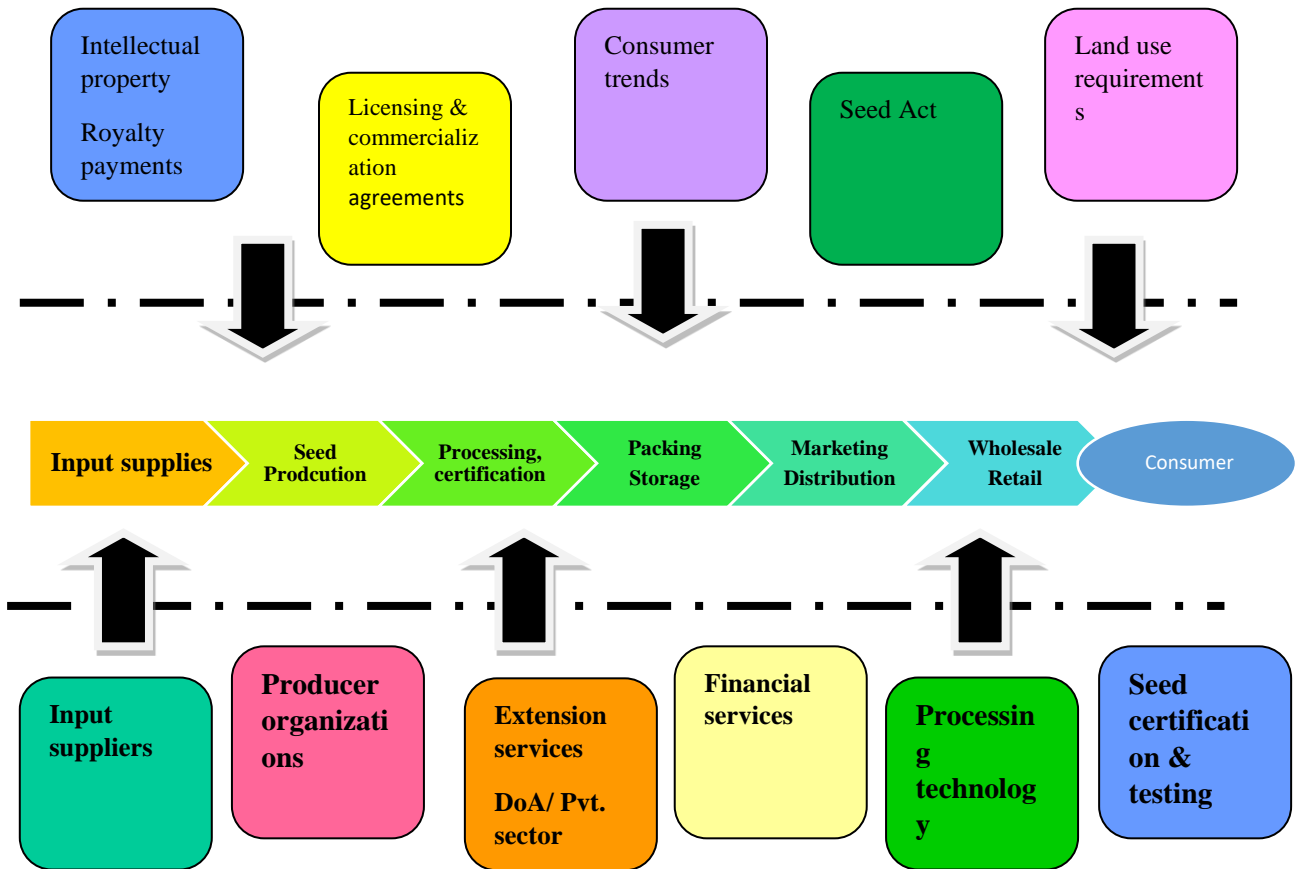
#### 4.10.3 Value chain map

Value chain mapping exercise was performed with the participation of industry stakeholders, subject matter specialists of DoA and ASMP project, officers of seed certification divisions, and farmers of Badulla, Vavuniya and Kilinochchi districts. Focus group discussions, virtual interactive platforms were key sources feed the process. Hybrid maize value chain is short, complex and fragile in nature. Hybrid maize value chain model is a combination of several short length function specific value chains embedded in a value network. Value network exchanges both tangible and intangible values. Tangible value exchanges involve all exchanges of goods, services or revenue, including all transactions involving contracts and invoices, return receipt of orders, request for proposals, confirmations or payment and Intangible knowledge exchanges include strategic information, planning knowledge, process knowledge, technical know-how, collaborative design, policy development, etc. Supplier value chains, 3 initiated the value network for hybrid maize seeds. Agriculture input, Hybrid seed production/research and

parental line supply. Three enabling value chains derived the seed production or multiplication value chain. Multiplication value chain linked into the Distributor/ retailer VC. Final link, buyer/farmer VC represents the downstream of the hybrid maize seed value chain.

Upstream of the value chain comprised of various government and private sector input suppliers, breeders, prenatal line producers and importing companies, seed multiplication companies and farmers and out growers. In contrast, out grower maize seed multipliers registered with DoA produce seeds in line with DoA seed certification requirements, and buy back arrangements of DoA seed certification division purchase the maize cobs. Seed separation, grading, selection, testing, packing, storage and distribution managed by the seed certification division. Downstream of the hybrid maize value chain comprised of out growers' farmers of small scale and commercial scale, seed producing companies, dealers, and consumers/farmers. Hybrid seed importing companies are maintaining integrated value chain for hybrid maize seeds. Imported hybrid seeds are being packed into to retail packs, stored in own warehouse, distribute to the distinct market places through own distribution network and regional agents are act as retailers. Agents are responsible for maintain healthy relationship with clients, timely supply of quality seeds help them to maintain healthy market share. Figure 25 explain the hybrid maize value chain along with enabling environment and service providers.

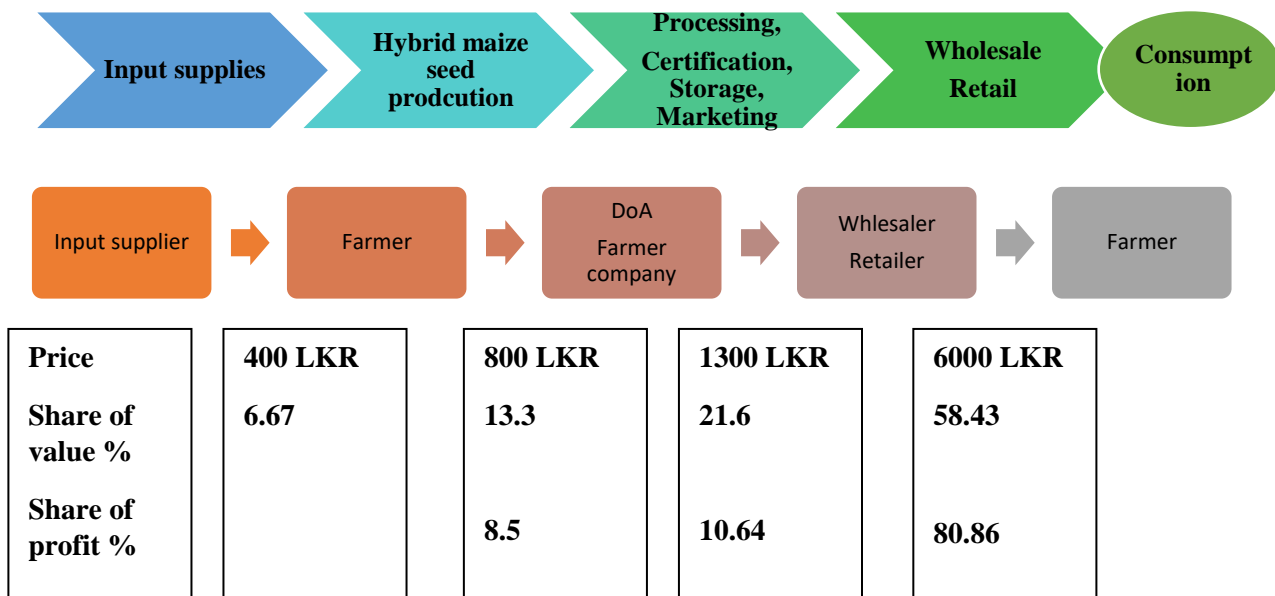
Enabling Environment



**Figure 25:** Hybrid maize value chain explain the enabling environment and service providers

Results of the economic analysis of the maize value chain explain in figure 26 and main concerns were on price, percentage share of both value and profit.





**Figure 26:** Economic analysis of hybrid maize value chain of Sri Lanka

**Table 19:** Economic analysis of variety wise hybrid maize value chain

<b>Stakeholders Share in Supply Chain</b>	<b>99 Jet</b>	<b>808</b>	<b>HP4311</b>
Price (1kg)	1800 LKR	1400 LKR	1200 LKR
Input Supplier	24.4%	23.7%	19.5%
Ordinary Farmer	11.6%	12%	13.8%
Primary Processor (Dehulling, Storing)	14.7%	14.2%	14.5%
Secondary Processor (Packaging)	4%	5%	9%
Collector & Distributor	35.3%	35.1%	33.2%
Wholesaler	7%	8%	7%
Retailer	3%	2%	3%

The value chain approach provides a useful and convenient tool for problem analysis, identify competitive position, strategic planning, operational planning, implementation, monitoring and evaluation. In practice, circumstances may vary from case to case, especially in agriculture and call for a carefully adapted approach. No blueprint exists, and no uniform operational guidance can be presented at this point.

#### **4.11 Technological Analysis**

##### **4.11.1 Mechanization in Sri Lankan Maize Seed Production**

Due to labor shortage, low productivity both in farming and processing, inefficient use of resources, associated risk on not meeting maize seed farming operation timeliness and higher production cost leads to have a sound mechanization in Sri Lankan maize seed production. Sustainable mechanization considers all technological, economic, social, environmental, and cultural aspects that contribute to the sustainable development of the maize seed production communities.

As revealed from the literature survey there was no marked shift towards mechanization of maize production until 2011/12 Maha season, however, the HARTI survey reveals a gradual shift towards mechanized processing of maize by 2013/14 Maha season (Kumara S.K., Weerakkody R. and Epasinghe S., 2016).

**Table 20:** Power sources used for selected operations in Maize production in Monaragala District

Operation	Farmer % Using Labour/ Draught Power*				Farmer % Using Machinery			
	08/09	09/10	10/11	11/12	08/09	09/10	10/11	11/12
General land preparation	48	50	74	40				
1 <sup>st</sup> & 2 <sup>nd</sup> Plough					74**	80**	100***	94***
2 <sup>nd</sup> Plough only	26*	20*		6*			54***	
Preparation of ridges		36*	36*		68	64	74	88
Digging holes & Seeding	100	100	100	100				
Weeding & Earthing up	100	100	100	100				
Fertilizer Application	98	100	100	100				
Harvesting & Drawing	100	100	100	100				
Threshing & Processing								
2W Thresher	22				64	70	46	58
4W Thresher					14	30	54	42

- \* Draught power
- \*\* - 2 wheel tractors
- \*\*\* - 4 wheel tractors

Source: Department of Agriculture, Multiple Years

**Table 21:** Machinery Usage by Maize farmers in Anuradhapura and Monaragala Districts

Operation	Machinery Usage by Maize Farmers – Maha Season 20/21	
	Anuradhapura District	Monaragala District
Land Preparation	76%	83%
Seeding	-	-
Weeding	-	-
Harvesting	-	-
Drying	-	-
Shelling	100%	100%

Source - calculations based on HARTI Survey Data (Sep – Oct 2021)

**Table 22:** Labor Deployment in Maize Production in Anuradhapura and Monaragala Districts

In global context, machinery usage in maize production is around 95%. (Source: [Modelling energy use pattern for maize \(Zea mays L.\) production in Nigeria - ScienceDirect](#))

Operation	Labor Deployment – (%) in Maize Production – Maha Season 20/21	
	Anuradhapura District	Monaragala District
Land Preparation	9%	11%
Seeding	27%	21%
Fertilizing	28%	19%
Weeding	4%	5%
Harvesting	28%	39%
Drying	4%	5%

Source - calculations based on HARTI Survey Data (Sep – Oct 2021)

Seeding, fertilizing and harvesting can be identified as most labor-intensive processes in maize production. However, there are qualitative restrictions in farm mechanization of maize seed production as harvesting and fertilizing (for some extent) cannot be mechanized.

The economy of scale is a key limiting factor in mechanization of maize seed processing in Sri Lanka.

#### 4.11.2 Land Preparations

The primary objective of land preparation is to eliminate weeds, and provide a better environment for good germination and vigorous growth of seedlings. The recommended land preparation involves ploughing followed by one or two harrowing, rotovating and ridge forming.

Ploughing can be done by using either “moldboard plough” or “disc plough” coupled to a 45 HP four-wheel tractor. It takes about 1-2 hours to prepare one-acre of land. The “moldboard plough” is used for a hard soil while “two discs plough” is commonly used (74% of maize farmers in Ampara district and 82% maize farmers in Monaragala district

use discs plough– source: Harti Survey Data 2014) to provide required 9” ploughing depth.

The using of discs harrows machine with 14 discs followed with a rotovator can be recommended for tilling the soil.

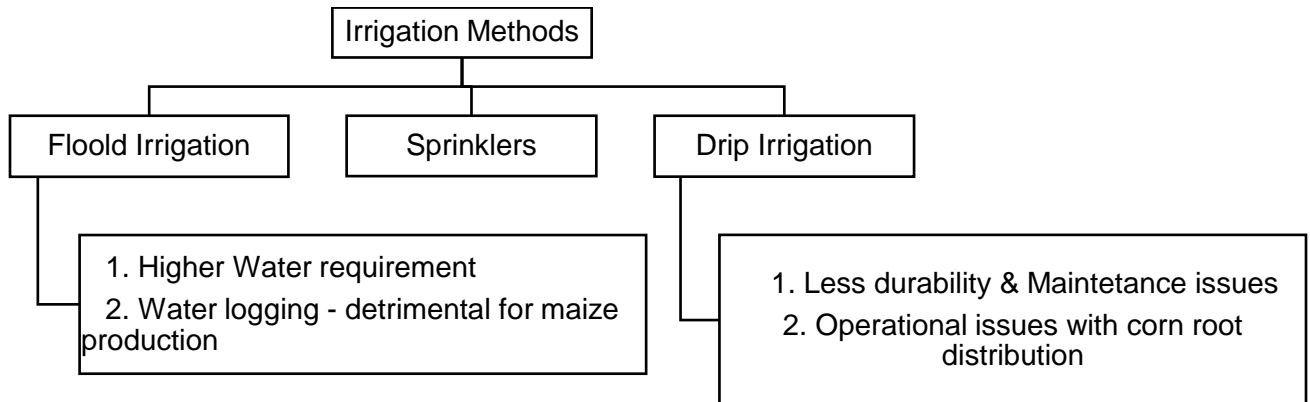
An introduction of a ridge former is proposed in order to have a well-drained maize field during rainy seasons and prevention of water logging with rain and introduced irrigation system/s.

Land preparation should be planed ahead considering the application of modern machineries in field maintenance i.e., applying of mechanical seeder, weeding machines and mechanical harvesters. Increasing water retention, levelling of terrain and removing of weeds, large stones, roots, etc. are to be considered in land preparation stage.

Recent discussions with groups of farmers in Kandaketiya (Badulla district), Vavuniya, Kilinochchi and Padiyathalawa (Ampara district) disclose that a few farmers have four-wheel tractors (about 15% of participated farmers have four-wheel tractors). Thus, an investment of four-wheel tractors is not considered instead of purchasing, hiring of tractors is proposed.

### 4.11.3 Field Maintenance

#### 4.11.3.1 Water Management



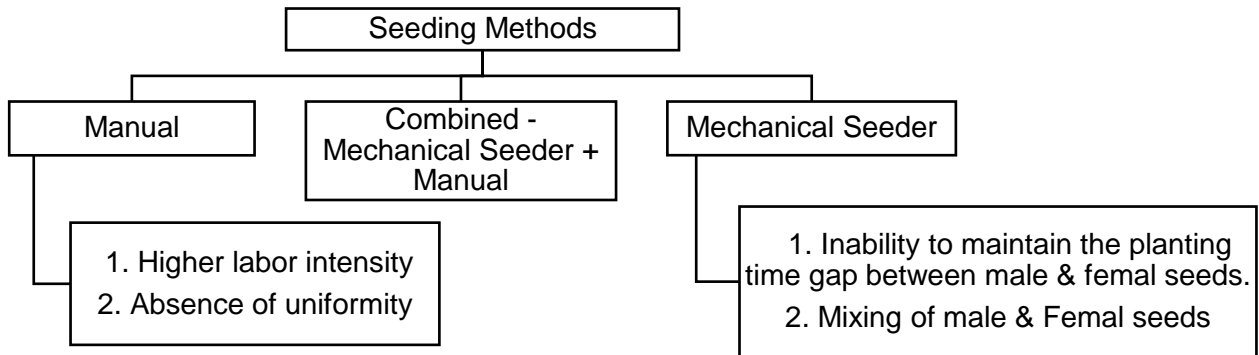
**Figure 27:** Water management

The total water requirement for Maize seed production is 500 – 800 mm per annum (*Water and Soil requirements – Fao,org*). Considering the past irrigation applications, thoughts of field experts, regional climate conditions, soil type, water availability and water requirement, sprinkler irrigation method is recommended.

Arranging sprinklers with 2m height in 5m-by-5m distances and operating the same at 1.5 to 2 bar pressure with flow rate of 600 – 750 ml/h rate has been tested successfully at Maha Iluppallama. It is advisable to have adjustable sprinklers as the sprinkler height needs to be increased with the plant growth. Generally, the sprinkler height is adjusted from 1m to 2m.

Note: As per the experts' thoughts, avoiding water supply during morning hours within the pollination period is advisable.

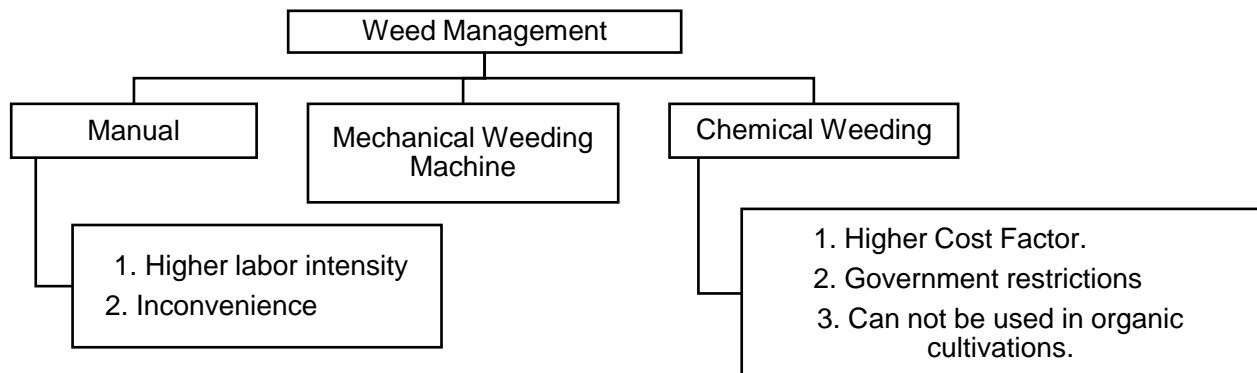
### 4.11.3.2 Seeding



**Figure 28:** Seeding

Considering practical limitations of using mechanical seeder, a combination of mechanical and manual seeding method is proposed. Female seeds can be planted first by using a mechanical seeder with four rows coupled to a four-wheel tractor. After allowing required time gap, male seeds need to be planted manually. The selection of mechanical seeder is based on Farm Mechanization Research Centre (FMRC) guidelines and recommendation. The expected output is around 5 to 6 acres per day.

### 4.11.3.3 Weed Management



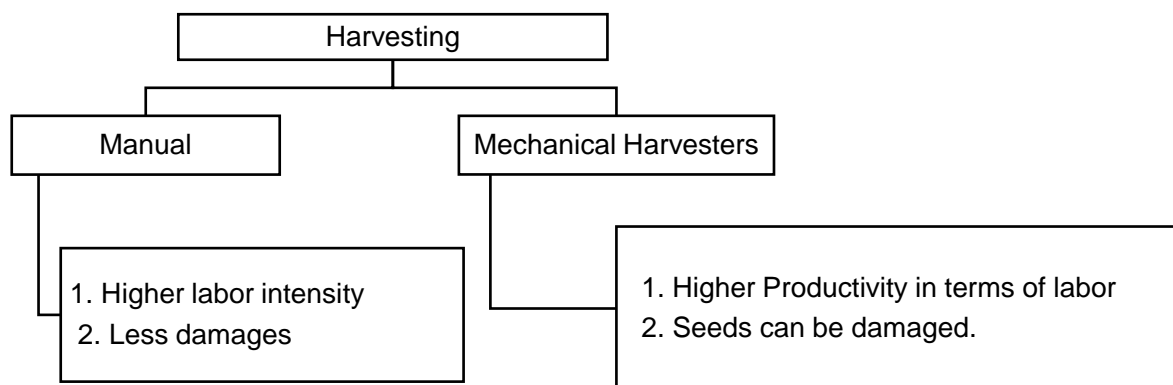
**Figure 29:** Weed management

Weeds are the undesirable plants that compete for resources like water, nutrients, sunlight, space etc. with the cropped plants. They reduce crop yield and quality to a greater extent. Researches and assessments that has been carried out indicate that around 35% maize crop loss if the land is not kept free during its' critical periods.

Self-propelled power weeder is suitable for inter-row weeding of maize crop. It can cover 1-1.2 ha area per day.

#### 4.11.4 Processing

##### 4.11.4.1 Harvesting



**Figure 30:** Harvesting

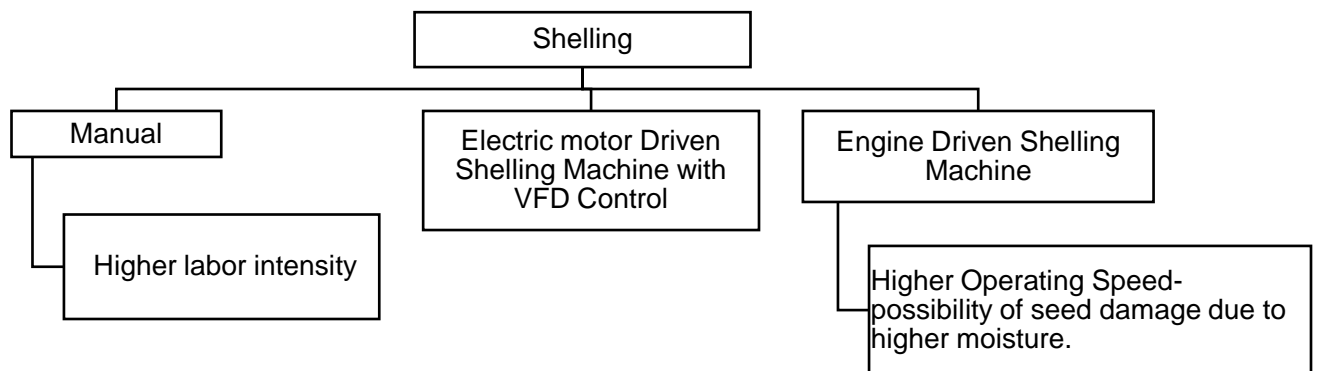
Maize seeds attain physiological and functional maturity at seed moisture contents ranging from 32% to 40%. At that time the seed have reached maximum dry weight, germinability, and vigor. It is recommended that the corn seed be harvested on the cob by hand at a moisture content of 25 - 35% moisture (Mathews R.K., Dougherty G.M., Delouche J.C., and Boyd A.H., 2021). Longer the mature crop remains in the field, higher the deterioration of seed characteristics.

The combined paddy harvester can be used for maize harvesting as well with a minor modification to the machine front section. Then, hiring paddy harvesters will be an economical option for maize production for consumption purpose. The harvester takes care for harvesting, de-husking and shelling.

For maize seed production, manual harvesting needs to be applied as seeds could be damaged with mechanical harvesters. Technically, male maize should be harvested first.



#### 4.11.4.2 Shelling

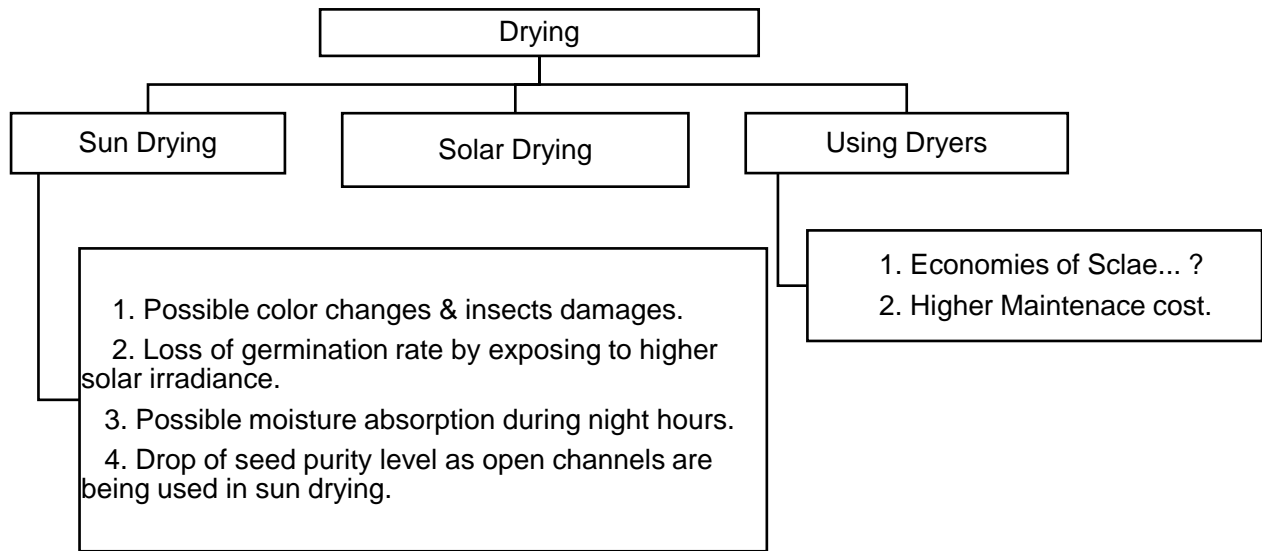


**Figure 31:** Shelling

Shelling is the most important post-harvest operation in maize seed production. Using of a motor driven shelling machine with controlled rpm is advisable considering higher shelling output and less seed damage (breaking and cracking).

As seeds with higher moisture content (more than 13 %) are prone to damage, it is beneficial to have a facility for regulating the operating rpm with variable frequency drive (VFD) depending on seed moisture content. It is feasible to have shelling output around 800 – 1000 kg/h considering the total seed production per cluster (around 30 – 40 MT in 1<sup>st</sup> season). It is recommended to go for a locally designed sheller machine under FMRC guidelines and recommendations.

#### 4.11.4.3 Drying



**Figure 32: Drying**

Drying is required in two stages.

Stage 1 – drying of maize cobs to bring down its' moisture content from 30% to 12 - 13% prior to shelling process.

Stage 2 – drying of maize seed to reduce moisture content below 8% prior to packing and storing.

It is recommended that maize seed be dried on the cob to 12- 13% moisture content (*Publication on MI Maize Hybrid 01by DoA – 2016*), which is sufficiently dry for shelling process. A poly tunnel solar dryer along with controlled temperature and humidity system is recommended for maize cob drying. Air circulation should be automatically regulated in order to maintain the maximum temperature inside the poly tunnel at 110 F. Exhaust fans are to be powered with solar electric system. The poly tunnel structure needs to be erected with the construction of maize seed processing and storage centre.

Reducing seed moisture to 8% is advisable for a longer storage period i.e., more than 9 months (*Wani A.A., Joshi J., Titov A., and Tomar D.S., 2014*). A batch type tray drier

coupled to a multi fuel (diesel, kerosene & biodiesel) fired burner with drying air temperature not to exceed 110 ° F (43 C) is recommended for maize seed drying. The particular dryer can be used for Maize cobs drying in a rainy season as well. The recommended capacity of the dryer is 3 ton per batch.

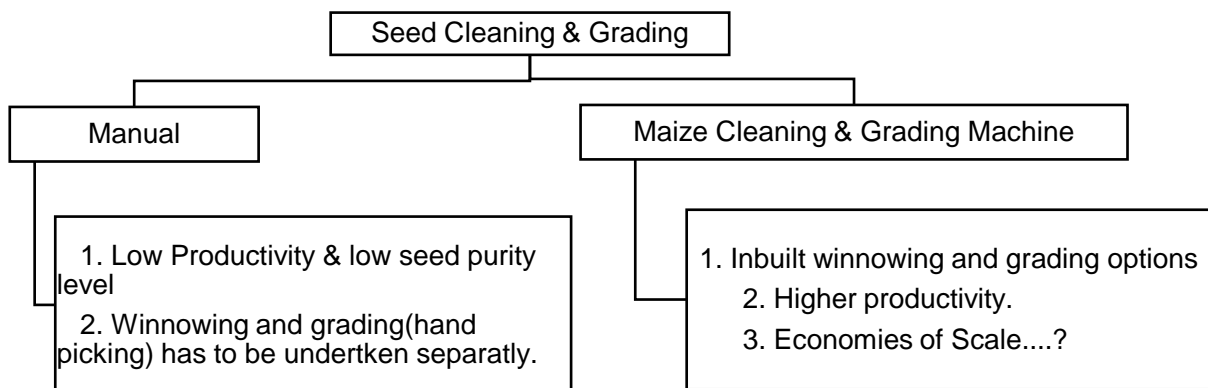
In Maize drying, a positive temperature gradient should be followed. Greater the seed moisture content lesser should be the drying temperature and vice versa.

10% MC and below 110 F (43.3 C)

10-18 % MC 100 F (42.2 C)

18-30 MC 90 F (32.2 C)

#### 4.11.4.4 Seed Cleaning and Grading



**Figure 33:** Seed Cleaning and Grading

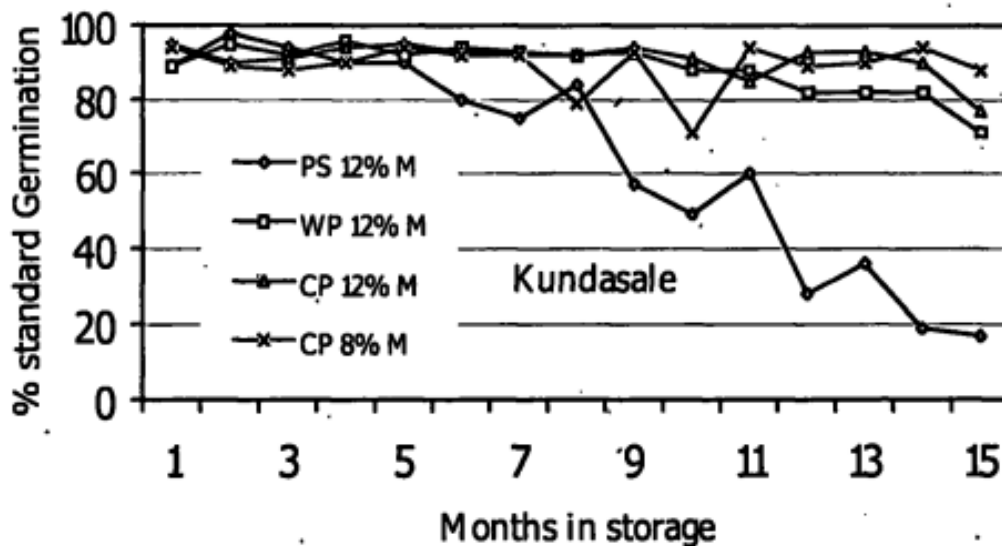
It is recommended for selecting a moderate throughput rate (800 – 1000 kg/h) cleaning and grading machine locally as going for an available higher capacity foreign grader unit is not economically viable with proposed maize seed production capacity particularly in 1<sup>st</sup> phase. Winnowing should be facilitated with the grading unit itself. Hiring of existing paddy grader units is another option.

#### 4.11.4.5 Packaging and storing

Packing in Poly bags (polythene bags, tetra packs) or cloth bags (jute bags) coupled to the grading machine is expected to be introduced. The suitability of packing material

depends on potential moisture regaining, germination rate and vigor index (multiplying the number of normal seedlings with the average sum of shoot and root length).

Research was done by the Department of Agriculture in year 2001 to identify the relationship of packing material and maize seed moisture content on seed germination rate at storing. As per the results, maize seed at 8% moisture, packed in clear polythene have a long storing period while maintaining the germination rate at desired level (more than 80%).



Source - K.A. Mettananda, S.L. Weerasena and Y. Loiyana. *Effect of storage environment, packing material & seed moisture content on storability of Maize seeds - 2001*

**Figure 34:** Effect of packing material on storability of maize seed stored at the Kundasale. (PS - Poly-sack, WP - White polythene, CP - Clear polythene, M -Moisture)

Using a seed protectants machine (Coating machine) to enhance lifespan of maize seed is not economically viable with expected seed production capacity at the initial phase. Seed coating machine at Gannoruwa Agri processing centre can be used at a necessity. However, a seed coating machine is proposed for the 2<sup>nd</sup> phase.

### Storing

Seeds are hydroscopic, i.e., they tend to either gain or lose moisture depending on how much moisture they contain and on the humidity of the air which they are in contact. The main purpose of storage is to maintain seed quality. This is best accomplished by storing

high quality, well dried seed under conditions that will prevent any regain in seed moisture and provide for reasonably moderate storage temperatures. As a rule of thumb, it is required to provide low moisture and low temperature atmosphere in maize storing.

Storing is going to be done in a well-designed storing facility with air conditioners to maintain the desirable temperature (20 C) and humidity (RH – below 70%). Based on maize seed density, the required storing capacity is around 10 ft<sup>2</sup>/ton at the maximum storing height at 6 ft. Features of well-designed maize seed storing facility.

- Tightly constructed room.
- Proper thermal insulation.
- Provision of good vapor barrier (eliminated water vapor through walls, ceiling and floor)
- Prevention of air infiltration through doors by fitting gaskets

## **4.12 Analysis on physical infrastructure**

### **4.12.1 Access Roads**

As per preliminary discussions we had with selected groups of farmers in Badulla, Vavuniya and Kilinochchi districts, it was found that 97% of farmers have satisfied access to their lands that wish to use for maize production. Thus, a minimum roads rehabilitation will be undertaken for the rest based on its impact to the cluster development.

### **4.12.2 Water Irrigation System**

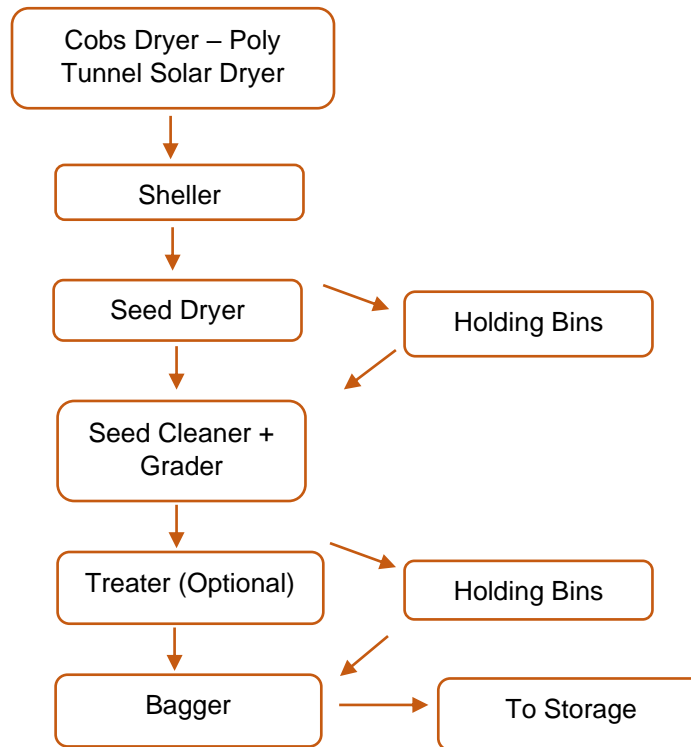
It is recommended to give sprinkler irrigation system package (sprinklers in 5m-by-5m distances, maximum height of 2m (adjustable) operating at 1.5 to 2 bar pressure with flow rate of 600 – 750 ml/h) to all farmers. It was found from the preliminary study that about 10% of addressed farmers have water pumps mainly driven with kerosene and about 20% have national grid supply to their lands. Thus, it is proposed to provide electric pumps, solar pumps or kerosene pumps as appropriate.

Most of farmers have their own Agro wells or common water facilities from reservoirs and water streams. The total new requirement of water sources will be ascertained with farmer

selection process and met the same subsequently. It is always encouraged to have a common water facility.

### 4.12.3 Processing Centre

The processing centre need to be designed to accommodate receiving of maize production, drying (both cobs and seeds), shelling, grading, packing and storing.



**Figure 35:** Flow Diagram of Processing Maize Seeds

#### 4.12.3.1 Seed Processing Plant Building Layout

Seed processing plant building will comprise of following components:

1. Receiving-cum-drying platform

This area will be utilized to receive raw maize cobs and solar drying. There will be an arch shaped roofing structure design covered with UV treated polythene to harness more solar thermal energy. The air circulation will be regulated automatically by controlling exhaust fans and turbine ventilators. Humidification system will be introduced to control the inside temperature.

2. Processing area

The processing area should be situated between the maize receiving platform and storage building. The facility should be connected to ventilated flat stores through a covered gallery for easy movement of processed and packaged seed to seed stores. The processing unit should have a separate entry to permit entry of seed processing machineries for installation and maintenances purposes.

The unit should have sufficient provision for natural as well as forced ventilation in order to maintain congenial atmosphere inside the building. Storing area are to be designed with proper pest control measures. Fire extinguishers depending on the associated fire risk and applicability of correct extinguishers are to be placed.

It is proposed to have a Rooftop Solar PV System under “Net Metering” scheme to generate, consume and sell electricity to the national grid. This provides an extra income to the farmer company and provide opportunity to run the process even at a power outage.

### 3. Auxiliary buildings

Following auxiliary buildings are to be constructed:

- General Office
- Marketing Outlet
- Worker Sanitary facilities
- Biogas and compost making facility
- Biodiesel producing facility.

#### **4.12.3.2 Potential location to construct – Maize seed processing centres**

It was identified in discussions with selected group of farmers and district level project officials that there are abounded government buildings that can be rehabilitated to use as maize seed processing centres.

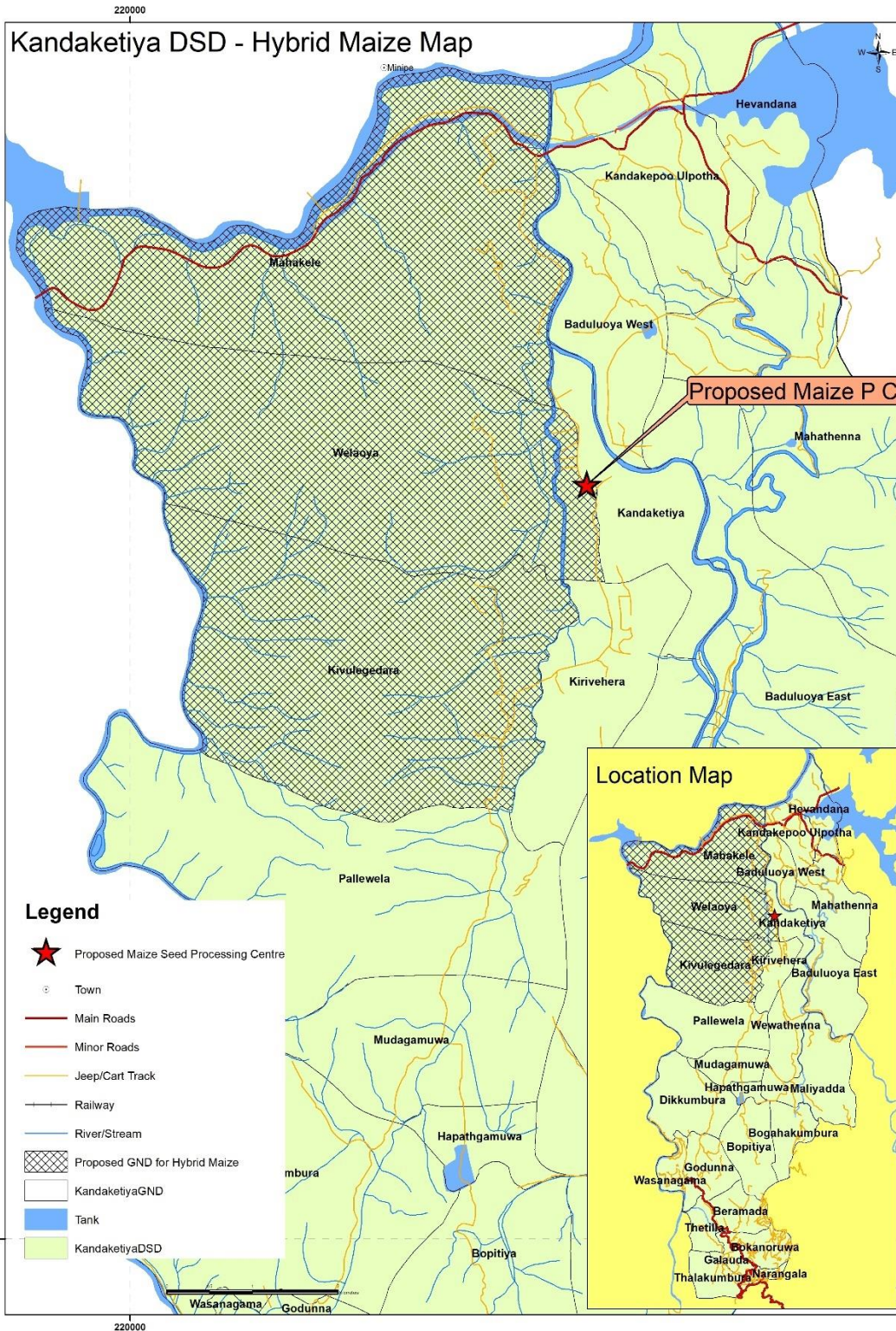
#### **Potential places**

Kandaketiya – Wiyaluwa cooperative paddy storing centre

Vavuniya South - Agricultural marketing department building.

Kilinochchi – Iranamadu (Building belongs to DoA)

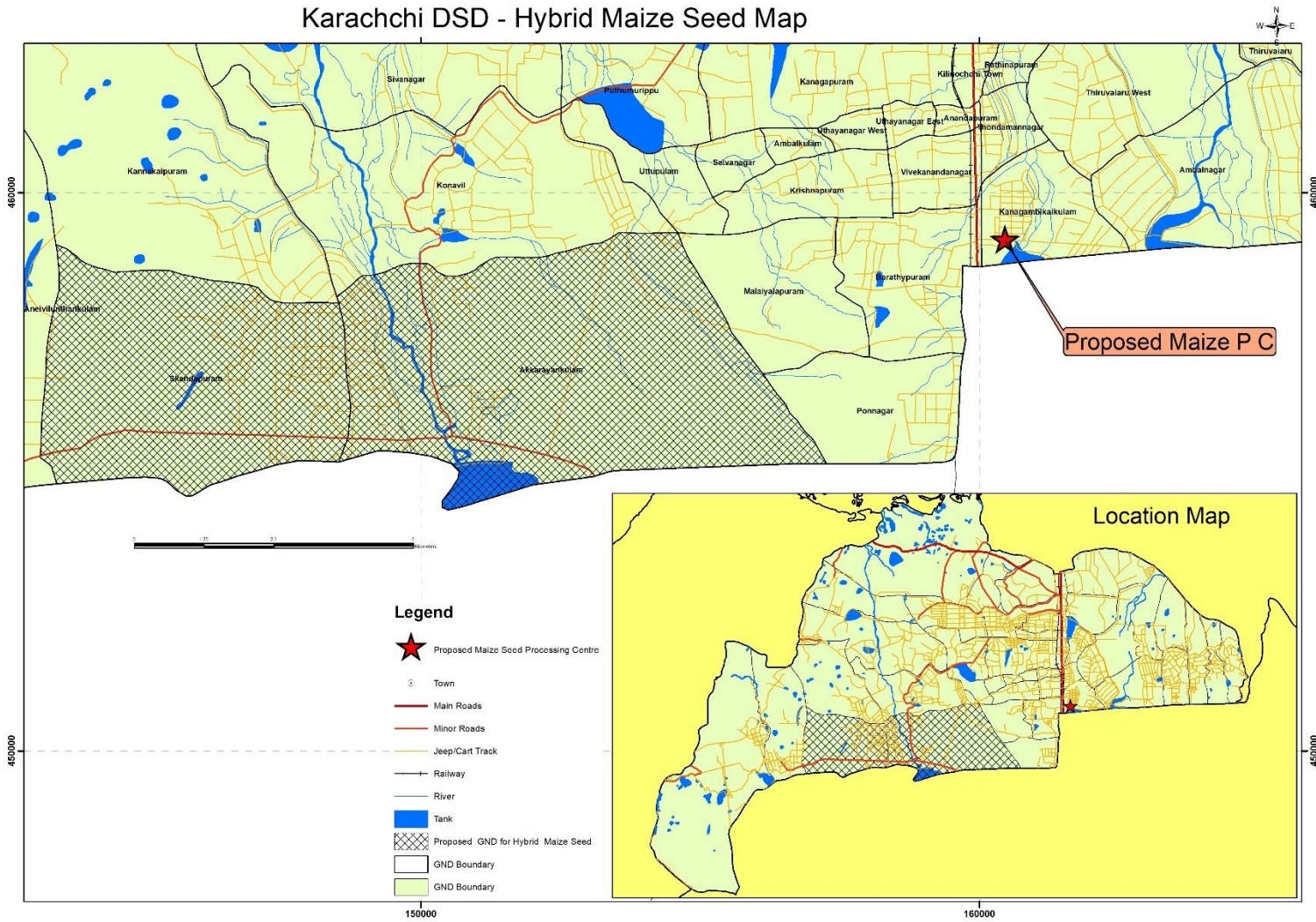
Padiyathalawa – “Sawsiri Building” at Thalapitaoya funded by “World Vision”



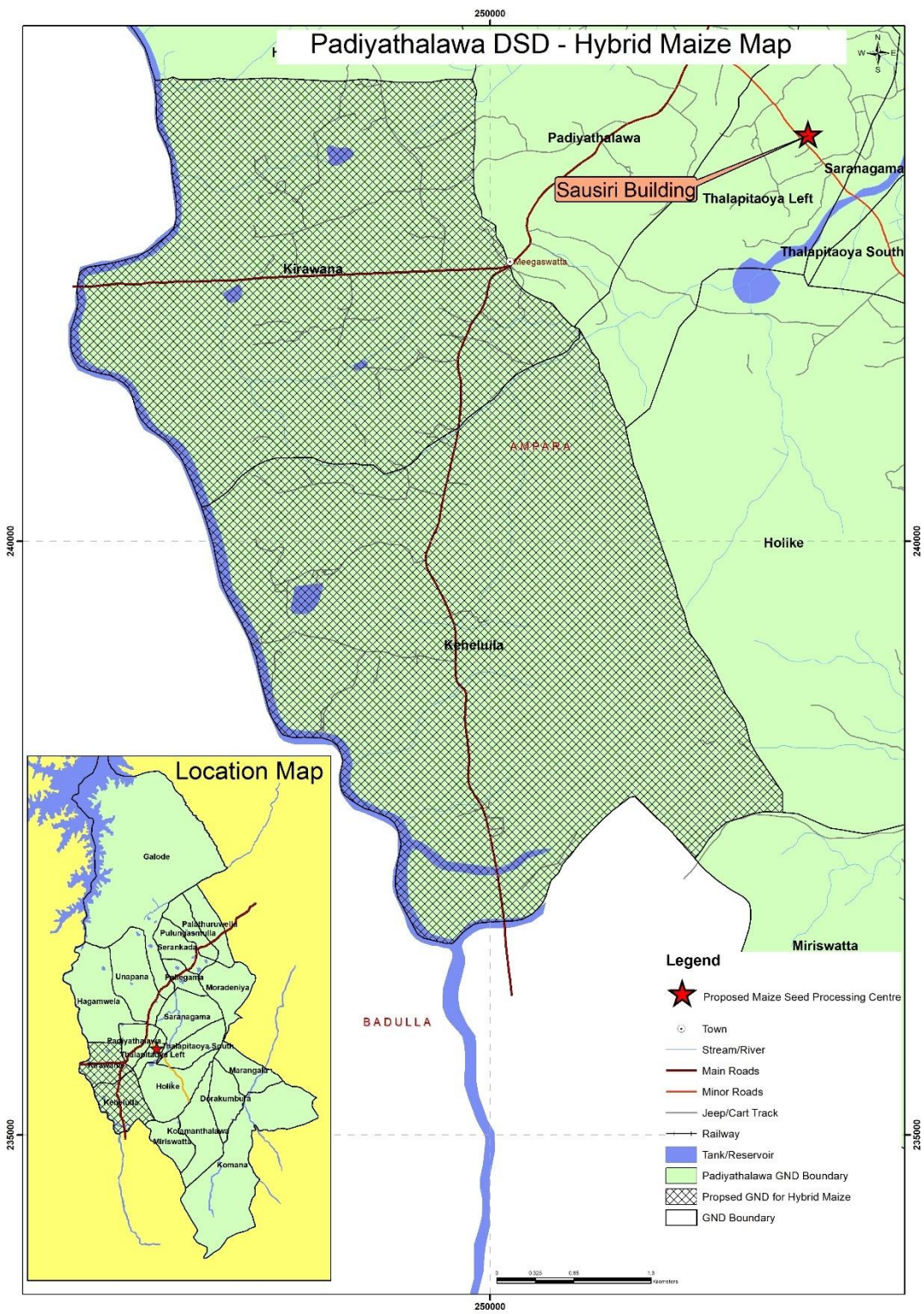
**Figure 36: Potential Locations for Processing in Kandaketiya**



### Karachchi DSD - Hybrid Maize Seed Map



**Figure 37: Potential Locations for Processing in Karachchi**



**Figure 38: Potential Locations for Processing in Padiyathalawa**

Vavunia & Vavunia South DSD - Hybrid Maize Seed Map

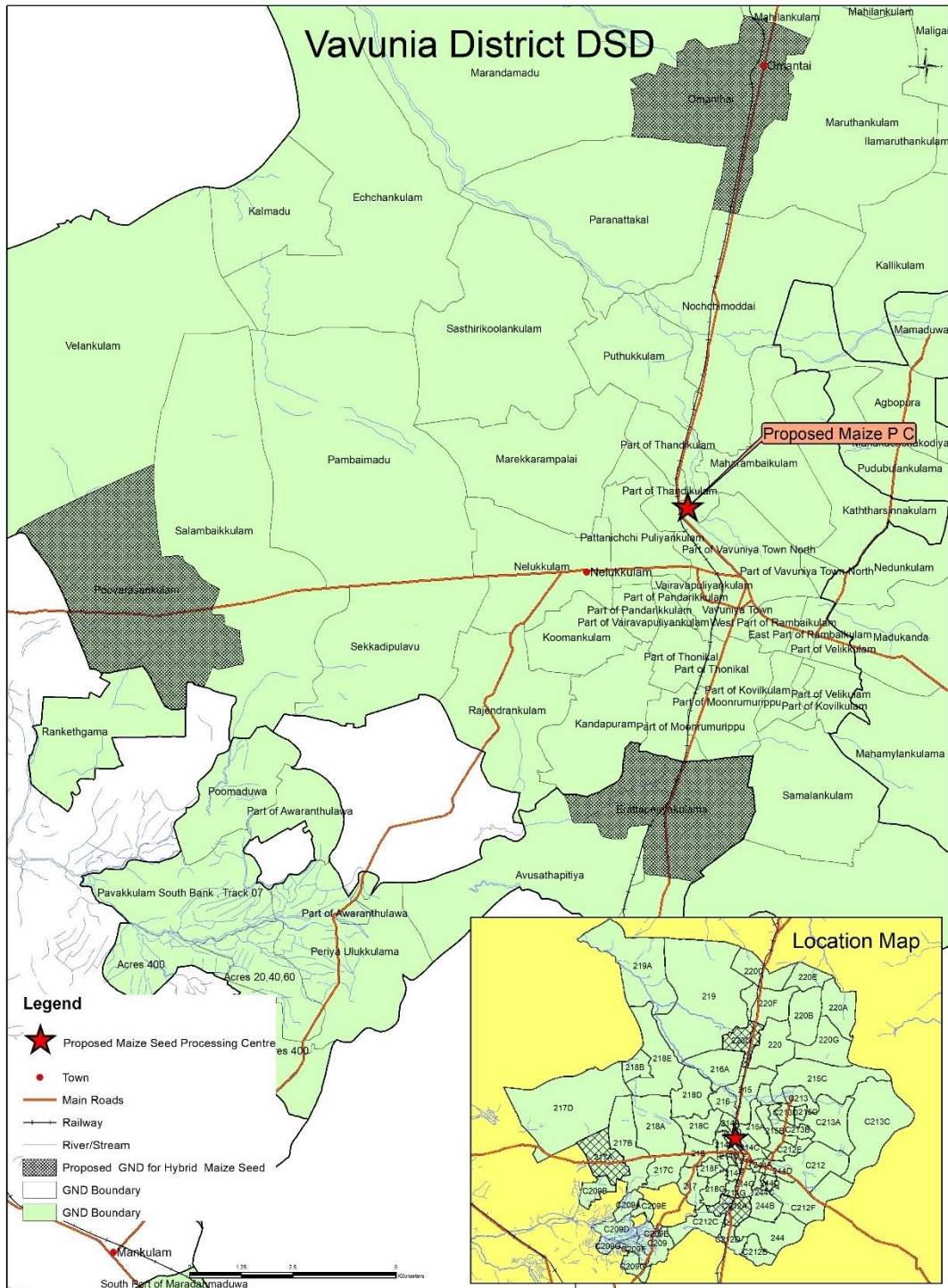


Figure 39: Potential Locations for Processing in Vavuniya

## **4.13 Economic Data Analysis and Findings**

### **4.13.1 Preliminary Findings**

In Sri Lanka several imported hybrid varieties of maize are cultivated. Jet 999 and Pacific varieties are most popular among farmers. Apart from them DoA has introduced MI (III), MI (IV) and MI (V) varieties and they are found to be resistant to Sena Caterpillar. According to the officials of DoA, these MI varieties are low responsive to fertilizer i.e the harvest is not affected by the low level of inorganic fertilizer. However, the exotic varieties are highly responsive to inorganic fertilizer. If seeds of these varieties are produced in farmer field starting from October 15<sup>th</sup> 2022 (Maha Season), at least one acre needs to be cultivated to gain economic profits. Isolation of maize field is highly essential and quality of seed production should be maintained properly. Quality maintained should be started even from activities of soil conservation. One of the main skillful activities in seed production is de-tasseling or removal of male part. Normally the germination rate of hybrid seed is more than 90%. High density planting is suitable and proper irrigation facilities should be provided. If the seed production is started in Maha season, there can be some issues of high moisture level and water issue therefore, excess water may need to be drained of for the proper maintenance of the plant. Soil conservation practiced should also be adopted properly. In cultivating the parental lines, there are no special recommendations from DoA. Therefore, normal agronomic practices used in maize production can be adopted. However, site specific fertilizer recommendation can be made through soils test. Apart from these, proper postharvest handling is essential in maintain the quality of seeds. Packaging is very important in this regard. Impermeable materials are needed in packaging and poly sack or polythene can be used for this task.

### 4.13.2 SWOT Analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• availability of lands</li> <li>• Active participation of women in farming activities</li> <li>• availability of water in some areas</li> <li>• dedicated agricultural officers</li> <li>• dedicated farmer availability</li> <li>• centralized locations can be found</li> <li>• climate and soil are suitable</li> <li>• storage facilities available in some districts</li> <li>• import substitution</li> <li>• use of local parental materials</li> <li>• availability of farmer organizations</li> <li>• some trained farmers available</li> <li>• some army camps are engaged in maize seed production</li> <li>• Potential to cultivate Jatropha for bio-diesel</li> <li>• Availability of 30-50 acres in one land slot in some places</li> <li>• Availability of a training Centre</li> <li>• Availability enthusiastic young farmers</li> <li>• Abandoned buildings are available for storage facilities by renovating</li> </ul>	<ul style="list-style-type: none"> <li>• most farmers are less experienced in maize seed production</li> <li>• no maize seed production has been done earlier in some places</li> <li>• less trained farmers</li> <li>• shortage of staff with specialized knowledge in maize seed production</li> <li>• allocation of funds is less</li> <li>• less consumption of maize in North Province</li> <li>• lack of primary processing machineries</li> <li>• high labor requirement for watching the growing crop</li> <li>• less technical know how</li> <li>• Land ownership issues in some places</li> <li>• Still depends on middlemen for selling their products</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• availability of buyers (DoA and Prima like private companies)</li> <li>• future availability of raw material</li> <li>• increased bargaining power of farmers</li> <li>• Farmers receive knowledge, skills, experience, financial assistant, machineries, irrigation facilities etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Unavailability of fertilizer and other chemical inputs</li> <li>• If available, they are very expensive</li> <li>• Wild animal attack</li> <li>• Heavy rains can damage the crop</li> </ul>

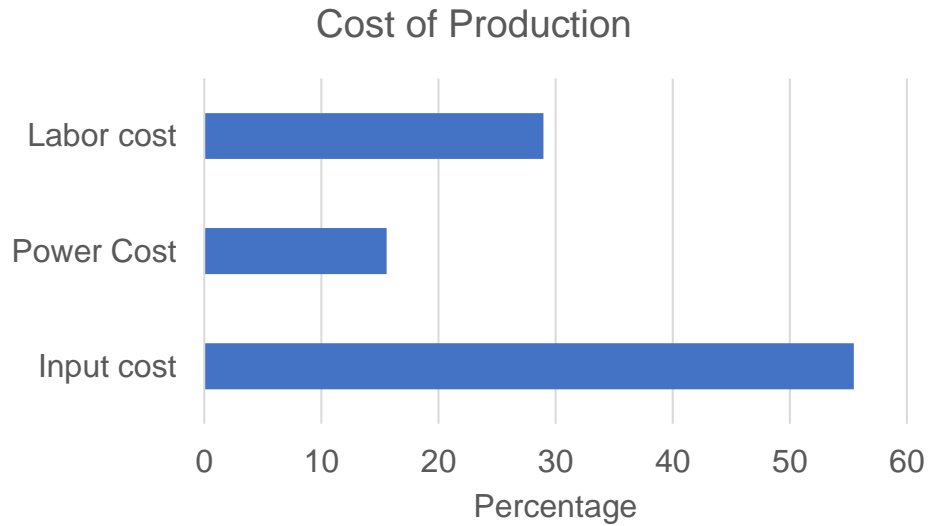
### 4.13.3 Financial Analysis

If hybrid maize seed production is to be implemented in Badulla, Vavuniya and Kilinochchi districts, the implementation must be financially feasible and economically viable. As it has created to a high demand for local hybrid seed especially as a result of the price escalations due to exchange fluctuations, the production of hybrid seed must generate economic profits to the farmer and continuous supply of seed should be assured. Otherwise, the whole effort of hybrid seed production will be to no purpose. Therefore, assessing the financial feasibility is crucial as the ASMP intends to invest on the seed production by providing capital requirements.

#### Assumptions

- Two seasons (Maha and Yala) per year are cultivated
- Agronomic practices, cost of production per season and the yield per season do not differ
- Prices do not change from year to year
- Existing yield is increased up to 1000 kilograms with project
- Discount rate is 14%
- Opportunity cost of land is 360000 LKR

Table 23 shows the costs and returns of hybrid seed production. In calculating the cost, total cost has been divided into three categories namely cost of crop establishment, cost of crop management and cost of harvesting and processing.



**Figure 40:** Components of Cost of Production

Major cost component of the hybrid seed production is input cost and 55% of the cost incurs for input utilization. About 29% of the cost incurs for labor and the rest goes for power. An acre of land yield 600kg of maize including cob and 400kg of hybrid seeds. The price for kilogram of maize with the cob is 800.00 LKR and a kilogram of seed receives 1280 LKR at the market. The net returns from hybrid seeds are slightly higher than that of seeds with cob. Unit cost of maize is 460.47 LKR while it is 215.84 LKR for seeds.

**Table 23:** Costs and Returns of hybrid seed production

Operation	<u>Input cost</u>			Power cost (Rs/ac)	<u>Labor</u>			Total cost (Rs/ac)
	Quantity (Kg/ac)	Unit Cost (Rs/ac)	(Rs/ac)		<u>Man</u> <u>days</u>	<u>Unit Price</u> (Rs/ac)	<u>Cost</u> (Rs/ac)	
<b><u>Crop establishment</u></b>								
Land Preparation with 4wt				20000.00				20000.00
Seeding	5.00	2500.00	12500.00		6.00	2000.00	12000.00	24500.00
Basel fertilizer	Urea	30.00	730.00	21900.00	2.00	2000.00	4000.00	25900.00
	TSP	40.00	730.00	29200.00				29200.00
	MOP	20.00	730.00	14600.00				14600.00
<b><u>Crop management</u></b>								
Top Dressing fertilizer	Urea	96.00	730.00	70080.00	2.00	2000.00	4000.00	74080.00
Weeding and earthing up					8.00	2000.00	16000.00	16000.00
Removing male flowers					5.00	2000.00	10000.00	10000.00
Pest and disease control			5000.00		2.00	2000.00	4000.00	9000.00
Irrigation (fuel/ electricity)				8000.00				8000.00
<b><u>Harvesting and processing</u></b>								
Harvesting					7.00	2000.00	14000.00	14000.00
Processing with 4w thresher				6000.00	3.00	2000.00	6000.00	12000.00
Transport to the stores				4000.00	1.00	2000.00	2000.00	6000.00
Drying and Packing material				5000.00	4.00	2000.00	8000.00	13000.00
<b>Total cost</b>			<b>153280.00</b>	<b>43000.00</b>	<b>40.00</b>		<b>80000.00</b>	<b>276280.00</b>



**Average yield and prices**

Yield including cob (kg/ac)

Seed Yield (kg/ac)

Producer price including corn

(Rs/kg)

Market Price for hybrid seed (Rs/kg)

Unit cost of production with cob

(Rs/kg)

Unit cost of Production for seed

(Rs/kg)

**Gross and net return**

600.00 Gross return including cob (Rs/ac) 800000.00

400.00 Net return including cob (Rs/ac) 523720.00

800.00 Gross return for hybrid seed (Rs/ac) 844800.00

1280.00 Net return for hybrid seed only (Rs/ac) 568520.00

215.84

460.47

Maize farmers receive benefits from maize seed production, milky corns and the remaining byproduct or remains of the crop. Accordingly maize farmer receives 960000 LKR per annum with a monthly income of 80000 LKR. However, cost of production per annum is 552560 LKR. His net return is 407440LKR which means the farmer receives a net income of 35953 LKR. If an assumption is made that the farmer sells milky corn from male plants of hybrid seed production, he receives an extra income of 837000 LKR while he can earn 10000LKR by selling the remains of the maize cultivation. Thus, the farmer receives an extra income of 847000 LKR per annum i.e. monthly he receives an extra income of 70583 LKR. The table below provides Benefit Cost ratio and NPV values with and without extra income.

**Table 24:** Financial Analysis with and without extra income

	Without Extra Income	With Extra Income
Present Value of Benefits	3,294,720.00	6,201,624.00
Present Value of Costs	2,256,385.92	2,256,385.92
B/C Ratio	1.46	2.75
NPV	1,038,334.08	3,945,238.08
IRR	85%	293%
Gross Margin	32%	64%
Break even yield (kg)	345.35	345.35

Even without extra income, the maize farmer’s benefits are greater than cost and the NPV is a positive value. The gross margin is 32% while the breakeven yield is 345.35Kg. Having an extra income from milky corn and the remains of maize seed production increases the farmer’s benefits and gross margins.

**Table 25:** Financial Analysis with and without project

	Without Project	With Project
Present Value of Benefits	3,294,720.00	5,491,200.00
Present Value of Costs	2,256,385.92	3,256,385.92
B/C Ratio	1.46	1.69

District Feasibility Report – Hybrid Maize Seed Production

NPV	1,038,334.08	2,234,814.08
IRR	85%	51%
Gross Margin	32%	41%
Break even yield (kg)	345.35	276.28

It is expected that the project will provide mini sprinklers for each farmer and the cost for mini sprinklers estimated to be 01 million LKR. It is also assumed that the yield of the farmer will increase up to 1000kg of maize with cob. With this scenario, the farmers receive more benefits with interference of the project. However, benefit Cost ratio is greater than that of without project scenario and the gross margin also decreases. The IRR with the project is 51%.

**Table 26:** Financial Analysis with and without project and extra income

	Without Project	With Project	With Project and with Extra Income
Present Value of Benefits	3,294,720.00	5,491,200.00	8,398,104.00
Present Value of Costs	2,256,385.92	3,256,385.92	3256385.92
B/C Ratio	1.46	1.69	2.58
NPV	1038334.08	2,234,814.08	5141718.08
IRR	85%	51%	108%
Gross Margin	32%	41%	61%
Break even yield (kg)	345.35	276.28	276.28

Although the Benefit Cost ratio in “with project” scenario is slightly less than that of “without project scenario”, it is greater “with project” and “with extra income scenario”. Generally, when maize is cultivated, those extra benefits are also generated. As result, the income of the farmer goes up and the Benefit Cost ratio also becomes greater than those other scenarios. IRR also increases up to 108% and gross margin increases up to 61.22% with the extra income.

Farmers’ monthly net income with project is 87286.67 LKR. This income generates only from maize seeds with the cob. However, when the other income generated from milky corns and maize remains are added to the net income, farmers receive 157870 LKR.

Table 27 shows that the farmers gain in with project and without project scenario if the directly sell only seeds at the market place. Benefits are always higher if the gain extra income from selling milky corns and corn remains.

**Table 27:** Financial Analysis with and without project assuming that the farmers sell seeds directly in the market

	Without Project	Without Project and Extra Income	With Project	With Project and Extra Income
Present Value of Benefits	3514368	6421272	5798707	8705611
Present Value of Costs	2256386	2256386	3256386	3256386
B/C Ratio	1.56	2.85	1.78	2.67
NPV	1,257,982.08	4164886	2542321	5449225
IRR	101%	309%	57%	114%
Gross Margin	35.80%	64.86%	43.84%	62.59%
Break even yield (kg)	215.84	215.84	215.84	215.84

#### 4.13.4 Sensitivity Analysis

This section describes the different scenarios and their outcome with respect to changes in farm gate and market prices, changes in costs and reduction in quantity of quality seeds. The scenarios are;

1. 10% change in farm gate price
2. 10% change in cost of production
3. 10% change in market price of seeds
4. 10% reduction in quality seeds

The Table 28 provides the outcome of first scenario where the farm gate price is changed by 10%. Accordingly, the farmers receive higher benefits in each case. If the farm gate

price is reduced by 10% the cost benefit ratio, NPV and IRR are reduced. However, the farmers benefits are positive.

**Table 28:** Scenario I – 10% change in farm gate price

	<b>10% increase in price with project</b>	<b>10% increase in price with project and Extra Income</b>	<b>10% decrease in price with project</b>	<b>10% decrease in price with project and Extra Income</b>
Present Value of Benefits	6040320	8947224	4942080	7848984
Present Value of Costs	3256386	3256386	3256386	3256386
B/C Ratio	1.854915	2.747593	1.52	2.41
NPV	2783934	5690838	1685694	4592598
IRR	62%	119%	39%	98%
Gross Margin	46.09	63.60	34.11	58.51
Break even yield (kg)	345.35	345.35	345.35	345.35

According to the table 29, although the cost of production is increased by 10%, famers' benefits are still greater than the costs.

**Table 29:** Scenario II – 10% change in cost of production

	<b>10% increase in cost with project</b>	<b>10% increase in cost with project and Extra Income</b>	<b>10% decrease in cost with project</b>	<b>10% decrease in cost with project and Extra Income</b>
Present Value of Benefits	6040320	8947224	6040320	8947224
Present Value of Costs	3446025	3446025	3066747	3066747
B/C Ratio	1.752837	2.59639	1.969618	2.917496
NPV	2594295	5501199	2973573	5880477
IRR	58%	115%	66%	122%
Gross Margin	42.95%	61.48%	49.23%	65.72%
Break even yield (kg)	379.88	379.88	310.81	310.81

Assuming that the farmers sell seeds directly in the market and the market price is 1280 LKR, how change in market price by 10% affects the farmers' benefits are assessed. It also shows that the gains to farmers in greater when price is increased by 10%. Although the case is such, farmers still receive greater benefits than costs.

**Table 30:** Scenario III – 10% change in market price of seeds

	<b>10% increase in seed price with project</b>	<b>10% increase in seed price and Extra Income</b>	<b>10% decrease in seed price with project</b>	<b>10% decrease in seed price and Extra Income</b>
Present Value of Benefits	6378578	9285482	5218836	8125740
Present Value of Costs	3256386	3256386	3256386	3256386
B/C Ratio	1.958791	2.851469	1.602647	2.495325
NPV	3122192	6029096	1962451	4869355
IRR	69%	125%	45%	103%
Gross Margin	48.95%	64.93%	37.60%	59.93%
Break even yield (kg)	196.22	196.22	239.82	239.82

As hybrid seeds are produced, the quality of the seeds matters a lot and nobody can expect 100% quality seeds from a farmer field. If the fields are managed properly and farming practices are monitored well enough to produce quality seeds, quality can be assured with certain allowance for low quality seeds. Therefore, assuming that the amount quality seeds are reduced by 10%, the gains to the farmers are assessed.

**Table 31:** Scenario IV – 10% reduction in quality seeds

	<b>10% decrease in quality seed quantity with project</b>	<b>10% decrease in quality seed quantity with project and Extra Income</b>
Present Value of Benefits	5218836	8193694
Present Value of Costs	3256386	3256386
B/C Ratio	1.602647	2.516193
NPV	1962451	4937308

IRR	45%	104%
Gross Margin	37.60%	60.26%
Break even yield (kg)	215.84	215.84

Thus, the Table 31 shows that still the benefits to the farmers are higher even if the amount of quality seeds are reduced by 10%.

#### 4.13.5 Qualitative Analysis

Although the financial analysis highlights the fact that the hybrid maize seed production is economically feasible with a payback period of less than a year, the qualitative analysis suggests that the overall feasibility in cultivation maize for seed production is at a medium level. Value for overall feasibility is 3.3 meaning that the cultivation of crop is not easy.

**Table 32:** Results of the qualitative analysis

Criteria	Dimensions	Average Score	Overall Feasibility (Easy or difficult to cultivate)
<b>Criterion 01</b> Cultivation costs (Skills, money, technology)	Skills special knowledge needed	3.0	Medium
	Equipment/ technology needed	3.8	High
	Labor needs for cultivation	3.0	Medium
<b>Criterion 02</b> Cultivation quality (difficulties for high quality cultivation)	Difficulty to get inputs for cultivation	4.2	High
	Difficulty reaching adequate quality by farmers (including vulnerability to damage during cultivation)	2.8	Low to medium
<b>Criterion 03</b> Processing costs (Skills, money, technology needed for processing)	Skills for processing	2.8	Low to medium
	Money needed for processing	3.2	Medium
	Technology needed for processing	3.0	Medium

<b>Criterion 04</b> Scaling up (difficulty getting high quality supply)	Difficulty for processors get enough supply	2.2	Low
	Difficulty of reaching adequate quality by processors	3.0	Medium
<b>Criterion 05</b> Infrastructure costs (assets needed across entire value chain)	Water	1.8	Low
	Electricity	2.0	Low
	Transport infrastructure	1.8	Low
<b>Overall Feasibility</b>		<b>3.3</b>	<b>Medium</b>

It implies that the cultivation of maize for seed production needs special attention on some dimensions. For example, farmers’ experience and knowledge in maize seed production is very limited so that they have to be trained properly to gain the skills needed for hybrid seed production. Otherwise, as results suggest, the hybrid seed production would be a difficult task for them and the needed results will not be able to be gained. Next main issue is the cost of inputs at the current crisis. As ASMP expects the farmers also should bear a certain cost of input while the project assists in providing some inputs in concessionary rates. It is also evident that without equipment and technology needed for the maize seed production, the expected benefits would not be possible. The analysis further suggests that scaling up is easier. Most of the farmers have electricity and water for their cultivation. However, those who have water pumps face kerosene oil issue if pumps are to be used in farming activities.

Issues identified

- Seeds for the farmers were provided free of charge and some farmers had to purchase them. Therefore, it is recommended to have one policy in providing seeds
- Once the seeds were provided, no recommendations from DoA have been given and close monitoring of farming activities have not been done. All the activities in seed production have to be monitored properly
- At present the fertilizer cost is very high. Hence, the Cost of Production (CoP) is very high.



- Marketing or selling issues due to absence of fixed agreements with buyers. Therefore, this has to be strengthened and facilitated until they stand on their own with the Proposed Public Unlisted Farmer Company.

#### 4.14 Geographical Suitability Assessment based GIS

Selected land use categories such as Paddy, Home Garden, Seasonal crops and other selected land use types from Land use layers, Soil, Agro-ecology, Wildlife, Forest, Rainfall and Temperature data layers used for identification of suitable lands for Maize seed production. Outcomes of the suitability assessment is given below tables including suitability maps for each district:

**Table 33** Vavuniya District Suitability Outcomes

<b>Forest Type</b>	<b>Area (Ha)</b>	<b>Suitability</b>
Dry Monsoon Forests	104164.68	Not Suitable
Open & Sparse Forests	18349.36	Not Suitable
Shrubs	3990.30	Not Suitable
<b>Wildlife</b>	<b>Area (Ha)</b>	<b>Suitability</b>
National Park	3245.20	Not Suitable
<b>Agro Ecological Region</b>	<b>Area (Ha)</b>	<b>Suitability</b>
DL1b	70986.57	Suitable
DL1e	84821.93	Suitable
DL1f	44722.66	Suitable

<b>Soil Type</b>	<b>Area (Ha)</b>	<b>Suitability</b>
Alluvial soils of variable drainage and texture	8214.13	Suitable
Eroded land	969.69	Suitable
Erosional remnants	482.88	Suitable
Reddish Brown Earths & Low Humic Gley soils	180667.11	Suitable
Solodized Solonetz & Solonchaks	4191.55	Suitable
Rock knob plain	6005.79	Not Suitable

#### Vavuniya District Land Suitability

District Feasibility Report – Hybrid Maize Seed Production

DSD Name	Suitable Area (Ha)	Not Suitable Area (Ha)
Vavuniya	31050.01	30677.55
Vavuniya north	16058.55	60760.14
Vavuniya south	11118.30	10882.67
Vengalacheddikulam	14802.50	25692.87

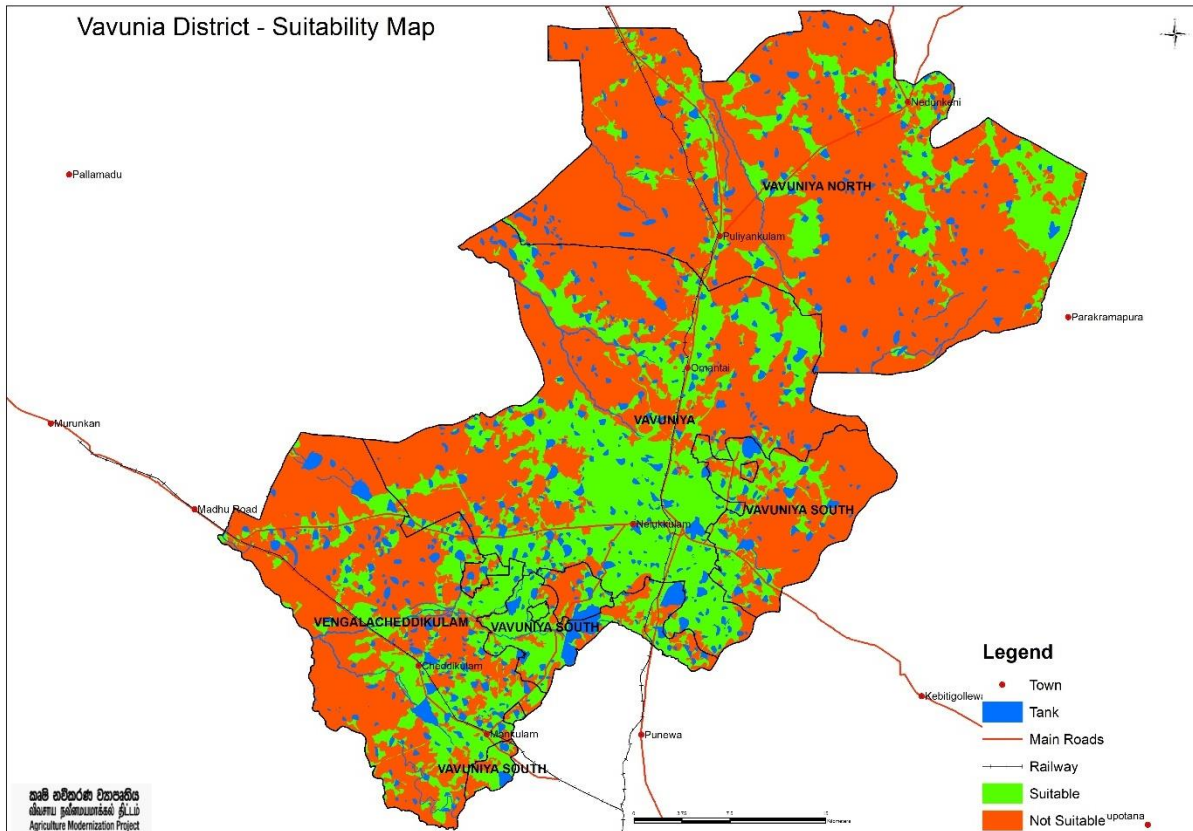


Figure 41 Vavuniya District Suitability Map

Table 34 Kilinochchi District Suitability Outcomes

Forest Type	Area (Ha)	Suitability
Dry Monsoon Forests	31243.62	Not Suitable
Forest Plantations	7.63	Not Suitable
Mangrove Forests	1787.55	Not Suitable
Open & Sparse Forests	4796.39	Not Suitable
Shrubs	7500.23	Not Suitable

## District Feasibility Report – Hybrid Maize Seed Production

<b>Wildlife</b>		
<b>Type</b>	<b>Area (Ha)</b>	<b>Suitability</b>
National Park	8356.40	Not Suitable

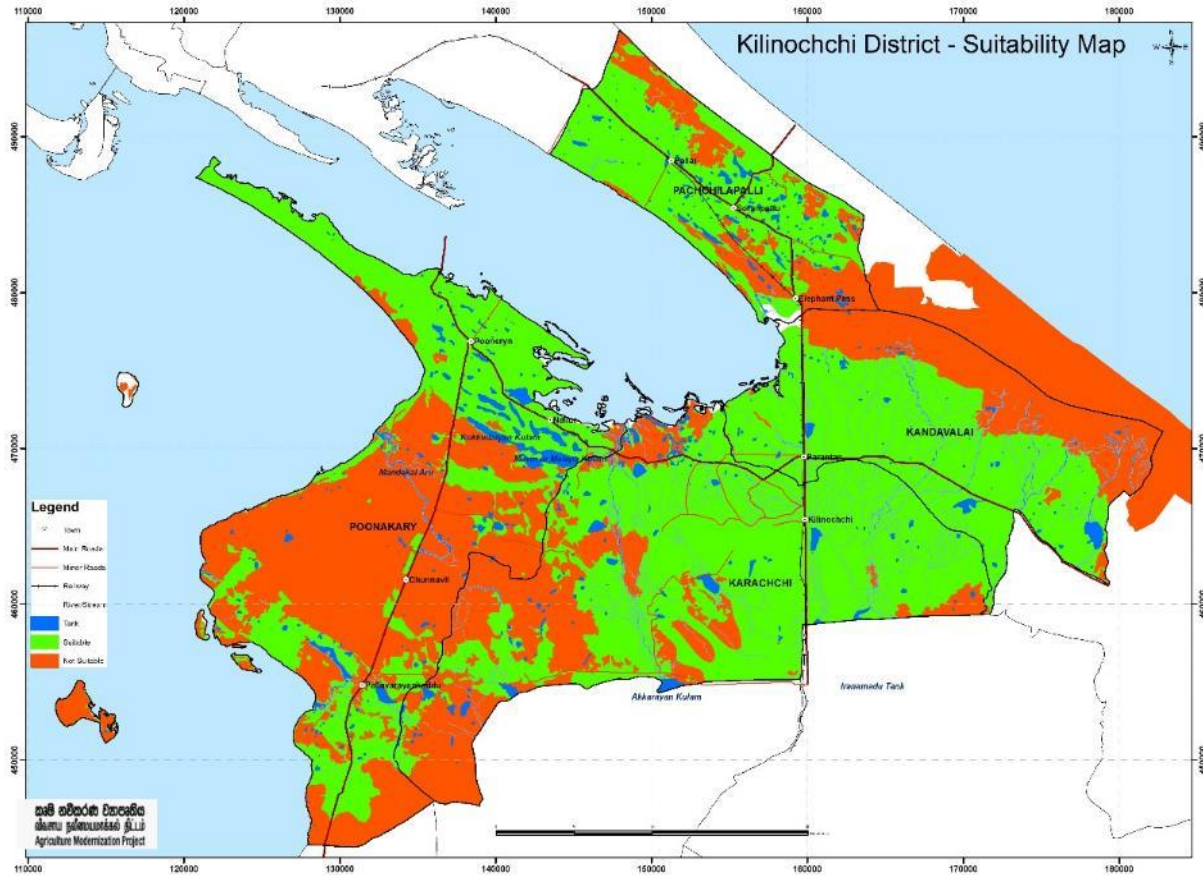
<b>Agro Ecological Region</b>	<b>Area (Ha)</b>	<b>Suitability</b>
DL1f	546.31	Suitable
DL3	69538.42	Suitable
DL4	54792.80	Suitable

<b>Soil Type</b>	<b>Area (Ha)</b>	<b>Suitability</b>
Alluvial soils of variable drainage and texture	25520.11	Suitable
Soils on Recent marine calcareous sediments	6.03	Suitable
Solodized Solonetz & Solonchaks	34420.01	Suitable
Regosols on Recent beach and dune sands	14677.27	not Suitable
Water	151.80	not Suitable

### **Kilinochchi District Land Suitability**

<b>DSD Name</b>	<b>Suitable Area (Ha)</b>	<b>Not Suitable Area (Ha)</b>
Kandavalai	18114.91	7770.81
Karachchi	31013.76	12282.67
Pachchilapalli	12590.77	4253.63
Poonakary	20656.87	24569.76

# District Feasibility Report – Hybrid Maize Seed Production



**Figure 42** Kilinochchi District Suitability Map

**Table 35** Badulla District Suitability Outcomes

Forest Type	Area (Ha)	Suitability
Dry Monsoon Forests	3727.67	Not Suitable
Moist Monsoon Forests	15408.50	Not Suitable
Montane Forests	5070.01	Not Suitable
Sub Montane Forests	578.25	Not Suitable
Forest Plantations	5910.17	Not Suitable
Montane Grasslands	749.60	Not Suitable
Open & Sparse Forests	28026.03	Not Suitable
Savannah	16250.86	Not Suitable
Shrubs	12878.13	Not Suitable
<b>Wildlife</b>	<b>Area (Ha)</b>	<b>Suitability</b>
National Park	21138.82	Not Suitable

District Feasibility Report – Hybrid Maize Seed Production

Nature Reserve	98.26	Not Suitable
Strict Nature Reserve	742.65	Not Suitable
Sanctuary	5161.14	Suitable

Agro Ecological Region	Area (Ha)	Suitability
DL1a	9129.08	Suitable
DL1c	25298.56	Suitable
IL1c	745.03	Suitable
IL2	82654.63	Suitable
IM1a	36761.21	Suitable
IM1c	8228.55	Suitable
IM2a	7212.92	Suitable
IM2b	33057.58	Suitable
IU2	10964.86	Suitable
IU3a	5479.22	Suitable
IU3b	6460.86	Suitable
IU3c	32799.87	Suitable
IU3d	5442.18	Suitable
IU3e	22110.64	Suitable
WU3	881.59	not Suitable

Soil Type	Area (Ha)	Suitability
Alluvial soils of variable drainage and texture	6870	Suitable
Erosional remnants	73265	Suitable
Red Yellow Podzolic soils	62742	Suitable
Red Yellow Podzolic soils & Mountain Regosols	70591	Suitable
Reddish Brown Earths & Immature Brown Loams	51557	Suitable
Reddish Brown Earths & Low Humic Gley soils	4927	Suitable
RYP soils with dark B horizon & RYP soils with prominent A1 horizon	1657	Suitable
Steep rockland & lithosols	3728	Suitable
Rock knob plain	11890	Not Suitable

**Badulla District Land Suitability**

<b>DSD Name</b>	<b>Suitable Area (Ha)</b>	<b>Not Suitable Area (Ha)</b>
Badulla	4843.03	86.86
Bandarawela	5976.12	1030.86
Ella	8888.52	2046.02
Haldummulla	11847.45	29547.17
Hali ela	16013.44	1000.22
Haputhale	5442.46	1588.23
Kandaketiya	10282.01	4987.49
Lunugala	8886.89	5286.66
Mahiyanganaya	28439.85	31394.56
Meegahakivula	8299.31	2570.20
Passara	11286.91	2303.57
Rideemaliyadda	30188.19	13657.72
Soranathota	7125.50	963.28
Uva paranagama	11948.90	1797.25
Welimada	11618.50	7888.37

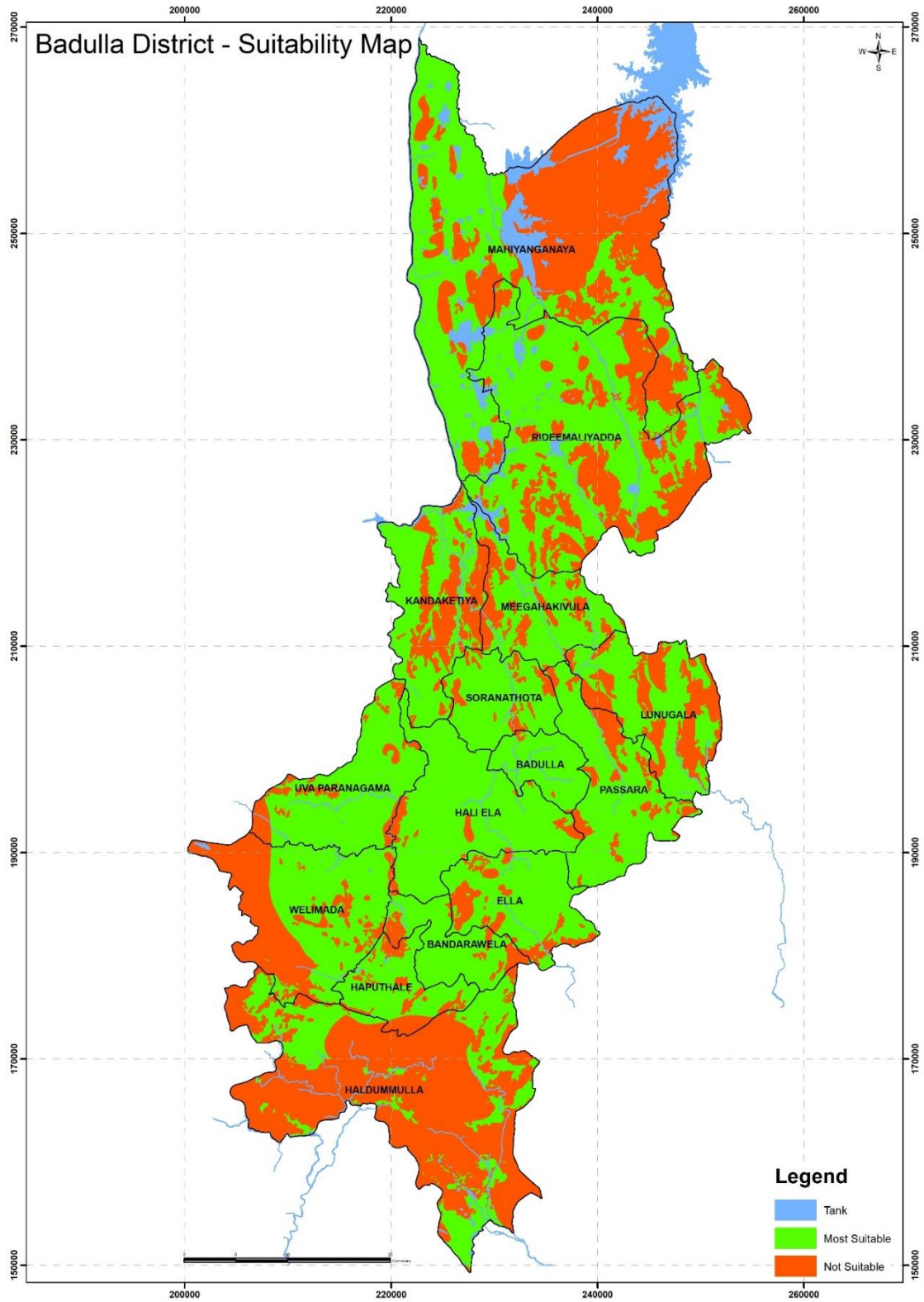


Figure 43: Badulla District Suitability Map

**Table 36:** Ampara District Suitability Outcomes

<b>Forest Type</b>	<b>Area (Ha)</b>	<b>Suitability</b>
Dry Monsoon Forests	96856.40	Not Suitable
Moist Monsoon Forests	18295.37	Not Suitable
Riverine Dry Forest	1082.76	Not Suitable
Forest Plantations	2114.69	Not Suitable
Mangrove Forests	617.52	Not Suitable
Open & Sparse Forests	31661.88	Not Suitable
Savannah	2895.07	Not Suitable
Shrubs	63760.70	Not Suitable
Thron Forest	2.02	Not Suitable

<b>Wildlife</b>	<b>Area (Ha)</b>	<b>Suitability</b>
National Park	75083.61	Not Suitable
Nature Reserve	847.21	Not Suitable
Sanctuary	19109.91	Not Suitable
Strict Nature Reserve	4.94	Not Suitable

<b>Agro Ecological Region</b>	<b>Area (Ha)</b>	<b>Suitability</b>
DL1b	39672.70	Suitable
DL1c	45115.32	Suitable
DL2a	150754.93	Suitable
DL2b	121841.45	Suitable
DL5	17926.56	Suitable
IL2	57298.85	Suitable

<b>Soil Type</b>	<b>Area (Ha)</b>	<b>Suitability</b>
Alluvial soils of variable drainage and texture	70503.45	Suitable
Erosional remnants	79882.54	Suitable
Noncalcic Brown soils & Low Humic Gley soils	34799.54	Suitable
Noncalcic Brown soils & soils on old Alluvium & Solodized Solonetz	1829.73	Suitable
Red Yellow Latosols	2016.50	Suitable
Reddish Brown Earths & Immature Brown Loams	27209.69	Suitable



## District Feasibility Report – Hybrid Maize Seed Production

Reddish Brown Earths & Low Humic Gley soils	58170.48	Suitable
Reddish Brown Earths & Solodized Solonetz	16087.83	Suitable
Reddish Brown Earths with high amount of gravel in subsoil & Low Humic Gley soils	3448.34	Suitable
Reddish Brown Earths, Noncalcic Brown soils & Low Humic Gley soils	32271.65	Suitable
Solodized Solonetz & Solonchaks	18182.42	Suitable
Regosols on Recent beach and dune sands	8640.42	Not Suitable
Rock knob plain	84137.32	Not Suitable

### Ampara District Land Suitability

DSD Name	Suitable Area (Ha)	Not Suitable Area (Ha)
Addalachchenai	4900.41	1535.56
Akkaraipattu	5285.03	586.48
Alayadiwembu	5697.00	1147.12
Ampara	7128.86	9614.96
Damana	14659.52	40378.78
Dehiattakandiya	19320.48	18899.44
Eragama	5863.50	1560.12
Kalmunai	869.03	1623.60
Karativu	606.84	452.54
Lahugala	6285.36	76654.43
Mahaoya	30119.92	38024.60
Navinthanveli	5467.69	1171.54
Ninthavur	2594.86	962.23
Padiyathalawa	14210.65	25109.79
Pothuvil	9600.91	17386.55
Sainthamarathu	105.40	142.57
Samanthurai	10976.04	921.77
Thirukkovil	8389.40	10355.24
Uhana	23898.07	26465.53

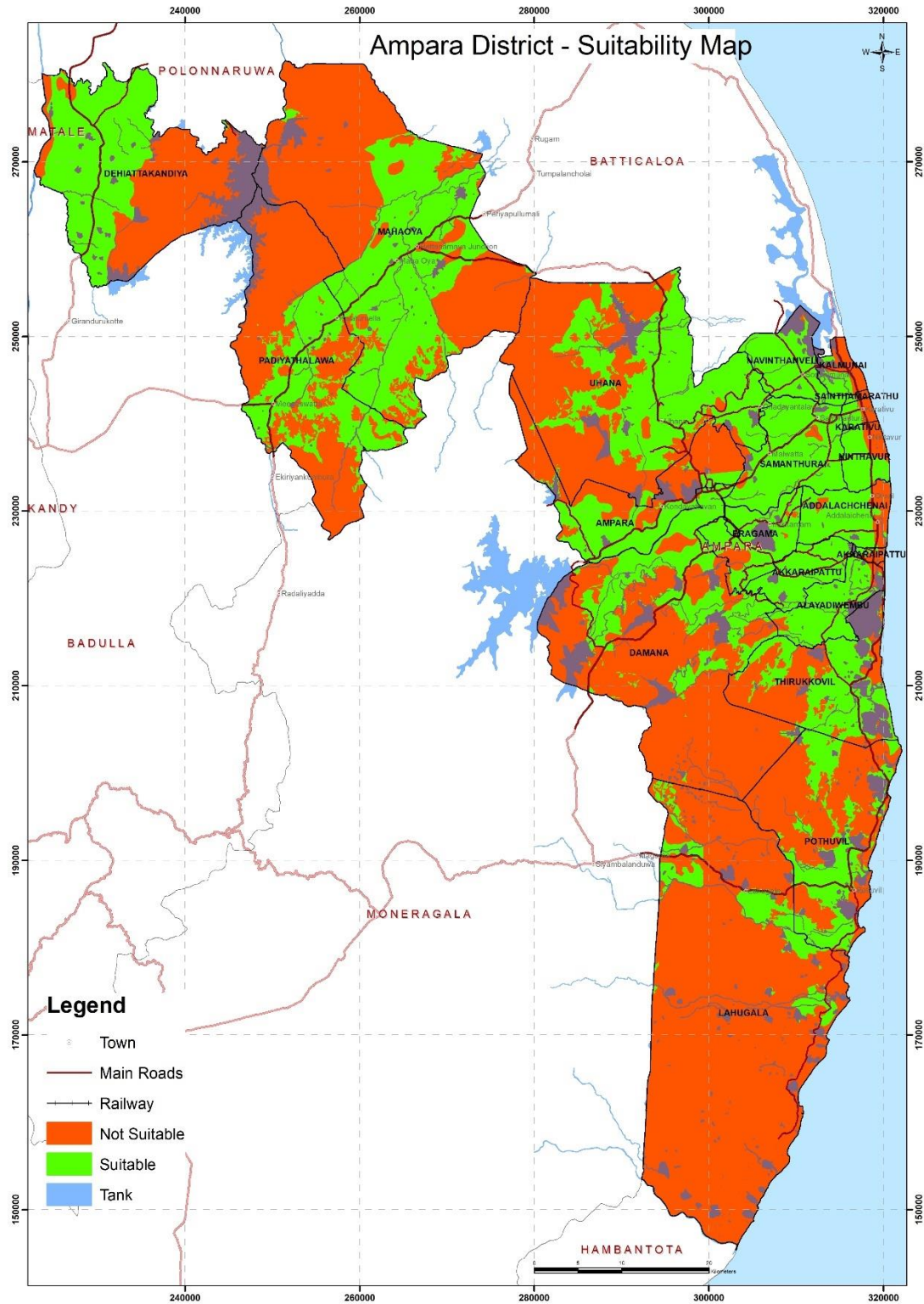


Figure 44: Ampara District Suitability Map

## **CHAPTER 5: ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACTS AND IMPACT MANAGEMENT FRAMEWORK**

### **5.1 Preliminary assessment of environmental and social impacts of ASMP**

With the preliminary assessment of all types of impacts triggered by ASMP could be generalized under (i) typical generic cultivation related impacts, (ii) typical generic construction impacts which can be mitigated with good construction practices, (iii) impacts which will be arising due to operational activities which can be mitigated by implementing proper measures and (iv) specific impacts that can arise due to engineering interventions proposed for some activities and hence require careful planning.

In general, following are the lists of broad positive and negative impacts that are very likely to arise from the activities funded by ASMP.

#### **Overall positive impacts of the project**

- Introduce new technologies to increase yield of Maize
- Improve and increase local agricultural products
- Productive Land preparation methods
- Import substitution and saving of forex
- Conservation and Management of Water resources and water accessibility will be improved
- Improve Disease control efficiency and new disease control techniques will be introduced
- Reduce use of weedicides and pesticides and use Integrated Pest Management methods
- Enhancement of productivity and Quality of Maize
- Reduce postharvest losses
- Increases sustainable farm income and reduce poverty level
- Create new employment opportunities
- Identify international market opportunities

- Benefits of development of FPOs. Training, awareness and capacity building of Farmers'
- Improve Business professionalism
- Increase the Legal compliance
- Sustainable farm income will be increased
- Training and awareness will strengthen skills, talents, and knowledge to undertake and manage all activities of commercial organization
- Community empowerment and reduce marginalization

### 5.2 Negative Impacts with Severity by each district

In terms of implementing the maize cultivation in Kilinochchi, Vavuniya and Badulla districts, following potential environmental and social impacts in its severity given would be arise. For a better implementation of the cluster, following impacts should be avoided or mitigated.

**Table 37** Impact Matrix with Severity at each district

#	Potential Negative Impact	Impact Severity (High, Moderate and Low)				Remarks
		Kilinochchi	Vavuniya	Badulla	Ampara	
1	Soil erosion and siltation	Low	Low	High	Moderate	Soil erosion in Badulla is a critical existing issue due to Agricultural activities. Slop and intensive agriculture in the area has resulted a severe soil erosion. As a result, many water resources being subjected to siltation. Specially, Kandaketiya, Rideemaliyadda and Meegahakiula are having high erosive rate. Potential lands in Ampara are undulating.
2	Reduction of Water Resources (impact on	High	High	Moderate	Moderate	Kilinochchi and Vavuniya existing water levels are very

District Feasibility Report – Hybrid Maize Seed Production

	water table) and increase vulnerability towards Climate change including issues related water rights					low. Climate change vulnerability of both districts are higher. Practice of conventional farming will increase stress level of water table.  Use of major irrigation systems' water issued for paddy should be used with prior approval
3	Lack of knowledge on basic harvest and postharvest practices lead to low quality of product and high amount of waste	Moderate	Moderate	Moderate	Moderate	Harvesting and Post-harvesting losses are very high due to primitive practices. This will have an impact on the volume of the yield and the quality of production
4	Removal of trees	Low	Low	Low	Low	Potential tree removals will be very low. Maximum of efforts will be taken to avoid tree removals
5	Exposing and damaging of physical cultural resources (PCR)	Low	Low	Low	Low	Already identified monuments are recorded and can be recognized. But there will be many unidentified monuments

District Feasibility Report – Hybrid Maize Seed Production

						pecially areas such as Vavuniya
6	Spreading of Invasive Alien Species	Moderate	Moderate	Low	Moderate	Land clearing, disposal of overburden, introduction of new species, etc may lead to increase in spreading. Spreading of <i>parthenium hysterophorus</i> in Northern area is very high
7	Contamination of water, land and air during usage of chemicals (pesticides, weedicides.)	Moderate	Moderate	High	Moderate	Automated fertigation and watering system will reduce the magnitude of this. Use of chemicals in Badulla district is comparatively higher than other districts which indicates the level residues added to the surface water sources.
8	Impaired water quality due to pollutants including silt	Low	Low	High	High	Topography of each district will be a critical factor. As mentioned above, erosive rate in Badulla is higher and already a siltation of waterbodies is problem identified.

District Feasibility Report – Hybrid Maize Seed Production

9	Blocking of surface drainage paths leading to localised flooding and ponding of water	Moderate	Moderate	Low	Low	There are considerable low land areas in Northern province where those are very susceptible to temporary inundation. Badulla is less probability due to sloppiness.
10	Solid Waste Disposal, degradable, non-degradable, chemical, etc including operational stage	Moderate	Moderate	Moderate	Moderate	Solid waste generation due to operational activities will be a key factor which may lead to consider EPLs
11	Spread of crop related diseases among other flora species	Low	Low	Moderate	Moderate	Wind directions and speed in slopy areas specially in Badulla may have higher possibility of spreading crop diseased than flat terrain
12	Health hazard such as CoVID-19, Snake Bites, exposure to chemical, etc	Low	Low	Low	Low	Snake bites and exposure to chemicals will be critical and due to poor awareness of the people health hazards can be aggravated.



District Feasibility Report – Hybrid Maize Seed Production

13	Air Pollution including dust generation that can affect nearby vegetation and households due to many activities	Moderate	Moderate	Moderate	Low	Slash and burn of cleared land areas will lead to severe air quality degradation
14	Damage to wildlife Specially impacts to elephants roaming in the area	Low	Moderate	Moderate	Moderate	Mahiyanganaya, Redeemaliyadda, Kandeketiya, etc are closer to many Wildlife areas. Vavuniya South, and Vavuniya North are also considerably severe
15	Impacts on ecosystems and bio-diversity (fauna and flora)	Moderate	Moderate	High	Moderate	Highest bio-diversity of Sri Lanka is in Badulla district. Vavuniya and Kilinochchi districts are predominantly very high forest areas.
16	Greenhouse gas emission which results climate change including cultivation activities and operational activities of processing centres	Moderate	Moderate	Moderate	Moderate	Use of diesel and fossil fuels for operations will have greater impact on Climate change. Measures such as stack height changes, different fuel types with low carbon emission,

District Feasibility Report – Hybrid Maize Seed Production

						sustainable energy sources, etc can be explore
17	Exclusion of vulnerable groups in the beneficiary selection	High	High	High	High	Biasness and poor transparency by the FOs during selection of Farmers will lead to this. Dominance of existing FOs executive committees and Officials may lead to biasness and which will have an impact social cohesion. Existing FOs in Badulla observed to be having such conflicts among members.
18	Receive double benefits which leads miss opportunities to needy groups	Low	Low	Low	Low	Single family receiving double benefits from the project should be avoided with proper farmer selection
19	Livelihood impacts during engagement in cultivation activities	Low	Low	Low	Low	Opportunity cost and loss of productive time due to engagement in ASMP activities will be a matter if the return is low

District Feasibility Report – Hybrid Maize Seed Production

20	Labour influx for proposed infrastructure improvement activities	Moderate	Moderate	Moderate	Low	Influx of labour for infrastructure development such as possessing centres, rural roads, etc need to be managed to avoid community issues. Further, use of local labour should be given priority to gain maximum benefit to the community
21	Reduction in social cohesion due to biasness within the project	Moderate	Moderate	High	Moderate	Farmer selection, land selection, distribution of benefit packages, etc are highly sensitive which can create imbalances of harmony in the community

### **5.3 Potential issues that require specific guidelines**

In some of the sub-projects specific issues that are apart from typical cultivation and construction related impacts may arise. Such issues have to be addressed with specific guidelines so that the real impacts could be evaluated successfully and mitigation measures proposed accordingly. One such issues have been identified;

#### **5.3.1 Impacts on physical cultural resources (PCR)**

Many districts have rich in cultural heritage and requires particular attention to mitigate any negative impacts on PCRs that can take place either directly or indirectly during project implementation. As highlighted in the preceding chapter, PCRs in three cities are dominated by built PCRs such as historic buildings, monuments, temples and monastic complexes. For Kilinochchi, and Kandy, cultural heritage buildings and properties have been inventoried and mapped by both the Department of Archaeology and the Central Environmental Authority and a historic building code is in practice which requires historic buildings to adhere to conservation guidelines when any change is implemented.

### **5.4 Impact Management Framework**

#### **5.4.1 Environmental Assessment**

Detailed Environmental assessment will have to be carried out during Cluster Development Stage with more clear and detailed project interventions. The main objective of Environmental Assessment of project will be to (a) determine the anticipated environmental impacts, risks and opportunities of the sub-project (ii) determine if the anticipated impacts and public concern warrant further environmental analysis, and if so to recommend the appropriate type and extent of Environmental Assessment needed. Assessment should go hand in hand with project concept development.

#### **5.4.2 Social Assessment**

Screening of subprojects for assessing their potential Involuntary Resettlement impacts will be carried out by the respective implementing agency/regional project offices during the preparation using the Social Screening Format. Based on the screening data on the extent of likely impacts, subproject safeguard requirements will

be only B and C category as defined below. The project will not support any A category subprojects.

- Not significant (**Category B**) – If, as a result of the sub-project, fewer than 200 people will be physically displaced from housing or lose less than 10% of their productive (income- generating) assets, Abbreviated Resettlement Plans are prepared commensurate to their impacts;
- No resettlement effect (Category C) – If the subproject does not require temporary or permanent land acquisition, and there are no impacts involving the loss of land, structures, crops and trees, businesses or income, no resettlement plan is required. This category also includes temporary but not significant impacts which will have to be mitigated as a part of construction management in consultation with the Affected Persons by the Contractor.

## **5.5 Mitigation of potential impacts**

As highlighted above, environmental impacts from majority of activities under ASMP will be associated with general cultivational, construction and some operational related activities which can be effectively mitigated with good agricultural practices, construction planning, site management, debris disposal and public safety practices. For such impacts, environmental best practices (relevant to the sub-project) as highlighted in the table below would be sufficient where impacts of a particular activity are minor and easily arrested. Implementation of Environmental Management Plan would be able to mitigate most potential impacts. All industrial activities which discharge pollutants such as air emission, noise, vibration and waste will require obtaining EPL for operational stage. Proper, transparent and unbiased selection of farmers will reduce most social impacts. Further, land ownership should be thoroughly screened during selections to avoid ownership issues.

### **5.5.1 Health and Safety Guidelines**

Health and safety of workers and the public should be designed into Cultivation, constructions, and operational activities. It is cheaper and easier to prevent risks to workers as well as the public before starts on site by proper planning, training, site induction, worker consultation and incorporating strict safety procedures in construction plans. The proposed project interventions will mostly involve small to medium scale activities. As such, extreme dangers posed by working in environments

such as great heights, deep water and involving dangerous chemicals and radioactive material will not be present. Potential dangers associated with ASMP sites will include exposure to chemical, snake bites, falling from moderate heights, vehicle/pedestrian accidents, falling into trenches, breathing dust and other air pollutants, back aches caused by handling heavy material, suffering hearing loss from noise etc and can be mitigated with following safety guidelines.

EA for each cluster should mandatorily include a risk assessment as to what are the hazards involved in the work site, who might be harmed and how seriously, how likely this harm might happen and what actions are required to eliminate or reduce the risk and incorporate such measures in the EMP and clearly set out in the tender documents. All sub-projects must observe health and safety regulations, hence during implementation it is important to check if these control measures are put in place and are meeting the legal requirement.

## **5.6 District Level Feasibility for Maize Seed Production**

### **5.6.1 Badulla District**

Considering environmental and social factors such as proximity to Wildlife Conserve areas and Forest Reserves, Land use, Soil Type, Agro-ecological zones, Topography and terrain, availability of water, willingness of farmers, availability of lands, social capital, etc establishment of maize seed production cluster in Kandaketiya, Meegahakiwula, Rideemaliyadda and Mahiyanganaya would be feasible. However, these potential areas are observed to be having high-rate soil erosion as per the literature due to heaving agricultural practices, soil types, and terrain. Therefore, implementing serious/proper erosion control measures from commencement will reduce the erosive forces and impact due to soil erosion can be reduced up to greater extent. Victoria-Randenigala-Rantembe Sanctuary found to be bordered to Kandaketiya area and Maduru Oya National Park bordered to Mahiyanganaya area. Therefore, selection of lands and farmers should avoid selecting farmers in the border areas to reduce the edge effects due to Cultivation. In addition, human-elephant conflict and damages to cultivations are higher. Hence, precautionary measures should be made. Furthermore, selection of farmers in this area should be carefully and transparently carried out to reduce the biasness which will lead to issues in social cohesiveness.

### **5.6.2 Vavuniya District**

In relation to Vavuniya district, Topography and terrain, Soil types, Agro-ecological zones, availability of water sources, willingness of farmers, experience in farmers, social capitals, etc are in favour of establishing a Maize seed production cluster in Vavuniya. However, Vavuniya district has more than 40% of Forest Cover in total, which needs to be considered during selection of lands and farmers. Water resources in the district has severe stress and therefore, water conserving methods should be introduced in terms of using water resources in a sustainable manner. Selection of farmers in this area should be carefully and transparently carried out to reduce the biasness which will lead to issues in social cohesiveness. In addition, human-elephant conflict and damages to cultivations are higher in Vavuniya South, Vavuniya and some parts of Vavuniya. Hence, proactive measures should be arranged.

### **5.6.3 Ampara District**

Potential areas in Padiyathalawa in Ampara district have favourable soil type, agro-ecological zones, availability of water, topography & terrain, farmers willingness, support from DOA, experience in maize cultivation. However, proper approval from MASL should be obtained before commencement of cultivation. Damages to surrounding forest areas including Maduru National Park and Rambaken Oya should be minimized. Further, proper measures should be taken to protect from elephants and other wild animals. Silt-trapping methods should be applied during land preparation to avoid silt being carried to adjoining streams, canals, rivers specially Maduru Oya. Water conserving methods should be introduced in terms of using water resources in a sustainable manner. Selection of farmers in this area should be carefully and transparently carried out to reduce the biasness which will lead to issues in social cohesiveness.

### **5.6.4 Kilinochchi District**

Topography, Soil types, availability of lands, Agro-ecological zones, terrain, availability of water sources, erosive forces, willingness of farmers, social capitals, etc are potential factors when considering the Maize Seed Production in Kilinochchi. However, experience of the farmers, and forest areas in close proximity will hinder the potentials. Avoiding forest areas including buffer zones will enable selection of lands for maize cultivation. Silt-traps should be constructed during land preparation to avoid silt being

carried to adjoining streams, and canals. Water resources in the district has severe stress and therefore, water conserving methods should be introduced in terms of using water resources in a sustainable manner. Selection of farmers in this area should be carefully and transparently carried out to reduce the biasness which will lead to issues in social cohesiveness.



## CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

### 6.1 Conclusion

Maize hybrid seed production is financially feasible in farmers' perspective and market perspective and the payback period is less than one year. Farmers have to be encouraged to sell the milky corns and remains of corn if they expect to have more benefits from hybrid seed production. As shown in the qualitative analysis, maize seed production is somewhat difficult activity as most of the farmers have not been trained for such an activity. One farmer should cultivate at least one acre to gain the anticipated benefits. Required technology and some inputs should be given to the farmers.

Cultivation of Maize for seed production will help to upgrade their living standard up to a certain extent. Small land sizes are not enough to sustain. Minimum land extent of one acre needs for seed cultivation, in the same time they have to continue the other vegetable seed production also (about ¼ an acre of land extent). It is essential to shift to higher value crops with value addition to ensure the large-scale income. Mango and Banana are most potential crops to achieve that target.

Soil type, Rainfall, Relative Humidity, land availability, farmers' experience and willingness of farmers have been considered as selection criteria. Different soil types in one divisional secretary division available and couldn't find the soil types relevant Grama Niladhari divisions and Rain fall also the same. Farmers' experience and willingness identified through the rapid discussions with farmers. Considering three main categories namely Soil type, Rainfall and farmer willingness and experience most suitable, suitable and not suitable areas identified and mentioned in above table. Kandaketiya, Meegahakiula, Padiyathalawa and Vavuniya are most suitable areas for Maize seeds cultivation. Several recommendations have been given 5.1 and that should be strictly followed for successful end.

With reference to the findings of the district level feasibility study Only the Ampara and Badulla district farmers have prior experience in maize cultivation along with best agro-climate suitability (4th largest producer where top producers were Anuradhapura, Moneragala and Ampara respectively). Maize, as a crop and hybrid seed production

is totally new venture to North (Vavuniya and Kilinochchi districts). Only the plus point was Vavuniya farmers are experienced certified seed (paddy, black gram, cowpea, mung bean, ground nut) producers and their industriousness will empower the planned hybrid maize seed production in Vavuniya. In contrast, farmers of Kilinochchi district were small scale marginal group and exposure to unknown certified hybrid maize seed production would be high risk and challenging task for them. They are not in a position or a knowledge to undertake such ventures.

Hybrid maize seed production essentially need to consider educated, young and entrepreneurial farmers who have capacity to take change and risks. Especially, the farmers of Ampara and Badulla district were experience maize growers but they have no idea on certified hybrid seed production. In addition to that they are risk averse group of people and only looking for subsidy and other facilities available to empower their farming. Again challenging task to establish hybrid seed business.

The conflict prone nature of measures, especially the selection of beneficiaries, offer subsidy package, etc. intended to redistribute benefits and formalise various stakeholders' roles and responsibilities – careful moderation and mediation is required to promote equity among the farmer groups concerned.

The inseparable interdependency between political/ legal-regulatory/ institutional framework conditions on the one hand, and technical/practical issues on the other – ensuring sustainability of the hybrid maize seed business as a cornerstone of environmentally and socially friendly supplies of feed ingredient is a governance issue of the value chain.

The need to regard the promotion of hybrid maize seed value chains as a mutual learning process of the concerned stakeholders, especially educated young farmers. Careful farmer selection, capacity building, effective training, monitoring and evaluation through out the crop establishment, venture creation and marketing facilitation along with appropriate technology is key components of the package to the cluster.

In general, the proposed Maize Seed Production in Badulla, Vavuniya, Ampara and Kilinochchi Districts will have a significant positive impact on rural agriculture communities by enhancing their economic conditions and prosperity while it has an influence on national economy at the national level which outweigh the potential negative impacts. Environmentally and socially, establishing Maize Seed Production Cluster in the above districts is feasible subjected to the conditions laid down in chapter 5.6 and 6.2.5.

Furthermore, in general Wild animal issues specially elephant threat on the cultivation will be matters in every district as mostly the potential areas are closer to forest or wildlife protected areas. In addition, water scarcity will be a serious concern for Ampara, Vavuniya and Kilinochchi whereas soil erosion will be highly concerned in Badulla and Ampara.

Transparent farmer selection and possess of legal ownership for lands will mostly reduce social issues.

**Table 38:** Suitability chart

Area	Soil type			Rainfall			Farmers experience			Environmental			Social			Overall Suitability
	Most suitable	Suitable	Not suitable	Most suitable	Suitable	Not suitable	Most suitable	Suitable	Not suitable	Most suitable	Suitable	Not suitable	Most suitable	Suitable	Not suitable	
Kandaketiya	√			√			√				√			√		<b>Most suitable</b>
Meegahakiula	√				√		√				√			√		<b>Most suitable</b>
Padiyathalawa	√			√			√			√			√			<b>Most suitable</b>
Vavuniya	√			√			√				√		√			<b>Most suitable</b>
Kilinochchi			√			√			√		√			√		<b>Not suitable</b>

**Table 39:** District Wise Comparative Assessment - Available Infrastructure & Processing Facilities for Maize Seed Production

Interested Area	Kandeketiya - Badulla	Karachchi East - Kilinochchi	Vavuniya South - Vavuniya	Padiyathalawa - Ampara	Derived on
Sample Size - No of farmers	64	12	17	30	Participants
<b>Infrastructure Availability</b>					
Field Access Road Condition	4	1	2	3	Nos.
Availability of national grid Connection	4	2	1	3	Nos.
Availability of Water Sources	3	1	2	4	Nos.
Conclusion	Most Favorable	Least Favorable	Less Favorable	Favorable	
<b>Availability of Own Maize Farming Machineries</b>					
Tractors - 4 Wheel	3	2	4	1	Nos.
Maize Seeders	3	1	2	4	Nos.
Weeding Machines	4	1	2	3	Nos.
Chemical Sprayers	4	1	3	2	Nos.
Water Pumps	2	3	4	1	Nos.
Conclusion	Most Favorable	Least Favorable	Favorable	Less Favorable	
<b>Availability of Hire-out Maize Seed processing machineries and lab testing facilities</b>					
Shelling Machines	3	1	2	4	Nos. & Distance
Grader (Paddy Grader Machine)	1	2	4	3	Nos. & Distance
Seed Coating Machine	4	1	3	2	Nos. & Distance
Lab Facilities	2	4	1	3	Nos. & Distance
Conclusion	Favorable	Least Favorable	Less Favorable	Most Favorable	
Availability of abandoned government buildings for processing and storing facilities	Less Favorable	Favorable	Least Favorable	Most Favorable	Distance & Required rehabilitation works
Technical Know-how on Agri Machineries	Most Favorable	Least Favorable	Less Favorable	Favorable	Nos.

## **6.2 Recommendations**

### **6.2.1 Agronomy**

Selected areas Kandaketiya and Meegahakivula in Badulla district and Padiyathalawa in Ampara can be recommended as most suitable places for Maize seed cultivation. Close monitoring and proper training are essential, because the farmers are not experienced in seed production. From the rain fall and ecology point of view Vavuniya has the less suitability for maize seeds cultivation. If we consider the farmers' experience, Vavuniya farmers have large experience in other vegetable seed production. Kilinochchi district is not suitable for Maize seeds production because the agro-ecology also not good except Karachchi. In addition to that experience and the willingness of farmers are also not satisfactory level.

Some recommendations to necessarily implement for the successes of the project.

- Soil testing.
- Additional fertilizer and growth regulators application.
- Training and appreciation.
  - Specially hybrid seeds production
  - Weed control and pest and disease management.
- Monitoring.
- Create WhatsApp group.

#### **Soil testing**

Soil samples to be taken on the basis of minimum six samples per ha, if the land is sloppy the sample size should be increased to ten.

Testing parameters: pH, CEC, EC, Organic Matter, Nitrogen (N), Phosphorus (P), Potassium (K), Magnesium (Mg), Calcium (Ca), Manganese (Mn), Molybdenum (Mo), Sulphur(S) ferrous (Fe) and Zink (Zn).

#### **Additional fertilizer and growth regulators**

As an additional fertilizer, required liquid fertilizer should be applied according to the soil analysis report.

Sustained increase in leaf photosynthesis may increase yield. Due to many limitations, plants use much less photosynthetic capacity than is theoretically possible. Plant Nano

biotics investigates nanoparticle application in living plants, which improves certain plant functions (*Wang C., et.al., 2021*)

According to this study “Triaccontanol” (200ml/Ac.) can be sprayed as photosynthesis enhancer.

## Training

Training component is very crucial because these farmers are very new to this seed producing Job.

Training component		Way of training
Field isolation, Land preparation, seeding, fertigation	Participatory	Practical oriented
Weed, Pest and Disease management (IPM)	Participatory	Practical oriented
Pollination	Participatory	Practical oriented
Harvesting and processing	Participatory	Practical oriented with exposure visits

## Appreciation of farmers

After the completion of first phase the success farmers must be appreciated and certificates should be issued for them.

## Monitoring

Monitoring aspect is very important and crucial for the success of the project. If this is not being done properly, what they are given in training session not implement properly and that negatively effect to the final out comes of the project. Suggest to monitor the whole process with two documents as follows:

1. The record to be kept with farmer and to be filled by cluster coordinator.
2. The record to be kept with coordinator and to be filled by him.

**The record to be kept with farmer and to be filled by cluster coordinator**

Name of the Farmer:..... Crop ;.....			
Acreage:.....	Date of Seeding:.....	DSD:.....	GND:.....
To be kept with farmer and filled by cluster coordinator.			
Serial number.	Activity	Should be done (Date)	Actually done (Date)
01	Land preparation		
02	Ridge and furrow preparation		
03	Fertilizer first application		
04	Fertilizer second application		
05	Fertilizer third application		
06	Fertilizer fourth application		
07	Folio fertilizer 1st application		
08	Folio fertilizer 2nd application		
09	Folio fertilizer 3rd application		
10	Folio fertilizer 4th application		
11	Weed management		
12	IPM activities first		
13	IPM activities second		
14	IPM activities third		
15	Harvesting		

**This record should be kept with farmer and cluster coordinator should fill when he is visiting that relevant farmer.**



**The record to be kept with cluster coordinator and to be filled by cluster coordinator**

Crop:...	DSD.....		GND.....				Total Ac.....			Total farmers... (Number)... ..
Serial number	Name	Acre age	DOS	DO Visit	to	DOV actual				Remarks
01										
02										
03										
04										
05										
06										
07										
08										
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31										
32										

This record should be kept with cluster coordinator and he can fill this when he is visiting farmers and upload to the system.

### **Create WhatsApp group**

Recommend to create WhatsApp group within the cluster and this may be very useful for information and knowledge sharing.

### **6.2.2 Agribusiness and Value chain perspectives**

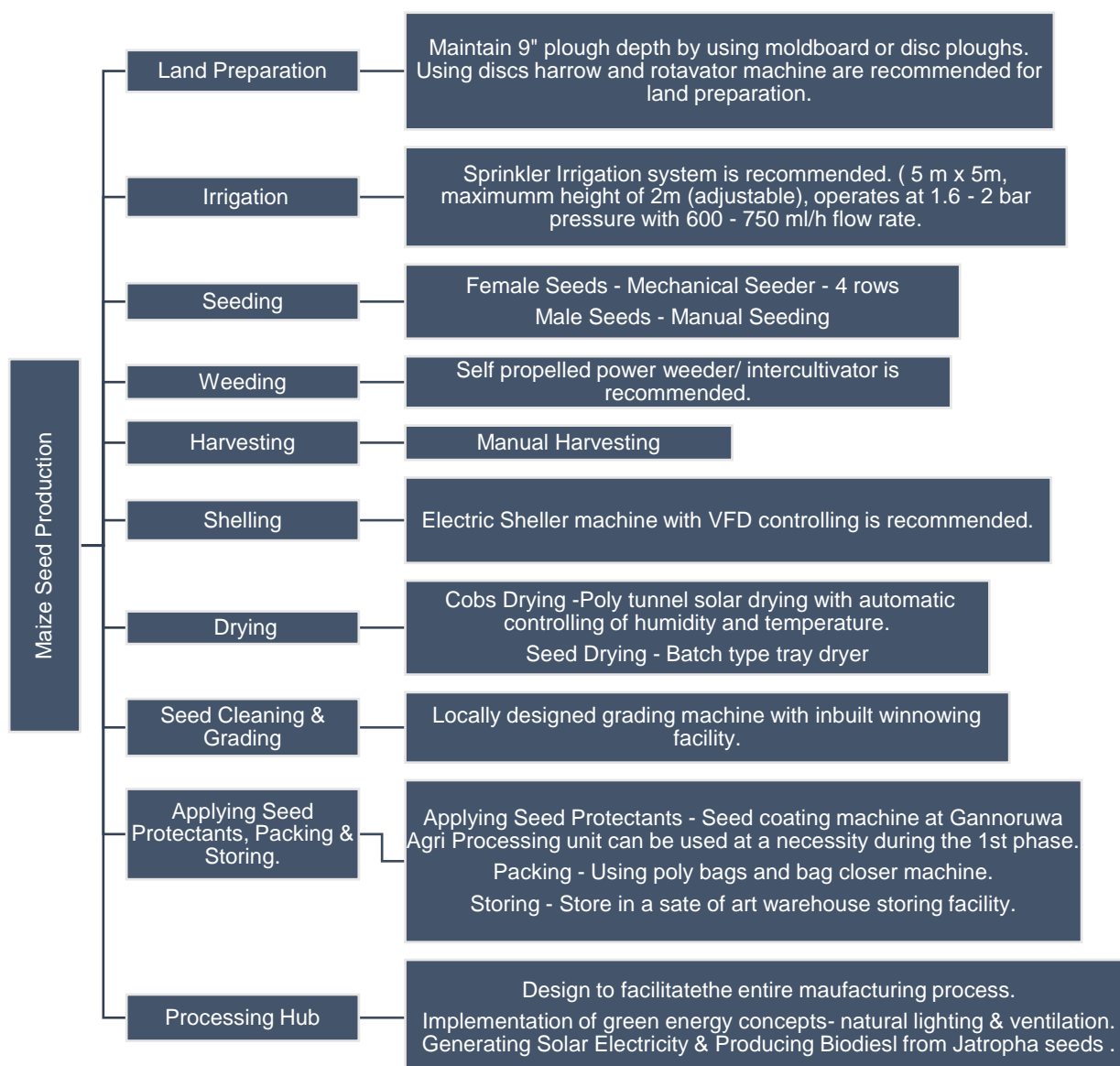
- The need for systematic, multi-faceted analysis on hybrid maize seed value chain, as a precondition for any activity to promote the maize seed production business
- With reference to the findings of the district level feasibility study Only the Ampara and Badulla district farmers have prior experience in maize cultivation along with best agro-climate suitability (4th largest producer where top producers were Anuradhapura, Moneragala and Ampara respectively). Maize, as a crop and hybrid seed production is totally new venture to North (Vavuniya and Kilinochchi districts). Only the plus point was Vavuniya farmers are experienced certified seed (paddy, black gram, cowpea, mung bean, ground nut) producers and their industriousness will empower the planned hybrid maize seed production in Vavuniya. In contrast, farmers of Kilinochchi district were small scale marginal group and exposure to unknown certified hybrid maize seed production would be high risk and challenging task for them. They are not in a position or a knowledge to undertake such ventures.
- Hybrid maize seed production essentially need to consider educated, young and entrepreneurial farmers who have capacity to take change and risks. Especially, the farmers of Ampara and Badulla district were experience maize growers but they have no idea on certified hybrid seed production. In addition to that they are risk averse group of people and only looking for subsidy and other facilities available

to empower their farming. Again challenging task to establish hybrid seed business.

- The conflict prone nature of measures, especially the selection of beneficiaries, offer subsidy package, etc. intended to redistribute benefits and formalise various stakeholders' roles and responsibilities – careful moderation and mediation is required to promote equity among the farmer groups concerned,
- The inseparable interdependency between political/legal-regulatory/institutional framework conditions on the one hand, and technical/practical issues on the other – ensuring sustainability of the hybrid maize seed business as a cornerstone of environmentally and socially friendly supplies of feed ingredient is a governance issue of the value chain,
- The need to regard the promotion of hybrid maize seed value chains as a mutual learning process of the concerned stakeholders, especially educated young farmers. Careful farmer selection, capacity building, effective training, monitoring and evaluation throughout the crop establishment, venture creation and marketing facilitation along with appropriate technology is key components of the package to the cluster.
- The need to foster ownership by means of a commonly agreed strategic vision on hybrid seed production as a responsible business
- The need for operational planning using the road-map approach for future business
- The need for impact-oriented monitoring as an indispensable factor of success. Effective training and monitoring the progress of training and use online and mobile tools are vital for the success of establishment of certified hybrid seed production and marketing business.

### **6.2.3 Technology**

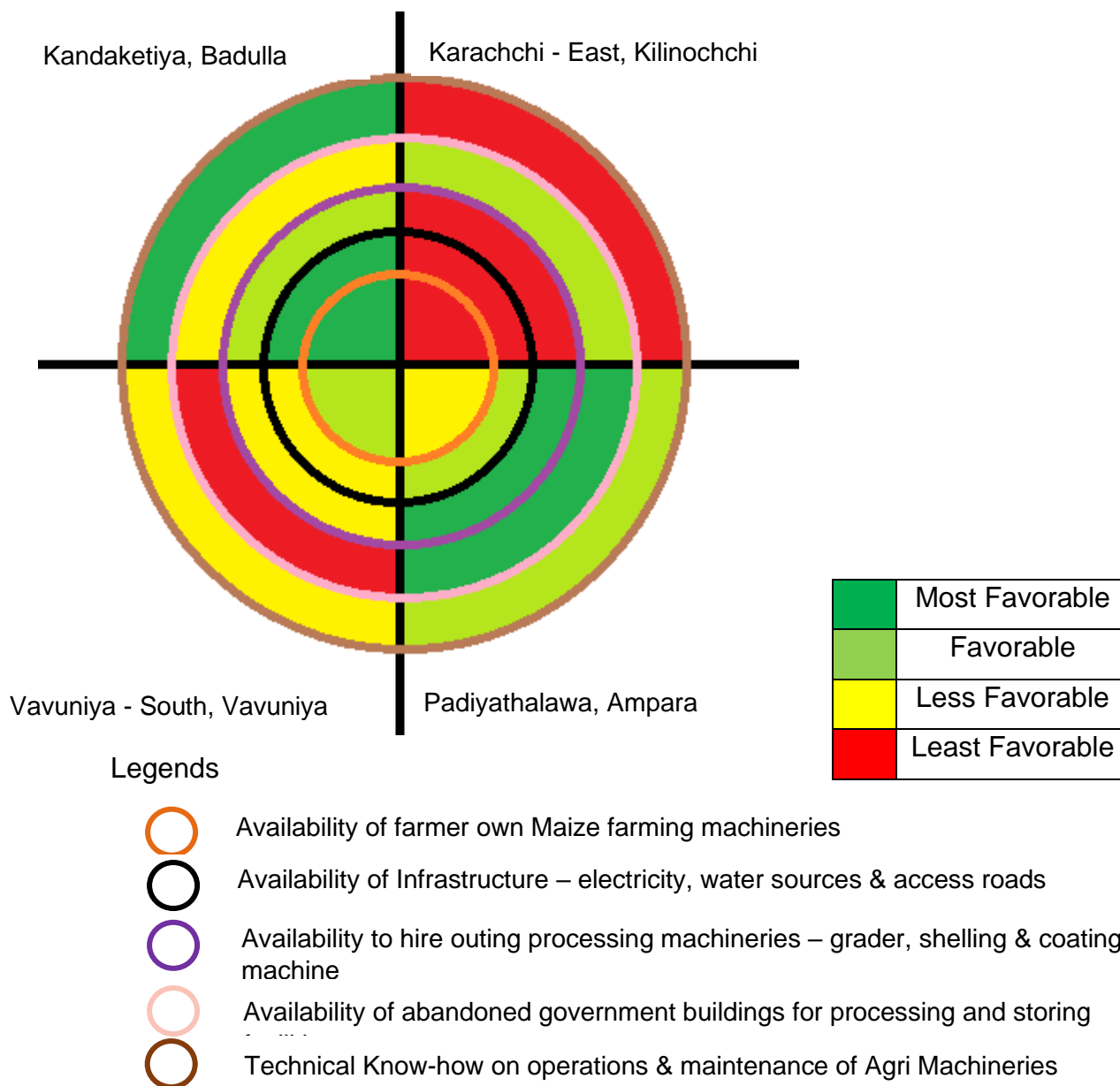
The recommended mechanization practices and higher potential technologies in Maize seed production and processing is summarized as per the diagram below:



**Figure 45:** Recommended mechanization and technologies for Maize seed producing and processing

**Note:** All machineries except seed coating machine are locally designed and fabricated. The performance of locally available seed dryer is going to be tested and decide thereon. Total machinery requirement and approximate costing has been annexed. Please refer Annexure 7.

Comparative district wise technical feasibility on available infrastructural and maize seed processing facilities - based on field visits and farmer level discussions.



Note: Please refer the annexure – Comparative assessment on available infrastructure and processing facilities for maize seed production.

Order of feasibility on available infrastructure and processing facilities is  
Kandaketiya > Padiyathalawa > Vavuniya - South > Karachchi – East.

Recommendations for increasing sustainability in maize seed production cluster.

Following initiatives are proposed in order to sustain the farmer involvement in maize seed production.

- a. Using maize empty cobs as a planting medium for Mushrooms. – Mushrooms production can be implemented in household level where farmers can have an extra income.
- b. Using maize empty cobs and husks for biogas and compost making.  
Cob yield is about 1.6 t/ha. Its potential biogas production is about 30 Nm<sup>3</sup> (with methane percentage of 52%) per acre. Biogas plants can be introduced for applications in farmer households and processing centre.
- c. Generating solar electricity and selling to the national grid under “Net Metering” scheme. The potential solar electricity generation capacity subject to roof availability and “KVA demand” registration is about 75 kW.
- d. Producing biodiesel from Jatropha seeds for cluster operations. – The approximate diesel requirement for a 50-acre seed producing cluster is 2000L for a season. As per energy calculations, it is required to grow Jatropha in 5 acres to cater the requirement. As per the preliminary discussions with farmers, it was identified Jatropha seeds can be found in Kandaketiya & Padiyathalawa areas. It is proposed to grow jatropha as a fencing material with the purpose of harvesting Jatropha seeds for producing biodiesel. The producing cost of biodiesel is ascertained at Rs. 400.00 per litre.

#### **6.2.4 Economical Recommendations**

High density planting is recommended and quality F1 seeds should be provided to the farmers. If possible, site-specific fertilizer recommendations need to be made as DoA has not provided any specific recommendations for hybrid maize seed production. Proper isolation is a must to maintain the quality of the seeds. Although the farmers' interest is high in Ampara district, special attention should be given to the interested farmers having their farmlands closer to lagoon areas as those areas are inundated in during some months of the year. As the economic returns are higher and the future maintenance of the seed production is planned to be conducted through the Public Unlisted Farmer Company, their ability for direct marketing of the seeds should be strengthened as the gains from direct marketing is higher. Investing in hybrid seed production is economically more feasible if we scale up the maize seed production as ASMP assists in fulfilling less than 10% country's seed requirement. Market for the seed industry should be assured and there can be huge competition from private sector companies that import hybrid seeds. Farmers' perception on local quality hybrid

seeds should be increased or else the total effort of the ASMP will be wasted. Assuring a seed market will cater to the long-term sustainability of the Public Unlisted Company. Training on how to market their product through Urban Marketing Centers should be given to the farmers. Having a fixed buyer will not always serve the purpose as they again will depend on the middlemen whereby, they reduce their share in total benefits. The farmers bargaining power should be improved through collectivism and direct marketing should be promoted as much as possible by shortening the supply chain. The farmers may have to be trained on costing, innovative marketing, financial management, use of IT and online platform. They should also be trained to manage their own data as those data will assist them in future planning and identifying their failures and successes. Providing subsidies and other machineries will initially assist them in establishing their business. Farmers' contribution to the production of seeds should properly be identified and they must be trained to stand on their own without making them dependents on subsidies and other facilities. Entrepreneurial should be inculcated through proper training program especially paying attention to young farmers and women farmers as they are the game changes in any program. However, proper monitoring is essential once they start to produce and market their product.

#### **6.2.5 Environmental and Social Safeguards**

- As there are areas which is considered as an upper watershed which generates water supply to down streams, supporting human and natural activities. Therefore, it is recommended to obtain approval for use of such perennial surface waterbodies from relevant regulating agencies such as Irrigation Department.
- Soil erosion in Badulla district is very high and with activities related to maize cultivation the erosion rate will aggravated further. Therefore, good engineering measures should be implemented to mitigate the soil erosion impact and take measures soil improvement measures. Avoid siltation of surface waterbodies in and around the area.
- Sedimentation and slippage of earth fills near water bodies should be strictly controlled as impacts can lead to burial of its breathing roots.
- As there are many Wildlife and Forest areas, abundance of diverse and significant fauna and flora in the area would be very higher. Therefore, it needs to protect flora and fauna including aquatic life as well as their habitats. Lands selection should be

carefully and properly done ensuring the Wildlife and Forest areas are not encroached by the Farmers.

- Community forestry types of initiatives should be implemented in terms of protecting ground water resources which is highly stressed due to climate change impacts.
- Implementation of integrated pest management practices from land preparation up to marketing is essential and reduce the use of chemicals as much as possible
- Hunting and poaching should be strictly prohibited as there are many forest areas which has very high population of wild animals
- Solid waste, construction debris should not be dump into project location or nearby. Best waste management practices such as segregation, collection, reuse, recycle, etc should be practiced as much as possible
- Burning of vegetation debris cleared from the construction should be strictly prohibited. However, in cultivation activities, burning of slash should be controlled to reduce the impact
- Air pollution, noise, vibration and waste shall be maintained to fulfil the Central Environmental Authority (CEA) regulations.
- Environmental Protection License for each industrial activity should be obtained.
- Modern and innovative measures should be implemented as practicable as possible such as waste management, introduction of bio-gas making methods, bio-diesel making, etc to reduce the amount of greenhouse gas emission due to project activities
- Sustainable solutions for processing activities should be implemented to increase the efficiency and sustainability

#### **6.2.6 Geo-Information**

Following steps has to be followed for development of spatial database. GIS Mapping outcomes are attached in Annex 6.

- GIS planning, development and implementation process  
Planning, design, implementation, management, and proper usage are the key phases of any effective and successful GIS Project. Therefore, a structured process is proposed to develop this GIS which fulfils the needs of ASMP. This methodology comprises the following main phases:



1. Planning and Requirement Analysis
2. Design Geo-Database
3. Acquisition and Development
4. Operation and Maintenance
5. Farm Level GPS locational data and Attribute data
6. Baseline Survey: A team of field officers will be deployed to capture the GPS location of each farm plot and other related data (identified during the planning stage) about farmers, plot details, existing crops, etc. Unique identification numbers will be assigned to these plots as required.
7. Drone imagery survey & new land use maps for crop clusters Large-scale maps (e.g. land use) can be developed for farm clusters using drone imagery. These maps will be extremely useful for detailed crop planning and visual analysis purposes. Required drone imagery will be purchased by the ASMP.
8. Large-scale maps (e.g. land use) can be developed for farm clusters using drone imagery. These maps will be extremely useful for detailed crop planning and visual analysis purposes. Required drone imagery will be purchased by the ASMP.
9. Monthly Updates: In order to perform temporal analysis, it is required to collect monthly farm-level data. This is a time-consuming field activity that needs proper coordination. Also, required advice and support are expected from ASMP consultants, PMU, and district level staff
10. User Interfaces and Applications. Applications with user-friendly interfaces will be developed for ASMP users to log in to ASMP server access data, GIS products, and services. Data and product downloading routings will be developed to fulfil ASMP user needs

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விவசாய நவீனமயமாக்கல் திட்டம்  
Agriculture Modernization Project



## **Agriculture Sector Modernization Project (ASMP)**

**District Feasibility Study, for preparing Cluster Development Plans (CDPs) and to guide the field staff & farmers on initial implementation of CDPs in new project Districts (Ampara, Badulla, Kandy, Kilinochchi, and Vavuniya)**

### **Stakeholders' Workshop I**

**Potential agribusinesses and Value chain development for the new districts funded by European Union**

## Rationale for the Workshop:

ASMP project for new EU districts aim to contact district level feasibility Studies with respect to the establishment of Agriculture Technology Development Parks (ATDPs), and prepare comprehensive crop Cluster Development Plans (CDPs), and to aware the farmers / farmer companies, technically guide the implementation staff about the technical matters regarding the feasibility studies & especially the CDPs during the initial stage of the crop Cluster establishments.

First stakeholder workshop with agri-food industry crowd is aimed to obtain the insights of industry personnel on new trends in global market place, what opportunities available for us to link into global value chains?, problems and issues from farm to plate with reference to our context, suggestions on crops, value additions, safety and quality management, transport and logistics, etc. Comprehensive literature reviews were conducted to identify the Sri Lankan context to understand their potential capacities and gaps relating to value chain development. Industry environmental scanning and Institutional analysis are planning to understand the status of business enabling environment. A workshop with necessary stakeholders is needed to finalise the potential crops, agribusiness ventures, value additions, safety and quality requirements, technological interventions, logistic and postharvest chain management practices.

## Objectives of the Workshop:

The objectives of the proposed workshop are threefold:

1. Introducing the concept of the project, objectives and expectations in the context of new project locations/districts with specific focus on the agricultural sector
2. Discussion on potential crops, agribusiness ventures, value additions, safety and quality requirements, technological interventions, logistic and postharvest chain management practices.
3. Identifying recommendations from stakeholder perspectives about the way forward in implementing the crop production clusters, Agriculture Technology Development Parks, capacity building of individual as well as farmer groups, knowledge sharing and information sharing methods

## Methodology:

Selection of stakeholders was based on their business engagement and both public and private sector institutions in agriculture sector were purposely selected for the event. Executive level officers were selected across the institutions and stakeholder workshop was planned to conduct via online mode due to the prevailing conditions of the country. First, all participants were invited via telephone calls and later concept of the workshop (annex 1) and agenda (annex 2) was emailed to all invited participants prior to the workshop. Reminders were sent to all invited participants and confirm their participation through the telephone calls. Final list of invited participants were divided into 3 groups; industry, exporters and policy makers.

Further, each sub group was allocated into the breakout rooms and discussions were planned with each group separately and discussions were managed by 2 consultants and facilitated by the note takers. Overall discussion was managed by the agribusiness and value chain specialist. First part of the discussion based on presentations made by ASMP project team and the presentations were on introduction to the project along with brief presentations of each subject specialist. Brief presentation of the subject specialists were selection and development of agricultural value chains, economic analysis of selected value chains, formation of farmer companies, environmental and social safe guard of the project, agronomic perspectives, value addition and formation of farm cluster processing hubs and GIS base decision support system.

Second part of the workshop was begun with the allocating each individual participant into respective breakout room. Three questionnaires, Google forms were shared among the group. Questionnaires were on potential crops; perennial crops, seasonal crops, etc. for the new project districts, potential agribusiness and analysis of institutional environment of the each district. Ten minutes were allocated to each questionnaire and discussions were performed after completing the questionnaire. Discussions were facilitated by the project team. Details of the sessions are as follows;

- All the stakeholders were assigned to three breakout rooms based on the following categories and for each breakout rooms, one facilitator and a note taker was assigned. (Annex 01)

- Policy Makers: Mr. Chopadithya Edirisinghe & Mr.S.B. Adikari

Note taker – Ms. Thilini Hansika

- Exporters: Dr. S.Darmadasa & Mr. G. Prathapasinghe

Note taker – Ms. Ruwini Bandara

- Industry Stakeholders: Mr. Arjuna Dissanayake & Prasad Jayaweera

Note taker – Ms. Sulochana Senevirathne

- **1<sup>st</sup> Discussion Session: Primary activities of the value chains**

- Ten minutes provided for filling the survey on primary activities of the agri-food value chains  
(Survey Link: <https://docs.google.com/forms/d/e/1FAIpQLSfx34rBrhNCh3IV3Ksi4-h6unnsTtcTNMNT9lFhy7sPtvRptQ/viewform>) (Annex 02)
  - Twenty minutes for the discussion: Discussed on the tentative crops, crop clusters, potential agribusinesses, value additions, safety and quality requirements, postharvest chain management, etc.
- **2<sup>nd</sup> Discussion Session: support activities of the value chain**
    - Ten minutes provided for filling the survey on support activities of the value chain.  
(Survey Link:  
<https://docs.google.com/forms/d/e/1FAIpQLSdasauSOszLiJB48YV67Gq1GcuMTtODkwf0M9uvjyaTLc0BMA/viewform>) (Annex 02)
    - Twenty minutes for the discussion: Discussed on the technological interventions, logistics, networking and market intelligence, farmer companies, capacity building, management of cluster sustainability, food and income security, etc.
  - **3<sup>rd</sup> Discussion Session: Institutional Environment**
    - Ten minutes provided for filling the survey on institutional environment of the agri-food value chains.  
(Survey Link:  
[https://docs.google.com/forms/d/e/1FAIpQLSeohMJQ\\_87lLzxhMLsdKmSW3rQb0unrQPuaL9QtNWwi6\\_qsbQ/viewform](https://docs.google.com/forms/d/e/1FAIpQLSeohMJQ_87lLzxhMLsdKmSW3rQb0unrQPuaL9QtNWwi6_qsbQ/viewform)) (Annex 03)
    - Twenty minutes for the discussion on supportive institutions related to the agri-food value chains.

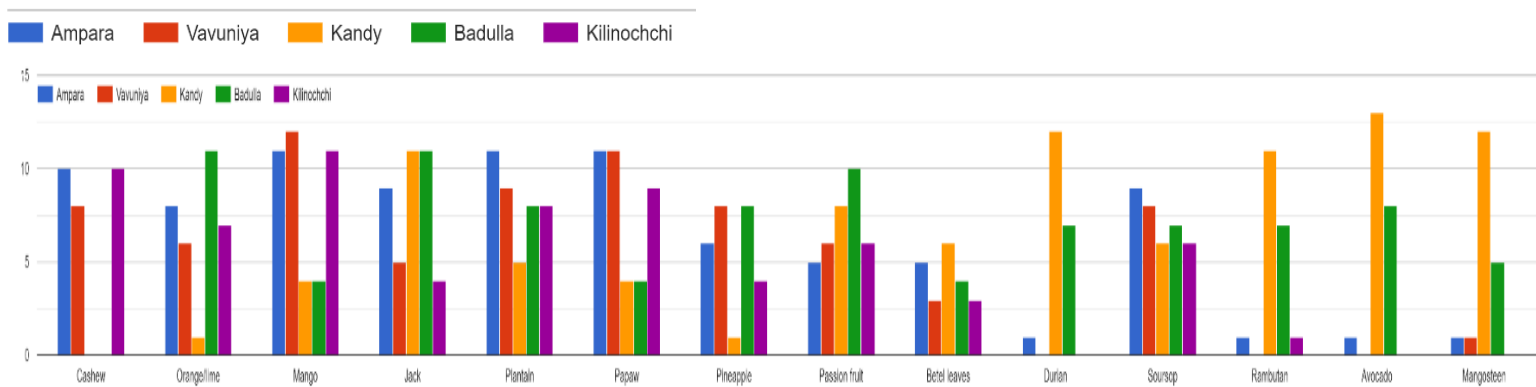
After all, three discussion sessions; a facilitated discussion was conducted by Prof. D.A.M. De Silva with all the stakeholders on the most effective export oriented, and or import substitution crops/clusters to design cluster development plans, ATDPs, etc.



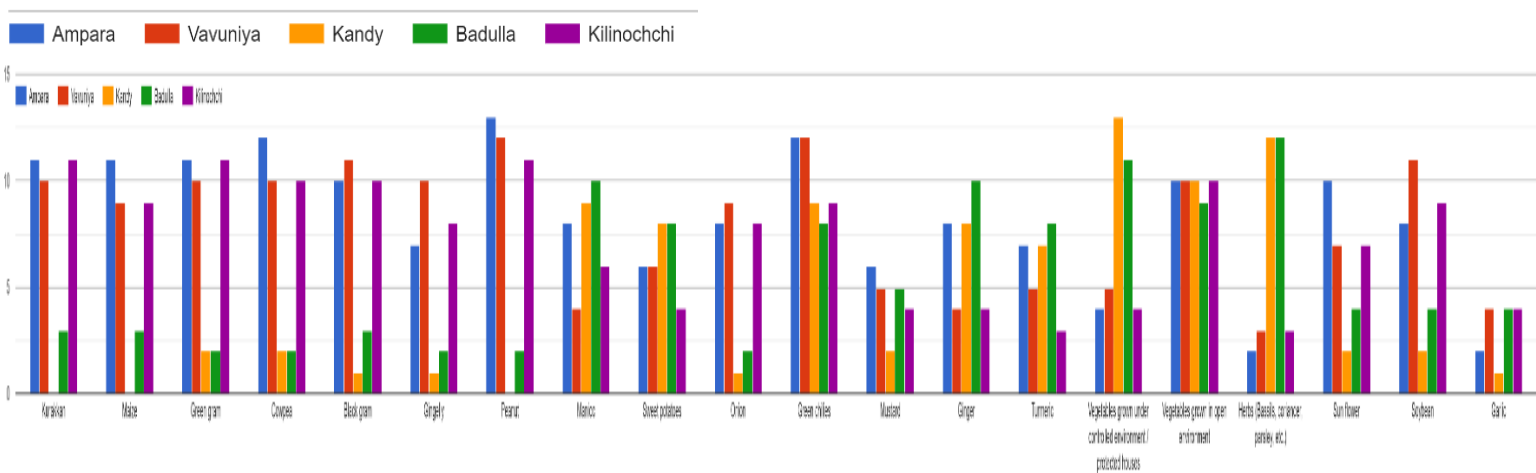
## Results :

### Discussion Session 01: Primary activities of the value chains

In the first session, the stakeholders were selected most suitable districts for permanent/semi-permanent crops and for seasonal crops as shown in the following fig.1 and fig.2. Majority of the stakeholders have selected Kandy and Ampara as most suitable districts for the both types of crops.



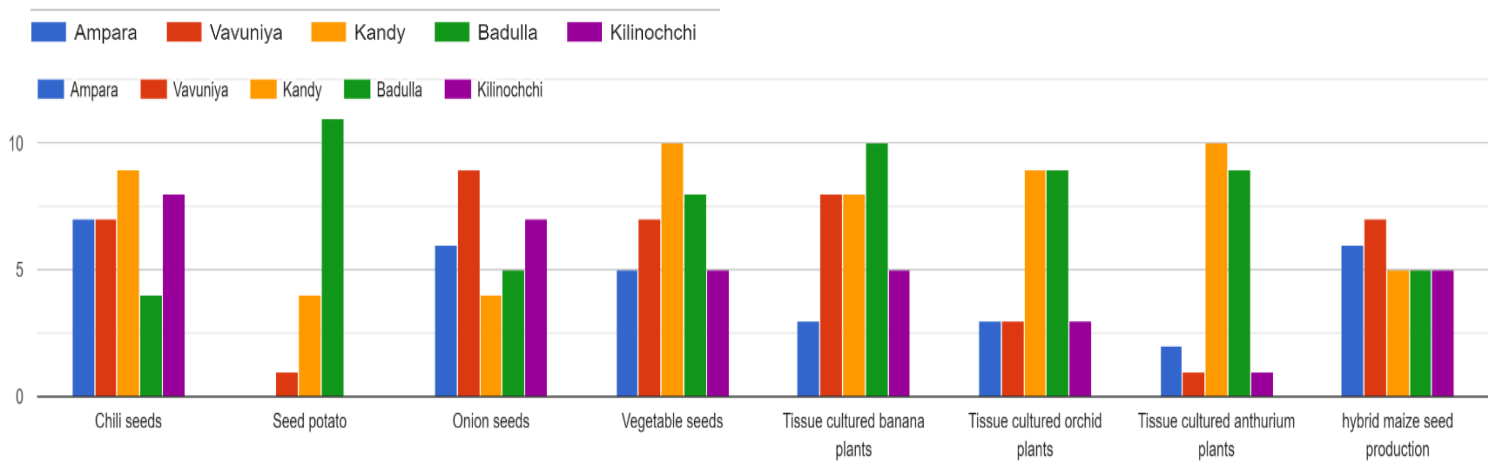
**Fig.1** Most Suitable districts for permanent/semi permanent crops



**Fig.2** Most suitable districts for Seasonal crops

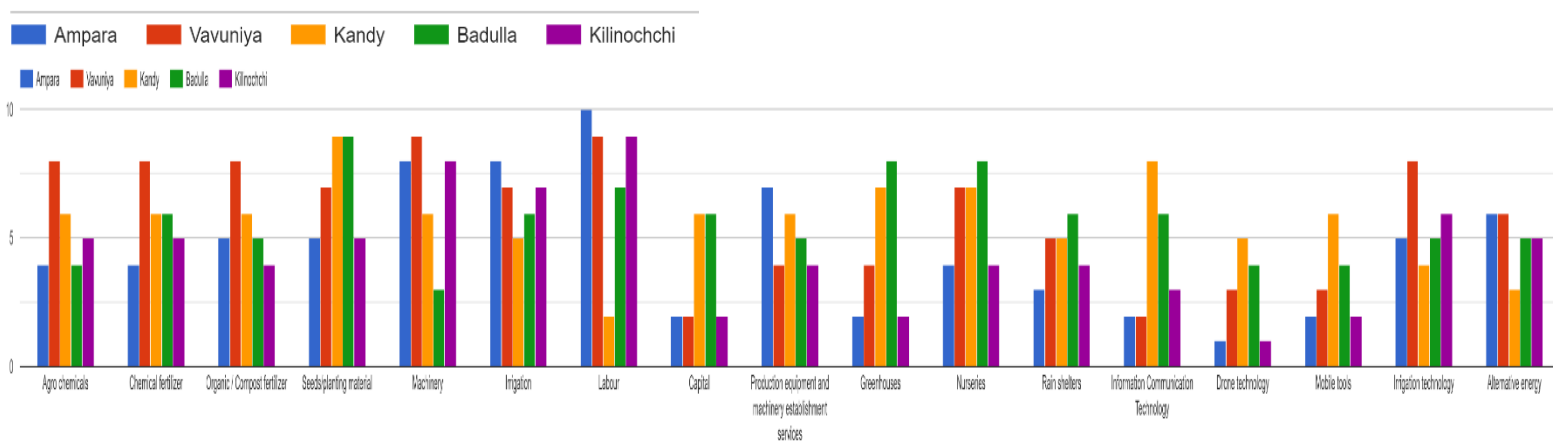
Further, the stakeholders have suggested that herbals, moringa leaves, soursop leaves, tamarind, rampe, sera etc. also can add to this crop list and Maize and cowpea also mentioned as potential crops in this areas and suggested Anuradhapura district also a potential district to consider.

As potential districts for planting material production, stakeholders have selected Badulla district mainly for seed potato production, tissue cultured banana plants and tissue cultured orchids plants. And also majority of them have selected Kandy district for vegetable seeds and tissue cultured anthurium plants. (Fig.3)



**Fig.3** Most suitable districts for the Planting material production

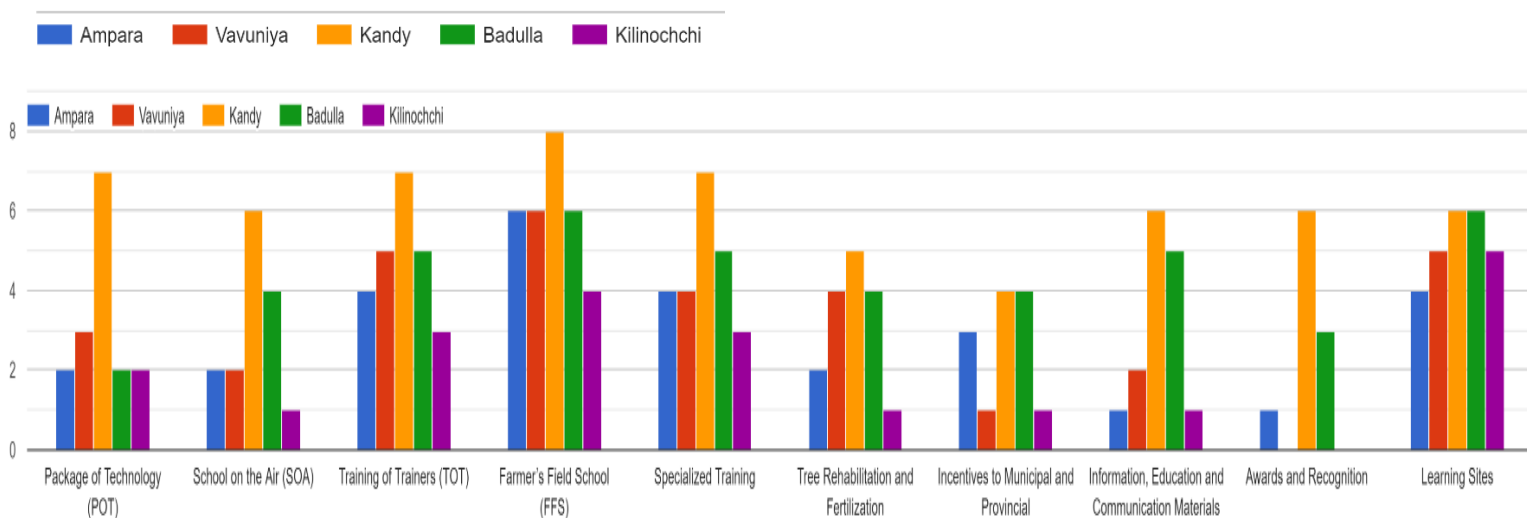
When considering on easy access to the production and input services, majority of stakeholders have selected as Ampara district for labours, Badulla for nurseries and green houses. And further Vauniya district for agro chemicals, chemical fertilizer, organic/compost fertilizer, irrigation technology and machineries (Fig.4).



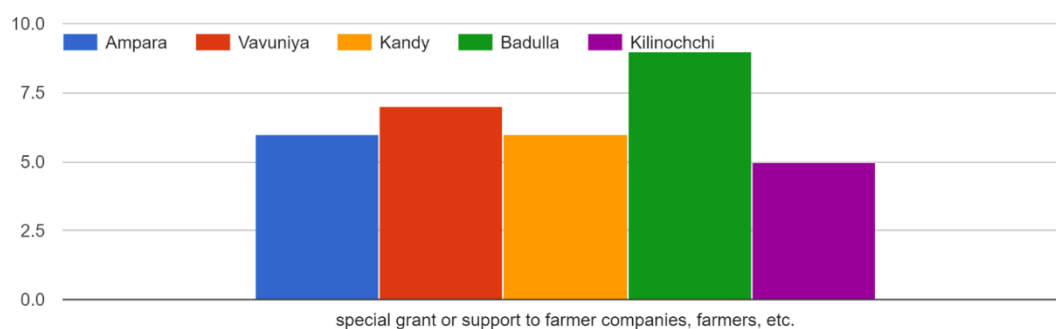
**Fig.4 Easy access to the production and input services**

Moreover, they have mentioned as lack of inputs services in Ampara and there is no special differences in case of access to inputs among districts. Its a national level problem. And those inputs can supply to any place in the country if the materials are available in the country.

As shown in the fig.5 and fig.6, stakeholders have selected Kandy district is the district which having easy access to the extension, education, and training services and also Badulla district as the most received opportunities for Research and development.

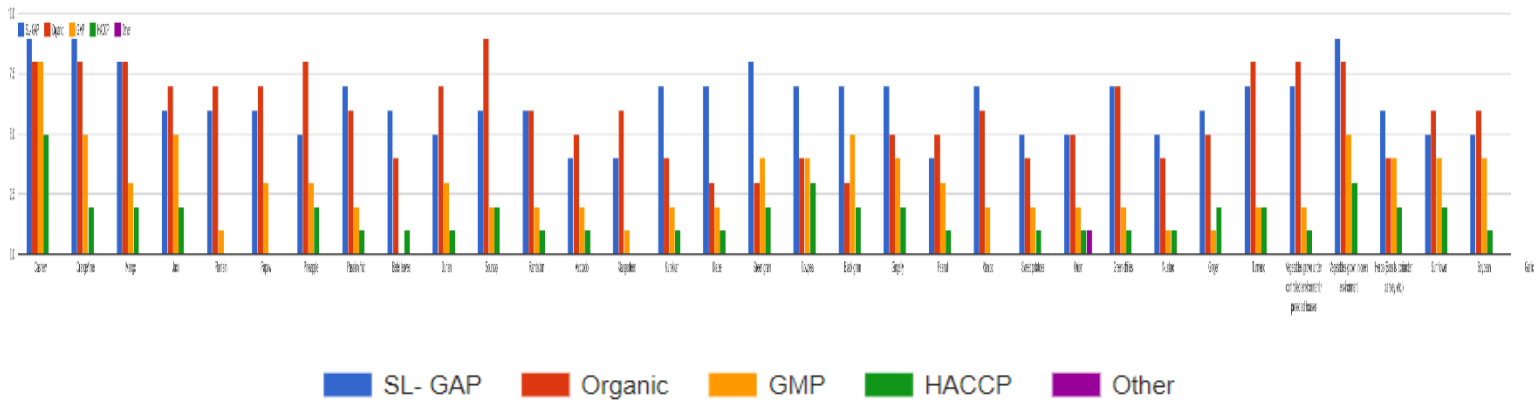


**Fig.5 Districts that have easy access to the extension, education, and training services**

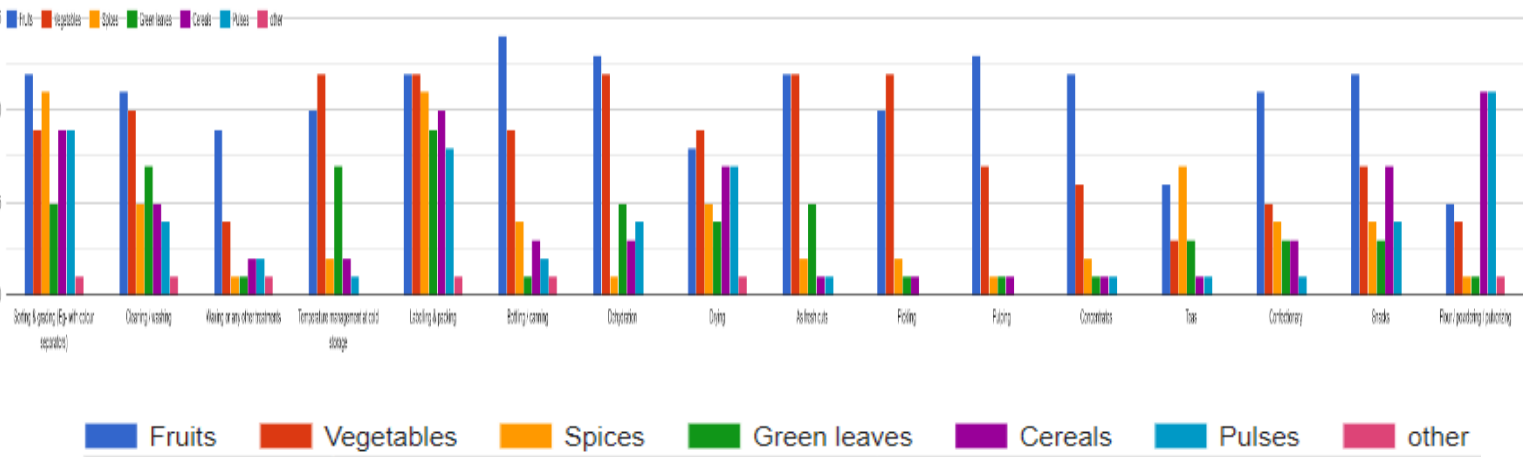


**Fig.6 Districts that have received opportunities for Research and development**

Majority of stakeholders, Sri lankan GAP and organic certifications were selected as the quality certifications / guidelines you need ASMP to go with each crop (Fig.7). Further, fruits, vegetables and spices selected as most potential value additions (Fig.8)



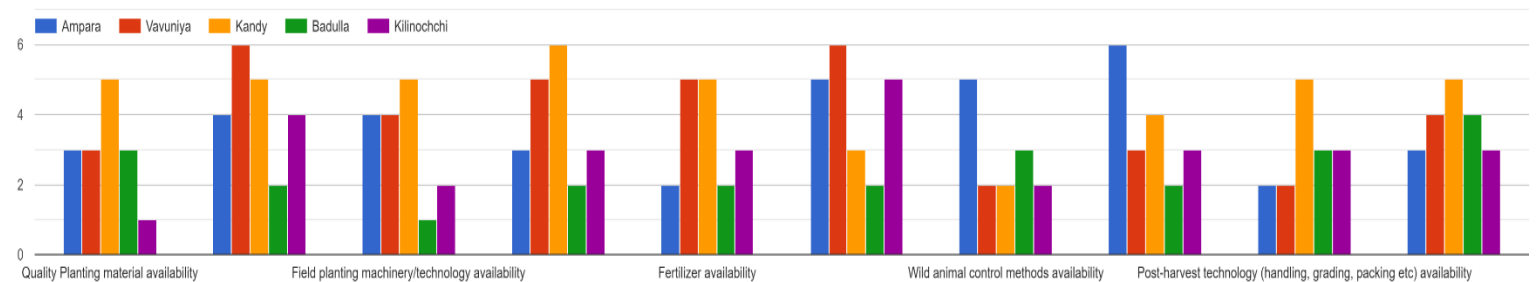
**Fig.7** The quality certifications / guidelines you need ASMP to go with each crop



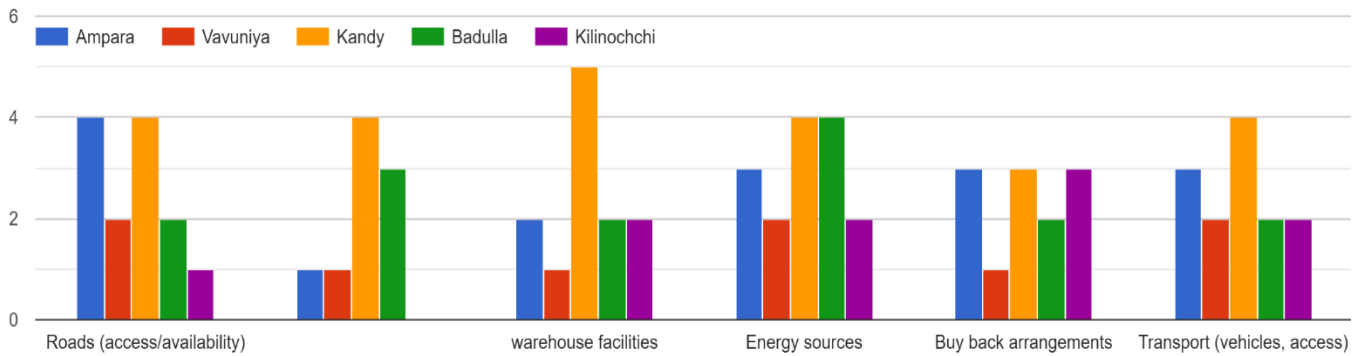
**Fig.8** Value addition potential

### Discussion Session 02: Support activities of the value chain

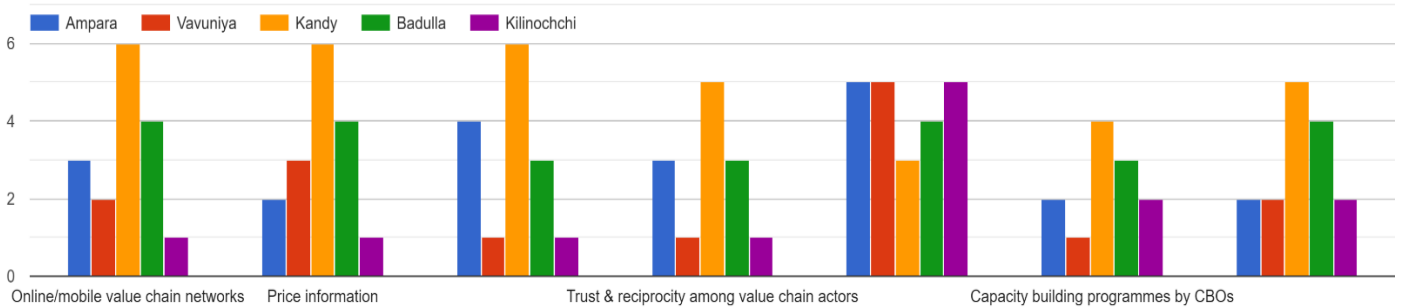
Second focus is on support activities of the value chain: Technological interventions, logistics, networking and market intelligence, farmer companies, capacity building, management of cluster sustainability, food and income security, etc. the majority of stakeholders have selected Kandy district for technological intervention, logistics and for networking and market intelligence facilities (Fig.9, Fig.10 and Fig.11).



**Fig.9 Technological interventions**

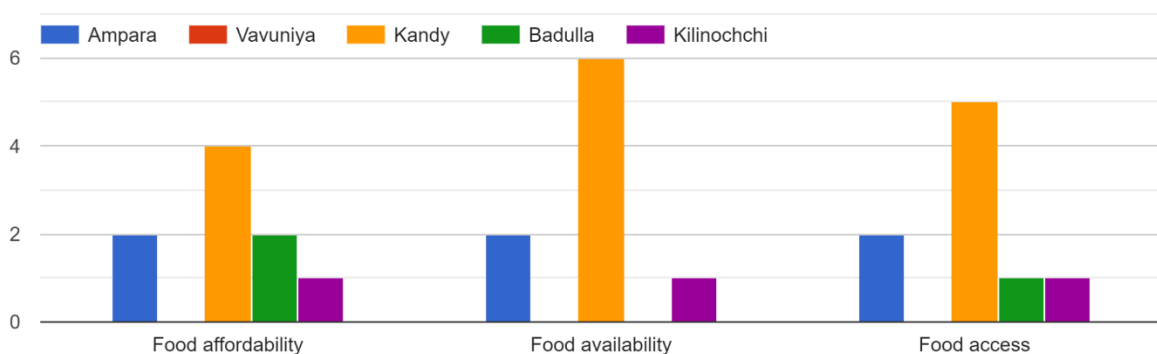


**Fig.10 Logistics Facilities**



**Fig.11 Networking and market intelligence facilities**

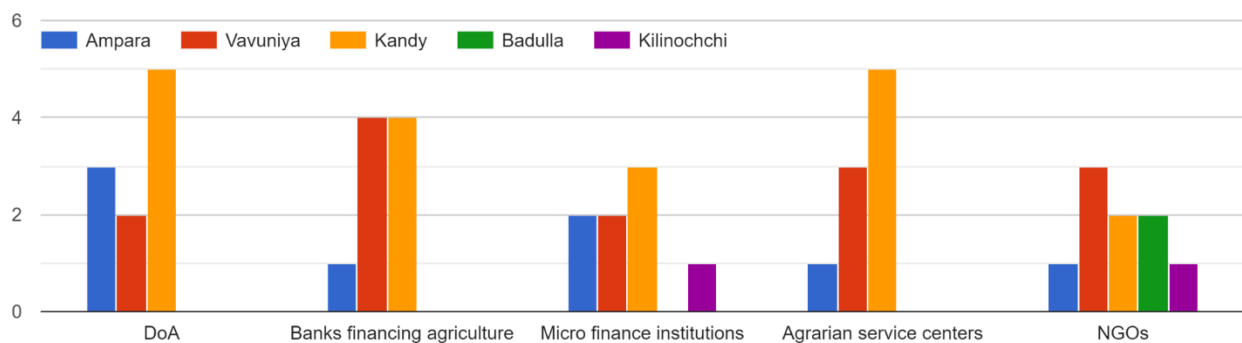
When considering on the food and income security dimensions, again Kandy district is the choice of majority of stakeholders. (Fig.12)



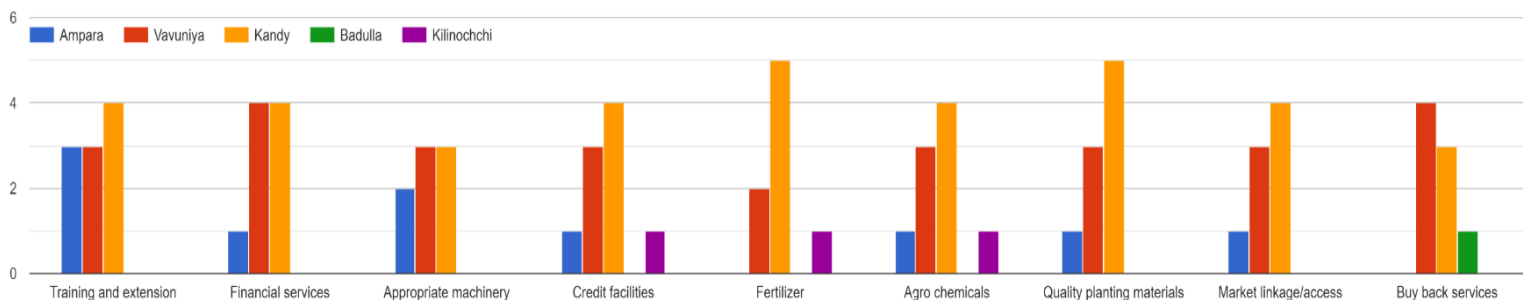
**Fig.12 Food and income security dimensions**

### Discussion Session 03: Institutional Environment

The draft institutional analysis developed by the project team was presented followed by a facilitated discussion between the stakeholders to refine the environmental scanning. As per the majority of stakeholders, most important institutions and easily accessed services also located in Kandy district which is shown in following fig.13 and 14.



**Fig.13** Most important institution/s



**Fig.14** Easily accessed services

The stakeholders have stated that, critical issues of the institutional environment on agribusiness & value chain development as per their view;

- Improper market facilities in Vavuniya District
- Scarcity of technology, Skills, Marketing standard and resources ,
- lack of awareness of the institutes and their services rendered
- Transfer of Scientific Knowledge and Cultural Practices of Growing for all crops
- Most important things are lab facilities, farmer networks, Machinery equipment packing materials, Value addition machineries (tea bags making machines

Further, for the expected services from institutions in each district on agribusiness & value chain development, they have mentioned as;

- Develop a good market, strengthen the farmer communication
- Need all necessary steps in value chain process
- 

**Special concerns;**

- 1. Traceability, authenticity & transparency of export oriented produce, Train farmers from the beginning of the production process on good practices, possibility of allocate NPQS officers throughout the chain
- 
- 2. Vegetable production in poly tunnel with uncommon vegetables unlike salad cucumber, bell pepper, cherry tomato (especially Badulla and Kandy districts ) and use abandoned tunnels.
- 
- 3. Vegetable seed production and tissue culture of planting material in Kandy and Badulla ( Anthurium. Pl. Discuss with Dr Shelumi Krisnaraja DG Botanical gardens regarding export potential of floriculture)
- Potential floriculture cluster in Badulla: Roses, Anthurium, Jerbera, Jasmine, etc
- EDB participation on export oriented production
- 
- High value herbs and condiments as inter crop for Hass Avacado cluster .
- 
- Jackfruit for all districts with IQF – cost?????????
-





## Annex 01: Concept note



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விவசாய நவீனமயமாக்கல் திட்டம்  
Agriculture Modernization Project



### **Agriculture Sector Modernization Project (ASMP)**

**District Feasibility Study, for preparing Cluster Development Plans (CDPs) and to guide the field staff & farmers on initial implementation of CDPs in new project Districts (Ampara, Badulla, Kandy, Kilinochchi, and Vavuniya)**

#### **Agenda**

##### **Stakeholders' Workshop 1**

**Potential agribusinesses and Value chain development for the new districts funded by European Union**

Date: Wednesday 22<sup>th</sup> June 2.pm

Place: Via Zoom

Zoom link: Join Zoom Meeting

<https://learn.zoom.us/j/64062108027?pwd=MTh4bmR0akd1ZjRLMEtvdmlNRHdxzd09>

Meeting ID: 640 6210 8027

Passcode: 8TGc%pY2

Duration: 3 hours

**Note:** *The Agenda, concept note and the draft programme objectives to be shared with the Stakeholders prior to the event.*

<b>Item</b>	<b>Time (SL)</b>	<b>Duration</b>	<b>By</b>		
Introduction	2.00pm	10 Mins	ASMP		
Aims and expectations of the stakeholder meeting	2.10 pm	10 Mins	Prof. Achini De Silva, Dept. of Agribusiness Management, Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka		
Expectations of the economist	2.20pm	05 Mins	Dr. Sampath Dharmadasa		
Expectations of the agronomist	2.25pm	05 Mins	Mr. Gamini Prathapasinghe		
Expectations of the institutional specialist	2.30pm	05 Mins	Mr. Chopadithya Edirisinghe		
Expectations of the engineer	2.35pm	05 Mins	Mr. Arjuna Dissanayake		
Expectations of the environmental social safeguard specialist	2.40pm	05 Mins	Mr. Prasad Jayaweera		
Expectations of the GIS expert	2.45pm	05 Mins	Mr. S.B. Adikari		
<b>Break</b>	<b>2.50pm</b>	<b>05 Mins</b>			
<b>Discussion session 1</b> First focus is on <b>primary activities</b> of the <b>value chains</b> : The tentative crops,	2.55pm	30 Mins (10Mins.	<b>Breakout room 1:</b> <b>Policy Makers</b> Mr. Chopadithya	<b>Breakout room 2:</b> <b>Exporters</b> Dr. S.Darmadasa	<b>Breakout room 3:</b> <b>Industry</b> Mr. Arjuna

<b>Item</b>	<b>Time (SL)</b>	<b>Duration</b>	<b>By</b>		
<p>crop clusters, potential agribusinesses, value additions, safety and quality requirements, postharvest chain management, etc</p> <p>Tools to be used: Structured questionnaire (google form), will be uploaded to chat thread. Discussion commence after completion of the questionnaire</p>		Questionnaire & 20 Mins. Discussion)	Edirisinghe & Mr.S.B. Adikari	& Mr. G. Prathapasinghe	Dissanayake & Prasad Jayaweera
			Note taker – Hansika Thilini	Note taker – Ruwini Bandara	Note taker – Sulochana Senevirathne
<p><b>Discussion session II</b></p> <p>Second focus is on <b>support activities</b> of the <b>value chain</b>: Technological interventions, logistics, networking and market intelligence, farmer companies, capacity building, management of cluster sustainability, food and income security, etc</p> <p>Tools to be used: Structured questionnaire (Google form), will be uploaded to chat thread. Discussion commence after completion of the questionnaire</p>	3.25pm	30 Mins (10Mins. Questionnaire & 20 Mins. Discussion)	<p><b>Breakout room 1: Policy Makers</b></p> <p>Mr. Chopadithya Edirisinghe &amp; Mr. S.B. Adikari</p> <p>Note taker – Hansika Thilini</p>	<p><b>Breakout room 2: Exporters</b></p> <p>Dr. S.Darmadasa &amp; Mr. G. Prathapasinghe</p> <p>Note taker – Ruwini Bandara</p>	<p><b>Breakout room 3: Industry</b></p> <p>Mr. Arjuna Dissanayake &amp; Prasad Jayaweera</p> <p>Note taker – Sulochana Senevirathne</p>
<b>Break</b>	<b>3.55pm</b>	<b>05 Mins</b>			
<p><b>Discussion session III</b></p> <p>Third focus is on <b>institutional environment</b> of the agrifood value chains</p> <p>Tools to be used: Structured</p>	4.00pm	20 Mins (10Mins. Questionnaire & 20 Mins. Discussion)	<p><b>Breakout room 1: Policy Makers</b></p> <p>Mr. Chopadithya Edirisinghe &amp; Mr. S.B. Adikari</p>	<p><b>Breakout room 2: Exporters</b></p> <p>Dr. S.Darmadasa &amp; Mr. G. Prathapasinghe</p>	<p><b>Breakout room 3: Industry</b></p> <p>Mr. Arjuna Dissanayake &amp; Prasad Jayaweera</p>

<b>Item</b>	<b>Time (SL)</b>	<b>Duration</b>	<b>By</b>		
questionnaire (Google form) will be uploaded to chat thread. Discussion commence after completion of the questionnaire			Note taker – Hansika Thilini	Note taker – Ruwini Bandara	Note taker – Sulochana Senevirathne
Q& A, way forward	4.20 pm	30 Mins	Q & A – Prof. Achini De Silva  Note taker – Anjana Hettige  Way forward – Mr. Sanath Wicramathilake		
Wrap up session	4.50pm	10 Mins	ASMP		

## Annex 02: Concept



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Agriculture Modernization Project



### **Agriculture Sector Modernization Project (ASMP)**

**District Feasibility Study, for preparing Cluster Development Plans (CDPs) and to guide the field staff & farmers on initial implementation of CDPs in new project Districts (Ampara, Badulla, Kandy, Kilinochchi, and Vavuniya)**

### **Concept Note for Stakeholders' Workshop 1**

**Potential agribusinesses and Value chain development for the new districts funded by European Union**

**Prof. Achini De Silva**

**2022**

**Project Title:** District Feasibility Study, for preparing Cluster Development Plans (CDPs) and to guide the field staff & farmers on initial implementation of CDPs in new project Districts (Ampara, Badulla, Kandy, Kilinochchi, and Vavuniya)

The ASMP project team would like to invite you to take part in the stakeholder meeting, planned to get your valuable feedback for the potential export oriented agribusinesses and value chain development and or upgrading in new districts funded by EU. The summary of the workshop and the date, time and the zoom link are given below for your kind perusal. Your valuable comments during the stakeholder meeting will be highly appreciated. Contact details of the project lead and the organizers are given below. We kindly requests you to complete the table given in Annex I and return it to us ASAP.

Thank you.

**Proposed Workshop Date and Time:** *June* 22, 2022; 2 – 5 pm India

**Duration:** 3 hours

**Place:** Zoom only meeting

**Zoom Link:**

<https://learn.zoom.us/j/64062108027?pwd=MTh4bmR0akd1ZjRlMEtvdmlNRHdxdz09>

Date : June 22, 2022, 14:00 India Standard Time

Join Zoom Meeting

Meeting ID: 640 6210 8027

Pass code: 8TGc%pY2

**ASMP project (new EU Districts):**

The Agriculture Sector Modernization Project (ASMP) is comprised of three components. The Component-1, Agriculture Value Chain Development, seeks to promote commercial and export oriented agriculture and this component is implemented by the Ministry of Plantation Industries (MOPI). The Component-2, Productivity Enhancement and

Diversification Demonstration (this particular assignment relates to the Component-2) is implemented by the Ministry of Agriculture (MOA). The Component-2 aims to support smallholder farmers to produce competitive and marketable commodities, improve their ability to respond to market requirements and move towards increase commercialization. The Component-3 focuses on human resource management, and capacity building, logistic requirements, monitoring and evaluation, communication and coordination of the overall Project.

The listed below are the sub-components of the Component-2 of the ASMP implemented under the MOA:

- a. **Farmer Training and Capacity Building:** Under this Sub-component, all the non-technical farmer trainings (mainly through *Farmer Business School – FBS*) are provided to all the member farmers of the *Farmer Companies (FCs)* as well as to the selected non-member farmers living around the cluster areas with the aim of improving their soft skills (referring farming as a business), carry out related awareness and exposure visits (local as well as foreign), empowering Farmer Companies providing the related trainings to the lead farmers as well as to the potential second generation young farmers, and providing the assets needed to operate the Farmer Companies.

All related institutional capacity building activities are carried out under this sub-component in order to establish and empower the Farmer Companies.

- b. **Modern Agriculture Technology Parks (ATDPs):** This is the main Sub-component the Component-2 of ASMP. All the crop cluster selection, design, establishment and continuity of crop clusters is ensured under this sub-component. Each individual member farmer of the FC will receive a technology package as a grant under this Sub-component. In addition, farming related collective assets, cluster specific common *Agro Processing Hubs - APHs* (mostly one per each cluster), and common *Urban Marketing Centers - UMCs* (mostly one per each District – not necessarily), certain technical exposure visits, trainings and awareness, specific technical consultancies will be delivered under this Sub-component.

- c. **Production and Market Infrastructure:** Under this Sub-component, Cluster / ATDP specific market infrastructures (Eg. Common APHs, UMCs, *Compost Making Units - CMUs*), required irrigation infrastructures, identified market access roads and any other specific supportive infrastructures will be established. In addition, the consultancy assignments related to Engineering Designing and Establishments will be carried out under this sub-component.
  
- d. **Analytical and Policy Advisory Support:** Related Policy Studies as well as required Analytical Studies are carried out under this particular Sub-component. In addition, conducting certain related assessments / evaluations, organizing *Techno Forums, Policy Forums*, formulation Policy / Strategy briefs / guidelines are carried out.

**Project Locations:**

ASMP currently works in five provinces namely Northern Province, North Central Province, Uva Province, Eastern Province and Central Province in the implementation of the Component-2. Twelve districts have been selected to implement the Agriculture Technology Demonstration Park concept namely Amara, Anuradhapura, Badulla, Batticaloa, Jaffna, Kandy, Kilinochchi, Mathale, Monaragala, Mullativu, Polonnaruwa, and Vavuniya. Out of the above 12 Districts, this particular assignment relates only to the new ASMP Districts, namely Ampara, Badulla, Kandy, Kilinochchi, and Vavuniya Districts.

**Source of funding:**

The Democratic Socialist Republic of Sri Lanka has obtained a Credit of US\$ 58.63 Million from the World Bank through the International Development Association (IDA) and received Grant of US\$ 26 Million from the European Union (EU) for the ASMP of the Ministry of Agriculture.

**Rationale for the Workshop:**



ASMP project for new EU districts aim to contact district level feasibility Studies with respect to the establishment of Agriculture Technology Development Parks (ATDPs), and prepare comprehensive crop Cluster Development Plans (CDPs), and to aware the farmers / farmer companies, technically guide the implementation staff about the technical matters regarding the feasibility studies & especially the CDPs during the initial stage of the crop Cluster establishments.

First stakeholder workshop with agrifood industry crowd is aimed to obtain the insights of industry personnel on new trends in global market place, what opportunities available for us to link into global value chains?, problems and issues from farm to plate with reference to our context, suggestions on crops, value additions, safety and quality management, transport and logistics, etc.

Comprehensive literature reviews were conducted to identify the Sri Lankan context to understand their potential capacities and gaps relating to value chain development. Industry environmental scanning and Institutional analysis are planning to understand the status of business enabling environment. A workshop with necessary stakeholders is needed to finalise the potential crops, agribusiness ventures, value additions, safety and quality requirements, technological interventions, logistic and postharvest chain management practices.

### **Objectives of the Workshop:**

The objectives of the proposed workshop are threefold:

4. Introducing the concept of the project, objectives and expectations in the context of new project locations/districts with specific focus on the agricultural sector
5. Discussion on potential crops, agribusiness ventures, value additions, safety and quality requirements, technological interventions, logistic and postharvest chain management practices.
6. Identifying recommendations from stakeholder perspectives about the way forward in implementing the crop production clusters, Agriculture Technology Development Parks, capacity building of individual as well as farmer groups, knowledge sharing and information sharing methods

### **Outcome of the Workshop:**

The outcome of the workshop will be a summary report developed by the host. Furthermore, the conclusions and insights drawn from the discussions will help refine the feasibility studies, cluster development plans and capacity building in new project districts.

**Format:**

The workshop will be half-a-day (approximately 3 hours including breaks).

The workshop WILL BE RECORDED to provide for an accurate representation of views/discussions. The workshop host and the project lead will facilitate the discussions. To ensure maximum engagement of participants, at least 03 break-out rooms will be organised between practitioners, industry experts and the project team.

**Agenda:**

1. The workshop will begin with a general overview of the ASMP project and the new EU funded districts.
2. First focus is on primary activities of the value chains: The tentative crops, crop clusters, potential agribusinesses, value additions, safety and quality requirements, postharvest chain management, , etc developed by the project team will be presented followed by a facilitated discussion between the stakeholders to refine these.
3. Second focus is on support activities of the value chain: Technological interventions, logistics, networking and market intelligence, farmer companies, capacity building, management of cluster sustainability, food and income security, etc
4. The draft institutional analysis developed by the project team will be presented followed by a facilitated discussion between the stakeholders to refine the environmental scanning
5. A facilitated discussion on the most effective export oriented, and or import substitution crops/clusters to design cluster development plans, ATDPs, etc.
6. Recommendations on the way forward and an exchange of ideas on a common vision for the implementation of the proposed proect will be sought from participants.

**Confidentiality of data:**

All data that will be obtained in the workshop will be treated with strict confidentiality and will only be used for this research. Any information regarding any respondent or organisation

will not be disclosed, and the data collected will be kept in a secure location. The names of the respondents and the organisations will not appear in any publication resulting from this research. After participants have read this information and asked any questions, they will be given a consent form to be completed and signed. Participants will be able to withdraw at any time (even during the workshop), for any reason without explaining the reasons for withdrawing.

### **Contact Details for any Enquiries –**

#### **Workshop Hosts:**

Ms. Asoka – [policyspecialistasmp@hotmail.com](mailto:policyspecialistasmp@hotmail.com)

Mr. Sanath Wickramathilake – [sanathwickramathilake@yahoo.com](mailto:sanathwickramathilake@yahoo.com)

Prof. Achini De Silva: Email – [desilva.achini@yahoo.co.uk](mailto:desilva.achini@yahoo.co.uk) / [achini@agri.sab.ac.lk](mailto:achini@agri.sab.ac.lk)

Dr. Sampath Dharmadasa – [sampath@uwu.ac.lk](mailto:sampath@uwu.ac.lk)

Mr. Gamini Prathapasinghe – [gprathapasinghe@gmail.com](mailto:gprathapasinghe@gmail.com)

Mr. Chopadithya Edirisinghe – [chopadithya@gmail.com](mailto:chopadithya@gmail.com)

Mr. Prasad Jayaweera - [japjayaweera@gmail.com](mailto:japjayaweera@gmail.com)

Mr. Arjuna Dissanayake – [arjunauom@gmail.com](mailto:arjunauom@gmail.com)

Mr. S.B. Adikari – [adikari8@gmail.com](mailto:adikari8@gmail.com)

**Annex 1- Participant Consent Form**

**Project Title:** ASMP Agriculture Sector Modernization Project (new EU districts)

**Workshop Host:** Prof. Achini De Silva, Dr. Sampath Dramdasa, Mr. Chopadithya Edirisinghe, Mr. Gamini Prathapasinghe, Mr. Prasad Jayaweera, Mr. Arjuna Dissanayake, Mr. S.B. Adikari, Mr. Sanath Wickramathilake

**Name of the Workshop Participant:**

**Email of the Workshop Participant:**

Please delete as appropriate.

- I confirm that I have read and understood the information sheet for the above research and what my contribution will be
- I have been given the opportunity to ask questions about my participation
- I agree to take part in the workshop
- I understand that all the information I provide will be treated in strict confidence
- **I agree to the workshop, and my participation, being recorded**
- I understand that I have the right to withdraw from this study at any stage for any reason, and that I will not be required to explain my reasons for withdrawing

Yes	No
Yes	No
Yes	No
Yes	No
Yes	No
Yes	No

Name of the participant:

Signature:

Date:


## Annex 03: List of Participants

### Policy Makers:

No.	Name	Email	Contact Number	Role
1	Ms. Kumari Meegahakotuwa	<a href="mailto:kumari5meegahakotuwa@yahoo.com">kumari5meegahakotuwa@yahoo.com</a>	718570578	Director General, Research, Innovations, Ministry of Science and Technology
2	Mr. Suresh Demel	<a href="mailto:sureshdemel@yahoo.com">E-mail: sureshdemel@yahoo.com</a>	<a href="tel:94712221888">94 712221888</a>	EDB (Agriculture exports: export promotions, Organic & GI, Trade fairs, etc)
3	Ms. MaLani Badddegama	<a href="tel:7195008855">7195008855</a>	<a href="tel:112303973">112303973</a>	EDB (Agriculture exports: export promotions, Organic & GI, Trade fairs, etc)
4	Mr. Janak Sanjeewa Bdagama		112300731	EDB (Agriculture exports: export promotions, Organic & GI, Trade fairs, etc)
5	Mr. Gamini Weerasinghe	<a href="mailto:weerasinghe@slsi.lk">weerasinghe@slsi.lk</a>	<a href="tel:776226779">776 226 779, +94 711 000 054</a>	Senior Deputy Director at Sri Lanka Standards Institution
6	Ms.NHMS Chithrapala	<a href="mailto:madusajani@yahoo.com">madusajani@yahoo.com.</a>	94 112 252028/29 Ext: 212 +94 714 471408	Assistant Director of Agriculture (Research). National Plant Quarantine Service
7		-	94 11 2143434 Extensions:	SL Customs Export Division
8	Mr.G.L.Gnanatheva	<a href="mailto:gnanatheva@doc.gov.lk">gnanatheva@doc.gov.lk</a>	<a href="tel:0112329734">011 232 9734/</a> <a href="tel:0112329734">ext 316</a>	Department of Commerce, Deputy Head of Trade Promotion Division
9	Mr. K. Kanojan	<a href="mailto:npo@edb.gov.lk">npo@edb.gov.lk</a>	<a href="tel:94212215944">Telephone :94 21 221 5944</a>	Director,EDB Provincial Office North Province
10	Mr. Saranga Wijeyarathne	<a href="mailto:saranga111@gmail.com">saranga111@gmail.com</a>	Direct (+94) 773 219 773	Colombo Chamber of Commerce
11	Mr. Nasser Hammad		+94 773 082870	Lanka Fruit & Vegetable Producers, Processors and Exporters Association, Nawam Mawatha, Colombo, Sri Lanka

12	Prof. Dharmadasa	<a href="mailto:dharmadasarm@gmail.com">dharmadasarm@gmail.com</a>	<a href="tel:702588542">702588542</a>	Research Professor/ Director, Industrial Technology Institute
13	Prof. Manjula Magamage	<a href="mailto:magamage@agri.sab.ac.lk">magamage@agri.sab.ac.lk</a>	0716143955 0772445783	Chairman, National Livestock Development Board
14		<a href="mailto:direoh@health.gov.lk">direoh@health.gov.lk</a>	<a href="tel:94112694860">94 112 694 860</a>	Food Control Administration Unit Ministry of Health
15	Dr. (Mrs) Siddhika G Senaratne	<a href="mailto:dg@slsi.lk">dg@slsi.lk</a>	<a href="tel:94112671574">94 11 2671574</a>	Director General, SLSI
16	Ms. T.T. Upulmalee Premathilaka	<a href="mailto:cg@imexport.gov.lk">cg@imexport.gov.lk</a>	<a href="tel:94112448311">94 112 448311</a>	Controller General, Department of Imports and Exports Control
17	Ms. Menka Wanniarachchi		94 114 651 765	Director Operations, National chamber of exporters
18	Mr. Dilhan De Silva		714433104	central bank
17	Ms. Gayani		718365003	EDB (Agriculture exports: export promotions, Organic & GI, Trade fairs, etc)

Exporters:

No.	Name	Email	Contact Number	Role
1	Mr. A. R. A. Kumara (Proprietor)		<a href="tel:+94523533498">+94 523 533498</a>	AJITH CHINESE VEGETABLE SUPPLIER
2	Mr. Indralal Jayantha Alwis (Managing Director)	-	94 312 223898	ALWIS AGRO EXPORTS (PVT) LTD
3	Mrs. Celine Josephine Sujeewa Kuhafa (General Manager)	-	94 11 2940326	BEYOND EXPORTS
4		<a href="mailto:info@vegiland.lk">info@vegiland.lk</a>	<a href="tel:0112248516">0112 248 516</a>	Vegiland Exporters Pvt. Ltd
5	Mr. Upali Ranasinghe (Managing Director) Ms. R. A. Charindi Ranasinghe (Deputy Chairperson)		<a href="tel:94112224961">94 112 224961</a> <a href="tel:94773536353">94 773 536353</a>	C.R. EXPORTS (PVT) LTD
6		<a href="mailto:amkfood@sltnet.lk">amkfood@sltnet.lk</a>	<a href="tel:112855634">112855634</a>	A M K Food Export Pvt Ltd
7		<a href="mailto:info@raviexport.com">info@raviexport.com</a> <a href="mailto:info@raviexport.com">info@raviexport.com</a>	711250283	Ravi Exports (Pvt) Limited
8				
9	Mr. Indika Daraniyagala	<a href="mailto:indika@fairtradeorganicteas.com">indika@fairtradeorganicteas.com</a>	711935834	Greenfield Bio Plantation (pvt) ltd
10	Mr. Udayanga Abesinghe	<a href="mailto:udayanga@fairtradeorganicteas.com">udayanga@fairtradeorganicteas.com</a> (	-	Greenfield Bio Plantation (pvt) ltd
11	Mrs.Tharanga Abeynayake	-	718933313	Cocotana Coconut Products
12	Mr.Kusumsiri	-	711840769	Rasoda Dairy
14	Managing Director	<a href="mailto:mahesh@sriposha.lk">mahesh@sriposha.lk</a>	0718417497/ 0813124174	Sriposha Lanka Foods (PVT) Ltd Kandy
15	Mr. Eranga Abeywickrama Human Resource Manager (Head Office) Dole Lanka (Pvt) Ltd	<a href="mailto:Eranga.Abeywickrama@doleintl.com">Eranga.Abeywickrama@doleintl.com</a>	703703017	Dole Lanka (Pvt) Ltd

16	Mr. Sathis Abeywickrama Managing Director Gurbeula Farms & Restaurants (Pvt) Ltd	usa@eol.lk , copy email to vidarsha@printusagroup.com		Gurbeula Farms & Restaurants (Pvt) Ltd
17	Mr. Janaka Chandana Abeyratne General Manager Samagi Spice Exports Pvt Ltd. Baragama Road Makandura.	samagispice@gmail.com	0412268541/ 0777728787	Samagi Spice Exports Pvt Ltd. Baragama Road Makandura.
18	Ms. Shehani Liyanage, Country Senior Marketing Manager at Upfield, Upfield professionals Sri Lanka. Resmead Place, Colombo 07	shehani.liyanage@upfield.com	769226442	Upfield Sri Lanka

### Industry Stakeholders:

No.	Name	Email	Contact Number	Role
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1	Mr. Ishafir Izzadeen	izzadeen@aitkenspence.lk izzami65@gmail.com	077779507 / 0772449478	Senior General Manager, Atiken Spence Plantations
2	Mr. Geeth Kumara Dayananada	<a href="mailto:icco@elpitiya.com">icco@elpitiya.com</a>	<a href="tel:777225453">777225453</a>	Senior General Manager, Elpitiya Plantations, Aitken Spence Plantations
3	Mr. Nishan Senewirathne	<a href="mailto:nishanthas@lalanrubber.com">nishanthas@lalanrubber.com</a>	<a href="tel:072259777">072259777</a> <a href="tel:0772376209">0772376209</a>	General Manager, Lalans Rubber co. pvt. Ltd.
4	Mr. Prasanna Hettiaarachchi	<a href="mailto:prasanna@saaraketha.com">prasanna@saaraketha.com</a>	<a href="tel:773451768">773451768</a>	Founder, Saraketha Holdings
5	Mr. M.S. Andrew	<a href="mailto:andrew.marcus@maxies.lk">andrew.marcus@maxies.lk</a>	<a href="tel:+94704931727">(+94) 70 4931727</a> <a href="tel:+94312255555">(+94) 31 2255555</a>	Quality Manger Maxies & Company (Pvt) Ltd
6	Mr. Nalin Lokuge	nalinal@hddes.com	768945225	HDDDES Group General Manager
7	Dr. Nelum Vithana	<a href="mailto:nelum.v@cargillsceylon.com">nelum.v@cargillsceylon.com</a>	<a href="tel:770283149">770283149</a>	Group Manager, Health and Nutrition, Cargills Ceylon PLC
8	Mr. Vikum Nissanka	<a href="mailto:vikum.n@cargillsceylon.com">vikum.n@cargillsceylon.com</a>	<a href="tel:0717741333/0767481333">0717741333/0767481333</a>	Manager-Product Development, Cargills Ceylon Plc
9	Ms. Chalithra Dissanayake	<a href="mailto:chalithra.a@lankem.lk">chalithra.a@lankem.lk</a>	<a href="tel:776765673">776765673</a>	Manager-Marketing, Lankem Ceylon Plc.
10	Mr. Manjula Doloswala	<a href="mailto:doloswala@versa.lk">doloswala@versa.lk</a>	702110293	CEO, Versatile Business Solutions
11	CAN market	canmarket@thecreativeisle.com	+94 71 869 8084	CAN market

12	Tyrell Fernanodo	tyrell@slt.net.lk	00 94 312233773	Director, People's Organisation for Development Import & Export.
13	GOOD Market		077 020 8642	
14	Mr. Chamila Gunarathna		112 308308	(Manager Exports), Atiken Spence Plantations
15	Lanka Canneries (Pvt) Ltd	<a href="mailto:info@lankacanneries.com">info@lankacanneries.com</a>	011-2586622	Lanka Canneries (Pvt) Ltd
16	Mr. Randeewa Malalasoorya (Cluster CEO) Ms. Pasani Siriwardena (Business Support Executive)		117 388500 - 4	CBL NATURAL FOODS (PVT) LTD
17	Mr. Priyanthe		718684276	Amazon trading (Pvt) Ltd/ English tea shop
18	Mr. Sudesh Mahanama		342280092	Wijaya Products (PVT) LTD
19	Mr. U.J.Gunawardhana, Assistant Manager, CIC Agri Business, Hingurakgoda	<a href="mailto:jayasiri@sicagri.com">jayasiri@sicagri.com</a>	773570491	CIC Agri Produce Marketing ( Pvt) Ltd.
20	Mrs.Dilini Pathirage Quality Assurance Manager Lanka Spice (Pvt)Ltd- Mc Currie Green Foods (Pvt)Ltd	<a href="mailto:dilini@mccurrie.net">dilini@mccurrie.net</a> <a href="mailto:hrmccurrie@gmail.com">hrmccurrie@gmail.com</a>	703033725	Lanka Spice (Pvt)Ltd- Mc Currie Green Foods (Pvt)Ltd
21	Mr.Malinda Rajakaruna Production Manager ( Biscuits), Uswatte Confectionery Works (Pvt) Ltd, Millaniya.	<a href="mailto:malinda.k@uswatteconfectionery.com">malinda.k@uswatteconfectionery.com</a>	777543477	Uswatte Confectionery Works (Pvt) Ltd,
22	Mr. Nishantha Bandara Production Manager Sunquick Lanka Pvt Ltd Munagama, A8 Horana.	<a href="mailto:nishantha.b@sunquicklanka.com">nishantha.b@sunquicklanka.com</a>	(070) 337 3006	Sunquick Lanka Pvt Ltd

23	Mr.Clement Fernando		777302899	JH Holdings
24	Mr.Mafaz		077 3623791	Expolanka
25	Mr.Malinda Rajakaruna	<a href="mailto:malinda.k@uswatteconfectionery.com">malinda.k@uswatteconfectionery.com</a>	777543477	Production Manager ( Biscuits), Uswatte Confectionery Works (Pvt) Ltd, Millaniya.

## Annex 04: Questionnaire 01

Agriculture Sector Modernization Project (ASMP) District Feasibility Study, for preparing Cluster Development Plans (CDPs) and to guide the field staff & farmers on initial implementation of CDPs in new project Districts (Ampara, Badulla, Kandy, Kilinochchi, and Vavuniya)

Questionnaire 1: primary activities: ASMP

stakeholdermeeting2022@gmail.com (not shared)  
[Switch accounts](#)

Select the most suitable districts for the following crop cultivation. ( permanent/semi permanent crops).

	Ampara	Vavuniya	Kandy	Badulla	Kilinochchi
Cashew	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Orange/lime	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mango	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jack	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plantain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Papaw	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pineapple	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Passion fruit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Betel leaves	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Durian	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Soursop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rambutan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Avocado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mangosteen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Add your remarks on above here.

Long-answer text

Select the most suitable districts for the following crop cultivation. ( Seasonal crops)

Cowpea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Black gram	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gingelly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peanut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Manioc	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sweet potatoes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Onion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Green chilies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mustard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ginger	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Turmeric	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vegetables gro...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vegetables gro...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Herbs (Bassils,...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sun flower	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Soybean	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Garlic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Onion seeds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vegetable seeds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tissue cultured...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tissue cultured...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tissue cultured...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
hybrid maize se...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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Tick the districts that have easy access to the following production and input services.

	Ampara	Vavuniya	Kandy	Badulla	Kilinochchi
Agro chemicals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chemical fertili...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Organic / Comp...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Seeds/planting ...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Machinery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Irrigation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Labour	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Capital	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Production equi...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Greenhouses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nurseries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rain shelters	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Information Co...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drone technolo...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mobile tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Irrigation techn...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Alternative ener...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Add your remarks on above here.

Long-answer text

Tick the districts that have easy access to the following extension, education, and training services.

	Ampara	Vavuniya	Kandy	Badulla	Kilinochchi
Package of Tec...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
School on the A...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training of Trai...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Farmer's Field ...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Specialized Trai...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tree Rehabilitat...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Incentives to M...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Information, Ed...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Awards and Re...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Learning Sites	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Add your remarks on above here.  
Long-answer text

Tick the quality certifications / guidelines you need ASMP to go with each crop.

	SL- GAP	Organic	GMP	HACCP	Other
Cashew	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Orange/lime	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mango	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jack	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plantain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Papaw	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pineapple	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Passion fruit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Betel leaves	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Durian	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Soursop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rambutan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Avocado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>





	Peanut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Manioc	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Sweet potatoes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Onion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Green chilies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Mustard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Ginger	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Turmeric	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Vegetables gro...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Vegetables gro...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Herbs (Bassils, ...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Sun flower	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Soybean	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Garlic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Add your remarks on above here.

Long-answer text

Value addition potential - Tick the suitable crops for the given value added activities.

	Fruits	Vegetables	Spices	Green leav...	Cereals	Pulses	other
Sorting & g...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cleaning / ...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Waxing or ...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Temperatu...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Labelling &...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bottling / c...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dehydration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
As fresh c...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pickling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pulping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Concentrat...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Teas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Confection...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Snacks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flour / po...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



## Annex 05: Questionnaire 02

Agriculture Sector Modernization Project (ASMP) District Feasibility Study, for preparing Cluster Development Plans (CDPs) and to guide the field staff & farmers on initial implementation of CDPs in new project Districts (Ampara, Badulla, Kandy, Kilinochchi, and Vavuniya)

Questionnaire 02: Support activities (The overall expectation of this particular questionnaire is to analyze existing enabling environment at the provincial level with respect to the input / service availability & the consistency.)

1. Tick the districts which the below mentioned technological interventions can be easily accessed.

*Tick all that apply.*

	Ampara	Vavuniya	Kandy	Badulla	Kilinochchi
<b>Quality Planting material availability</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Land preparation machinery/technology availability</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Field planting machinery/technology availability</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Pest and disease control chemical / (IPM) availability</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Fertilizer availability</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Irrigation systems / technology availability</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Wild animal control methods availability</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Harvesting (combine harvesters) technology availability</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Post-harvest technology (handling, grading, packing etc) availability</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Processing (drying/dehydration, canning, etc) technology availability</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Add your remarks on above here

3. Tick the districts which the below mentioned logistic facilities can be easily accessed.

*Tick all that apply.*

	Ampara	Vavuniya	Kandy	Badulla	Kilinochchi
<b>Roads (access/availability)</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Cold chain facility (cold storages/cold chamber trucks)</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>warehouse facilities</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Energy sources</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Buy back arrangements</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Transport (vehicles, access)</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Add your remarks on above here

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5. Tick the districts which the below mentioned networking and market intelligence facilities can be easily accessed.

*Tick all that apply.*

	Ampara	Vavuniya	Kandy	Badulla	Kilinochchi
<b>Online/mobile value chain networks</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Price information</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Informal contracts among value chain actors</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Trust &amp; reciprocity among value chain actors</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Active farmer organizations</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Capacity building programmes by CBOs</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Management support</b>					

6. Add your remarks on above here

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7. Tick the districts which the below mentioned food and income security dimensions can be easily accessed.

*Mark only one oval per row.*

	Ampara	Vavuniya	Kandy	Badulla	Kilinochchi
<b>Food affordability</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Food availability</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Food access</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. Add your remarks on above here

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Annex 06: Questionnaire 03



Agriculture Sector Modernization Project (ASMP) District Feasibility Study, for preparing Cluster Development Plans (CDPs) and to guide the field staff & farmers on initial implementation of CDPs in new project Districts (Ampara, Badulla, Kandy, Kilinochchi, and Vavuniya)

Questionnaire 03-Institutional environment (institutions, services, problems, expected services)

1. Tick the most important institution/s mentioned below in each district with reference to agribusiness and value chain development

Mark only one oval per row.

	Ampara	Vavuniya	Kandy	Badulla	Kilinochchi
<b>DoA</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Banks financing agriculture</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Micro finance institutions</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Agrarian service centers</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>NGOs</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. What are the other important service providing institutions?

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3. Tick the easily accessed services from the following in each district.

Mark only one oval per row.

	Ampara	Vavuniya	Kandy	Badulla	Kilinochchi
<b>Training and extension</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Financial services</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Appropriate machinery</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Quality services</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. What are the other services that could be accessed easily?

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5. What are the critical problems of the institutional environment on agribusiness & value chain development? ( please mention with the district)

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6. What are the expected services from institutions in each district on agribusiness & value chain development?

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## Annex 07: Summary table of the Note taking

Policy-makers	Processors/ exporters	Industry
<p>Dr. Thushara Wickramarachchi-</p> <ul style="list-style-type: none"> <li>• Throughout the proposal, the export market orientation of the products has not been addressed.</li> <li>• Highly targeted to the agriculture technology demonstration.</li> <li>• Since the major portion of the export market-oriented production is produced by the small-scale farmers, they should be well aware of the plant protection, quarantine</li> </ul>	<p>Mr. Jagath (questionnaire 01 discussion)</p> <ul style="list-style-type: none"> <li>• ASMP has a poor focus on scientific aspect of farming, poor focus on yield and quality of the produce and poor scientific knowledge transfer to the farmers.</li> <li>• Farmer capacity building is very poor in Sri Lanka.</li> <li>• ASMP project targeted on different crops and those crops have different</li> </ul>	<ul style="list-style-type: none"> <li>• For this discussion, around <b>19</b> stakeholders participated to express their thoughtful ideas representing the leading Agri-Food industries.</li> <li>• Before the official talks starts, a small chat was there on different high-valued crops/food commodities, such as pumpkin flour, hybrid maize, capsicum (“Nai Mirisi”), etc.,</li> <li>• The pumpkin powder is identified as one of the highly valued flour. Further,</li> </ul>

<p>rules, and also the export market expectation.</p> <p><b>Supportive services-</b> Dr. Thushara Wickramarachchi-</p> <ul style="list-style-type: none"> <li>• At the grassroots level, farmers lack extension services and it is not well organized.</li> <li>• Agriculture diplomates can be involved in agriculture extension.</li> <li>• Extension officers should be independent since they have the responsibility of certifying the products.</li> <li>• Maldives and middle-East countries markets are more available for Sri Lankan products and Europe and the East-Asia (Korea, China) markets also can be targeted.</li> <li>• The project should be well connected with the EDB, the Department of Commerce, and the National quarantine center.</li> </ul> <p><b>Regulations</b> Dr. Thushara Wickramarachchi-</p> <ul style="list-style-type: none"> <li>• Each and every product starting from the farm should be monitored by the National plant quarantine center or any officer attached to the National plant quarantine center at all stages of the supply/ value chain.</li> </ul>	<p>time lines. Therefore, need to prioritize crops according to the necessity.</p> <ul style="list-style-type: none"> <li>• Better to target on cash crops/ crops with short life cycle; Ginger/turmeric/garlic/chili/maize.</li> <li>• Also need to target on safety/quality/cost of the product.</li> <li>• Need to source quality seeds and planting materials, pest, and disease control.</li> </ul> <p>Mr. Saman Dewage (questionnaire 2)</p> <ul style="list-style-type: none"> <li>• Some planting materials are unavailable in some districts. (Kandy/Badulla- Flower nurseries&gt; Kilinochchi/Ampara- Mango nurseries)</li> <li>• If SCS certification of DoA is available, then the planting material considered of high quality.</li> <li>• Agro chemicals were available in each district earlier, but now there is a shortage due to the economic recession of the country.</li> <li>• There is a huge shortage of materials (pest control/chemical fertilizer/ Agro chemicals) now in each district studies.</li> <li>• Earlier the government subsidies made fertilizer, Agro chemicals available with the farmers.</li> </ul>	<p>the practical issues such as processing issue in producing the pumpkin flour are further highlighted.</p> <ul style="list-style-type: none"> <li>• Suggestion were given from Mr. Arjuna for formulating clusters to produce Manioc flour specially as a substitute for a wheat flour. Mr. Gemunu answered that the manioc flour has high global demand and more expensive. Therefore, it there is will be a high potential to export. The cultivation can be done areas like Gamapha.</li> <li>• Mr. Gamunu highlighted that the problems arise in Sri Lanka due to the economics of scale specially affected on lack of production. Eg: Sunflower oil production</li> <li>• Mr. Nishantha Jayamanna : There is a possibility to do jumbo peanut production in areas such as angunakolapallassa, Vavuniya like areas with farmer clusters and buy back systems.</li> <li>• Suggestion came from Mr. Arnjuna to mix the moringa powder and white flour (flour enriched with moringa powder). Mr. Gamunu Jayasundara</li> </ul>
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<ul style="list-style-type: none"> <li>• Total traceability should be added</li> <li>• Suggest appointing one person from the project to demonstrate farmers the traceability and to link with the National plant quarantine center.</li> <li>• Suggest adding the system approach to monitor traceability in each stage.</li> <li>• Private-public partnership is suggested to gain the machinery and required equipment. (With Department of Agriculture)</li> <li>• 100% traceability and proper linkage with the National plant quarantine center is required to make the export process more successful.</li> </ul>	<ul style="list-style-type: none"> <li>• Better to provide inputs such as Agro chemicals and fertilizer and fuel for farmers to start their cultivation back. (Immediate need)</li> <li>• As secondary measures need to provide micro irrigation, training on high-tech, high-quality planting materials)</li> </ul> <p>Mr. Saman Dewage (questionnaire 3)</p> <ul style="list-style-type: none"> <li>• All the institutions are important to improve the agriculture sector. (DoA/ agrarian service centers/ micro finance etc).</li> <li>• Institutions need to have good coordination among each other.</li> <li>• By combining primary input + secondary inputs and service providing institutions, a good agri output can be sourced.</li> <li>• DoA should focus more in quality seed and planting material development. We are at a lower level in this area when compared to other Asian countries.</li> <li>• Also, agri finance aspects need to be developed more and should increase farmers' access.</li> <li>• Buy back agreements are not functioning well in Sri-Lanka due to two reasons. <ul style="list-style-type: none"> <li>○ Farmers are reluctant to sell to</li> </ul> </li> </ul>	<p>answered that it's possible for a niche market.</p> <ul style="list-style-type: none"> <li>• Mr. Gamunu: These days there is a high demand for capsicum "nie miris".there, the clusters have to be formed</li> </ul> <p><b>Official discussion</b></p> <p>The first focus is given to finding out the best crops which can be grown under the project. Different crops were taken one by one and highlighted the potential of cultivating each crop. Further, the stakeholders requested more time to go through the questionnaire and submit it after the end of the session.</p> <p><b><u>Cashew</u></b></p> <ul style="list-style-type: none"> <li>• Currently, Sri Lanka cashew production is unable to meet the market requirement. Mst of the processors import cashew from Ivory Coast and Vietnam and go back in the Sri Lankan name.</li> <li>• Sri Lankan cashew has more recognition rather than other countries, especially in terms of taste.</li> <li>• Therefore, there is potential</li> </ul>
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	<p>the company if the market price is higher than the agreed price.</p> <ul style="list-style-type: none"> <li>○ If the market price is low, then contract farmers will buy other farmers' harvest too and sell to the company. (Company receives more harvest than agreed).</li> <li>○ Also, companies need only high-quality product, but farmers want to sell their entire harvest to the company. Expectations are not matching between the farmer and the company.</li> </ul> <ul style="list-style-type: none"> <li>● To avoid this farmers and companies need to strictly adhere the terms and conditions if buy back agreements.</li> </ul>	<ul style="list-style-type: none"> <li>● Mr. Gamunu jayasundara highlighted that, for cashew, the harvesting time is 7 - 8 years.</li> <li>● Best cashew is grown in areas like; Vavuniya, Mannar, Kilinochchi, Wanathawilluwa, etc.)</li> <li>● Supporting institutes; Cashew corporation, cashew research institute, cashew authority)</li> <li>● Since there are very few cashew growers (as the farmers have to wait for a long time to collect the yield) in Sri Lanka the aforementioned institutes are giving their maximum support to the farmers in growing.</li> <li>● The upper top fruit of the cashew also can be used to produce a juice that has a high medicinal value.</li> </ul> <p>After the facts about cashew, the stakeholders were directed to focus on food items.</p> <p>Other than cashew; Mr. Jerad: to have 90</p>
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		<p>Mt of ground nuts monthly, the land requirement is 30,000 Ac.</p> <p>It was also highlighted that there is no marketing issue in the current scenario for the Sri Lankan food items. However, there is a high cost in the production process which was highlighted as a very serious issue in the industry. Can do the value addition by contracting to avoid the high cost.</p> <p>There are very few fruits that we can dehydrate in Sri Lanka. At the same time, the cost of production is very high.</p> <p>Preservation of foods for off peaks is another good idea</p> <p><b><u>Jackfruit</u></b></p> <ul style="list-style-type: none"> <li>• Another interesting topic which is popped out is potential for the jackfruit cultivation.</li> <li>• In Sri Lanka, the jackfruit trees are not properly maintained for cultivation.</li> <li>• Therefore, the products are not up to the standards.</li> <li>• Further, variations in varieties and breeds are there in Sri Lanka.</li> <li>• Thereby it was highlighted the importance of maintaining the</li> </ul>
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		<p>quality of jackfruit-related products through high-quality panting materials/varieties.</p> <ul style="list-style-type: none"> <li>• Mr. Nilaatha Jayamanna: Tender jackfruit also has the potential for vegan customers. (annual market value is around 32 billion)</li> </ul> <p>Individual Quick Freezing (IQF) is a technology to avoid post-harvest losses. But it was noted that is high-cost work. If it's possible can go to the IFQ. Lower-cost energy alternatives can be newly suggested to overcome that problem</p> <p><b><u>Avocado</u></b></p> <ul style="list-style-type: none"> <li>• Avocado oil extraction will be having high potential in the world market.</li> <li>• However, one of the problems in Sri Lanka is low economics of scale which resulted in high cost per unit and low production which is enabling to meet the demand.</li> <li>• In Sri Lanka there are around 35 Avacado varieties</li> <li>• But, global markets are demanding verities like “Hass”.</li> </ul>
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		<ul style="list-style-type: none"> <li>• Avocado paste is also having a huge market</li> </ul> <p><b><u>Cocoa</u></b>  <b>Mr. Jayasundara:</b> Local cocoa cultivation can be developed further. Sri Lankan cocoa has 50% cream whereas the other countries' cocoa includes only around 40- 42% cream. Thereby, there is a high potential. The industries with capabilities are waiting to develop it. The problems are with the lack of raw materials.</p> <p>❖ <b>Domestically the raw materials can be produced and can supply them to the domestic industries is one of the best ways. It will help to reduce the importation cost to the industries.</b></p> <p><b><u>Pineapple</u></b>  <b>Mr. Vikum Nissanka :</b> Concentrated pineapple also has a high demand. But in Sri Lanka the production negligible.</p>
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		<p>Mr. Bhathiya : A common problem for any crop production in Sri Lanka ;</p> <ul style="list-style-type: none"> <li>• Finding the plant materials (right variety) is a common issue in Sri Lanka for cultivations.</li> <li>• Low productivity</li> <li>• Low economics of scale</li> </ul> <p><b><u>Seed Production</u></b>  Ms. Chalithra: there may be a good market for good quality seeds. Therefore, producing seeds also will be a good option.</p> <p><b><u>Solar pumps:</u></b>  Mr. Bhathiya: There are practical concerns needed to give attention to when setting up solar pumps. Therefore, can go with a battery system.</p> <p><b><u>Solar drying system:</u></b></p> <ul style="list-style-type: none"> <li>• Mr. Bhathiya: It's a Sustainable solution and very easy. Whatever the product the best option is solar driers for reducing the moisture level and for drying.</li> <li>• Different systems can be adapted according to the crop</li> </ul>
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		<p><b><u>Growing crops under polytunnels</u></b></p> <p>Problem: Polyunnel in the dry zone area is possible or not?</p> <p>Mr. Bhatiya:</p> <p>In dry zone areas, the main issue is controlling temperature. However, the artificial cooling systems have to be used. For a 200m<sup>2</sup> greenhouse area for a month, the minimum energy cost will be Rs. 10,000. For a 400m<sup>2</sup> greenhouse area for a month, the minimum energy cost will be Rs. 15,000 Should think about the energy cost prior to implementing.</p> <p>Diversification of crops (Eg; brockerly, cucumber, beans) cultivated under polyunnel/ greenhouse is very much important.</p> <p>Kandy is suitable for the polyunnel establishment.</p> <p>In the dry zone (Areas such as Kilinochchi, Vavuniya) it is very much important and essential to go to the</p>
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		<p>temperature-controlled greenhouses whether it's a seed production project or a vegetable production project.</p> <p>The correct technology has to be used for a good outcome.</p> <p><b><u>Solar farming:</u></b> Mr. Nirmal: Its already available in Sri Lanka</p> <p>Mr. Bhartiya : the panels can be adjusted in order to receive the maximum light.</p> <p><b><u>Seed production :</u></b> Mr. Chandana Premaratne: seed production has to be increasd.</p>
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## Annex 2 - Outcome of the Technical discussion with personnel of DOA and other

### Fruit crops.

#### Banana

According to the researchers view Ambul Banana is most eligible due the resistance for Panama disease. Market value comparatively low to other varieties like Kolikuttu but risk is minimum.

Only around 60% of the product can be used for direct consumption as dessert and another 10% is used for consuming in another as fruit drinks etc..

Approximately balance 30% goes to garbage.

There is a big potential for bi products (That wasting 30% can be used for this production)

- Banana cubes as dessert.
- From raw fruits - flour production to mix with wheat flour to reduce the Gluten effect of Wheat.
  - Can be mixed with rice flour also.
  - Good substitute to corn flour(corn flour 1000 Rs/Kg, Banana flour 250Rs/Kg).
  - Very good up market from the health point of view.
  - In Barawakumbuka (Ambilipitiya), there is a Banana flour producer for CBL.
  - Seven Kgs of raw fruits needed for 1 Kg of flour.
  - Technology is very simple and machinery available in Sri Lanka.

Banana stem can be easily used for nursery planting pots cost effectively. Simple technology with pressing machines available (Dr Sujatha Weerasinghe in UC IRAF). Using of this Banana stems for the other product will be a very good remedial action to overcome the Banana weevil problem.

Cost of production is 50% against the current coir nursery pots (selling price will be around 6 Rs against the 12 Rs of coir one). If we can introduce this, that will be a great support to reduce the Banana weevil insect.

Banana stem → Chop → Wash and dry → Press with the cover of non-woven fabric.

#### Maize – for seed production

Dry zone low country is ideal for cultivation (DL 1a to DL 1f) in both Yala and Maha seasons and highly depend on the water availability.

Areas with high temperatures not good for specially seed cultivation. This problem can be overcome with the help of sprinkler irrigation system (this may not cost effective).

Parental lines are with DOA and can be purchased (If the requirement is high, purchase orders should be placed minimum four months before the season starts. (eg. Maha season order should be placed before 15<sup>th</sup> May).

Technology is very easy and not so expensive.

Seed driers are the main machinery needed. The Project Director says he has an idea to import parental lines from Thailand in near future.

Mr.Chandana Premarathna from Land Mark agro said that he has well experienced plant breeders working with him. If we need their assistance they are willing to help. He needs 20 mts of MI 5 hybrid seeds in every season.

ASMP propose to do 500 acres in Kilinochchi and 500 acres in Vauniya for coming Maha season (September 2022).

360 mln rs can be spent for cultivation and 100 mln for other activities.

Cost of the production of Maize 1 Kg is 250 Rs.

Normal selling price was 1200 rs per Kg but now it has gone up to 3600Rs (18,000 Rs for 5Kg packet).

If we are going to start seed preparation one cluster must be allocated for this purpose and those farmers should not be idled any way. We have to have a proper plan to keep them with us. The DOA propose the periods not cultivate Maize, to utilize vegetable seeds production.

Other advice of DOA is to follow the registered seed producing procedure and sell those production as registered seeds.

### **Jumbo Peanut**

Agro ecological zones with DL1a to DL1f soil types ideal for Jumbo Peanut.

In Kilinochchi district only Karachchi division has proper soil type, DL 1f.

Vavuniya district is more suitable according to the annual rainfall and soil types.

### **Highly sensitive for fertilizer (Sri Lankan yield is very low).**

- Gypsum is compulsory for basal fertilizer application.
- At flowering stage high Ca source needed.
- New technology needed to increase the productivity.
  - Organic manure and correct NPK ratios.
  - Micro nutrient also.
  - Some officers argue that, if we apply adequate quantity of Organic manure no need to apply micronutrient compulsorily.
  - Sulphur need to be applied.

Bed preparation depend on the soil type.

- ✓ In sandy soils, no need to prepare ridges.
- ✓ Only in other soils need ridge and furrow system.

Harvesting time can be decided only examine the colour of pods, at the optimum maturity the colour of pods start to discolour. At the harvesting time dying of plants cannot be seen in this variety like 'Thissa' variety (farmer awareness is very low about this identification).

### **Yield**

GM varieties give 1500 Kgs per Acre but our locally developed varieties give only 600-700 kgs per acre in Maha and 700 - 800 Kgs in Yala.

Machinery need for every moment of the cultivation and processing.

Harvesting, Depoding, Shelling, Sorting, Grading and drying.

Locally fabricated depodiaters are there with capacities of 600 kgs and 300 Kgs per hour.

Before storing, the moisture level should be brought down to 8% (some personnel say the requirement is 7% but the experts of DOA say 8% is OK).

According to the CW Mackie, here in local market also have high demand, 1000 Mts per year.

Second grade of this crop can be used for the Chocolate ball preparation also.

### **Nursery Industry**

All most all districts in the country other than Northern Province have nursery industries. This is very profitable with high market potential industry. Therefore this can be introduced to Kilinochchi and Vavuniya districts. Here can be introduced the nursery pot preparation from Banana stems also.

### **Potato seed production**

DOA has developed two varieties namely Sassi and Red la soda

Basic material (very clean material, Tissue culture plants or G zeros) can be brought from government farms and multiplied and produce G1s and G2s.

G1s and G2s can be cultivated in hilly areas during Maha seasons and produce G3s and keep those under proper storing condition to use in Yala seasons in Paddy fields. Production of this is directly for consumption.

A pilot project in Seethaeliya is continuing with ISP technology. This can be scaled up in Badulla district.

Machinery need for planting and harvesting.

20,000 RS per50 Kg is the price of seed potato (now it may have gone up).

### **Chili seed production**

Only 20,000 ft<sup>2</sup> of poly tunnels using for Chili seeds production.

Total annual hybrid seeds requirement of 5000Kg can be produced easily in 500,000ft<sup>2</sup>.

That means the total requirement of poly tunnel is 500,000ft<sup>2</sup> and at the moment only 20,000 ft<sup>2</sup> used.

A large number of poly tunnels are idling in Badulla and some other areas and can be converted easily for seed Chili production.

A considerable area can be covered by converting abandoned tunnels with minor repairs.

This 5000 Kgs of seeds enough for the total acreage requirement 10,000 Ha.

This 10,000 Ha enough to produce the total annual country requirement of dry chili (50,000 Mts from 250,000 Mts of raw chili).

Initially 6,000 Ha planned (4000 Ha in 2022) to be cultivated and within 3 years to achieve the target of 10,000 Ha for the self-sufficiency of Dried Chili.

This crop can be cultivated in different areas (DL1<sub>a,e</sub>, IL and IM soil categories) of the country with the irrigation facility.

Vavuniya and Kilinochchi farmers have proven that the potential raw Chili yield is 45-50 (Dried Chili 9-10) Mts per Ha.

Due to the prevailing situation of the country the raw chili price gone up drastically that affects to the dry chili production.

Because of that reason around 50 number of small scale Solar powered Chili driers are idling.

### **Urban Agriculture**

Very important suggestion came about the improvement of urban agriculture.

Develop entrepreneurs for nursery industry and train them plant seeds in pots and look after those until reproductive phase sell those with fruits at a reasonable price (about 200 Rs. Per pot). This system can be followed for Raw Chili, Tomato and Eggplant. This system will be a great help to overcome the Green chili demand especially in urban areas.

### **Soil and Soil Nutrients.**

Soil sample testing is very important and for the successes of any cultivation balanced soil nutrient and optimum water levels are very important.

We have to seriously think about the 'P' level of the soil because it can be accumulated due to less leaching character. If the 'P' levels are high, that inhibit the intake of other nutrients.

### **Sampling**

Lands must be categorized according to the slope of lands.



Sample size is around 5-6 samples per Ha is enough from a same level of land.

Test based fertilizer recommendation is compulsory in commercial cultivation.

Ferrous (Fe) deficit is noticed in northern area soils and ferrous sulphate ( $\text{FeSO}_4$ ) use as folio application may be the remedy of that.

Nitrogen ( $\text{NO}_3$ ) and Phosphorous ( $\text{P}_2\text{O}_5$ ) gives together by DAP (Di Ammonium Phosphate).

DAP not make significant PH changes to soil.

### **N.B.**

Application of TSP by dissolving in water, is not advisable because that dissolved 'P' can make bonds with Ca and make Calcium Phosphate which reduce the soil porosity.

### **IPHT (Institute of Post Harvesting Technology).**

Very good market opportunity has been created for different flour products as substitutes for Wheat flour (due to high Gluten content in Wheat flour).

Manioc Flour, Bread fruit flour, Banana flour and Raja ala.

Bread fruit flour has the 'Anti-oxidant' effect also.

Edible fruits and Vegetable market from Green hoses collapsed due to prevailing situation in the country.

Mr.Bhathiya Abeywardhana

He started very successful Chili seeds production in Galewela and handed over to ASMP.

Green houses with crops like Cauliflower are being converted to local vegetables like Bean etc.

### **IPM technology.**

IPM technology means application of collective measures (chemical and physical) to control all pest problems.

- Most important thing is awareness of farmers as well as field officers.
- Proper training series, identification and diagnose the problems clearly.
- Identification of harmful insects and natural enemies.

- How to control harmful insects.
- Different training methods to be applied, field trainings, different videos, printed materials.

### **Sweet Orange (further discussion needed).**

Sisila and Arogya varieties cannot be grown in Northern Province.

Bibila Sweet is good for Vauniya and Kilinochchi districts. Now available in Nadunkerni area.

More than nine months need to multiply.

Plants grafted to Wood apple perform well.

Continuous harvesting causes to deforming of fruits.

### **Pineapple (further discussion needed).**

Performance of new variety MD 2 is good.

Laggala and Monaragala have plantations.

New stocks of 70,000 plants going to be imported immediately.

Multiplying from tissue culture plants is very high risky thing.

Shortage of relevant chemicals also a barrier for multiplication.

### **Mango (further discussion needed).**

Proper pruning is very important for better yields and quality of fruits.

TomEJC is highly sensitive for Hormones.

**ASMP-EU**  
**Field Data Collection for Feasibility and Cluster Development**

1	Code Number	
2	Province	
3	District	
4	DS Division	
5	Local Authority	
6	Region	
7	AI- Range	
8	GS Division	
9	Sex	Male:- <span style="float: right;">Female :-</span>
10	Age Group	
11	Civil Status	1. Married 2. Unmarried 3 Widowed/Divorced
12	How many members in your family	No.
13	If "married" How many children do you have	[ ]
14	Age group of children and no.	1. Below 5 2. Between 6-10 3. Between 11-18 4. Above 18
15	Your Educational Qualification	1= Primary (1-5 grade) [ ] 2=5-11 grade[ ] 3= O/L pass [ ]
		4= A/L pass [ ] 5=Diploma [ ] 6=Degree [ ]
16	Your Spouse Educational Qualification	1= Primary [ ] 2=5-11 grade[ ] 3= O/L pass [ ]
		4= A/L pass [ ] 5=Diploma [ ] 6=Degree [ ]
17	Your Children Education group and no	1= Primary 1-5 grade) [ ][ ] 2=5-11 grade[ ] ( ) 3= O/L pass [ ] ( )
		4= A/L pass [ ] ( ) 5=Diploma [ ] ( ) 6=Degree [ ] ( )
18	Are you employed	1. No 2.Yes
19	If "Yes", what kind of employment	1. Public [ ] 2. Private [ ] 3 Self Employment [ ] 4 NGO [ ] 1. Labourer/Minor Employee/Similar 2. Teacher/Clerk/Technician/ Similar 3. Doctor/Engineer/Layer/Executive 4. Business/Self Employment 5. Other specific jobs
20	Is your Spouse employed?	1. No 2 Yes
21	If "Yes", what kind of employment	2. 1.Public [ ] 2. Private [ ] 3 Self Employment [ ] 4 NGO [ ] 1. Labourer/Minor Employee/Similar 2. Teacher/Clerk/Technician/ Similar 3. Doctor/Engineer/Layer/Executive 4. Business/Self Employment

		5. Other specific jobs			
22	How many children are employed	1. No                      2 Yes			
23	If "Yes", what kind of employment (category and No.)	6. 1.Public [ ] 2. Private [ ] 3 Self Employment [ ] 4 NGO [ ] 1. Labourer/Minor Employee/Similar      No [ ] 2. Teacher/Clerk/Technician/ Similar      No [ ] 3. Doctor/Engineer/Layer/Executive      No [ ] 4. Business/Self Employment      No [ ] 5. Other specific jobs      No [ ]			
24	Ownership of land	1. By owner 2. Rented/Lease land 3. Crown/Government land 4. Other (Specify)			
25	Experience in crop husbandry	1. Maize			
		2. Horticultural crop (Vegetable/Fruits)		Veg. [ ] Fruits [ ]	
		3. Floriculture			
		4. Nursery			
		5. Farm related -Entrepreneurial			
26	Land Extent ac	High land:		Low Land:	
27	Are you a member of farmer's organization	1. No.                      2 Yes			
28	If "Yes" how many years your membership	Name of organization.		Yr.	
29	Are you bearing post of the farmer organization	1. No                      2. Yes			
30	If "Yes" what is the position	1. Executive post (President/Chairman/Secretary/Treasure 2. Committee member 3. Others			
31	Type of Labour used	1. Only family labour 2. Hired labour 3. Both family and hired			
32	Pattern of Labour used	Field operation	No of Family labour	No of Hired labour and rate of daily/monthly payment	Cost (Rs)
		Pre weedicide application			
		Land preparation Labor Machinery			
		Digging and seeding			
		Weeding and earthing up			
		Weed control with weedicide			
		Fertilizer application per acre			

		UREA (amount and cost) TSP (amount and cost) MOP (amount and cost) FYM (amount and cost)			
		Harvesting and drawing			
		Threshing and processing with engine power			
		Threshing and processing manually			
		Drying			
		Transport			
		Any other cost			
33	Yield/ ac (kg)				
34	Price/ Kg (Rs.)				
35	Price/ corn				
36	Number corn per acre				
37	Whom to sell				
38	Any primary processing at home				
39	Any value addition				
40	What other crops grown with Maize				

41	Position on Slope	Bottom	Mid-slope	Upper-Slope		
42	Soil Erosion	Low	Medium	High		
43	Ground Water Availability	Dug Well	Tube Well	Other (specify)		
44	Source of fresh Surface Water	Spring/canal	Tank /Reservoir	Perennial Stream	Seasonal Stream	None
<b>ECOLOGICAL</b>						
Habitat Types in the Project Site (indicate the % of each habitat type)		Natural forest	Degraded forest	Natural scrubland	Degraded scrubland	Riverine forest
		Grassland	Abandoned agricultural land	Marsh	Lagoon	Estuary
		Coastal scrub	Mangrove	Salt marsh	Home-gardens	Other (list)
Habitat types within 500m radius from the site periphery (indicate the % of each habitat type)		Natural forest	Degraded forest	Natural scrubland	Degraded scrubland	Riverine forest
		Grassland	Abandoned agricultural land	Marsh	Lagoon	Estuary
		Coastal scrub	Mangrove	Salt marsh	Home-gardens	Other (list)

Are there any environmentally and culturally sensitive areas within 250m?	Protected Areas	Migratory pathways of animals	Archeological sites	Wetlands	Mangroves strands
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Probable Involuntary Resettlement Impacts	Yes	No	Not Known	Details
Is the intervention likely to cause any permanent damage to or loss of housing, other assets, resource use?				
Is the site chosen for this work free from encumbrances and is in possession of the government/community land?				
Are there any non-titled people who are living/doing business on the proposed site/project locations that use for work?				
Is any temporary impact likely?				
Is there any possibility to move out, close of business/commercial/livelihood activities of persons during implementation?				
Is there any physical displacement of persons due to implementation?				
Does this project involve resettlement of any persons? If yes, give details.				
Will there be loss of /damage to agricultural lands, standing crops, trees?				
Will there be loss of incomes and livelihoods?				
Will people permanently or temporarily lose access to facilities, services, or natural resources?				
Are any indigenous people living in proposed locations or affected/benefitted by the project intervention?				
Inclusion of Vulnerable families?				

- Number of Family members engage in farming.....
- Years of engaging in farming.....
- Type of farming: Paddy/ OFC/Livestock.
- Machinery availability: Tractors..... Ploughs.....water pumps.... sprayers .....other.....
- Relationship with different institutes. DOA,.....Agrarian.....Irrigation.....Banks.....other

Feasibility	Good	Moderate	Poor	Remarks
<b>1. Primary Production Feasibility</b>				

Natural resource variability				
High availability of hybrid maize seed				
Limited knowledge about hybrid maize seed morphology and renewal				
Unclear economic attractiveness to harvester				
Unfamiliarity with hybrid maize seed harvesting for market				
Horticulturists' preference of multiplication in controlled environment				
Uncertain knowledge about hybrid maize seed stable supply				
<b>2. Enabling Environment Feasibility</b>				
Embeddness constraint to reliable supply				
Environmental services' capacity building for to guarantee compliance of legal framework				
No trade barriers to market				
Available subsidy for VC development				
Potential long-term conflicts over landuse				
<b>3. Market Feasibility</b>				
Reliability of supply is key for market participation				
Standard specifications apply to products				
Increased supply might negatively affect pricing				
Recognized buyer is interested				
High potential supply of hybrid maize seed from other sources;				
High demand of hybrid maize seed versus limited supply				
<b>4. Structure Feasibility</b>				
Possibility to make use of external supports				
Well-organized producer associations as a necessary condition for effective participation				
Adequate cold chain management as a necessary condition to control quality				
Necessary to establish a management system to control quality and sustainable exploitation				
<b>5. Stakeholder Feasibility</b>				
Exploring new products and diversifying supply of hybrid seeds				
Promoting and opening market for hybrid seeds products				
Increasing job opportunities and income for women and youth,				

Valorising degraded areas and tribal land as well as biodiversity				
Promoting renewable resources related economic activities				
Sustainable resource exploitation				
Generating fair employment benefits				
Strengthening domestic horticultural sector				
Optimizing use of existing processing and exporting facilities				

1. Field Access Road Condition	Poor	Fair	Good
2. Availability of Grid Connection (Electricity)	No	Yes	Can be provided
3. Availability of Agri Machineries & Processing Facilities			
• Tractors			
• Land Masters			
• Maize Seeders			
• Weeding Machines			
• Maize Thresher (Agrimec Machines)			
• Sprayers			
• Water Pumps	Electrical	Diesel	Petrol Kerosene
• Poly tunnels – Solar Drying			
• Electricians with a fair knowledge			
• Mechanics with a fair knowledge			



Annex 4 – Photos of Field Works

Badulla District







ATTENDANCE SHEET  
AGRICULTURE SECTOR MODERNIZATION PROJECT - MONARGALA DISTRICT  
PROGRAM: G.D. GROUP

ಶಿಬಿರದ ದಿನ ಪಟ್ಟಿ  
ತಾರೀಖು: 02/11/2023  
ತಾಲ್ಲೂಕು: ಮಂಗಳೂರು

No	ಸಹಿ / Name	ಶಿಬಿರ / ಸಂಸ್ಥೆ/ವಿಳಾಸ Designation and Address	ಫೋನ್ / CONTACT No	ಸಹಿ / Signature
1	A. M. M. ...	...	078221274	
2	...	...	081304593	
3	...	...	078-8078700	
4	...	...	078441820	
5	...	...	078083495	
6	...	...	078010100	
7	...	...	071475476	
8	...	...	078-3000206	
9	...	...	078788921	
10	...	...	078788921	
11	...	...	078788921	
12	...	...	078788921	
13	...	...	078788921	
14	...	...	078788921	

16	W. G. ...	District ...	0714692719	
17	S. ...	...	078023590	
18	R. M. ...	...	071822211	
19	R. M. ...	...	071822211	
20	K. ...	...	071822211	
21	L. H. ...	...	071822211	
22	S. B. ...	...	071822211	
23	Y. ...	...	071822211	
24	G. ...	...	071822211	
25	A. ...	...	071822211	
26	R. ...	...	071822211	
27	M. ...	...	071822211	
28	S. ...	...	071822211	
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40	S. ...	...	071822211	

ATTENDANCE SHEET  
AGRICULTURE SECTOR MODERNIZATION PROJECT - MONARGALA DISTRICT  
PROGRAM: G.D. GROUP

ಶಿಬಿರದ ದಿನ ಪಟ್ಟಿ  
ತಾರೀಖು: 02/11/2023  
ತಾಲ್ಲೂಕು: ಮಂಗಳೂರು

No	ಸಹಿ / Name	ಶಿಬಿರ / ಸಂಸ್ಥೆ/ವಿಳಾಸ Designation and Address	ಫೋನ್ / CONTACT No	ಸಹಿ / Signature
1	...	...	078-8078700	
2	...	...	078-8078700	
3	...	...	078-8078700	
4	...	...	078-8078700	
5	...	...	078-8078700	
6	...	...	078-8078700	
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ATTENDANCE SHEET  
AGRICULTURE SECTOR MODERNIZATION PROJECT - MONARGALA DISTRICT  
PROGRAM: G.D. GROUP

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ತಾರೀಖು: 02/11/2023  
ತಾಲ್ಲೂಕು: ಮಂಗಳೂರು

No	ಸಹಿ / Name	ಶಿಬಿರ / ಸಂಸ್ಥೆ/ವಿಳಾಸ Designation and Address	ಫೋನ್ / CONTACT No	ಸಹಿ / Signature
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35	...	...	078-8078700	
36	...	...	078-8078700	
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ATTENDANCE SHEET  
 AGRICULTURE SECTOR MODERNIZATION PROJECT - MONARAGALA DISTRICT  
 PROGRAM: 6/4 @ 6/2020

දිනය: 2020.06.20  
 කාලය: 10.00 AM - 12.00 PM

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ATTENDANCE SHEET  
 AGRICULTURE SECTOR MODERNIZATION PROJECT - MONARAGALA DISTRICT  
 PROGRAM: 6/4 @ 6/2020

දිනය: 2020.06.20  
 කාලය: 10.00 AM - 12.00 PM

No	Sl. No / Name	Office / Designation and Address	Telephone / Contact No	Signature / Signature
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Vavuniya District





Agriculture & Fisheries (ASMP-NP)  
Field Visit by EU Consultants - Vavuniya & Kilinochchi Districts  
Thu, 1 Aug 2022 - Fri, 2 Aug 2022

**Attendance Sheet**

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Attendance Sheet  
Thu, 1 Aug 2022 - Fri, 2 Aug 2022

**Attendance Sheet**

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Agriculture & Fisheries (ASMP-NP)  
Field Visit by EU Consultants - Vavuniya & Kilinochchi Districts  
Thu, 1 Aug 2022 - Fri, 2 Aug 2022

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**Kilinochchi District**







Agriculture Sector Modernisation Project  
Maize Seed Production (Kandui - Kottachchi)  
Discussion with Officers in Agriculture Sector  
02/08/2022

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Kandui East  
Farmer Group Discussion  
02/08/2022

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# Ampara District











## **Overview of Environmental Legislation**

Sri Lanka is one of the leading countries in the South Asian region in enacting environmental legislations. Its concern for environment dates back to over two and a half millennia. The constitution of the Democratic Socialist Republic of Sri Lanka under chapter VI Directive Principles of State policy and Fundamental duties in section 27-14 and in section 28-f proclaim “The state shall protect, preserve and improve the environment for the benefit of the community”, “The duty and obligation of every person in Sri Lanka to protect nature and conserve its riches” thus showing the commitment by the state and obligations of the citizens.

The overall environmental concerns are addressed by the National Environmental Act No. 47 of 1980 (and subsequent amendments by act no 56 of 1988 and act no 53 of 2000). It is the umbrella legislation for environmental protection in the country. In addition, several other sectoral legislative enactments are in place (see section below). The national organization that has the mandate to protect and take measures to safeguard the environment is the Central Environmental Authority. It currently operates in the entire country except in the North Western Provincial Council (NWPC), where the NWPC has enacted a separate statute under the 13th amendment to the Constitution of Sri Lanka and had created a separate provincial institute.

There are several other key national agencies with a mandate for environmental management and protection. The Forest Department, the Department of Wildlife Conservation, Department of Archeology, Department of Coast Conservation and Coastal Resources Management, Disaster Management Center and Geological Survey and Mines Bureau have their regional offices and staff to cater to and monitor the environmental safeguards as per the policies and regulations governing them. In addition, there are several national agencies that are impacting on the environment and adopting environmental safeguards as well. They are the Sri Lanka Land Development Corporation, Urban Development Authority, Water Supply and Drainage Board, Water Resources Board and Irrigation Department.

The Local Authorities (LA) are also having provisions under their respective acts to safeguards and provide useful facility and maintain the same for the convenience of the public in their respective areas. The Municipal Council (MC) Act No. 19 of 1987 & Urban Council (UC) Act No. 18 of 1987 provide for the establishment of MCs and UCs with a view to provide greater opportunities for the people to participate effectively in the decision-making process relating to administrative and development activities at a local level and it specify the powers, functions and duties of such LAs and provide for matters connected therewith or incidental thereto. These acts contain sixteen and eight parts respectively, several schedules and 327 & 249 sections respectively. The MC act, spell out its status, powers & functions in Section IV, Section V and Section VI in sections 34 to 154 and covers public health, drainage, latrines, unhealthy buildings, conservancy & scavenging, nuisance etc. Further the respective local authorities have mandate regionally to implement the project activities and monitor the progress of compliance work.

The following section outlines the broad legal and institutional framework in Sri Lanka for environmental management and World Bank's environmental safeguards requirements, which will be relevant to the proposed project.

## **Detail Review of Key Environmental and Social Services Related Legislation**

### **1. The Constitution of Sri Lanka & the 13<sup>th</sup> Amendment**

The Constitution of Sri Lanka contains several provisions, relating to the environment 9 Article 27 (14) and article 28 (f). The 13<sup>th</sup> amendment to the constitution introduced a new level of institution for environmental protection and management. Therefore, the provincial government also has legislative and executive power, the North Western Provincial Environmental Authority to control, prevent and monitor all environmental related activities.

**Application to ASMP:** Overall responsibility of individuals and organizations to protect and conserve the natural environment. All project proponents/implementers and public are responsible.

## **2. The National Environmental Act. No. 47 of 1980 & its amendments**

The National Environmental Act (NEA) provides conservation and development guidelines for natural resources including water, soil, fisheries resources, forest, flora and fauna in Sri Lanka. It also paved the way for the creation of the Central Environmental Authority (CEA). Further it spells out the creation of an Environmental Council in collaboration with the respective line agencies to advise the CEA (Section 7) and provide necessary guidelines to establish District Environmental Agency under the chairmanship of the District Secretary. The NEA is the basic national decree for environmental protection. The three main regulatory tools implemented under the NEA are Environmental Impact Assessment/Initial Environmental Examination, Environment Protection License (EPL) and Schedule Waste Management License supported by standards for discharge and waste disposal guidelines.

It is the key regulatory tool enabling any developer to implement the development activity in line with the NEA and thereby assuring the long-term sustainability of the development undertaken while paying due respect to the environment.

The second regulatory tool under the provisions of the National Environmental Act is the Environmental Protection License (EPL). The EPL procedure has been introduced to prevent or minimize the release of discharges and emissions into the environment from industrial activities in compliance with national discharge and emission standards, to provide guidance on pollution control for polluting processes and to encourage the use of pollution abatement technology such as cleaner production, waste minimization etc. Here the industries are classified into three lists named A, B and C. List A is comprised of 80 potentially high polluting industries, List B is comprised of 33 medium polluting industries and List C is comprised of low polluting industrial activities. The operational details are given in CEA website ([www.cea.lk](http://www.cea.lk)).

The third regulatory tool deals with the disposal of scheduled waste. The gazette notification No 1534/18 of 1<sup>st</sup> February 2008 made by the Hon. Minister under section 23A and 23B of the National Environmental Act No. 47 of 1980 is referred to as the National Environmental (Protection & Quality) regulations No. 1 of 2008. It deals with waste from specific and non-specific sources. The notification has three parts and eight schedules. The Part I deals with the Issue of Environmental protection License



for Emission of Disposal of waste. Part II deals on issue of license for the management of scheduled waste (Hazardous Waste) and Part III on General matters including definitions and the effectiveness and validity of the license issued under National Environment (Protection & Quality) regulation No 1 of 1990 published in extraordinary gazette No 595/16 of February 1990. The eight schedules include the tolerance limits, applications, formats for reporting, categorization of non-specific and specific waste etc.

The 1994 amendment delegated the authorization to the local authorities to issue EPL for low polluting industries. The CEA's environmental management functions are holistic and they are very well set out in section IV of the act. Along with the EPL procedures several standards also have been gazette with regard to disposal of effluents to land and water bodies.

**Application to ASMP:** As per the initial screening, majority of project's activities are not yet finalized and considering the proposed components, project might be fallen under the prescribed categories. Considering the low impacts of project already identified and the present assessment carried out in compliance with WB's Safeguards policies would be sufficient with continuous monitoring during the construction, operation & maintenance phases. However, considering the complexity of the project activities, project might require an environmental assessment. During next phase of the assessment, project will submit the proposal to the CEA and CEA recommendation will be implemented accordingly.

### **3. State Land Ordinance Act No 13 of 1949**

The State Lands Ordinance provides necessary guidelines to:

- The protection of the source, course or bed of any public stream
- The protection of springs, reservoirs, lakes ponds lagoons, creeks, canals, aqueducts etc.
- The construction or protection of roads, paths, railways and other means of internal communication.
- The prevention of the erosion of soil.
- The preservation of water supplies.

In addition, section 75 of the State Land Ordinance highlights on riparian proprietors' activities. The occupier of land or the bank of any public lake or public stream shall have the right to use the water in that lake or stream for domestic purpose and shall not be diverted through a channel, drain or pipe or by means of a pump or other mechanical contrivance but shall be removed in a bucket or other receptacle.

**Application to ASMP:** This has significant influence on the waterbodies that will come under the project site for improvements by way of bank stabilization, erosion control and other small infrastructure development etc. Some of the project interventions support the mandate of this act by ensuring the protection and preservation of the canals and its banks. Further no supplies of water through the network of canals are proposed and hence none of the project investments are in violation of its provisions.

#### **4. Land Acquisition Act of 1950 (LAA)**

LAA of 1950 which has several amendments and the latest being the version of 1986 is the most important legal provision pertaining to the land acquisition process in Sri Lanka. The law governing acquisition of land for public purposes is explained in this act. It provides compensation for acquisition of land, structures and crops only. Therefore, acquisition of lands and properties and any resettlement as part of the project will have to follow this law.

#### **5. Sri Lanka National Involuntary Resettlement Policy (NIRP) of 2001**

To ensure that people affected by development projects are treated in a fair and equitable manner, and that they are not impoverished in the process, it is necessary that Sri Lanka adopts a NIRP. Such a policy would establish the framework for project planning and implementation. Subsequently, it will be necessary to prepare guidelines on resettlement planning and implementation to be used by PEAs.

NIRP principles include: (1) involuntary resettlement should be avoided or reduced as much as possible by reviewing alternatives to the project as well as alternatives within the project; (2) where involuntary resettlement is unavoidable, affected people should be assisted to re-establish themselves and improve their quality of life; (3) gender equality and equity should be ensured; (4) APs to be fully involved in selection of relocation sites; (5) replacement land should be an option for compensation in case of loss of land; (6) compensation for loss of land, structures, other assets and income

should be based on full replacement cost, including transaction costs; (7) resettlement should be planned and implemented with full participation of provincial and local authorities; (8) affected persons to be integrated into host communities using participatory measures; (9) CPRs and community and public services should be provided to APs, (10) resettlement should be planned as a development activity for the APs; (11) APs who do not have documented title to land should receive just treatment; (12) Vulnerable groups should be identified and given appropriate assistance to substantially improve their living standards; and (12) project executing agencies should bear the full costs of compensation and resettlement.

**Application to ASMP:** The application of the NIRP to the Project based on its scope, which applies “to all development-induced land acquisition or recovery possession by the State” and its definition of involuntary resettlement as “unavoidable displacement of people arising from development projects that creates the need for rebuilding their livelihoods, incomes and asset bases in another location” does not provide necessary guidance on compensation for temporary impacts during construction, which are the largest envisaged impacts due to the project. According to the NIRP, APs should be fairly compensated upon acquisition and their livelihood is established.

## **6. The Coast Conservation and Coastal Resources Management Act No.49 of 2011 (Amendment)**

The Coast Conservation and Coastal Resources Management Act (CCCRMA) makes provisions for the regulation and control of development activities within the coastal zone as well as formulates and executes schemes of work for coast conservation. Under the section 6 of the act, there is provision to appoint a Coast Conservation Advisory Council (CCAC) which would advise the Coast Conservation and Coastal Resources Management Department (CCCRMD) on all development activities proposed to be implemented in the coastal zone and review its coastal zone management plans. The law specifies that projects located wholly or partly within the coastal zone (the area lying within a limit of three hundred meters landwards of the Mean High Water line and a limit of two kilometers seawards of the Mean Low Water line and in the case of rivers, streams, lagoons, or any other body of water connected to these either permanently or periodically, the landward boundary shall extend to a limit of two kilometers measured perpendicular to the straight base line drawn between

the natural entrance point thereof and shall include waters of such rivers, stream and lagoons or any other body of water so connected to the sea) must undergo the approval process that is laid down in the Coast Conservation and Coastal Resources Management Act irrespective of its size.

Only those projects located totally outside the Coastal Zone will be subject to the approval process laid down in the National Environmental Act. Therefore, any development work taking place within this zone falls under the jurisdiction of CCCRMD. According to the CCA, Director of the CCCRMD has the discretion to request for an EIA/IEE from the project proponent if the initial screening reveals significant impacts in the coastal areas by the project. The process is very much similar to the NEA excepting that the Director of the CCCRMD reserves the right to request for an EIA/IEE depending on the nature and scale of anticipated impacts of the proposed investments rather than on pre-determined prescribed limits as in the NEA and also to make a final decision. The Director is advised by the CCAC on the findings of EIA/ IEEs.

**Application to ASMP:** The proposed project area includes two districts namely Ampara and Kilinochchi boarded to the Sea and Lagoons. Any activity falling under the jurisdiction of Coastal Zone as prescribed under CCA, approval should be granted by the Director, CCCRMD.

#### **7. Pesticides Act No. 33 of 1980, as amended by the Act No. 06 of 1994 & the Act No. 31 of 2011)**

Registrar of Pesticides (ROP) is the legal authority empowered and entrusted on the functions related to the registration and regulation of pesticides in Sri Lanka (appointed under the Control of Pesticides Act No. 33 of 1980, as amended by the Act No. 06 of 1994 & the Act No. 31 of 2011). According to the Act, it is the duty of the ROP to regulate pesticides imported to and produced in Sri Lanka, and to assure their quality and safe use, and to assess and to declare Maximum Residue Limits (MRLs) in agricultural produce. The basis of regulation is the compulsory registration of all pesticide material. The post registration activities are an inherent part of Sections 20-22 of the Control of Pesticides Act, which enables the regulatory process to safeguard food quality, human health and the environment against pesticides. Awareness and legal binding thus created would expect to minimize unscrupulous trade practices and

thereby prevent adverse impacts caused due to pesticides.

**Application to ASMP:** Project has prepared a comprehensive Pest Management Action Plan in complying with the above enactment and the WB’s Pest Management Plan. All agronomical practices which are to be undertaken under ASMP should be in-line with Integrated Pest Management Plan. IPM is triggered policy under WB’s Operational Policies related to ASMP and from land preparation up to marketing, IPM should be implemented as practicable as possible.

**Table 1: Mandates of different conventions related to the control of pesticides**

Name of convention	Area covered
Rotterdam Convention	Banned and severely restricted pesticides are managed in a form of international information sharing during importation and exportation, which is known as “PIC”, Prior Informed Consent Procedure.
Stockholm Convention	Persistent Organic Pollutant (POP) pesticides which are highly toxic and persistent in the environment and have global concerns due to their trans-boundary transport. The global elimination and safe disposal of these types of compounds are the ultimate objectives.
Basel convention	Control of transboundary movement of hazardous waste and their disposal.
Minamata convention	A global treaty to protect human health and the environment from human-induced emissions and releases of mercury and mercury compounds.

## 8. Plant Protection Act No.35 of 1999

The core activities of the Plant Protection Service can be stated as the control of pests/disease outbreaks, implementation, monitoring and evaluation of field level IPM programs in rice and vegetables managing pests in bulk seed storage in the Department of Agriculture farms through fumigation, conducting research in pest management and pesticides. These mandates revolve around regulatory provisions

made under the Plant Protection Act No.35 of 1999. Mitigating PPS was the entrusted division under SCPPC to implement and promote Permanent Crop Clinic Programs (PCCP) in the regional level that was initiated through the support of the Center for Agricultural Bioscience International (CABI).

**Application to ASMP:** Project has prepared a comprehensive Pest Management Action Plan in complying with the above enactment and the WB’s Pest Management Plan. All agronomical practices which are to be undertaken under ASMP should be in-line with Integrated Pest Management Plan. IPM is triggered policy under WB’s Operational Policies related to ASMP and any activity propose under agronomical practices should be in complying with these requirements stipulated.

### 9. Seed Act No. 22 of 2003

The objective of this enactment was to regulate the quality of Seed and Planting materials; and to provide for matters connected with. To safeguard the farmers as well as the seed handlers from malpractices that would harm the seed industry.

**Application to ASMP:** As there will be seed production activities under ASMP, the entire process of seed production should be in complying the regulations stipulated under this act. Process should be coming under proper Seed Certification programme and any planting material proposed under this programme should be complying with its regulation.

**Table 2: Important Services in Agriculture Sector**

Name of unit				Mandated Functions
National	Plant	Quarantine	Service	Facilitate the import and export of pest free plants and plant products, for the development of agriculture and related industries in the country.
Plant	Genetic	Resources	Centre	Explore, collect conserve, introduce, evaluate and utilize the diversity of crop genetic resources

## **National Plant Quarantine Service**

The mandate of the National Plant Quarantine Service of Sri Lanka is to facilitate the prevention of, introduction of, eliminate the spread of dangerous alien pests within the country and the establishment of and involvement in domestic pest control programmes; Development of treatment technologies to eradicate pests of quarantine importance; Promotion of the export of healthy plants and plant products, the import and export of pest free plants and plant products for the development of agriculture and related industries in the country. To achieve this, emphasis was given to both research and service-oriented quarantine activities. Phytosanitary certification, inspection and treatment of import and export plants and plant products, testing of detained samples, issuing of import permits for plant and plant products, pest risk analysis, field certification for fruits and vegetables and pack house registration, dissemination of knowledge on all aspects of plant quarantine via training and awareness programs for interested groups are the main activities accomplished in collaboration with national research institutes, universities and institutes and centers of DOA.

NPQS is equipped to carry out the testing of import and export of plant products on insects, pathogens and weeds, by drawing samples as required. It was noted that the major pests identified are parasitic nematodes, common storage pests in seed potato, maize, soya, etc. Pathogens were identified in the samples tested which included; *Mucor* spp., *Rhizoctonia* spp., *Erwinia* spp., *Geotrichum* spp., *Fusarium* spp., *Colletotricum* spp., *Cylindrocarpon* spp., *Bacillus subtilis* and *Curvularia* spp. Import consignments tested and found to be contaminated with soil and weed seeds will be confiscated and destroyed to avoid any infestation by alien species. This is considered as a potential risk of multiplication and infestation if released undetected. It was noted that a majority of work is focused on potato seed imports and to ensure a high quality of seed is delivered to farmers. A program was established to identify and to investigate the presence of maize wilt causal organism *Pantoea stewartii* in imported seed lots which may become infested if not protected. In order to increase technical expertise, the NPQS continue to carryout research and development activities through pest surveys, pest risk analysis, weed control research, Pathological research, Entomological research and Quarantine treatment research.

## **10. Agrarian Development Act. No. 46 of 2000**

An Act to provide for matters relating to landlords and tenant cultivators of paddy lands for the utilization of agriculture lands in accordance with agriculture policies; for the establishment of Agrarian Development Councils, to provide for the establishment of a land bank, to provide the establishment of Agrarian Tribunals, to provide for the repeal of the Agrarian Services Act No. 58 of 1979.

**Application to ASMP:** Conversion of paddy lands including abandoned paddy land to any other land use should be as per the approval of the Commissioner, Agrarian Development Department.

## **11. The Flood Protection Ordinance Act No.22 of 1955**

This act provides room for the Minister to declare any area in the country as flood area. It has provisions to prepare scheme for protection of flood area, creation of flood authority, regulations for management of flood area and acquisition of land for the purpose of the ordinance. The flood authority is usually the District Secretary of the affected area. In case of a large area of a Municipality is coming under flood the Minister may substitute the District Secretary by appointing the Mayor of the Municipality.

**Application to ASMP:** Overall, knowing the experiences in the past, this need to be considered. Badulla and Kandy are experiencing high intensity rains and subsequent flash floods. Even in Kilinochchi, Ampara and Vavuniya districts have several flood prone areas. The flood mitigation is a primary objective of this project that will facilitate the flood mitigation efforts project and strengthened the storm water management interventions and improve drainage in three cities. In particular to this land, land is recently reclaimed land which is surrounded by canal and there is a pond/water logging area within the site. It is observed that land is potentially a flood prone area. Therefore, proper drainage system should be established and building design should be looked in to the flooding effect in the future.



## **12. The Fauna & Flora Protection Ordinance Act No. 49 of 1993 & its amendments**

This act provides the protection, conservation and preservation of the fauna and flora of Sri Lanka. Under the Fauna and Flora Protection Ordinance (FFPO), five categories of protected areas are established viz. Strict Nature Reserves, National Parks, Nature Reserves, Jungle Corridors and Intermediate Zones including sanctuaries. According to this Act, any development activity of any description what so ever proposed to be established within a national reserve or within one mile from the boundary of any national reserve, is required to be subjected to EIA/IEE, and written approval should be obtained from the Director General, Department of Wildlife Conservation prior to implementation of such projects. The FFPO follows a similar process as the NEA in conducting scoping, setting the TOR, preparation of EA, review of EA and public consultation and disclosure. The decision of project approval or disapproval is finally granted by the Director General of the Department of Wildlife Conservation.

**Application to ASMP:** Kilinochchi, Vavuniya, Kandy, Badulla and Ampara districts as whole have several important Wildlife designated areas namely Protected Areas (National Parks, Sanctuaries, Reserves, etc). Any cultivation or development related activity falling in or around such areas should be consented by the DWLC.

## **13. The Sri Lanka Land Reclamation & Development Corporation Act No. 15 of 1968**

The Act provides the formation of the Sri Lanka Land Reclamation & Development Corporation (SLLRDC). The latest amendment to this act is the No 35 of 2006 which incorporated section 2A- Prohibiting filling or developing and reclaiming land, section 2B-Declaring areas as low lying marshy or swampy and section 20 C- stipulating that pollution of canal as an offence. In addition, Section 28 of the principal enactment has added new definition– retention areas. The gazette regulations under this act also had declared several areas as wetland.

**Application to ASMP:** The project supports and enhances the provisions set out in the act through improvement to the canal network for the smooth flow of storm water in the site. Also, the SLLRDC, who implements this act, required to be involved as a designer in the project although none of the SLLRDC acquired areas are found within both project sites.

#### **14. The Urban Development Authority Act No. 41 of 1978**

This act has provided provisions to establish the Urban Development Authority (UDA), declaration of areas as urban development area. Its Part II outlines 22-point powers and functions of the UDA. Under Part IV it has power to acquire immovable property and sale of land belonging to the authority. The act provides room to make regulations for the purpose of carrying out or giving effect to the principles and provisions of this law. The amendment brought in Act no 2 of 1980 under special provisions provided room to declare lands urgently require for urban development projects and remedies to affected parties and the uphold the power of Supreme court. The amendment brought under Act No 4 of 1982 in its Part II A describes the planning procedure, appointment of planning committees, preparation of draft development plans, approval of the same also provide room for subsequent amendment. It also provides room to issue permits for development work, and delegation of the powers of the authority and procedures to be followed if activity takes place in contrary to the permit issued. Further the principal enactment amended by the addition of section 29 by adding a schedule, indicating the matters for which provisions may be made in the development plan. The subsequent amendments deal with levies, joint venture development projects etc.

**Application to ASMP:** Any development activity which are to be proposed should be compatible with UDA regulations applicable to each district, zone, etc

#### **15. The Mines and Mineral Act No.33 of 1992**

The Geological Survey and Mines Bureau established under the Mines and Minerals Act No. 33 of 1992. Under this act, mining falls within the purview of the Geological Survey and Mines Bureau (GSMB). Mining and exploitation for minerals, including sand, must be licensed under the act by the GSMB. Mining licenses are issued only to a qualified individuals and companies registered to do business in Sri Lanka. Mining is not permitted within Archaeological Reserves and within specified distance of monuments. New mining licenses are subject to the EIA process, if the type and extent of mining is listed under the EIA regulations. Additionally, the GSMB has power to stipulate conditions including the taking of deposits and insurance for the protection of environment. Regulations made by the GSMB under the act cover a variety of environmental stipulations, criteria and conditions for licensing and operating mines.

This also covers the disposal of mines wastes. The act also deals with the health, safety and welfare of miners. Reclamation of mines is a major problem in Sri Lanka and due to current practice requires the mining enterprise to make a deposit to cover costs of recovery. The deposit however is inadequate for the purpose. Large extents of mined areas, particularly areas mined for clay and sand remain open. Mining rights on public and private land are subject to licensing by the GSMB and all minerals wherever situated belonging to the state. The right to mine particular parcels of public lands may be subject to EIA procedures as well as to lease for permit conditions.

**Application to ASMP:** Earth and quarry material will be needed for the development work undertaken by the respective implementing agencies either directly or through contractors. In such cases quantities specified need to be extracted and permission from the GSMB is required. Alternatively, the project contractors can procure them from the open market but they will have to make sure that such sources/traders are operating with valid licenses.

## **16. Local Authorities Acts**

The Municipal Council (MC) Act No. 19 of 1987 & Urban Council (UC) Act No. 18 of 1987 provide provisions for the establishment of MCs and UCs with a view to provide greater opportunities for the people to participate effectively in decision making process relating to administrative and development activities at a local level and it specify the powers, functions and duties of such Las and provide for matters connected there with or incidental there to. These acts contain sixteen & eight parts respectively, several schedules and 327 & 249 sections respectively. The MC act, spell out its status, powers & functions in Section IV, Section V and Section VI in sections 34 to 154 and covers public health, drainage, latrines, unhealthy buildings, conservancy & scavenging, nuisance etc. Further the respective local authorities have mandate regionally to implement the project activities and monitor the progress of compliance work.

**Application to ASMP:** The infrastructure improvement activities funded under ASMP through the LAs comprise of the basic services they ought to render to the public in line with these acts. Subsequently, maintaining this infrastructure would be the prime duty of the local authorities. In addition, majorly, management of solid waste should

be in-line with Las mandate.

### **17. Water Resources Board Act No. 29 of 1964**

Main responsibility under this act highlighted are control, regulation and development including the conservation and utilization of the water resources of the country. In addition, the promotion of afforestation, control of soil erosion, prevention of the pollution of rivers, streams and other water sources are also required to be considered. Mainly, the Water Resources Board is the key player of the formulation of national policies relating to the control and use of water resources of the country, as well as coordination of projects undertaken by government departments, local authorities and public corporations relating to the conservation, utilization development of the subterranean water resources of the country and the assessment of the possibilities, benefits and economic feasibilities of such projects.

**Application to ASMP:** Use of ground water in cultivation or infrastructure development should be seek recommendations from WRB in advance with a proper yield test.

### **18. Forest Ordinance including Amendments**

The Forest Ordinance is one of the oldest ordinances in the country, first enacted in 1887 under which the Forest Department was established in 1887. This act has been amended several times in the past. The Forest Reserves gazetted under the provisions of the ordinance and all proposed reserves that are not gazetted under these provisions but selected for conservation based on biological and hydrological importance should be taken into account in implementation of this project.

**Application to ASMP:** project interventions especially lands within the purview of Forest Department, should be obtained approval from Forest Department prior to implement the activities. This requires specially when removing trees within the proposed site.

### **19. National Wetland Policy**

The National Policy & strategies on Wetlands (2005) seeks to give effect to National Environment Policy and other relevant national policies, while respecting national commitments towards relevant international conventions, protocols, treaties and

agreements on wetland protection to which Sri Lanka is a party. Among the International Conventions, Ramsar Convention on Wetlands of International Importance (1971), the Convention on Conservation of Migratory Species of Wild Animals (1979) and the Convention on Biological Diversity (1992) are significant.

The definition given for Wetlands in the policy is “Areas of marsh, fen, peat and or water, where natural or artificial, permanent or temporary with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters and may incorporate riparian and coastal zones adjacent to the wetlands and islands or bodies of marine water deeper than six meters at low tide within the wetlands”.

The policy has six sections, Introduction, need for a national policy on wetlands, principles, objectives, policy directions and explanation of key concepts. The policy directions address wetland management, institutional arrangement, inter-sectoral linkages, research, development and education. The local level and national level institutions are proposed to be established. All sectoral development plans should be based on principles of wetland ecosystem management.

Institutional Arrangement to manage wetlands is well established at present. A multi-stakeholder National Wetland Steering Committee has been established in the Ministry of Environment to advise on wetland issues in the country and wetland management unit has been set up at the Central Environmental Authority to oversee and facilitate policy implementation.

**Application to ASMP:** Project investments identified so far have no direct impacts on wetlands. However, there are a number of freshwater marsh patches and mangrove habitats along some of the canals, respectively. Any impacts to these areas will be identified in the respective project at the time EAs and mitigatory measures will be identified.

## **20. The Irrigation Ordinance (Chapter 453)**

The ordinance in its part VI covers the protection of irrigation works and conservation of water in section 64. The section 65 deals with removal of encroachments. The Part V covers the construction and maintenance of major and minor irrigation schemes in sections 33, 34, 46, 54, 61, 62 and 63.

**Application to ASMP:** Any activity relevant to ID's command areas should be consented by the ID

## **21. The Antiquities Ordinance**

The Antiquities Ordinance (Revised in 1956 & 1998) is the main legislation dealing with Cultural Assets Preservation in Sri Lanka. Section 16 covers Ancient Monuments and their declaration as well as the declaration of specified trees as ancient monuments. According to Section 21, the restoration, repair, alteration or addition in connection with any protected monuments has to be conducted in accordance with the conditions of a permit issued by the Director General of Archaeology, or in accordance with an agreement entered in to under Section 20. Section 24 prohibits or restricts subjects to certain prescribed conditions, the erection of buildings or carrying out mining, quarrying, or blasting operations on any land within the prescribed distance of any ancient monument situated on Crown land or any protected monument. As per the ordinance the Director General of Archaeology "shall cause an impact assessment survey to be undertaken at the expense of the sponsors of such project or scheme to assess the consequences thereof upon the antiquarian, historical or archaeological aspects or value of the land in question or on any antiquities upon it and shall, within such period of time as may be agreed on.

**Application to ASMP:** Any potential activities closer to places with Importance of Physical Cultural should be approved by the Department of Archaeology.

## **22. Disaster Management Act No. 13 of 2005**

Under the Disaster Management Act No.13 of 2005, there is a provision to establish a National Council for Disaster Management (NCDM). The Act defines "disaster" as an actual or imminent occurrence of a natural or man-made event, which endangers or threatens to endanger the safety or health of any person or group of persons in Sri Lanka, or which destroys or damages or threatens to destroy or damage any property, and inter alia includes:

- An industrial hazard
- A fire
- An explosion

- A chemical accident
- Oils spills including inland oil spills
- Cyclones
- Tsunamis

Disasters may happen as the result of a malfunction of the normal operating procedures or precipitated by the intervention of an outside force such as a cyclone, flood or deliberate acts of arson or sabotage.

The major objective of this act is to protect human life, property and the environment of Sri Lanka from any event defined as a disaster. Therefore, this act plays key role to protect the environment and provides necessary guidelines for the protection of human life, property and the environment of the country.

Major functions of the NCDM include, to formulate a National Policy and Program on the management of disasters which shall provide for the protection of life of the community and environment and the maintenance and development of disaster affected areas; the effective use of resources for preparedness prevention, response, relief, reconstruction and rehabilitation; and the enhancement of public awareness and training to help people to protect themselves from disasters.

Section 10 of the Sri Lanka Disaster Management Act stipulates that “It shall be the duty of every ministry, Government Department and public corporation to prepare a Disaster Management Plan with respect to such ministry, Government Department or public corporation to counter any disaster or impending disaster based on the National Disaster Management Plan and in accordance with such guidelines as may be specified by the National Council for Disaster Management. As per the definition of public corporation provided under Section 25 of the said act, a Disaster Management Plan is compulsory for coal-based thermal power plant operations.

**Application to ASMP:** Specially, the proposed site situated in a low-lying area which will be a flood prone area in the Division, and within coastal belt which are susceptible to Tsunami and areas susceptible to Wind/cyclones. During the implementation stage, Disaster Management Centre (DMC) should play a major role in recognizing critical drains which are to be rehabilitated/improved and consent of DMC should be obtained

prior to implementation of project interventions. In addition, operational of processing hub will have potentials for fires, explosions and chemical spills.

### **23. Prevention of Mosquito Breeding Act No. 11 of 2007**

This act has been passed for the purpose of ensuring the prevention and eradication of all mosquito-borne diseases. Under this act, it shall be the duty of every owner or occupier of any premises to cause, (a) open tins, bottles, boxes, coconut shells, split, coconuts, tyres or any other article or receptacle found in or within such premises, capable of holding water, to be removed, destroyed or otherwise effectively disposed; (b) any well found in the premises and its surroundings to be maintained and kept in good repair so as to make it mosquito-proof and thereby prevent the breeding of mosquitoes; (c) any artificial pond or pool found in such premises to be emptied at least once every week; (d) any casual collection of water within the premises which is conducive to mosquito breeding, to be regularly drained; (e) shrubs, undergrowth and all other types of vegetation, other than those grown for the purpose of food or those which are ornamental, found within or outside any building or structure within the premises used as a dwelling place which has become a breeding place for mosquitoes, to be removed; (f) the removal and destruction of water plants having the botanical name pistiastratiotes and commonly known as “diyaparanda”, “kondepasei”, “telpassy”, “barawa-pasi”, “nanayaviraddi” and of any other water plant, or plants, found within the premises, which may facilitate the breeding of mosquitoes. Hence, this act placed to eradicate or prevent mosquito borne diseases and is mainly targeted at water sources.

**Application to ASMP:** All project interventions during the construction and operational stages should be comply with Prevention of Mosquito Breeding Act requirements to control or mitigate or avoid generation breeding sites.

### **24. Occupational Health and Safety**

Project interventions involve multifarious activities during construction and operation and maintenance phases. These activities are also associated with problems of occupational health and safety. The problems envisaged during construction and erection stages can mainly be due to exposure to dust, accidents and noise. The problems envisaged during the operation and maintenance phase are accidents, exposure to heat, noise, arc lights, chemicals etc.



The National Policy on Occupational Safety and Health in Sri Lanka is in the drafting stage. The Labour and Labour Relations Ministry in collaboration with 25 ministries, trade unions, employers and other authorities are involved in the drafting with the intention of reducing work place related injuries and other mishaps (Ceylon Daily News; 14th November 2014).

**Application to ASMP:** All project activities, during construction should comply with Factory Ordinance requirements related to occupational, health and safety and International Labour Organization (ILO) guidelines on the same.

## **25. Indigenous People of Sri Lanka**

Sri Lanka does not have a national policy or a legal framework exclusively on indigenous people. Sri Lankan Constitution guarantees equal rights and privileges to Veddas, which are accorded to any other ethnic community in the country. It does not accord special status to any ethnic, religious, cultural or social group. In addition, Veddas also receive State patronage at times when they raise their grievances with the relevant authorities. However, in popular literature and historical analyses, a group of forest dwellers known as Vedda are considered as indigenous people. Historically, they lived near forest and jungle areas. The Veddas are allowed to engage in their traditional livelihood practices in a limited way ('limited human activities') such as hunting and gathering forest resources. In 2011, a National Action Plan for the Protection and Promotion of Human Rights prepared by the Government, which emphasizes the need for greater attention to the rights of indigenous people. The action plan directs the Ministry of Cultural Affairs and National Heritage to review existing laws, policies, and practices and amend or enact policies to protect the rights of indigenous people by 2016. The government's plan also provides legal support to the indigenous community, measures to conserve their traditional knowledge and traditional medicines, and support to establish a museum on their heritage. In order to create greater awareness about the indigenous community and their culture, the Government has established several cultural centers and documented the history of the Vedda community and their way of life. The Forest Department which is responsible for management of national forest covers have recognized the livelihood needs of forest dwellers and issued 'permits' for only identifiable forest dwellers to

enter into forest areas and make use of forest resources for livelihood purposes. At present, except in a few locations near forests and national forest covers, majority of Vedda people have been integrated or assimilated with mainstream Sri Lankan society. They communicate with each other in national languages depending on where they live. On the other hand, there is no record of existence of Vedda people in national census or local record, and this fact makes it difficult to do any specific targeted development planning and/or interventions. The Bank has recently carried out a preliminary assessment to ascertain data and information of the presence of IP community, especially Vedda. The assessment reveals that in certain locations near forest areas, a few Vedda households identify themselves as forest dwellers or Vedda. However, the overwhelming majority does not exhibit any recognizable characteristics as IPs and they are fully integrated with the mainstream society having assimilated mainstream values as well. In addition, Sri Lanka's ethnic groups, such as Tamils, do not consider themselves as ethnic minorities because they enjoy equal rights as all other religious and ethnic groups well integrated and mainstreamed in national political system and governance with demonstrated capability to influence national policies and resource allocations. A national workshop is being planned to review and discuss the findings of the IP study and decide on whether Vedda communities or any other social groups should be recognized as IPs for targeted action, and determine the applicability of triggering of Indigenous People's Policy (OP 4.10) for Bank financed projects. The Project does not envisage to implement any interventions in the areas which are close to or interfere with the forest reserves and national parks earmarked as territories of the Vedda or any activities that would adversely affect the habitats and the social and cultural practices of the forest dweller populations. Through social screenings and related interventions, the project will ensure to promote greater social equity in outreach, community participation, and involvement of vulnerable groups in planning and service delivery under project activities. The PMUs will implement community consultations in each of the subproject areas to identify opportunities as well as problems and issues in the beneficiary communities associated with project design, and will adopt adequate safeguard measures to address those issues

## **26. Women Charter of Sri Lanka**

The State policy on women in Sri Lanka is articulated in the Sri Lanka Women's Charter of 1993, which is based on United Nation's Convention on the Elimination of

all forms of Discrimination against Women (UNCEDAW) and was a collaborative effort of the national machinery and women’s NGOs. Seven areas of concern, specific to women in Sri Lanka such as civil and political rights, right to education and training, right to economic activity and benefits, right to healthcare and nutrition, rights within the family, right to protection from social discrimination and right to protection from gender-based violence are addressed in the Charter. In this charter, the Constitution of the Democratic Socialist Republic of Sri Lanka recognizes that gender equality and freedom from discrimination on the grounds of sex is a fundamental right, and provides for its enforcement in the Courts of Law. Political and Civil rights ensure equality of men and women and eliminate discrimination against women in the public and private sectors. Moreover, this was planned to be established for the purpose of examining progress made on the realization of the obligations undertaken by the Charter and for monitoring the achievement of its objectives.

### 2.3 World Bank Safeguard Policies

Projects and programs funded by IDA resources need to comply with the World Bank’s operational policies. Therefore, all sub-projects eligible for funding under this project will be required to satisfy the requirements of the safeguard policies of the World Bank, in addition to conformity with national environmental regulations. The Agriculture Sector Modernization Project (ASMP) undertakes several cultivation, and infrastructure subprojects and they have to be screened and impacts have to be identified. The World Bank OP4.01 discusses the environment assessment process to be followed.

The main environmental safeguard policy to be triggered under this project will be OP/BP/GP 4.01 on Environmental Assessment. The other three environmental safeguard policies namely, OP/BP/GP 4.36 and 4.04 on forestry and natural habitats respectively, have been identified as there will be activities inside such habitats and will be considered to ensure minimal adverse environmental impacts due to the project.

#### World Bank safeguards policies triggered by the project

<b>Safeguard Policies Triggered by the Project</b>	<b>Yes</b>	<b>No</b>
Environmental Assessment (OP/BP/GP 4.01)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Natural Habitats (OP/BP 4.04)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Pest Management (OP 4.09)	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Physical Cultural Resources (OP 4.11)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Involuntary Resettlement (OP/BP 4.12)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Indigenous Peoples (OD 4.20, being revised as OP	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Forests (OP/BP 4.36)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Safety of Dams (OP/BP4.37)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Projects in Disputed Areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Projects on International Waterways (OP/BP/GP	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### a. OP 4.01 on Environmental Assessment

This policy is triggered, if a project is likely to have potential (adverse) environmental risks and impacts in its area of influence. The policy requires environmental assessment (EA) of projects proposed for World Bank financing to ensure that they are environmentally sound and sustainable, and thus to improve decision making. EA should take into account the natural environment, human health and safety and social aspects in an integrated way. It should also take into account the variations in project and country conditions, the findings of country environmental studies, national environmental action plans, the country's overall policy framework and national legislation, the project sponsor's capabilities related to the environment and social aspects, and obligations of the country, pertaining to project activities, under relevant international environmental treaties and agreements.

The pollution prevention and abatement measures and emission levels that are normally acceptable to World Bank is described in the *Pollution Prevention and Abatement Handbook*. However, taking into account country's legislation and local conditions, the EA may recommend alternative emission levels and approaches to pollution prevention and abatement for the project.

#### Project Categorization

When OP 4.01 is triggered, the World Bank classifies proposed projects in to one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.

(1) A proposed project is classified as Category A, if it is likely to have significant adverse environmental impacts that are sensitive, diverse or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.

(2) A proposed project is classified as **Category B** if its potential adverse environmental impacts on human populations or environmentally important areas

including wetlands, forests, grasslands and other natural habitats are less adverse than those of Category A projects. These impacts are site specific; few if any are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. The scope of an EA for Category B projects may vary from project to project, but it is narrower in scope when compared with Category A projects.

(3) A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. For example, technical assistance projects on institutional development, computerization, and training fall in Category C.

(4) A proposed project is classified as FI when the Bank provides funds to participating national banks, credit institutions and other financial intermediaries (FIs) for on lending at the FIs' risk to final borrowers.

In the case of such projects, the FI screens each sub project proposed for financing, and classifies it in to any one of three categories: A, B or C. FIs must prepare an Environmental and Social Management Framework, following the Bank's consultation and disclosure requirements as in the case of other safeguards documents (e.g., EAs, RAPs, IPPs). The ESMF, including the screening process for categorization of subprojects, must be spelled out in the operational manual.

World Bank OP 4.01 is very clear that for all Category A projects and as appropriate for Category B projects during the EA process, the project sponsor should consult project-affected groups and local non-governmental organizations (NGOs) about the project's environmental aspects and take their views into account. The project sponsor should initiate such consultations as early as possible. For Category A projects, the project sponsor should consult these groups at least twice (a) shortly after environmental screening and before the terms of reference for the EA are finalized, and (b) once a draft EA report is prepared. The EA should particularly incorporate such comments to improve the project's social acceptability and environmental sustainability. In addition, the project sponsor should consult with such groups throughout project implementation, as necessary to address EA related issues that affect them.

ASMP has been placed under environment Category B. Although project activities are expected to be environmentally beneficial in the long-term, implementation of certain activities will have the potential to trigger adverse environmental impacts which are likely to be localized and can be mitigated. Even though the project will operate in known agricultural areas, great care will be taken to address environmental issues at the earliest stage possible in order to minimize their potential impacts.

### **Environmental Management Plans**

According to annex C of the World Bank OP 4.01 an Environmental Management Plan (EMP) is an essential element of EA reports for Category A projects. The EMP should consist of a set of mitigation, management, monitoring, and institutional measures to be taken during implementation and operation to eliminate adverse environmental and social impacts, offset them, or reduce them to acceptable levels. The plan should also include the actions needed to implement these measures. In preparation of an EMP, the EA consultant should:

- a. Identify the set of responses to potentially adverse impacts
- b. Determine requirements for ensuring that those responses are made effectively and in a timely manner
- c. Describe the means for meeting those requirements.

#### **a. OP 4.04 on Natural Resources**

OP 4.04: Natural Habitats seek to ensure that World Bank-supported infrastructure and other development projects take into account the conservation of biodiversity, as well as the numerous environmental services and products which natural habitats provide to human society. The policy strictly limits the circumstances under which any Bank-supported project can damage natural habitats (land and water areas where most of the native plant and animal species are still present). Specifically, the policy prohibits Bank support for projects which would lead to the significant loss or degradation of any Critical Natural Habitats, whose definition includes those natural habitats which are either: legally protected, officially proposed for protection, or unprotected but of known high conservation value. In other (non-critical) natural habitats, Bank supported projects can cause significant loss or degradation only when there are no feasible alternatives to achieve the project's substantial overall net

benefits; and acceptable mitigation measures, such as compensatory protected areas, are included within the project. Identification and assessing of impacts to natural resources is generally undertaken as part of EA work. Where significant impacts are anticipated special habitat management plans will be required, depending on the circumstances. Also, it is essential to ensure any formal clearances/approvals are taken from relevant government authorities as per National legislations

This policy has been triggered mainly on precautionary basis because some of the project sites will be within or adjacent to protected natural habitat such as the drinking water reservoirs and roads proposed for improvements in Kandy. Also, in Galle, there are wetlands associated with the natural storm-water drainage network and could possibly be damaged during canal dredging. In Jaffna, there are extensive natural ground water aquifers, naturally formed ponds, salt marshes and shallow lagoon area are associated with the project area which might be impacted due to project interventions such as drainage improvements, urban upgrading, and road rehabilitation. However, major impacts are not anticipated.

#### **b. OP 4.36 on Forests**

The forest policy is a follow on from the Natural Habitats policy and applies specifically to all types of natural forests and plantation forests. The key objective of this policy is to assist the borrowing countries to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into economic development and protect vital local and global environmental services that forests provide. The Bank will not finance projects that in the Bank's opinion would involve significant conversion or degradation of critical natural forests or those that contravene applicable international environmental agreements. If a project involves significant conversion or degradation of forests the Bank must determine they are not critical, there are no other feasible alternatives and that comprehensive analysis has been carried out that demonstrates benefits outweigh environmental costs. Identification and assessing of impacts to forests is generally undertaken as part of EA work. Where significant impacts are anticipated special forest management plans will be required, depending on the circumstances. Also, it is essential to ensure any formal clearances/approvals are taken from relevant government authorities as per national legislations. The policy also has strict stipulations on commercial forest harvesting and community aspects on

forest management. The policy is usually triggered when projects are expected to have impacts on health and quality of forests, rights and welfare of people who depend on forest resources and those that aim to bring about changes to management, protection and utilization of forests and plantations.

This policy has been triggered mainly on precautionary basis because some of the project sites will be within or adjacent to protected natural habitat such as the drinking water reservoirs and roads proposed for improvements in Kandy.

**c. Pest Management (OP 4.09):**

The policy has been triggered as expansion, intensification and diversification of agricultural activities under the project could lead to changes in the application of pesticides for pest and disease control. As per the policy, a separate standalone Pest Management Plans (PMP) has been prepared for the project based on Integrated Pest Management (IPM) principles. The PMP describes the relevant national regulatory framework, current status of pest and disease control, monitoring and supervision mechanism, major experience and problems, and lessons learnt from past projects. It specifies a range of non-chemical methods and a training and monitoring program to facilitate implementation. While a list of all chemicals likely to be used during project activities that meet Bank requirements, and namely, comply with the World Health Organization's recommended categories, has been included in the PMP, the project will not be procuring pesticides.

**d. OP 4.12 Involuntary Resettlement**

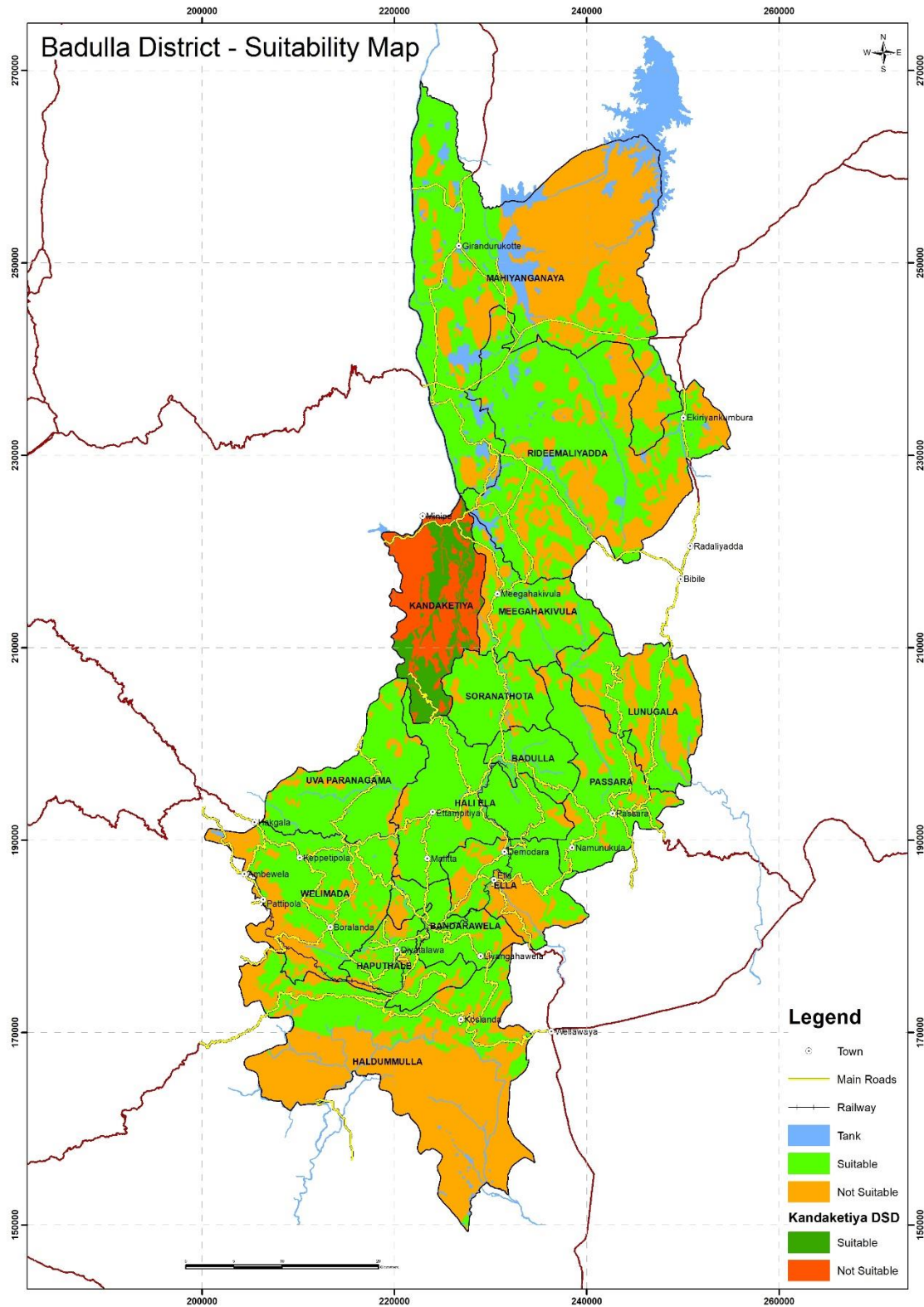
The World Bank's Operational Policy on Involuntary Resettlement (OP4.12) is applicable to the project. Involuntary resettlement covers situations where a project must compensate people for loss of land, other assets, livelihoods, or standard of living. World Bank Operational Policies seek to avoid - where feasible - or minimize involuntary resettlement, exploring all viable alternative project designs. Resettlement planning has the objectives of providing displaced persons with a standard of living equal to, if not better than, their pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher. The required measures to address the impacts resulting from involuntary taking of land, a RPF is required to ensure that the displaced persons are informed about their options and rights pertaining to resettlement; consulted on and provided with technically and

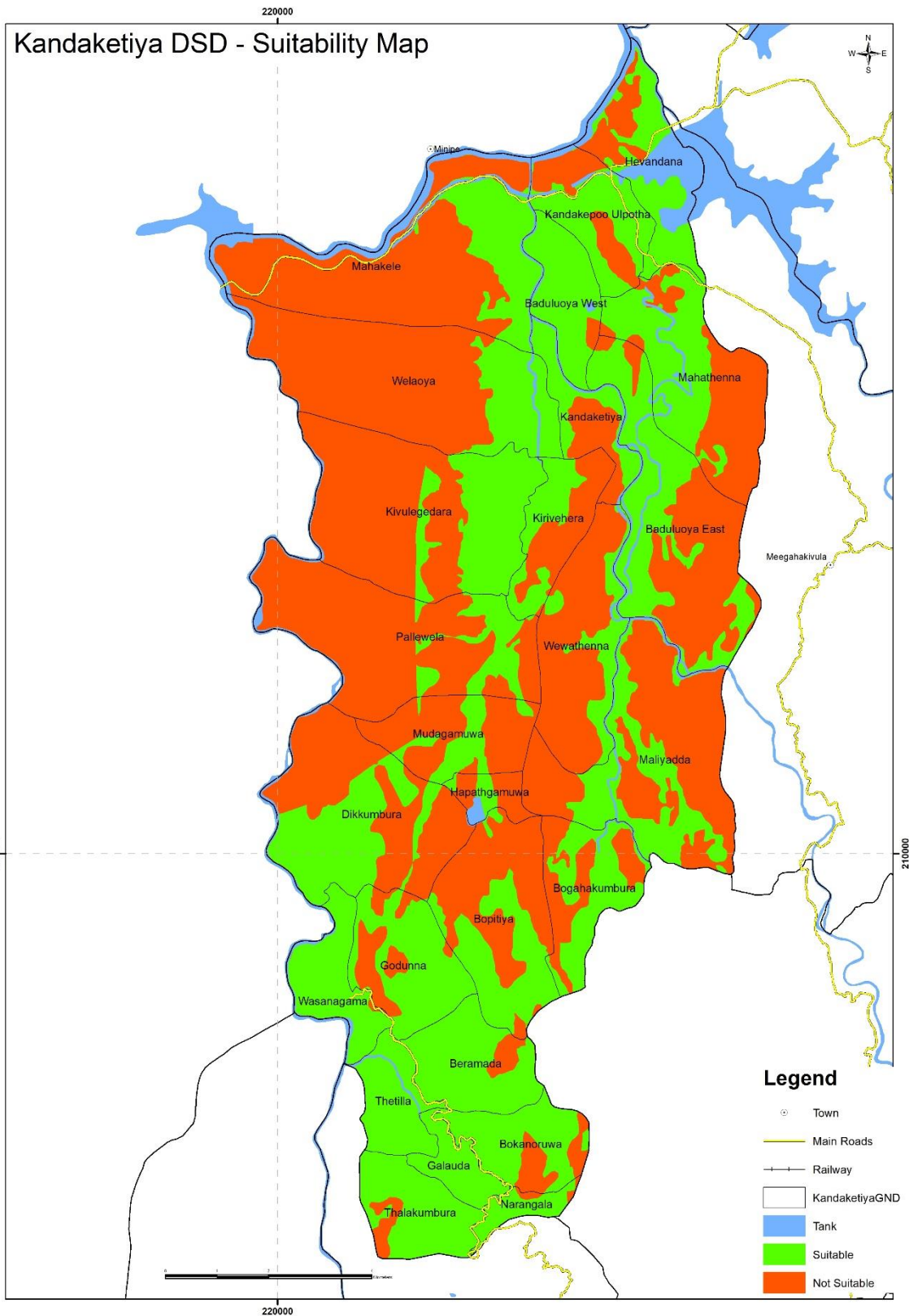


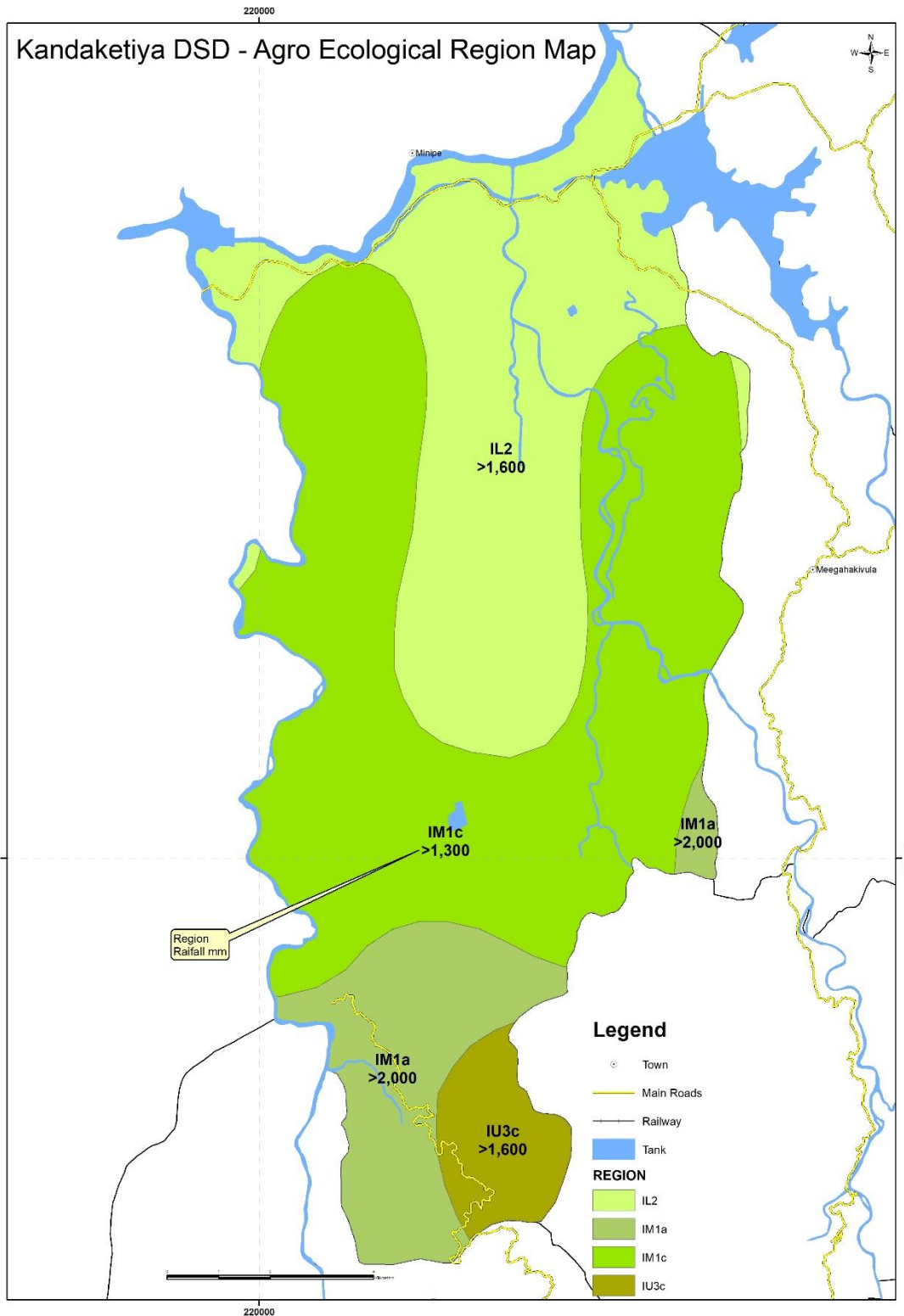
economically feasible resettlement alternatives and provided compensation at full replacement cost. No involuntary resettlement is envisaged under the project. Most project-supported physical interventions are expected to be of relatively small scale at household or village level on existing farmland of households that are participating in the selected sub-projects on a voluntary basis, following consultation. Specific activities would involve, for example some land preparation, construction of small-scale household level green houses, and installation of on-farm irrigation equipment. In addition, the construction of storage facilities, agriculture connectivity roads, markets, and facilities for product processing and others at the level of producer organizations or agribusinesses are likely to require some land and may generate a land acquisition case, if land is not donated voluntarily, purchased through willing-buyer willing-seller arrangements, or cannot be made available from State land. The RPF will guide the land acquisition process and the preparation of sub-project specific Resettlement Action Plans (RAPs) in compliance with the national legal and policy framework for land acquisition and OP 4.12. The RPF has set key principles and procedures for land acquisition, covering documentation, compensation and mitigation principles, a grievance redress mechanism, monitoring and evaluation, and institutional arrangements. All the subprojects that involve construction of agriculture infrastructure and facilities in new lands will be screened in respect of the involuntary resettlement policy, including any community/government owned land required for new constructions is free of squatters/informal settlements and other encumbrances.

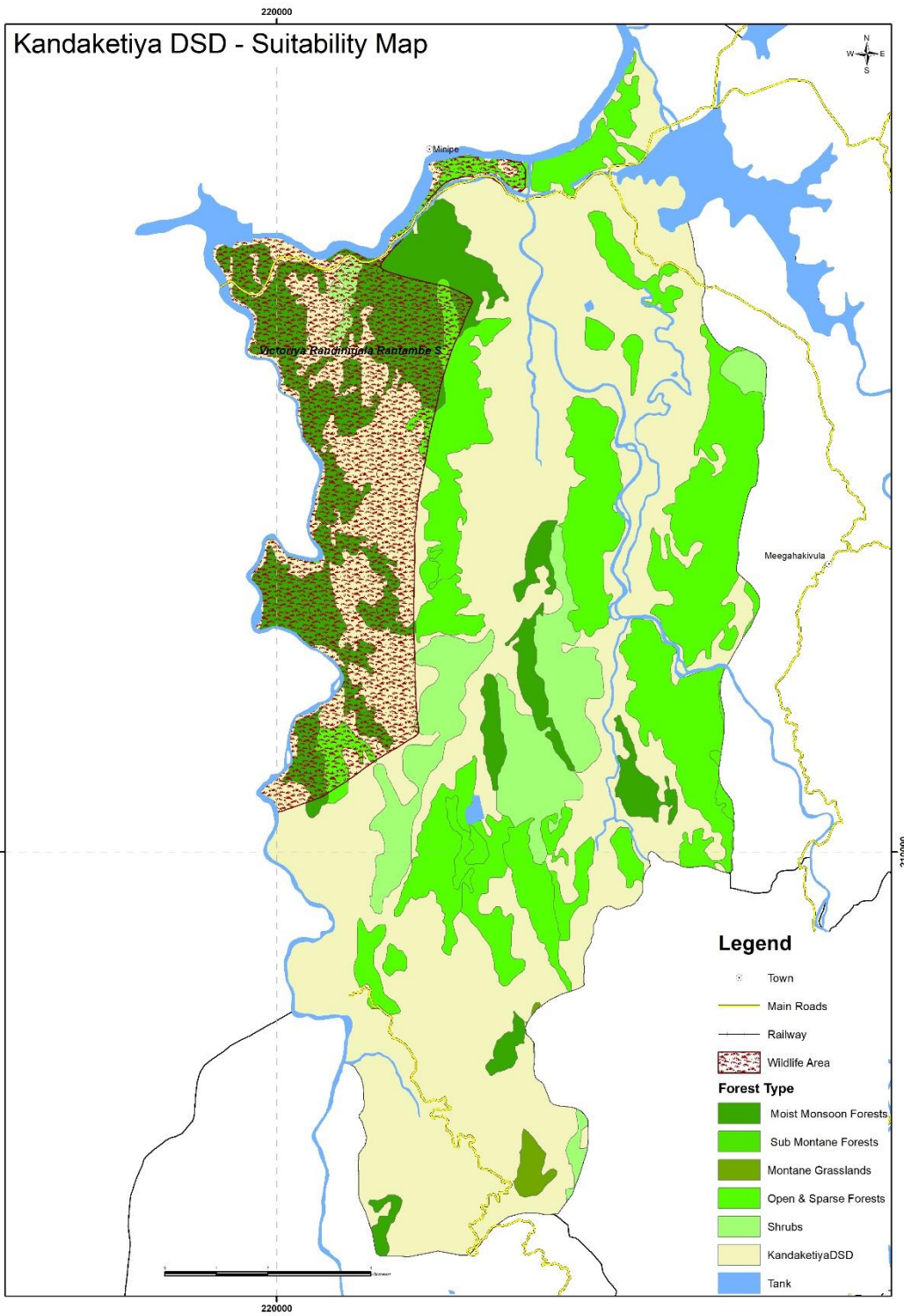
# Annex 6 – GIS Mapping Outcomes

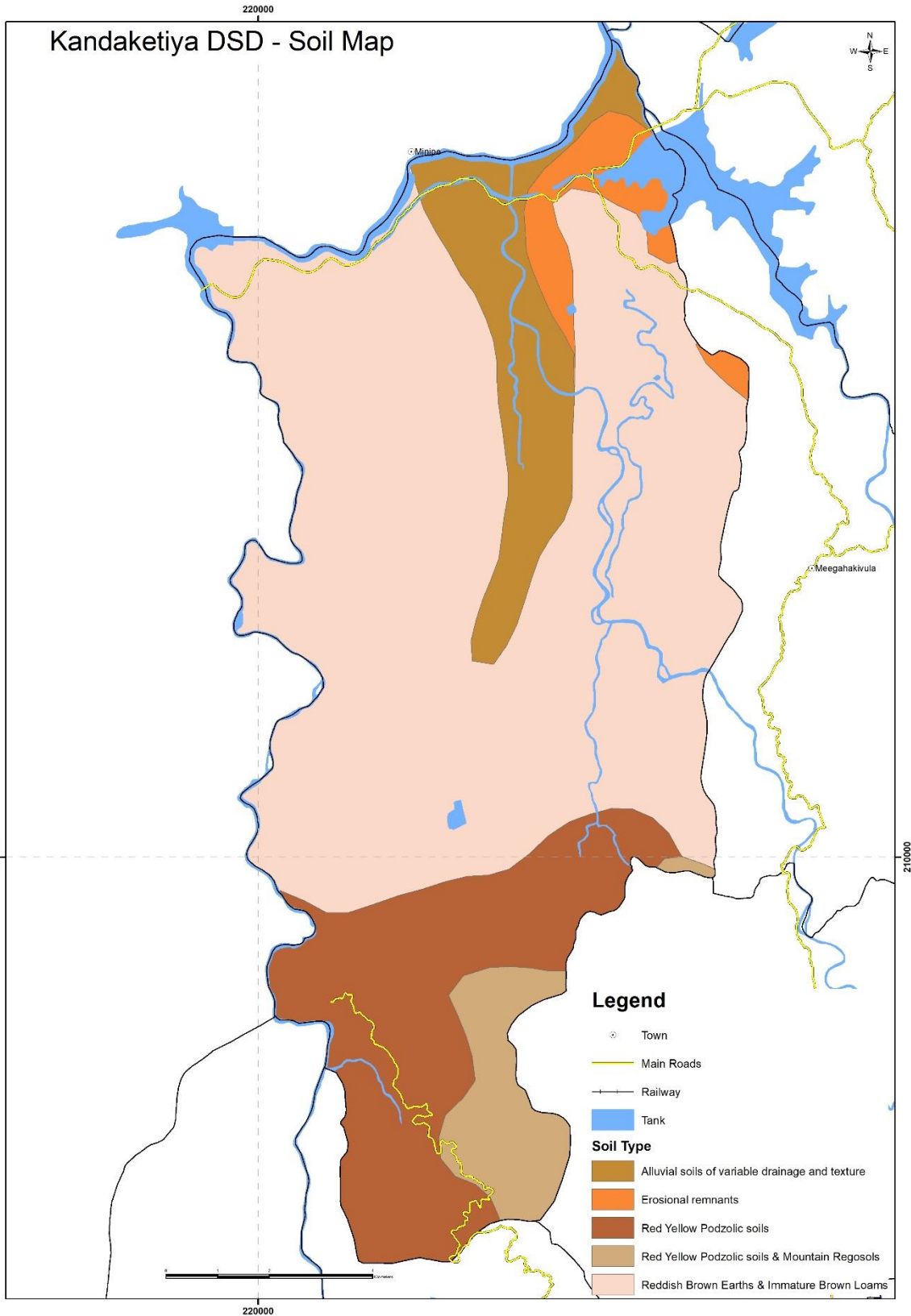
## Badulla District

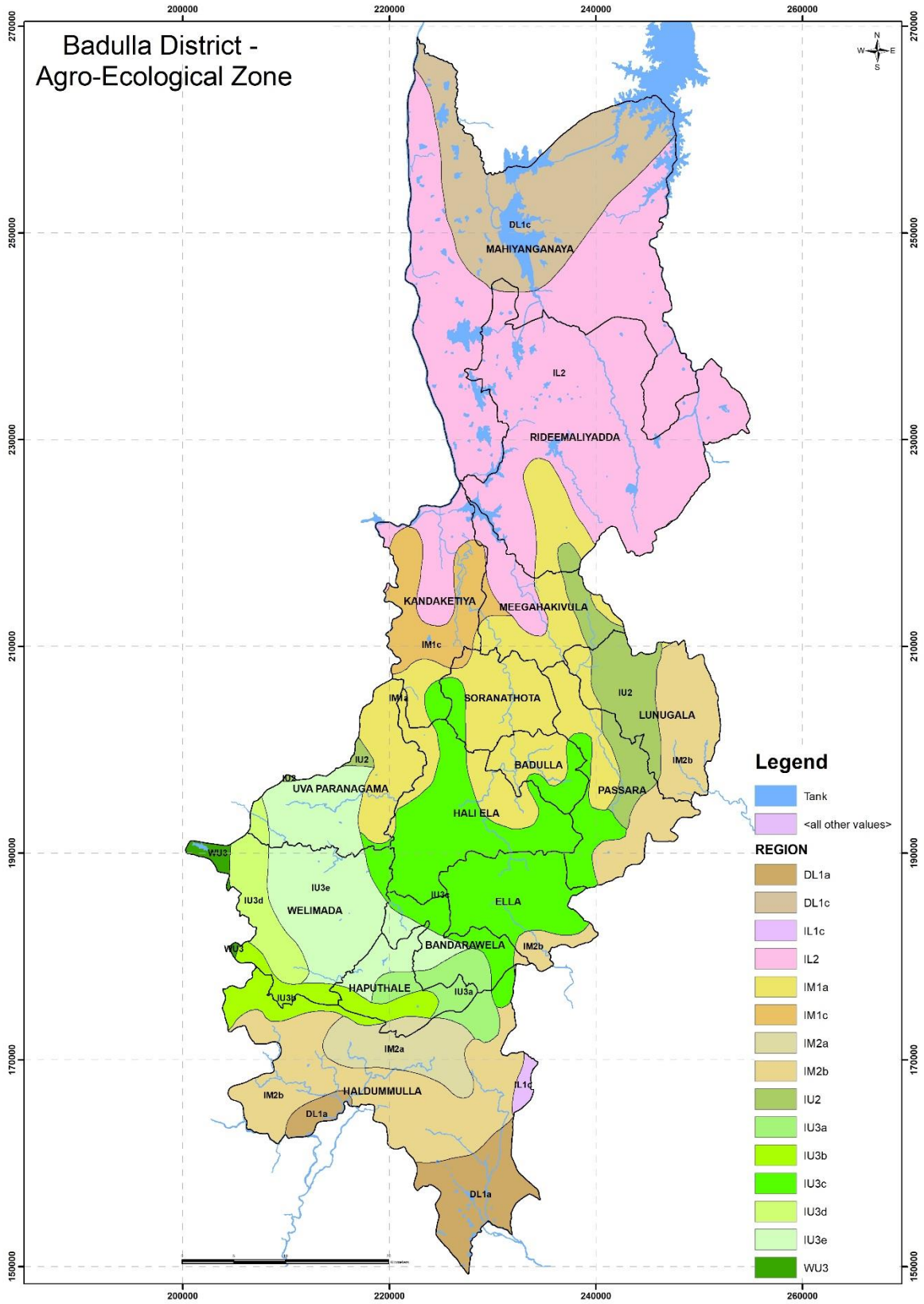


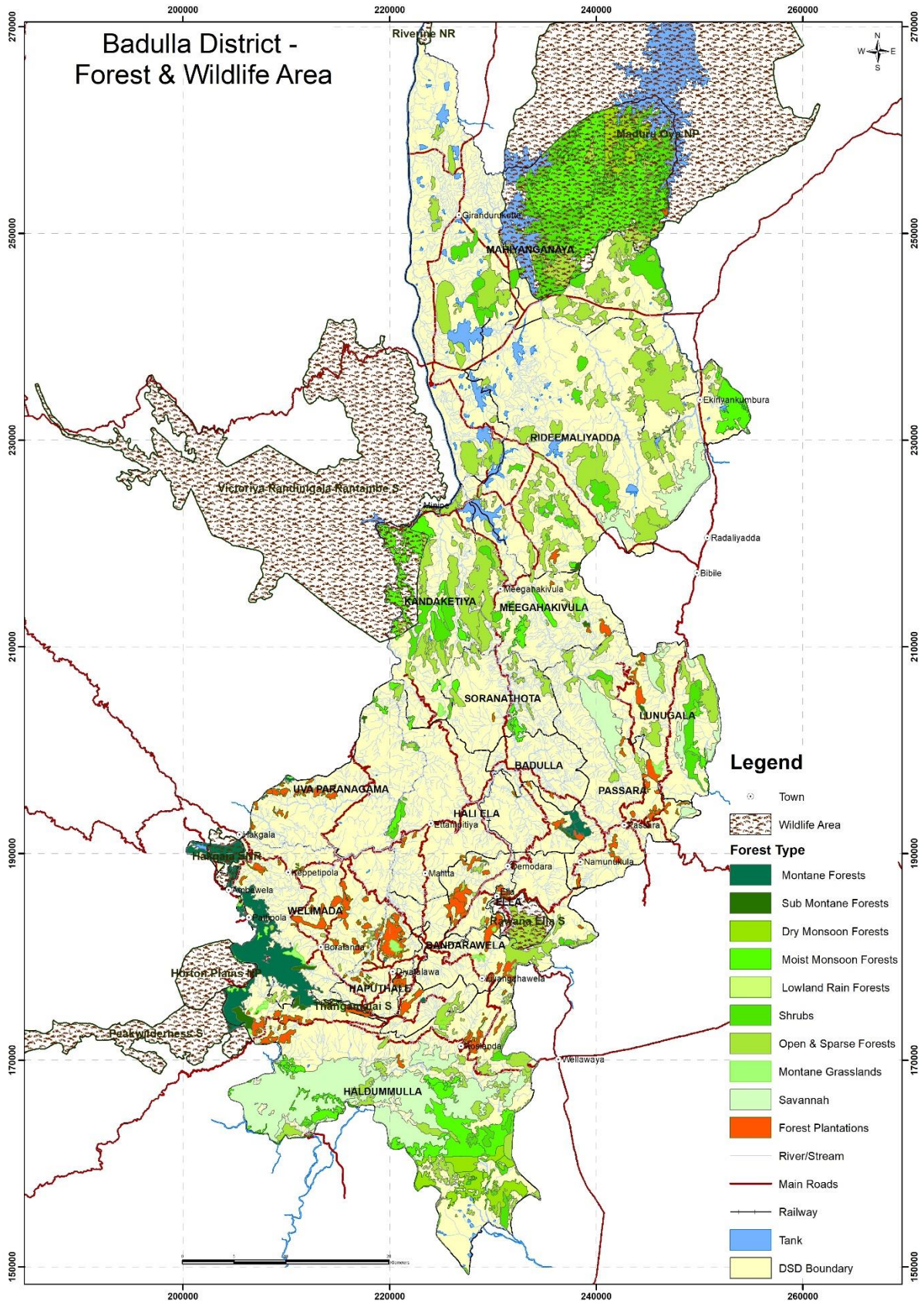




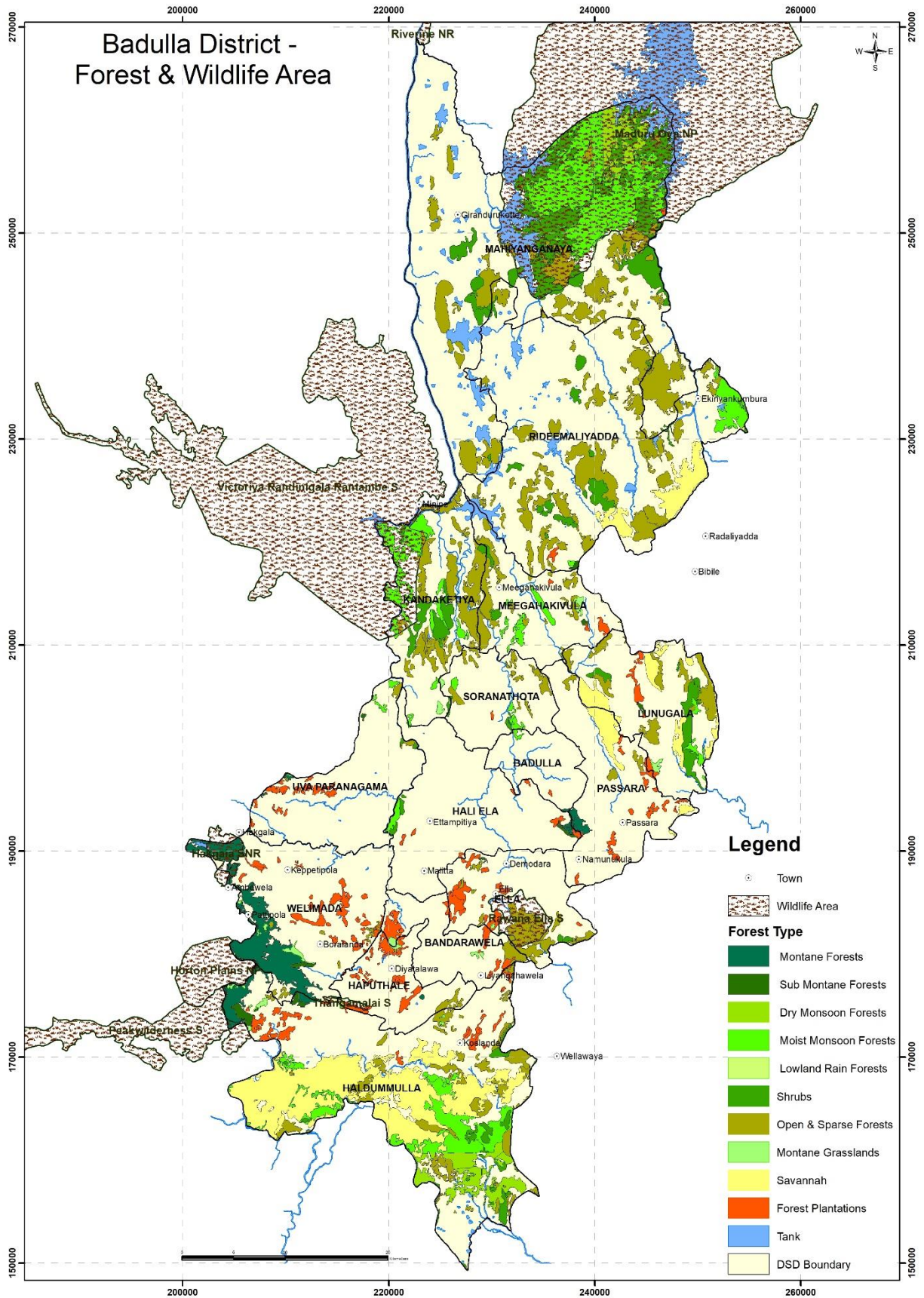


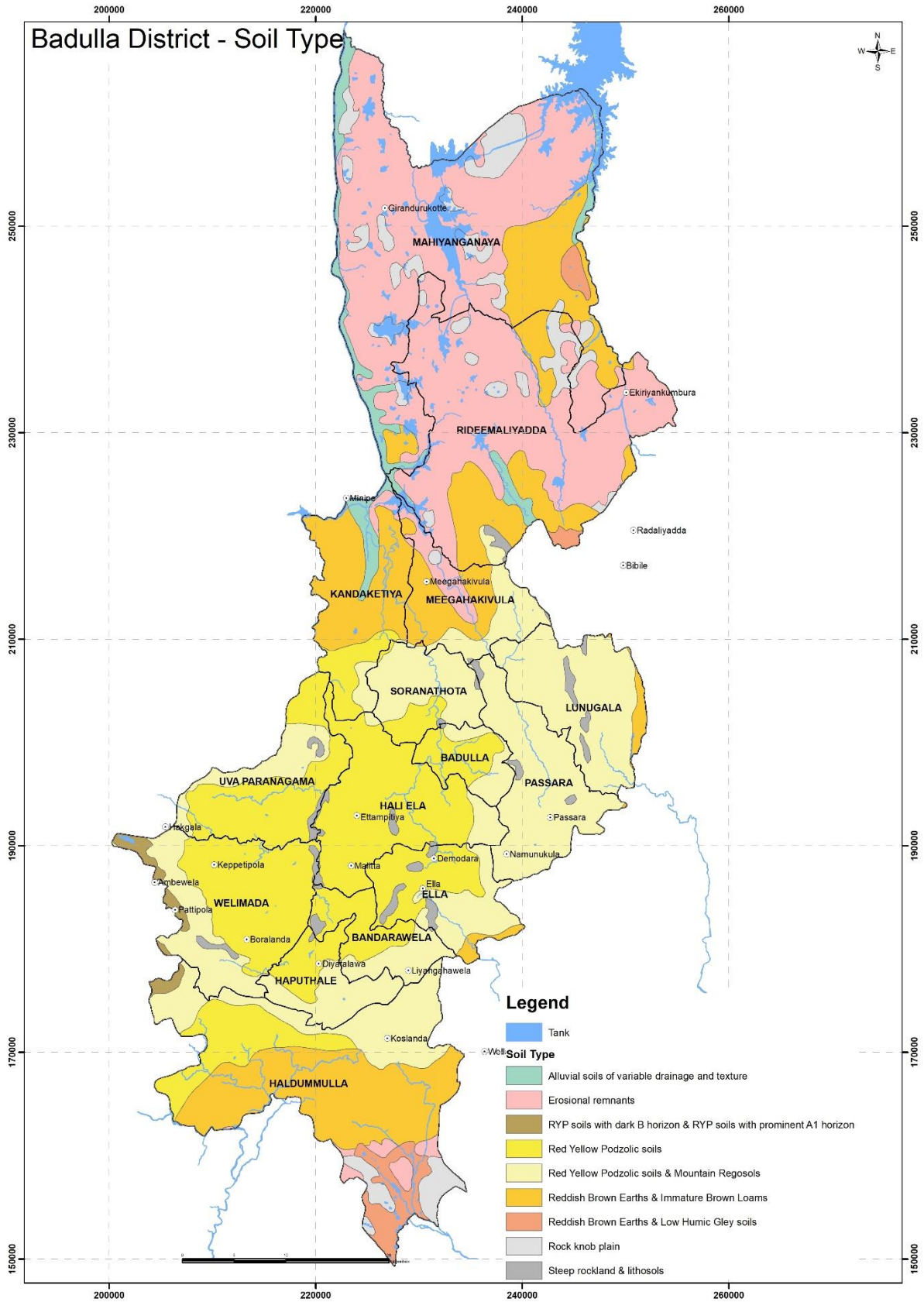


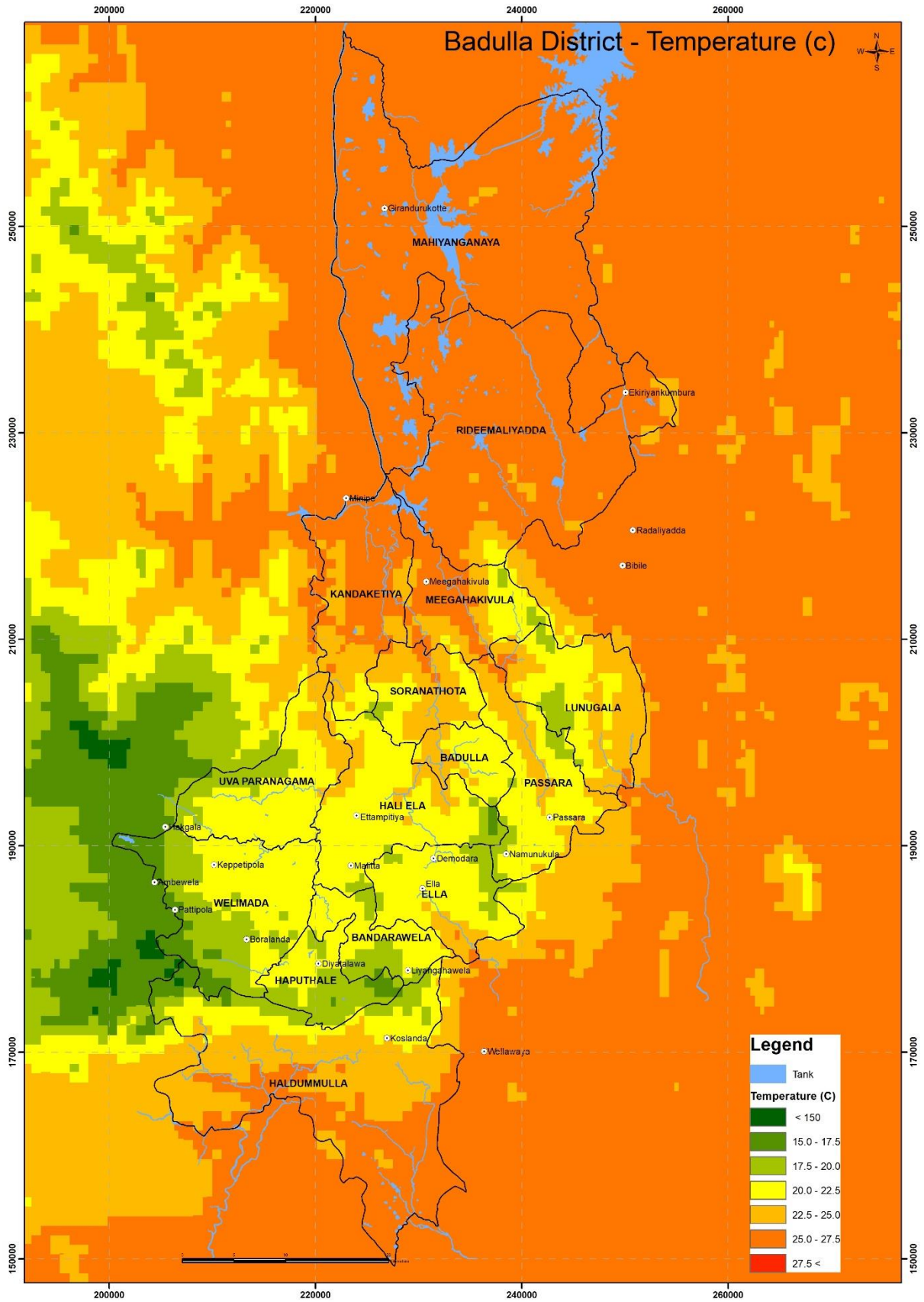




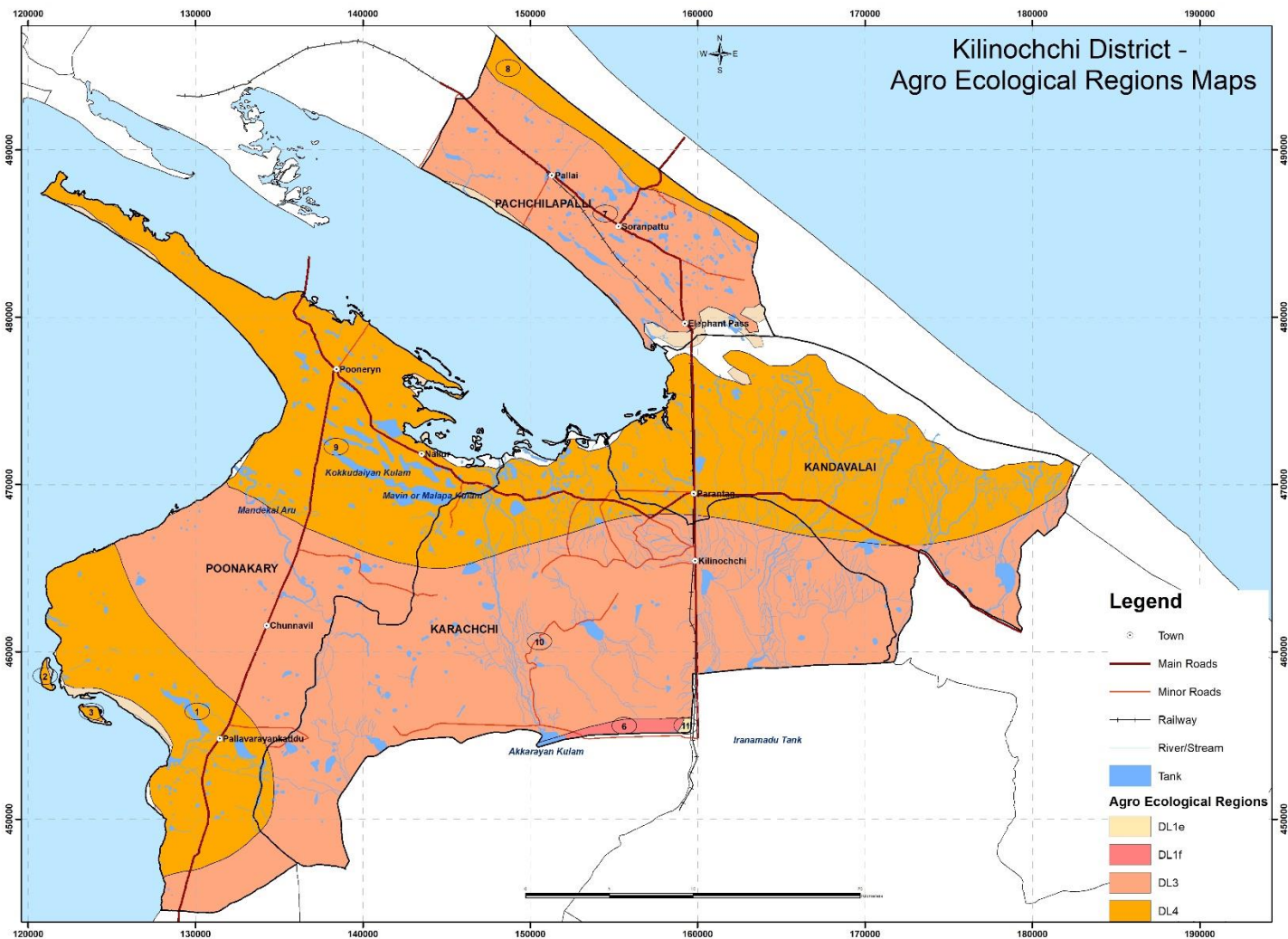


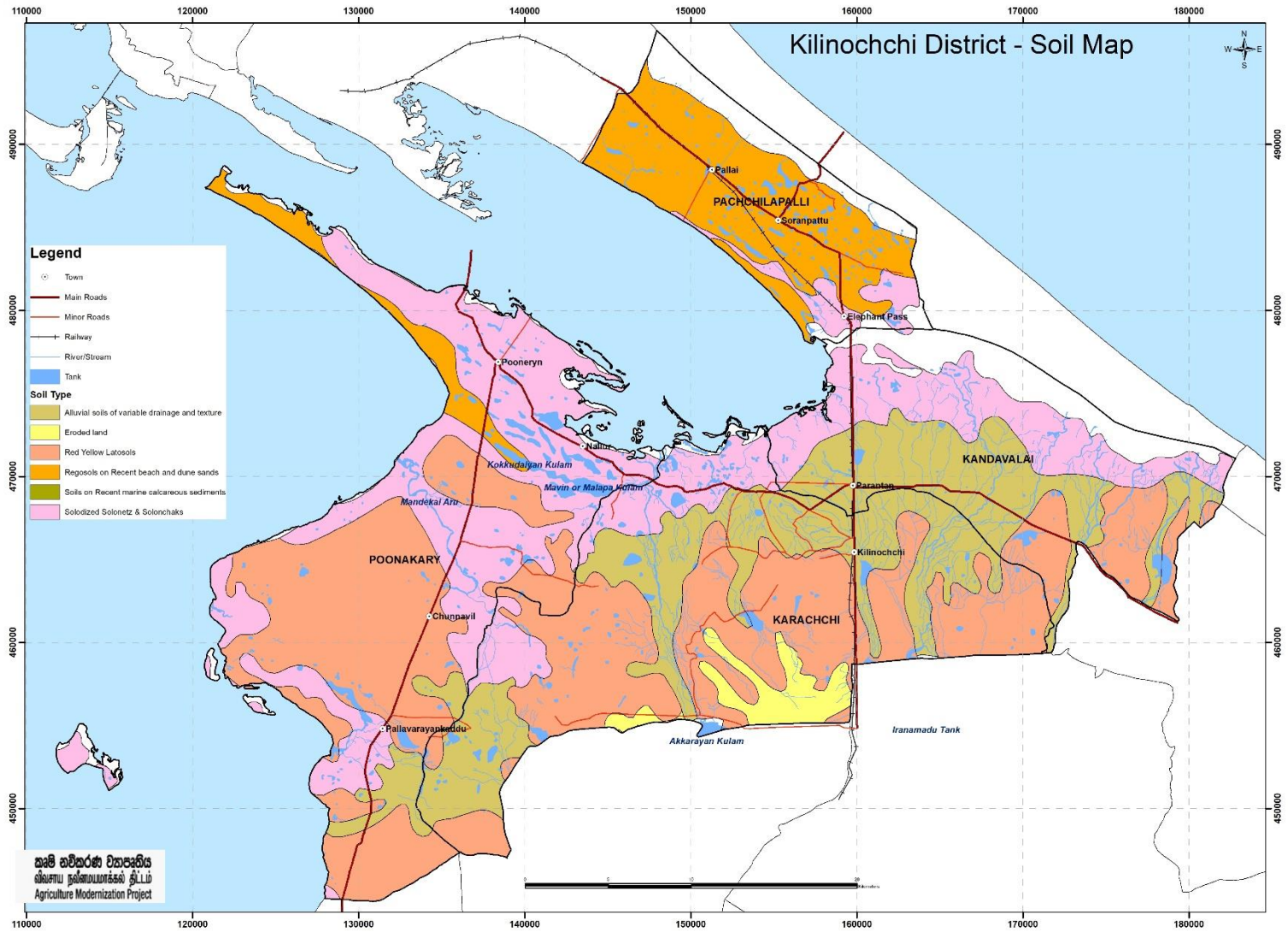


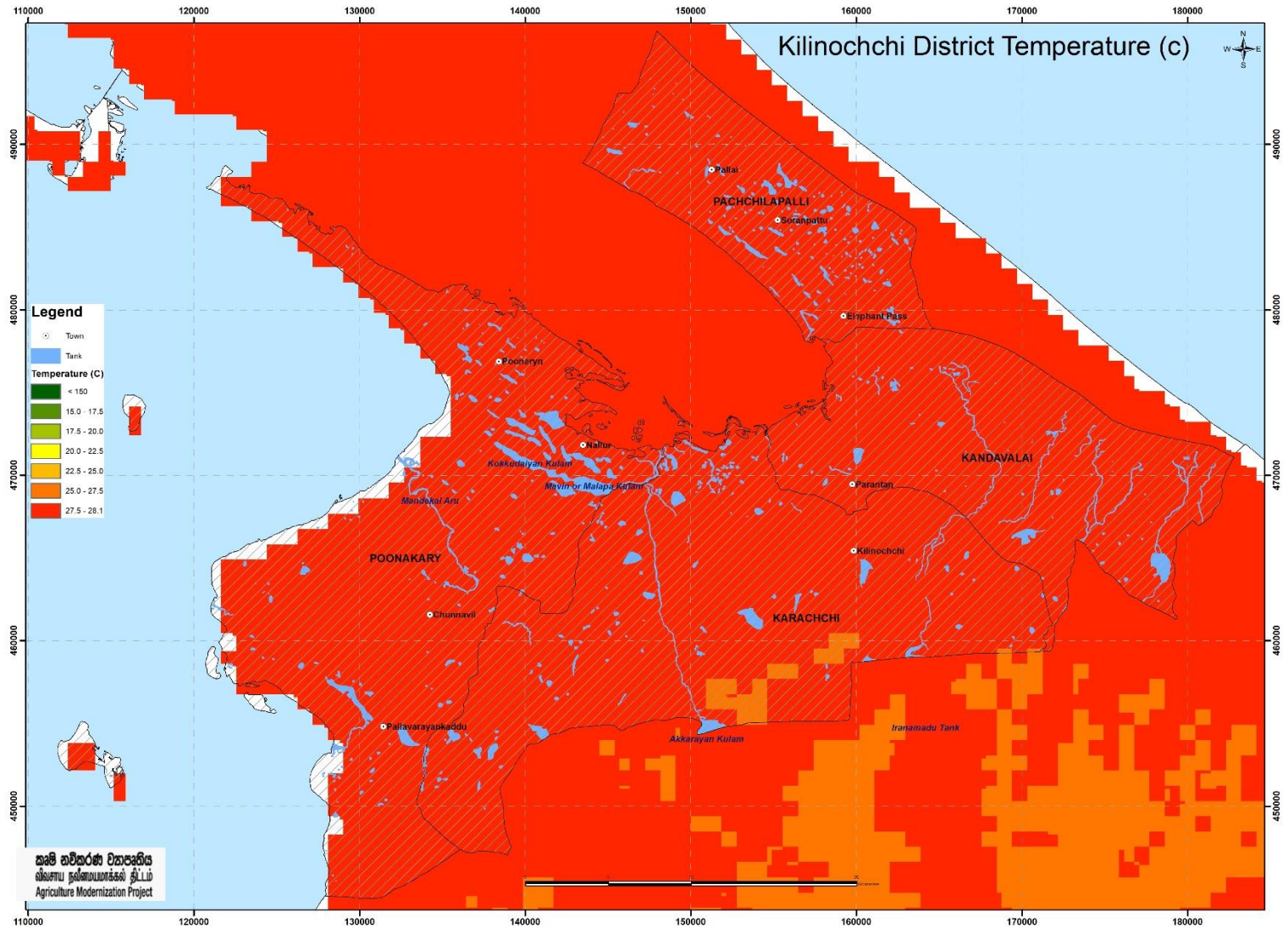


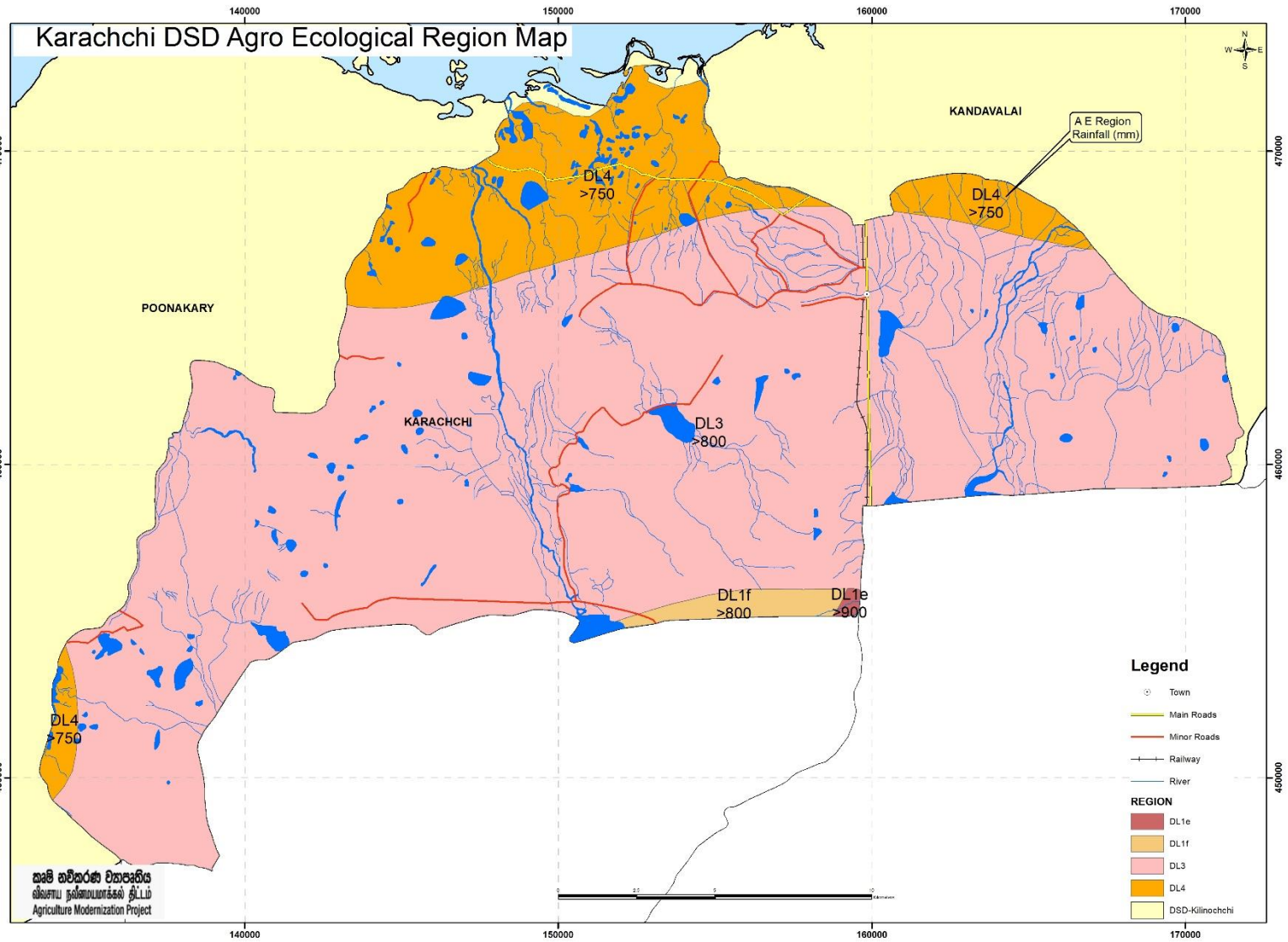


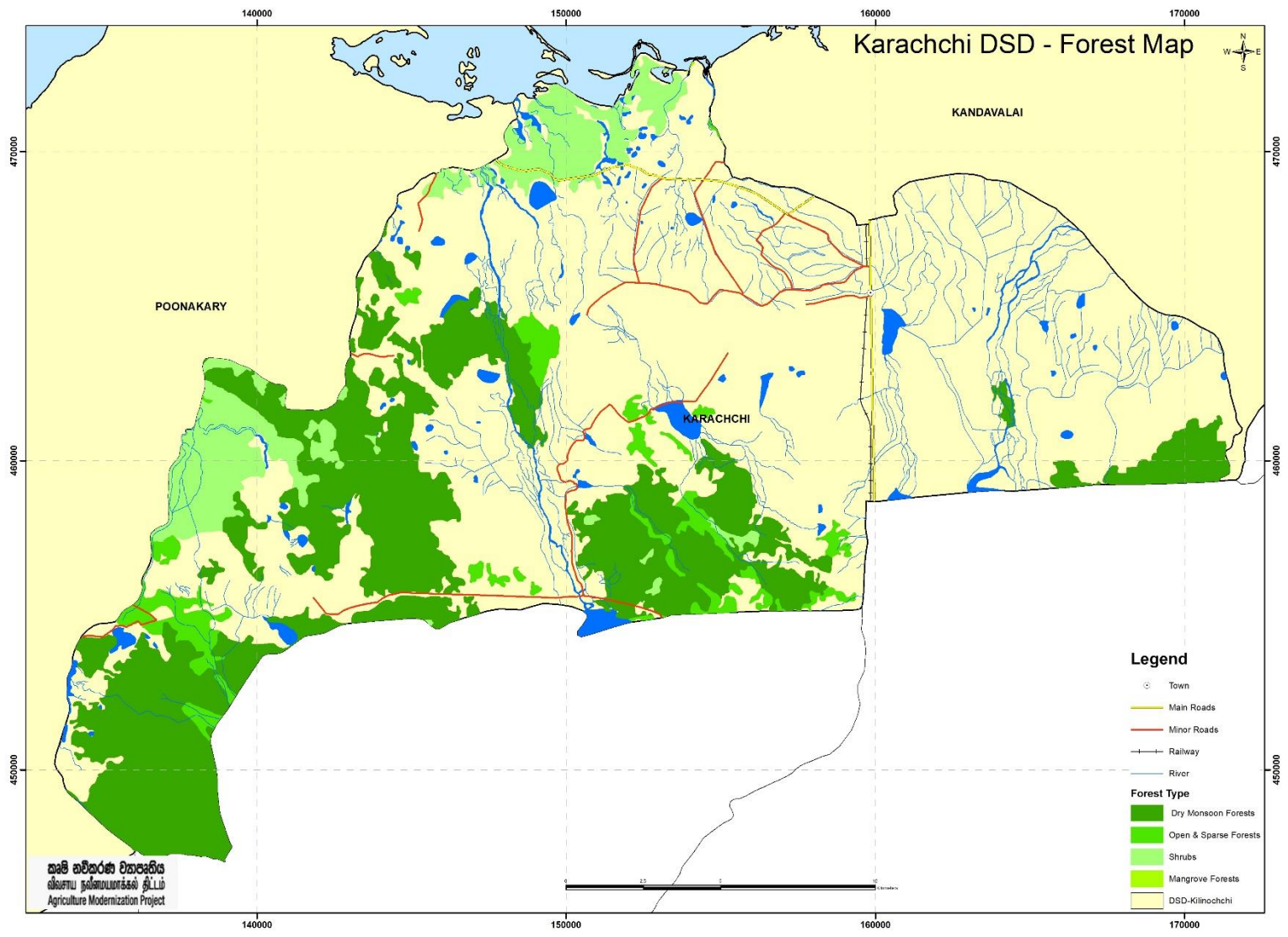
# Kilinochchi District



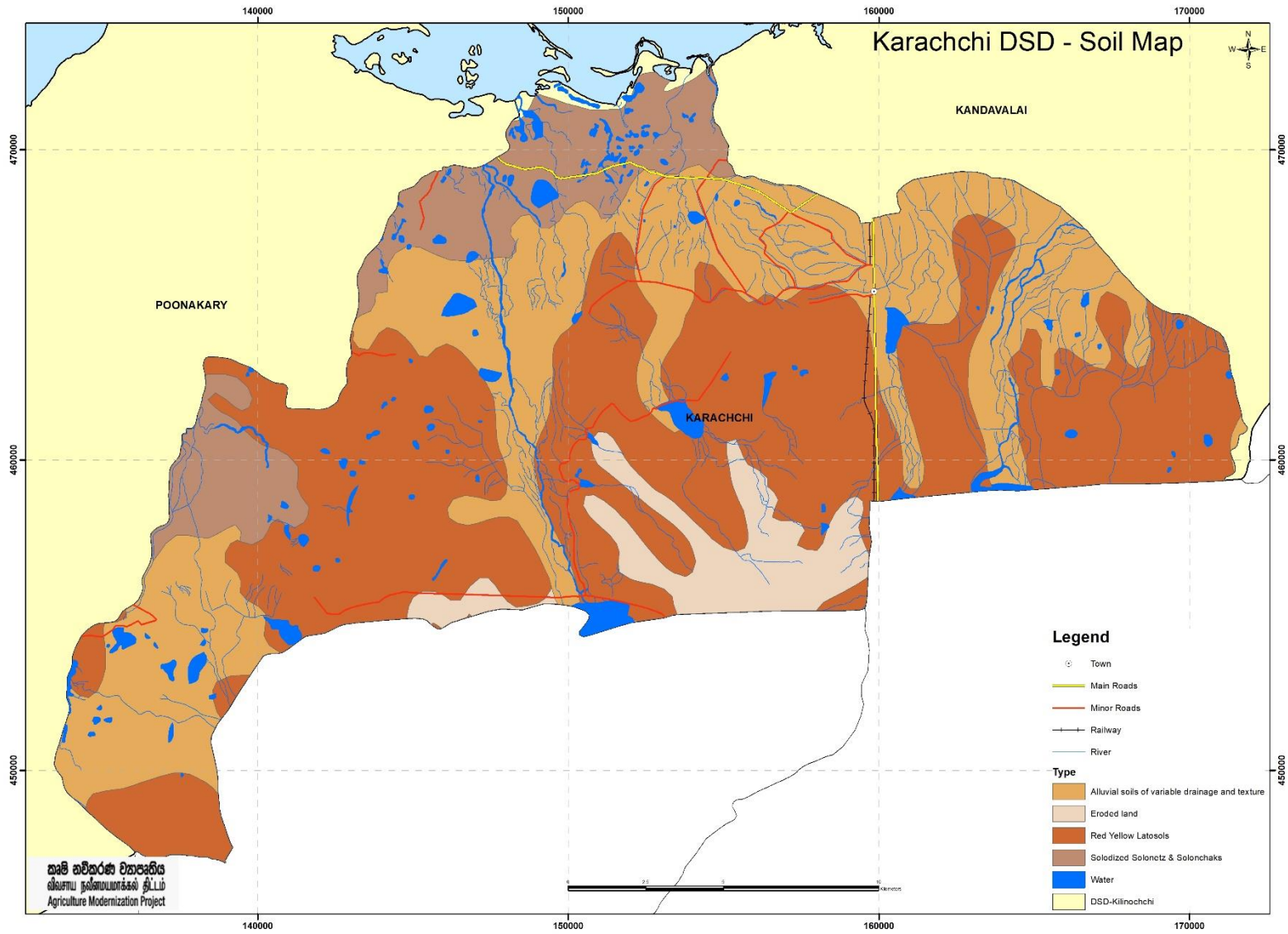




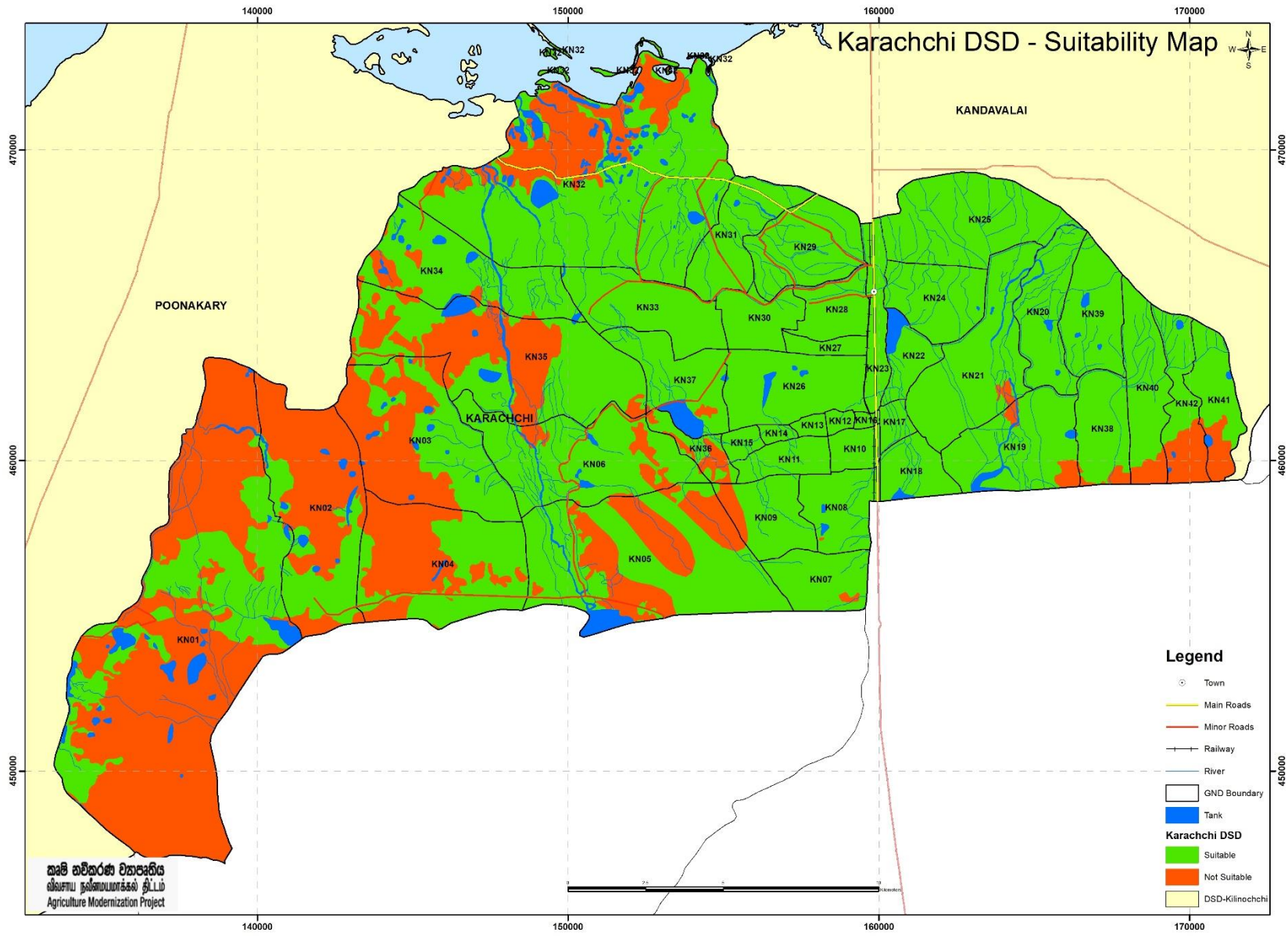


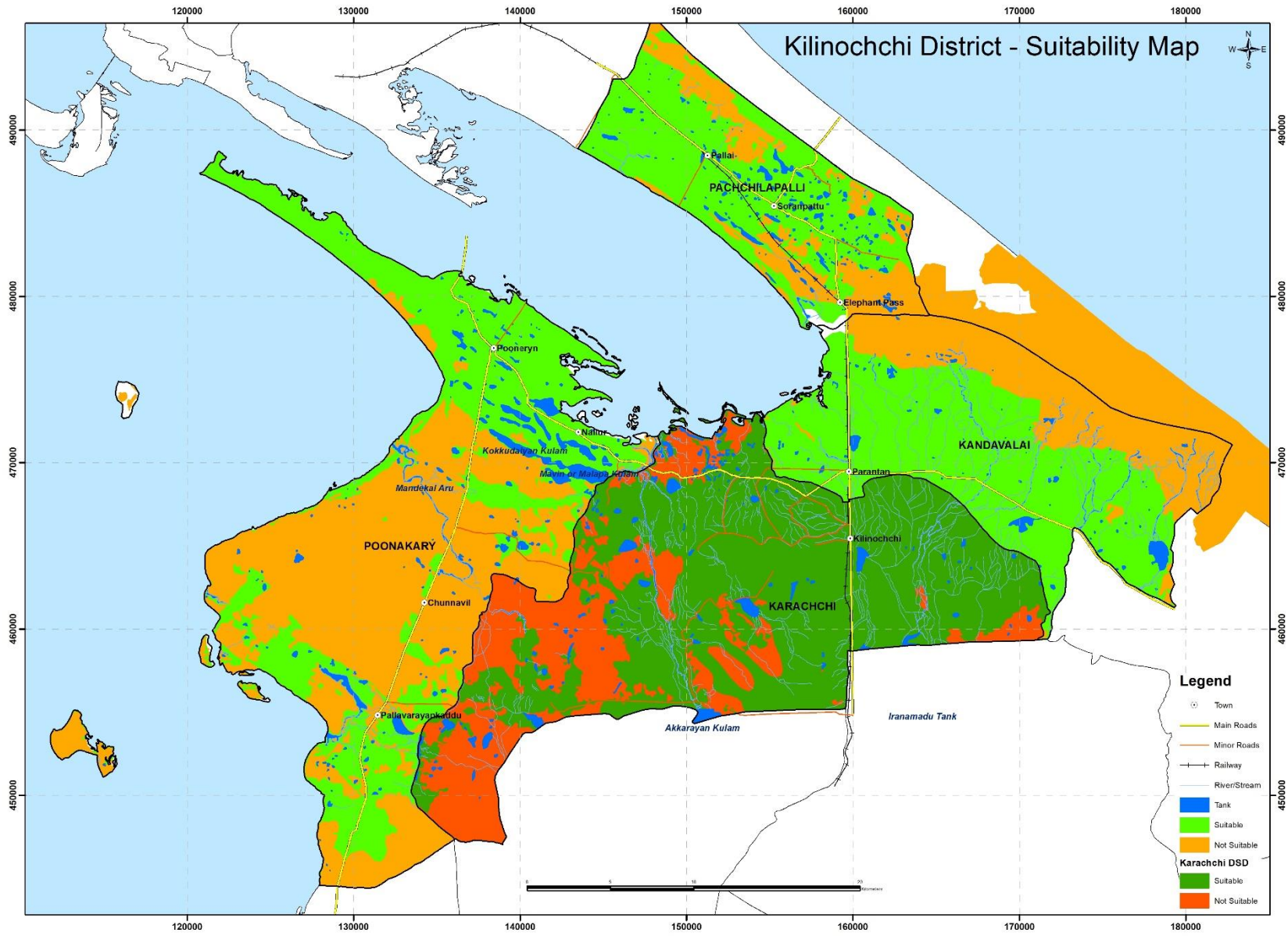


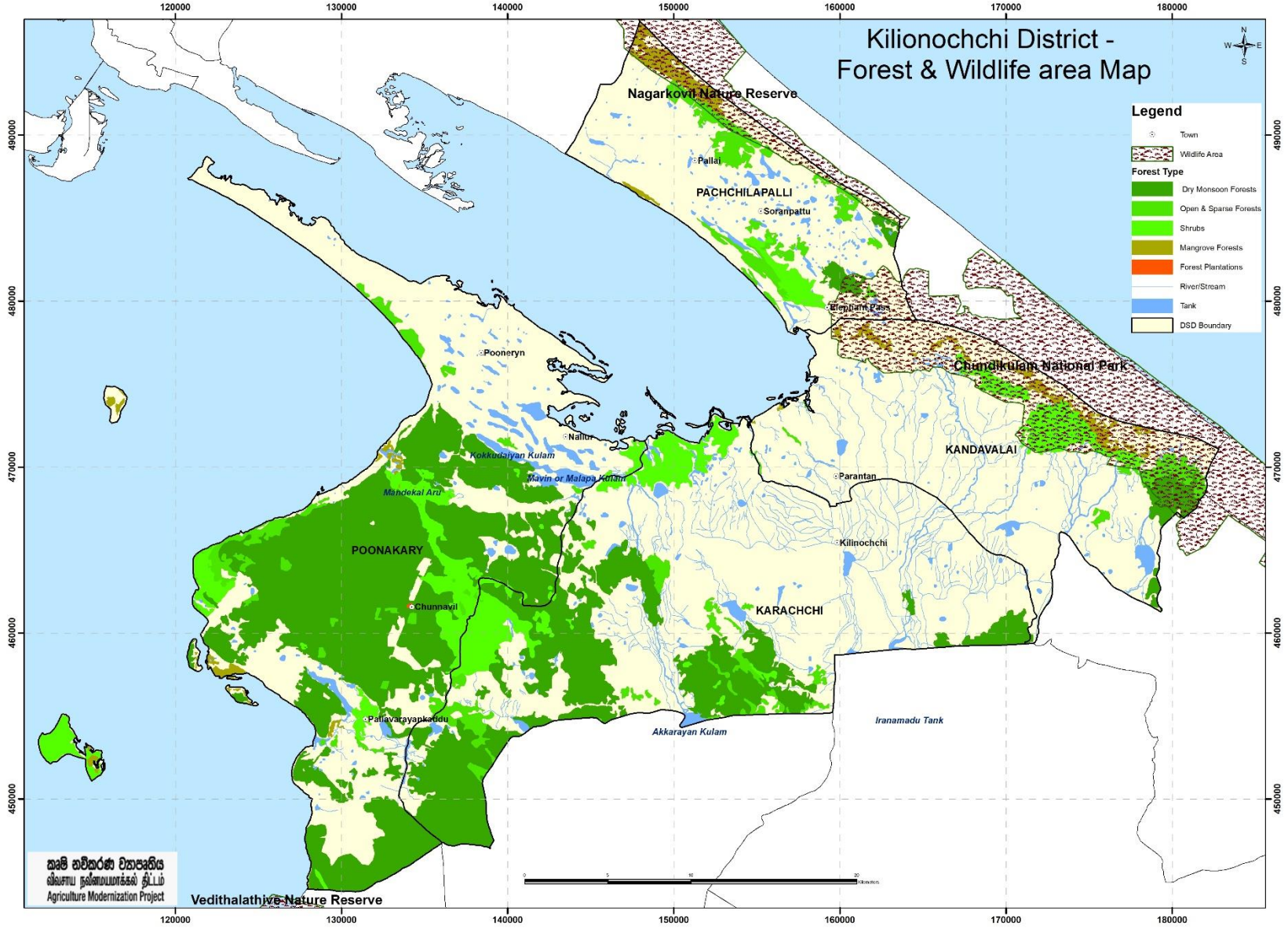




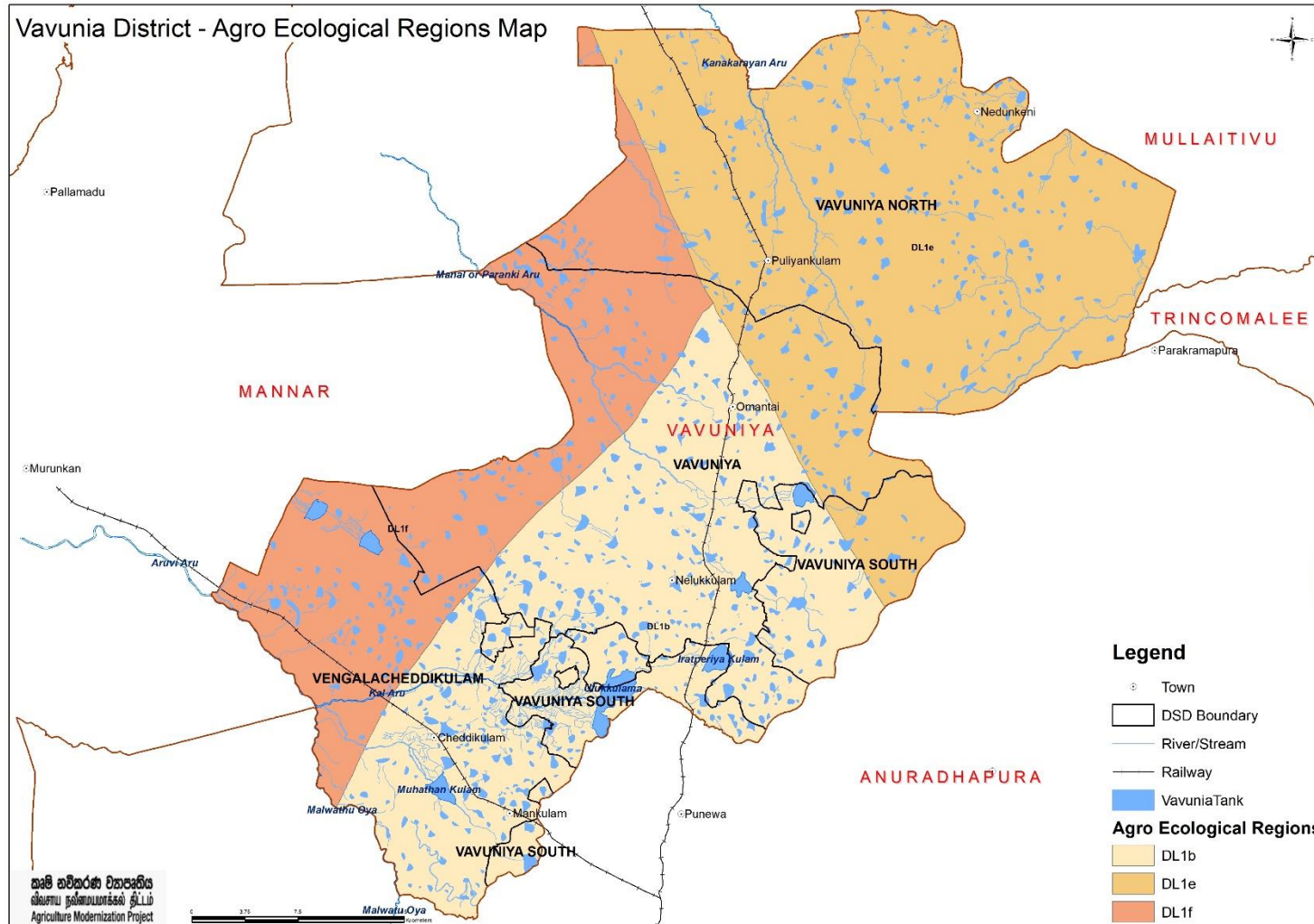
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 Agriculture Modernization Project



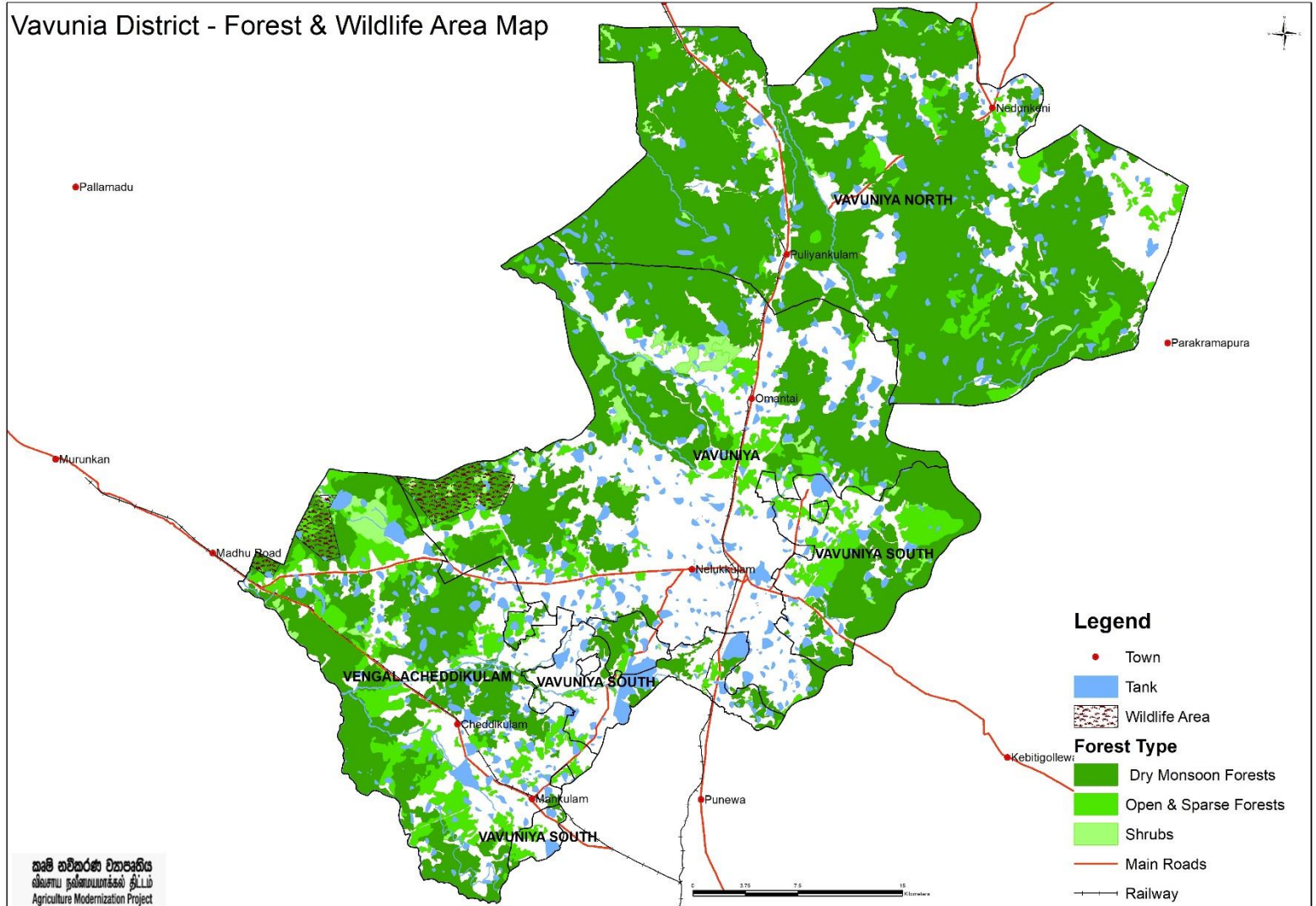




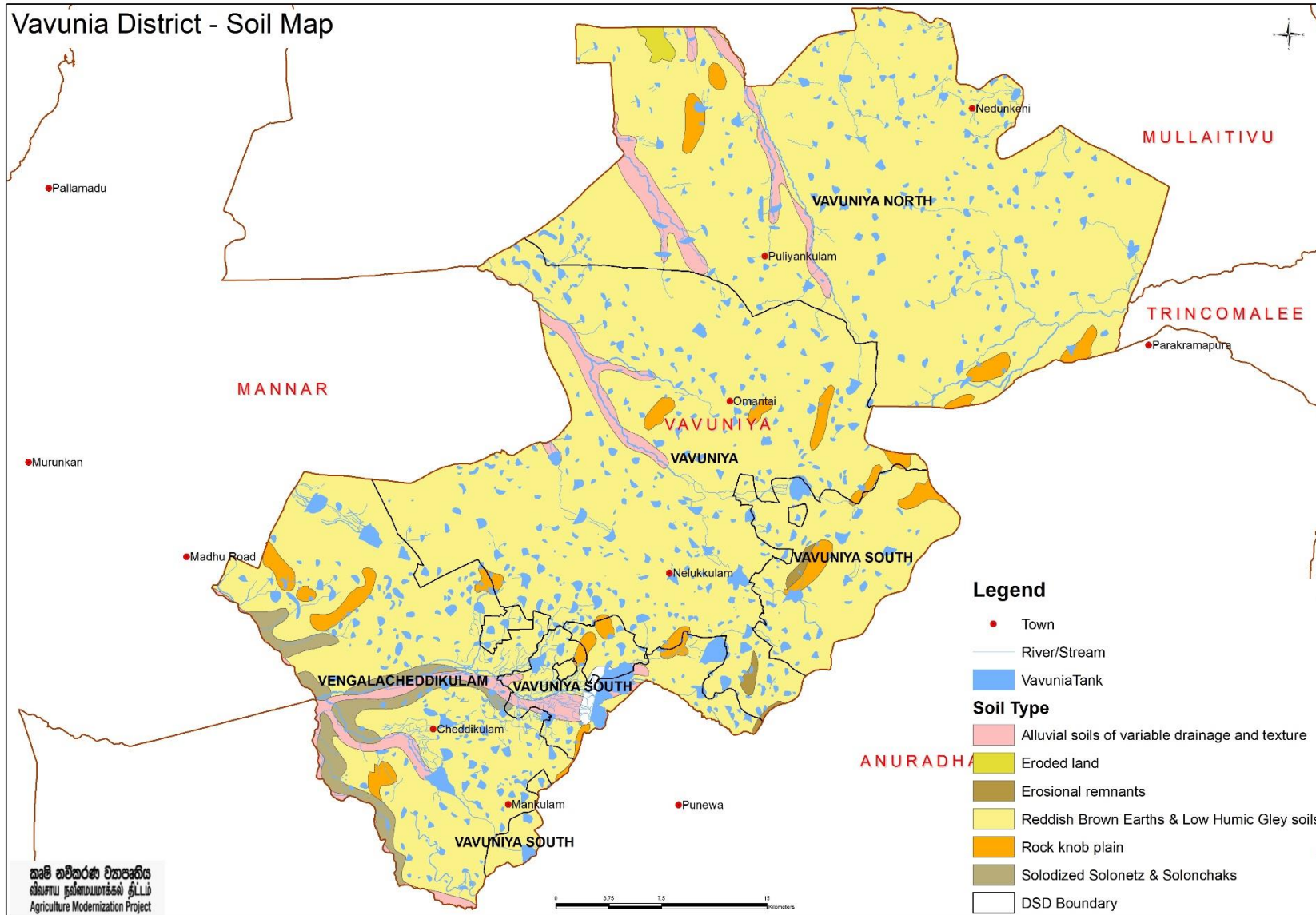
# Vavuniya District

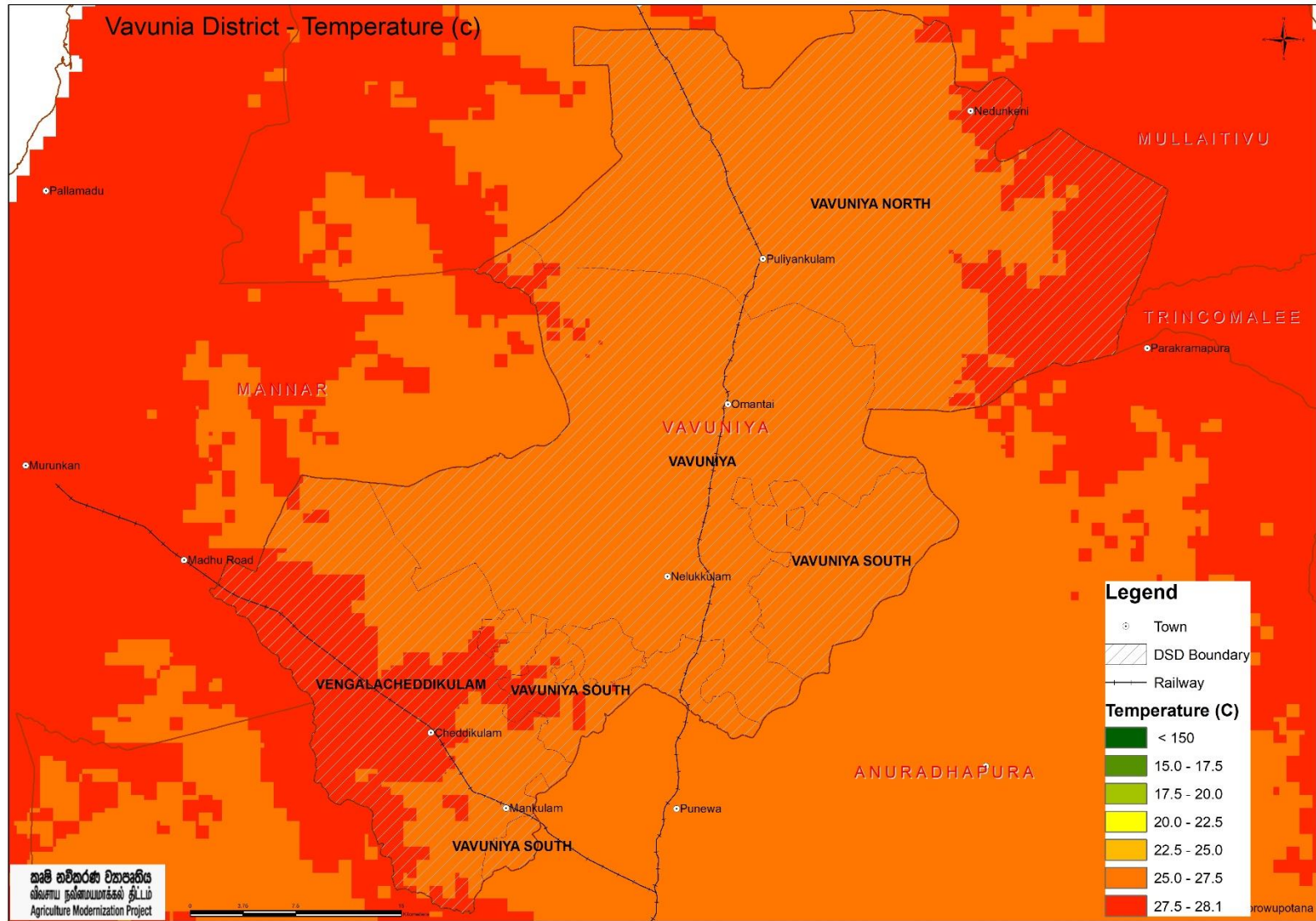


# Vavunia District - Forest & Wildlife Area Map

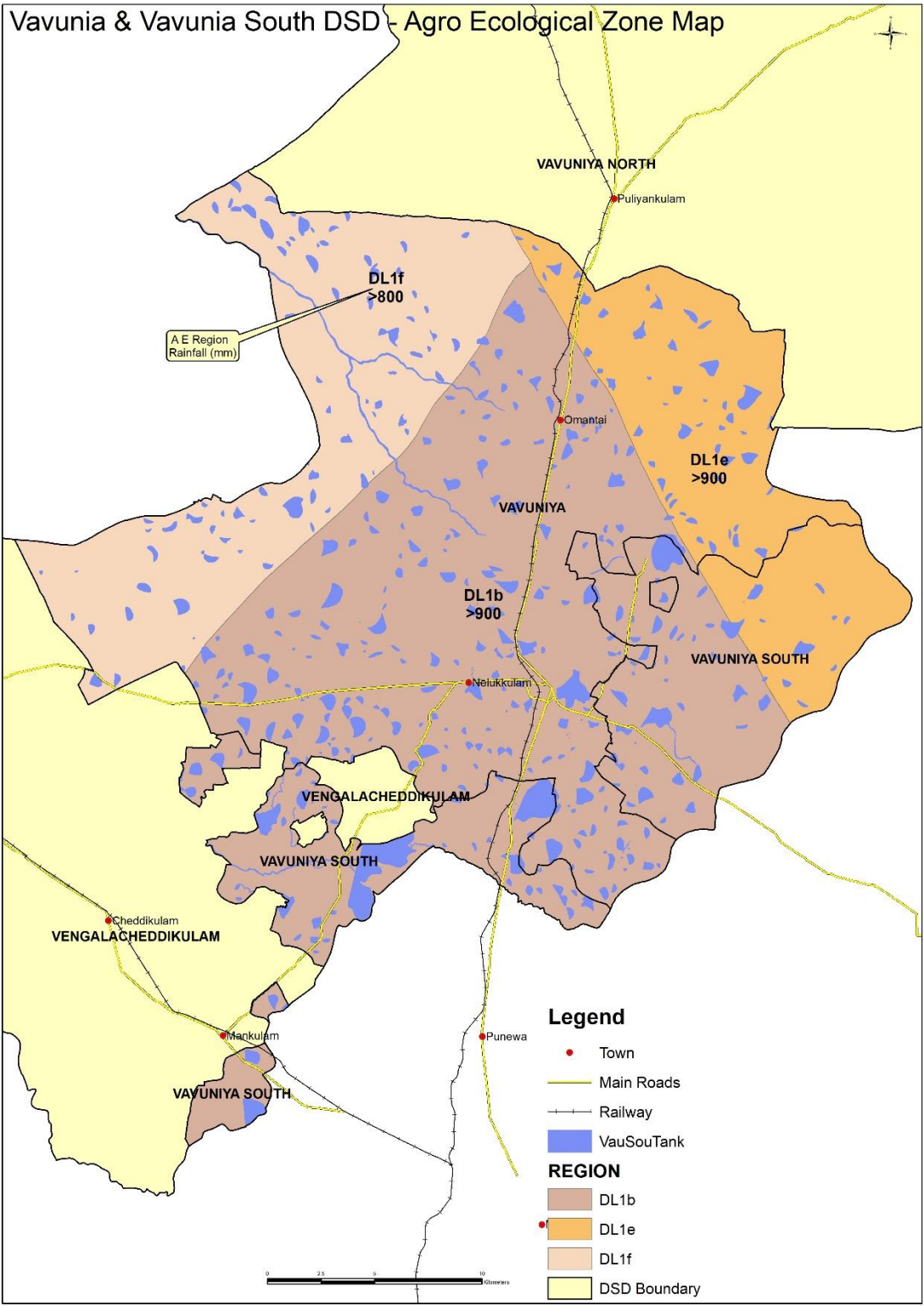


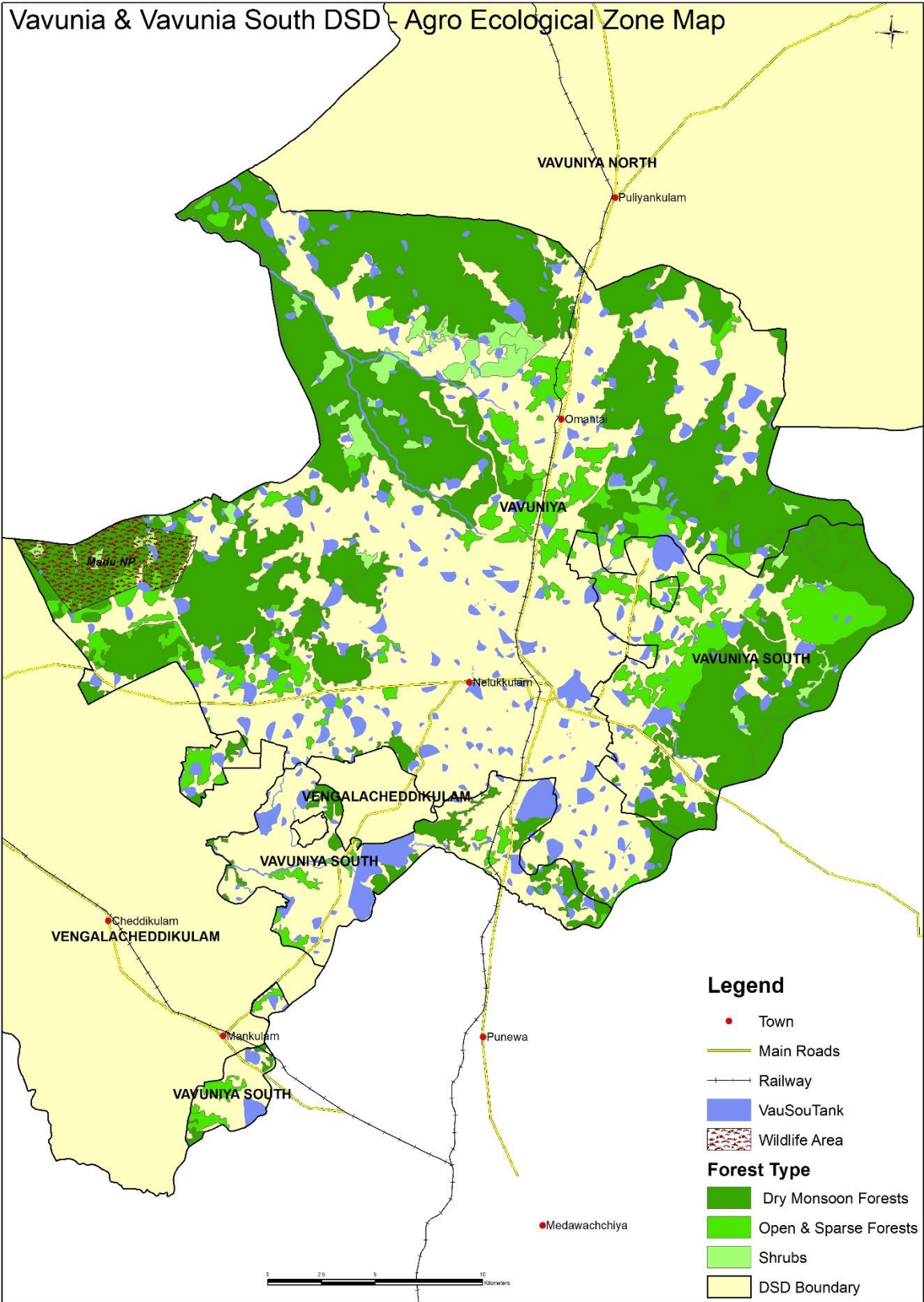
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 Agriculture Modernization Project

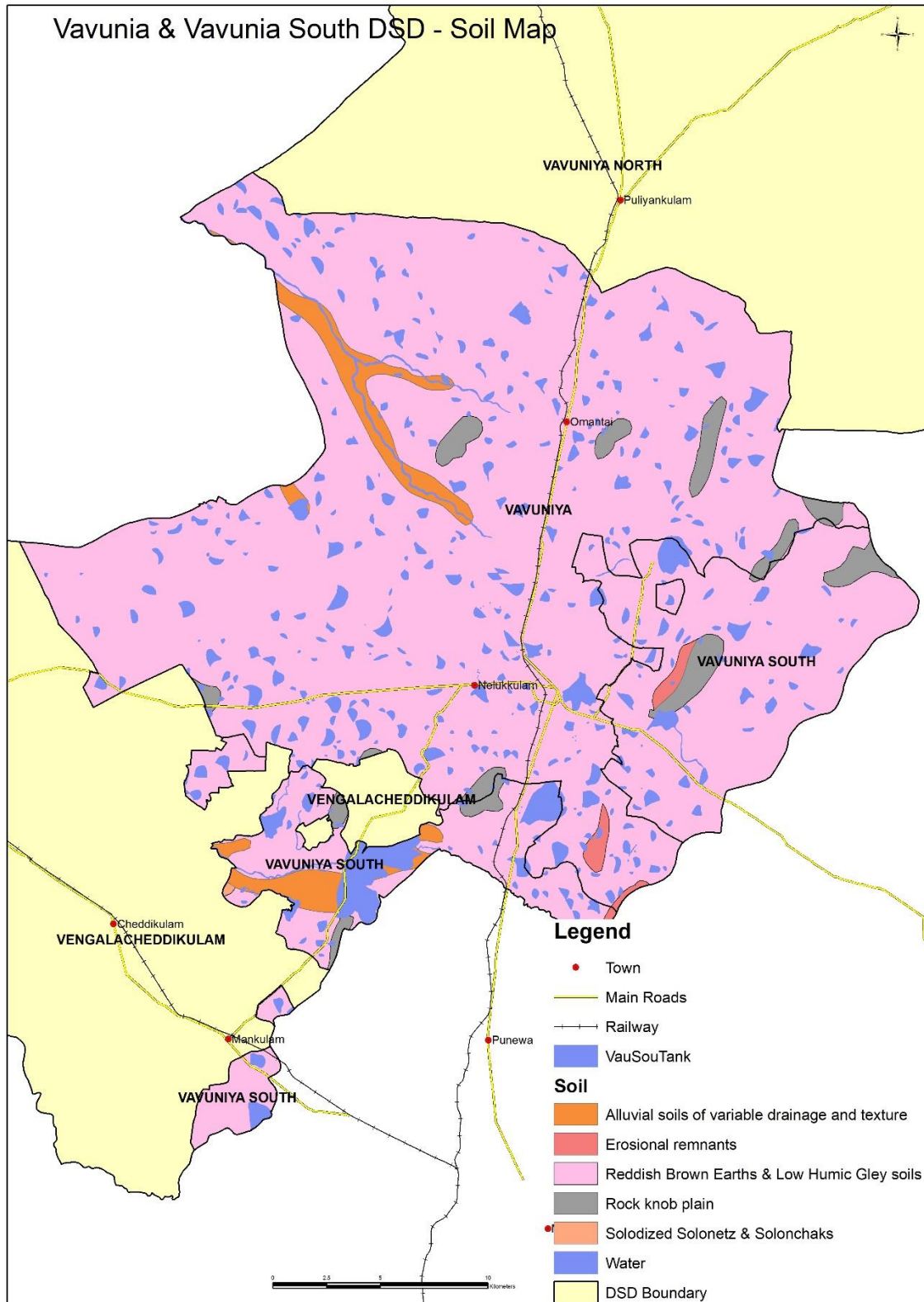




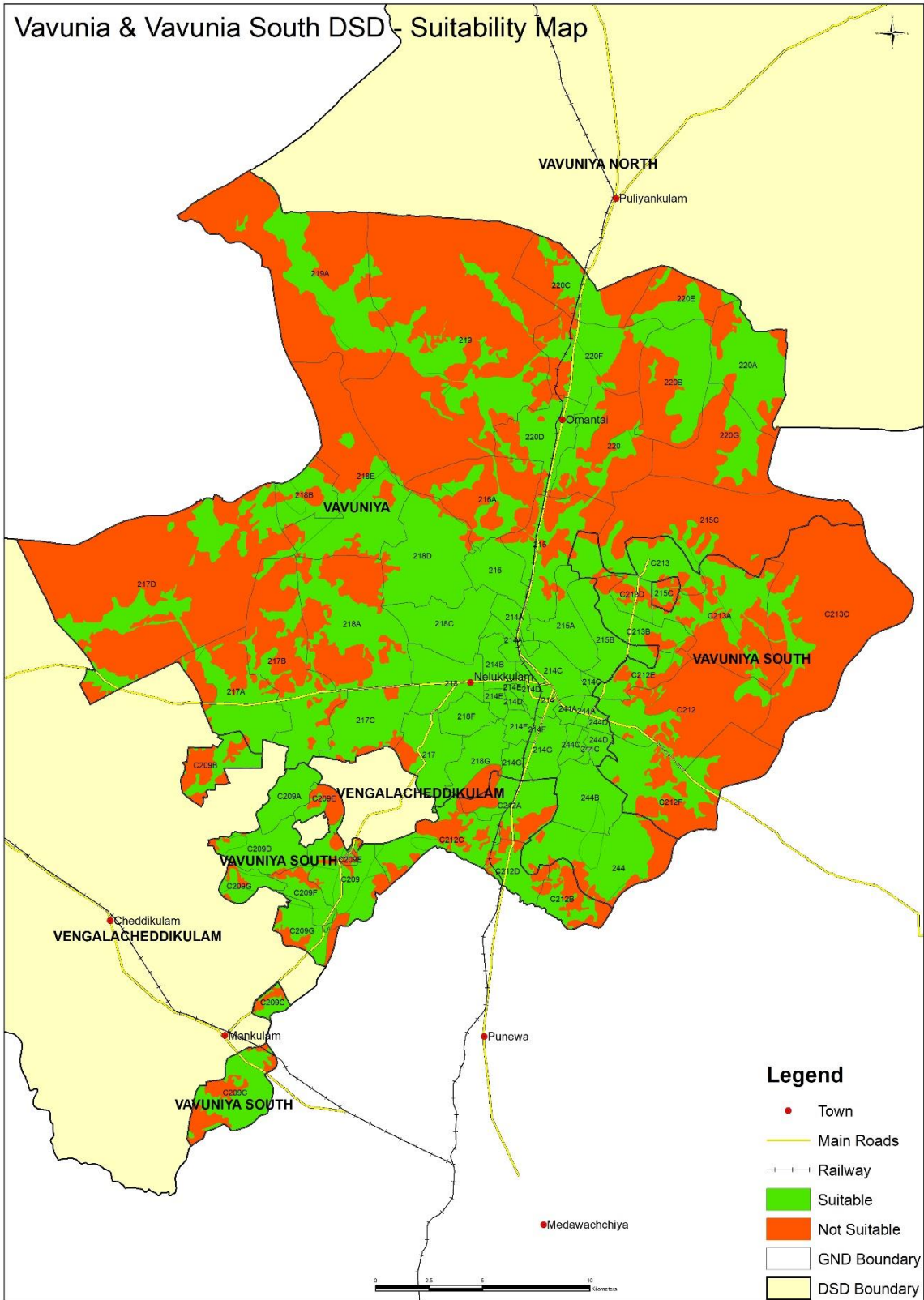


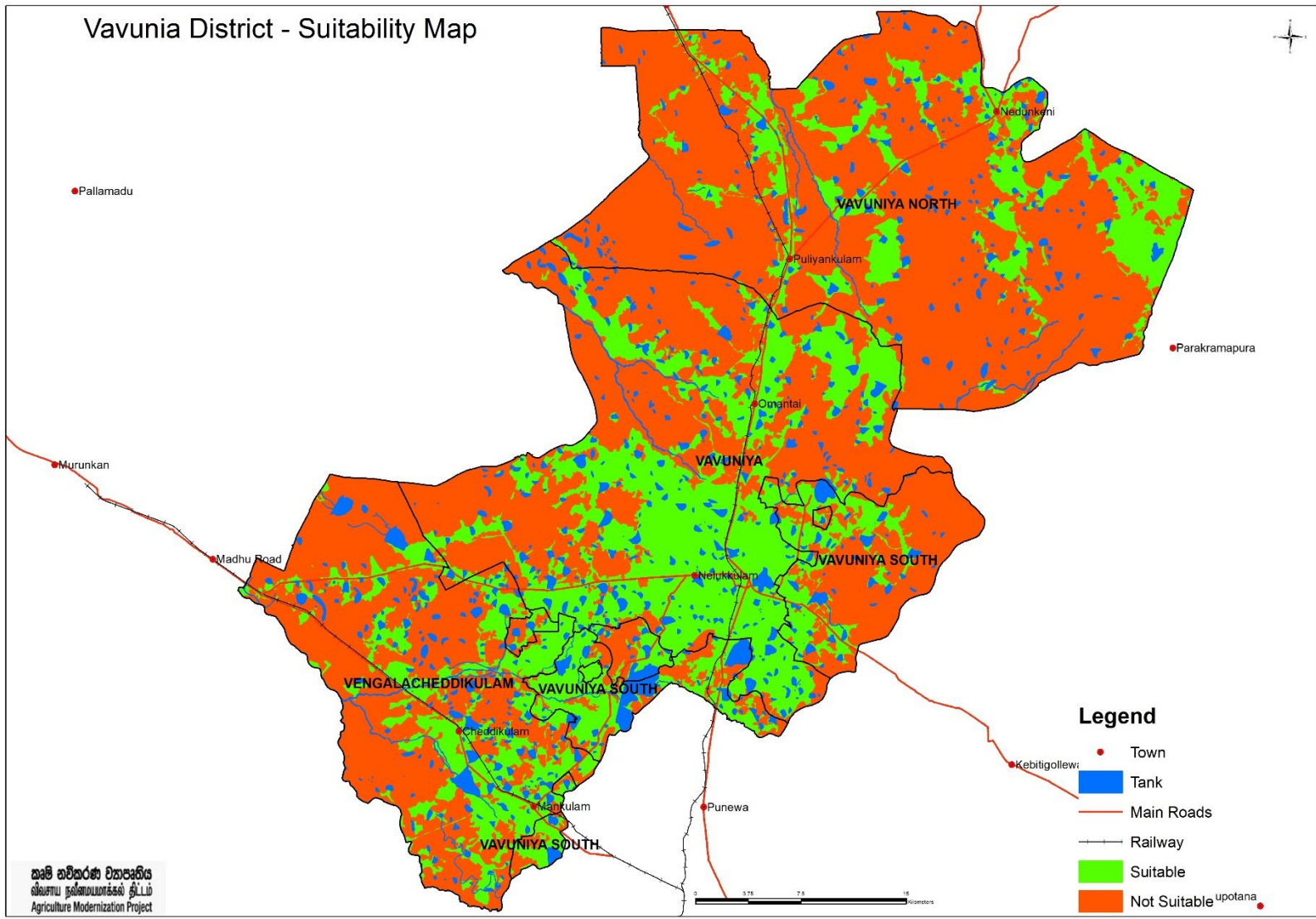


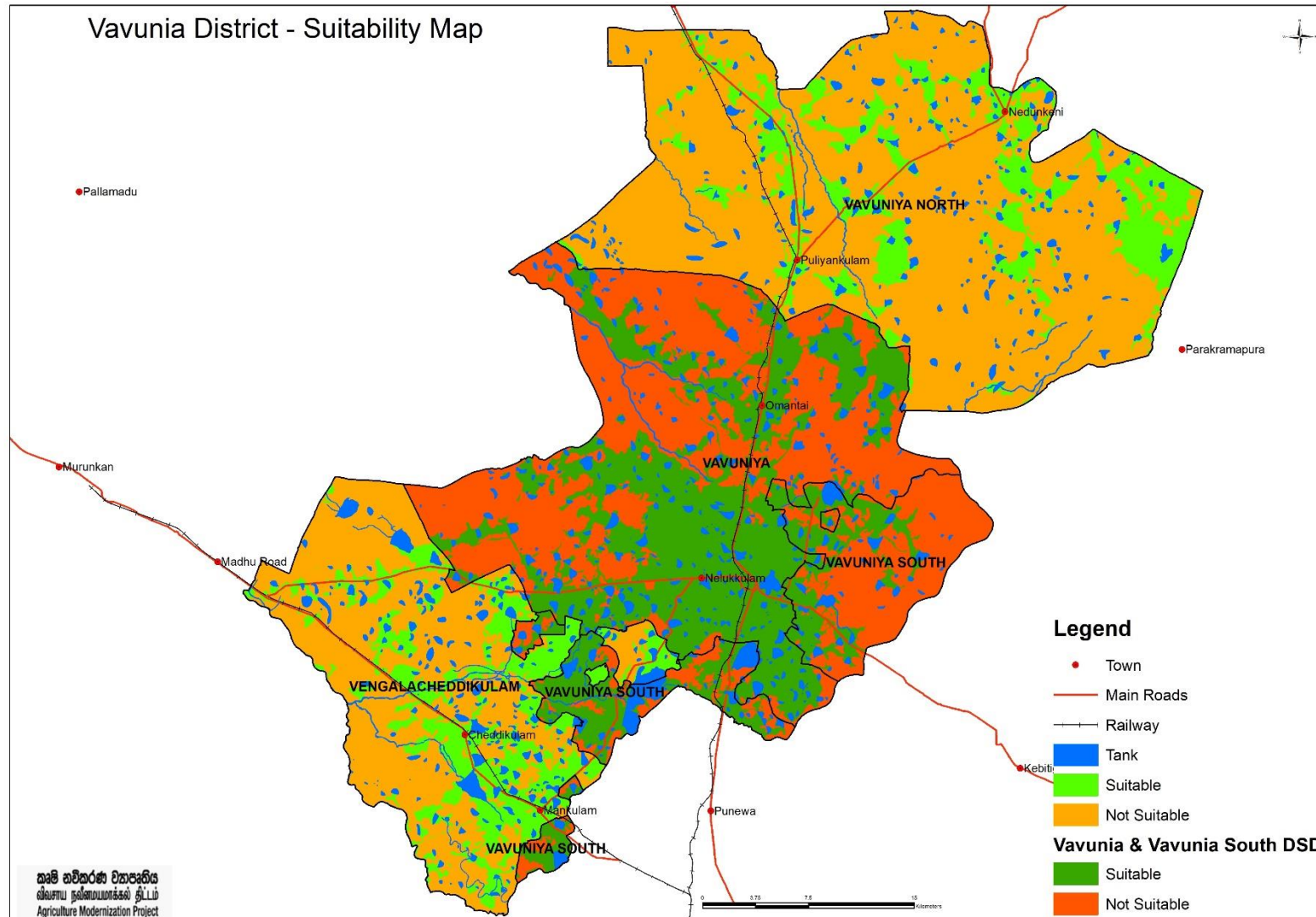




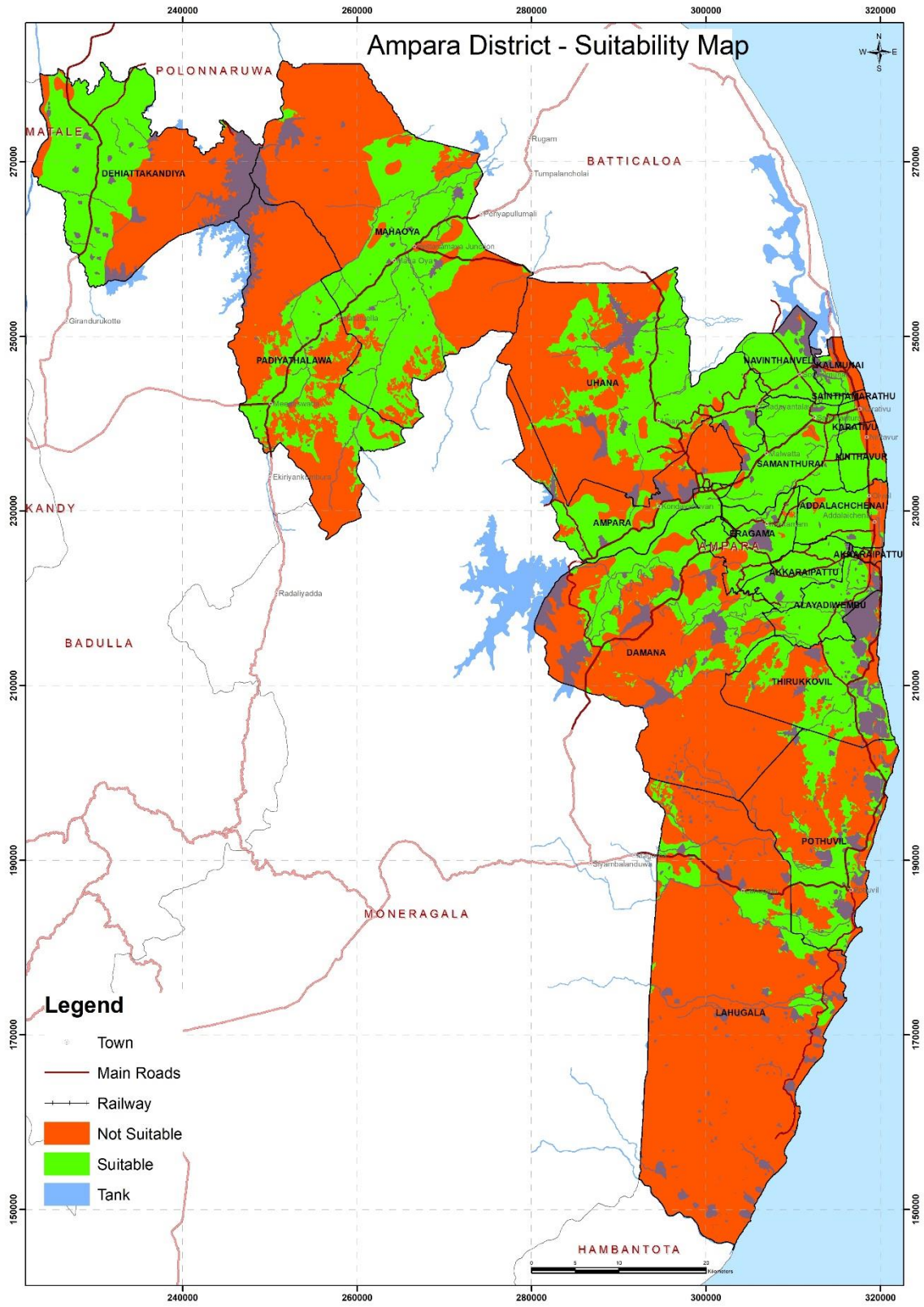
# Vavunia & Vavunia South DSD Suitability Map

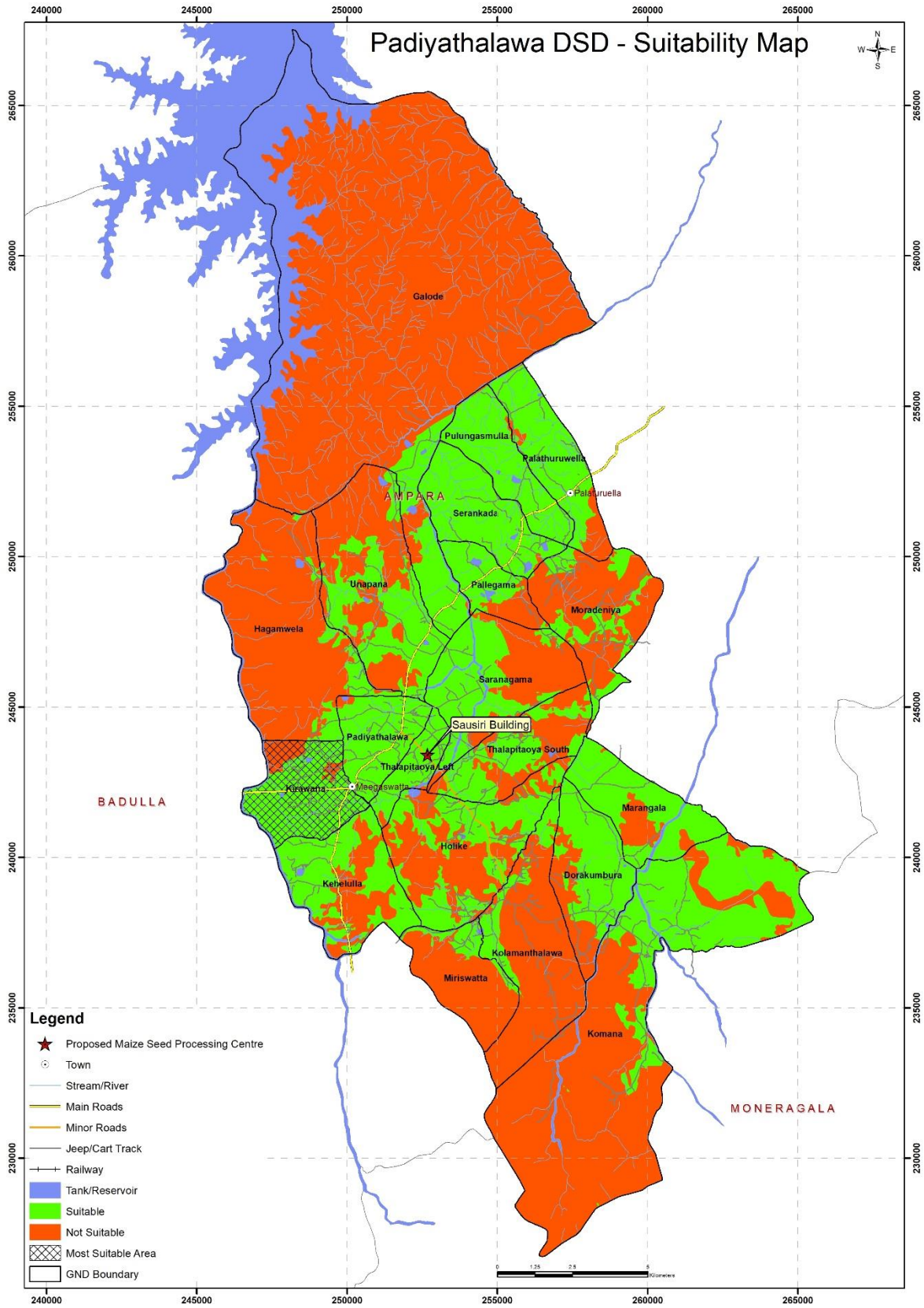




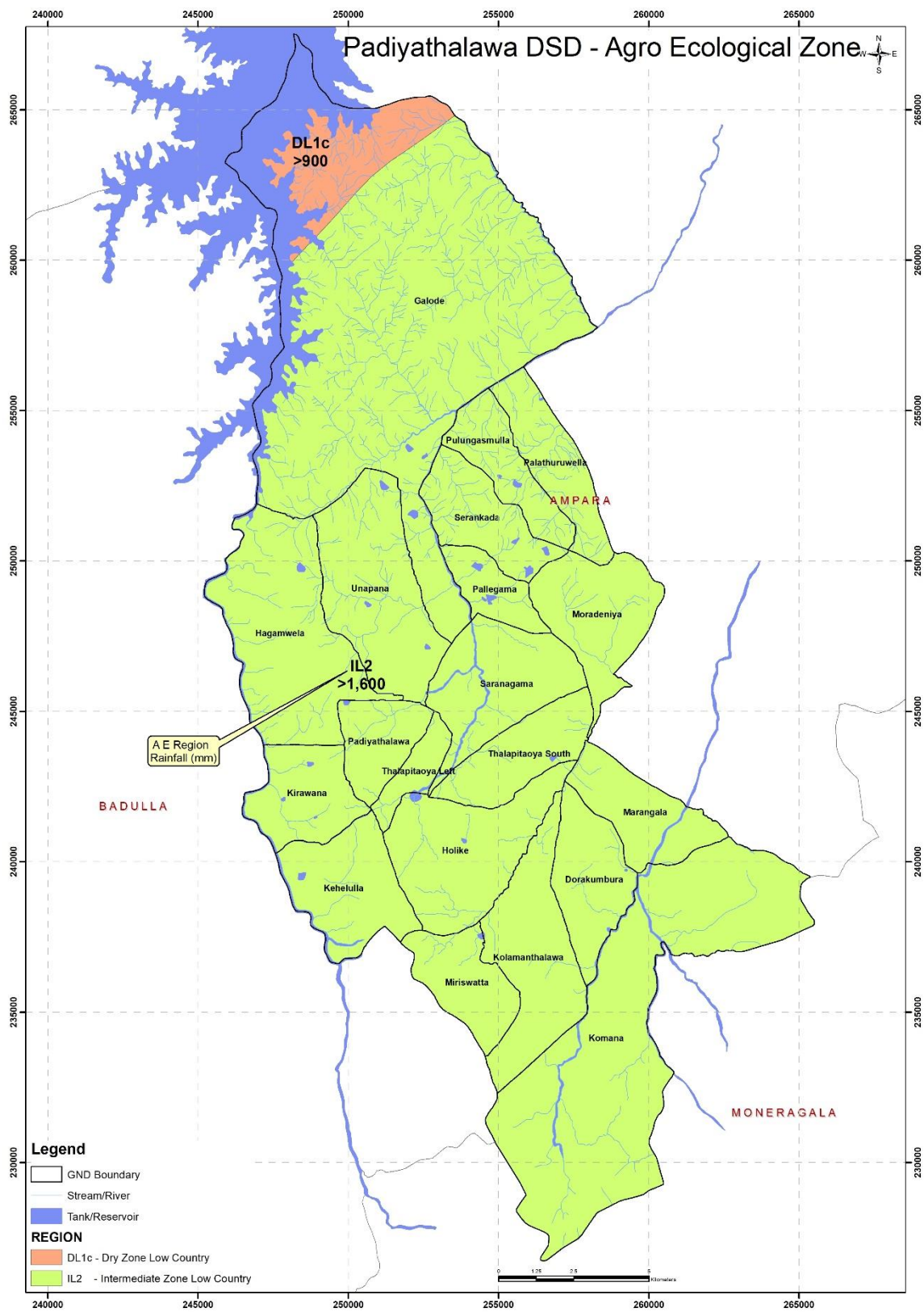


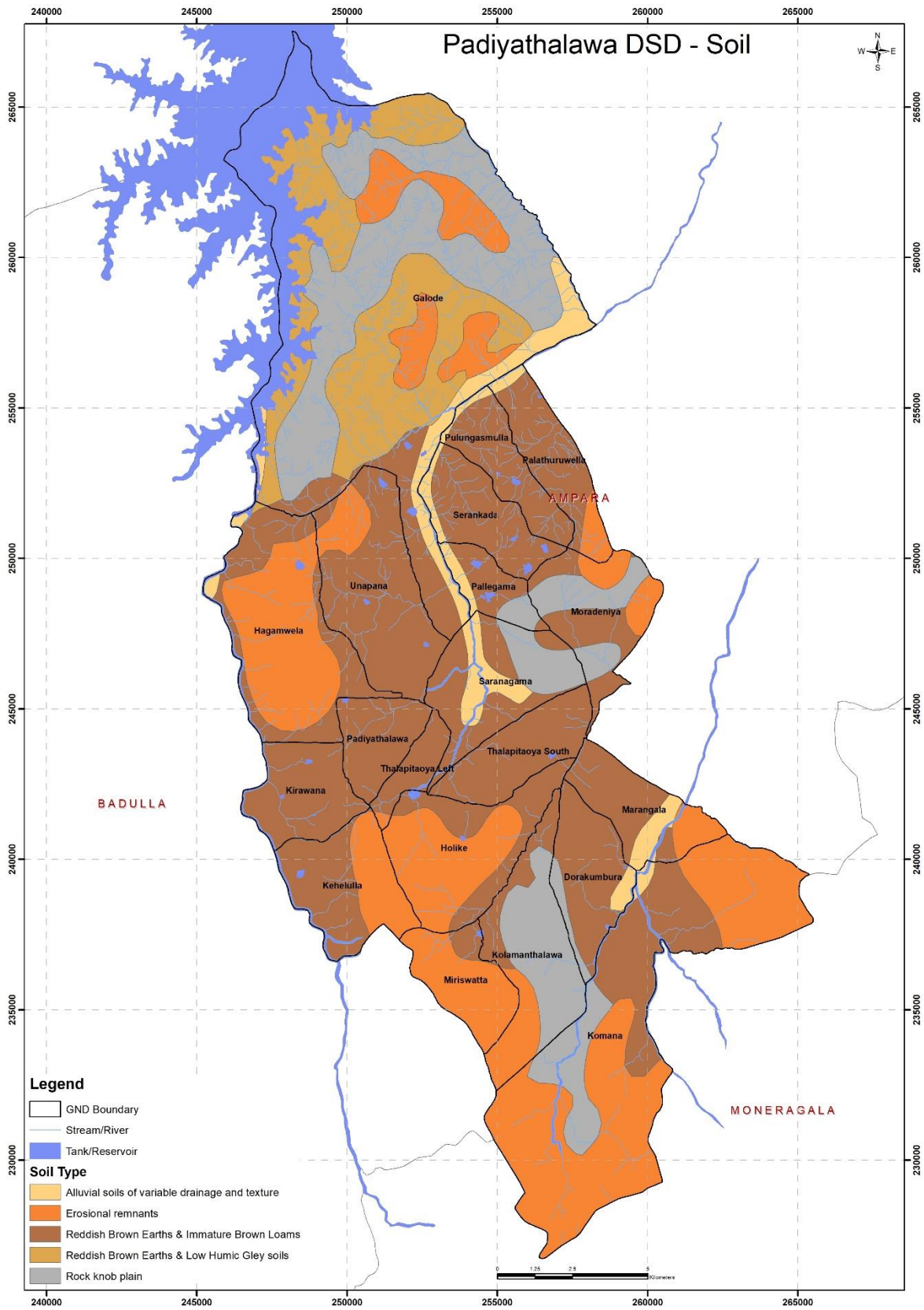
# Ampara District

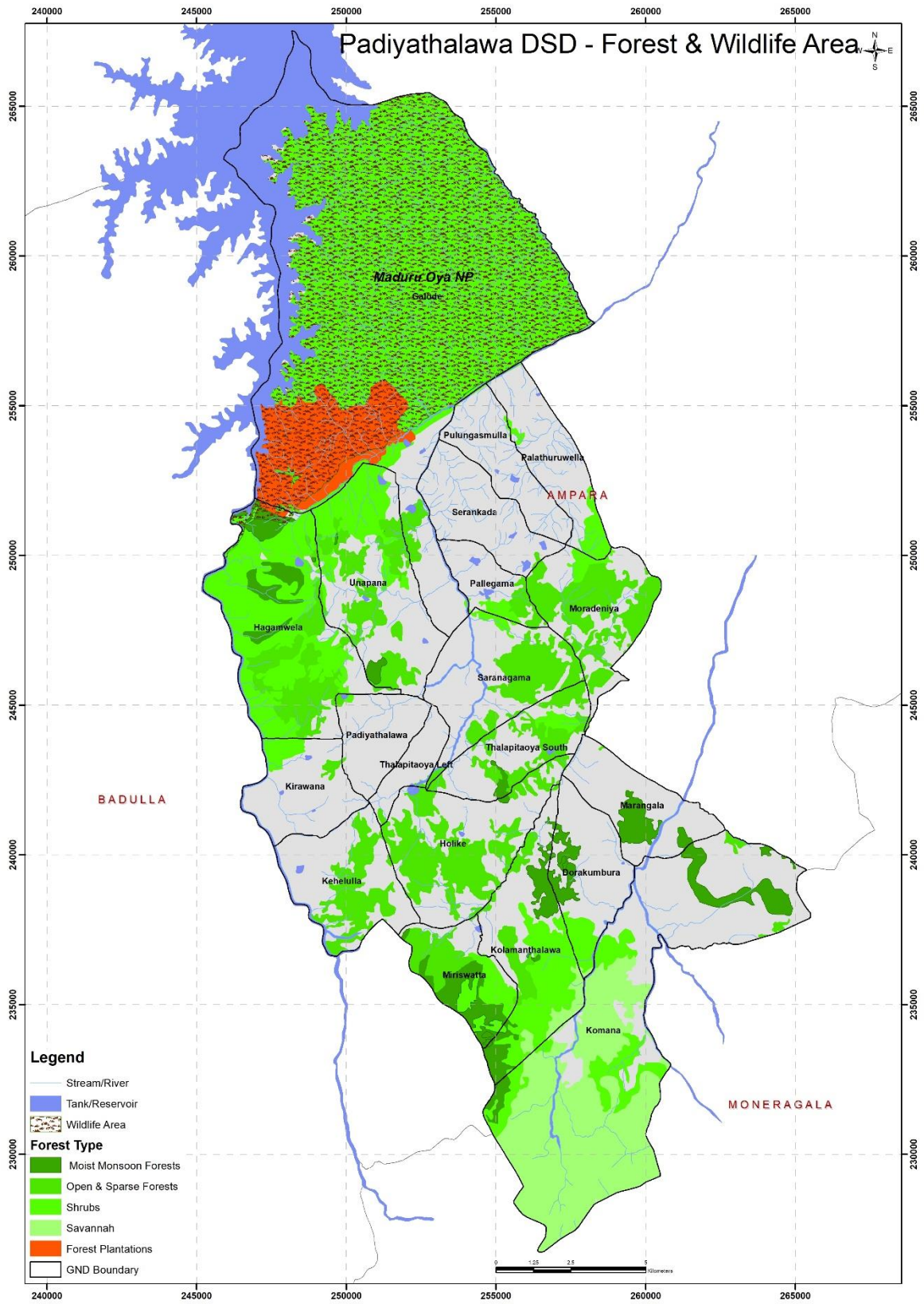


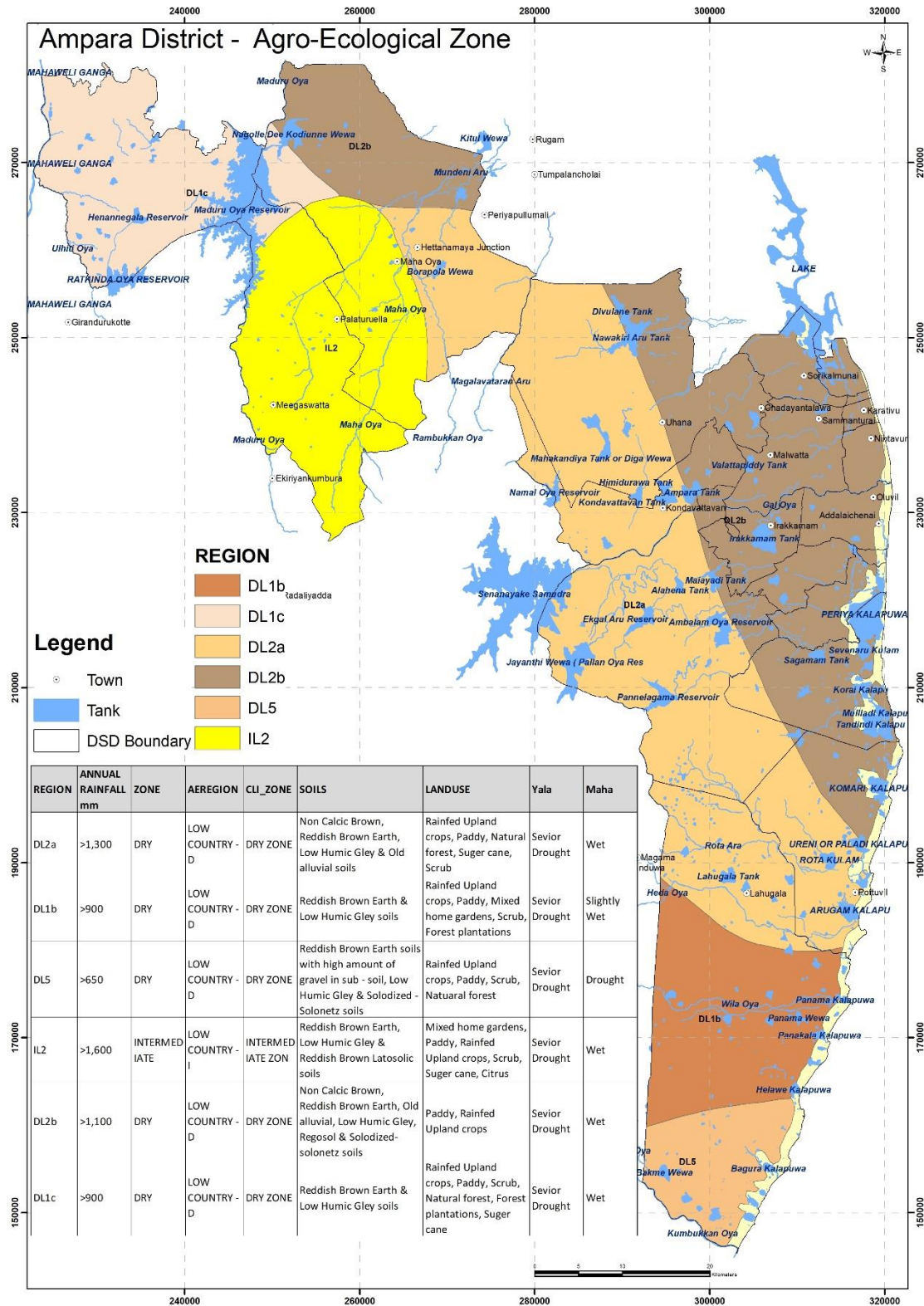


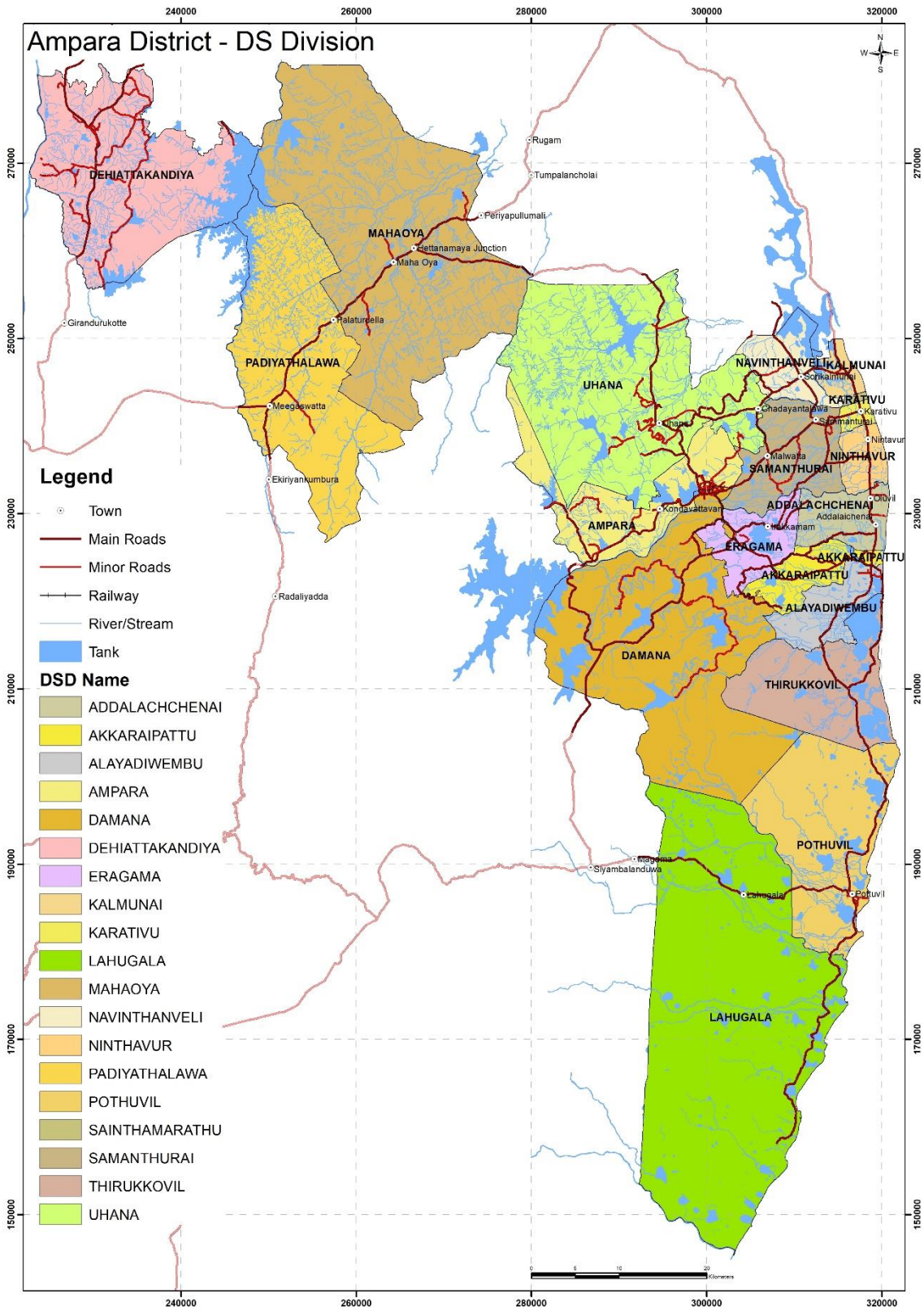


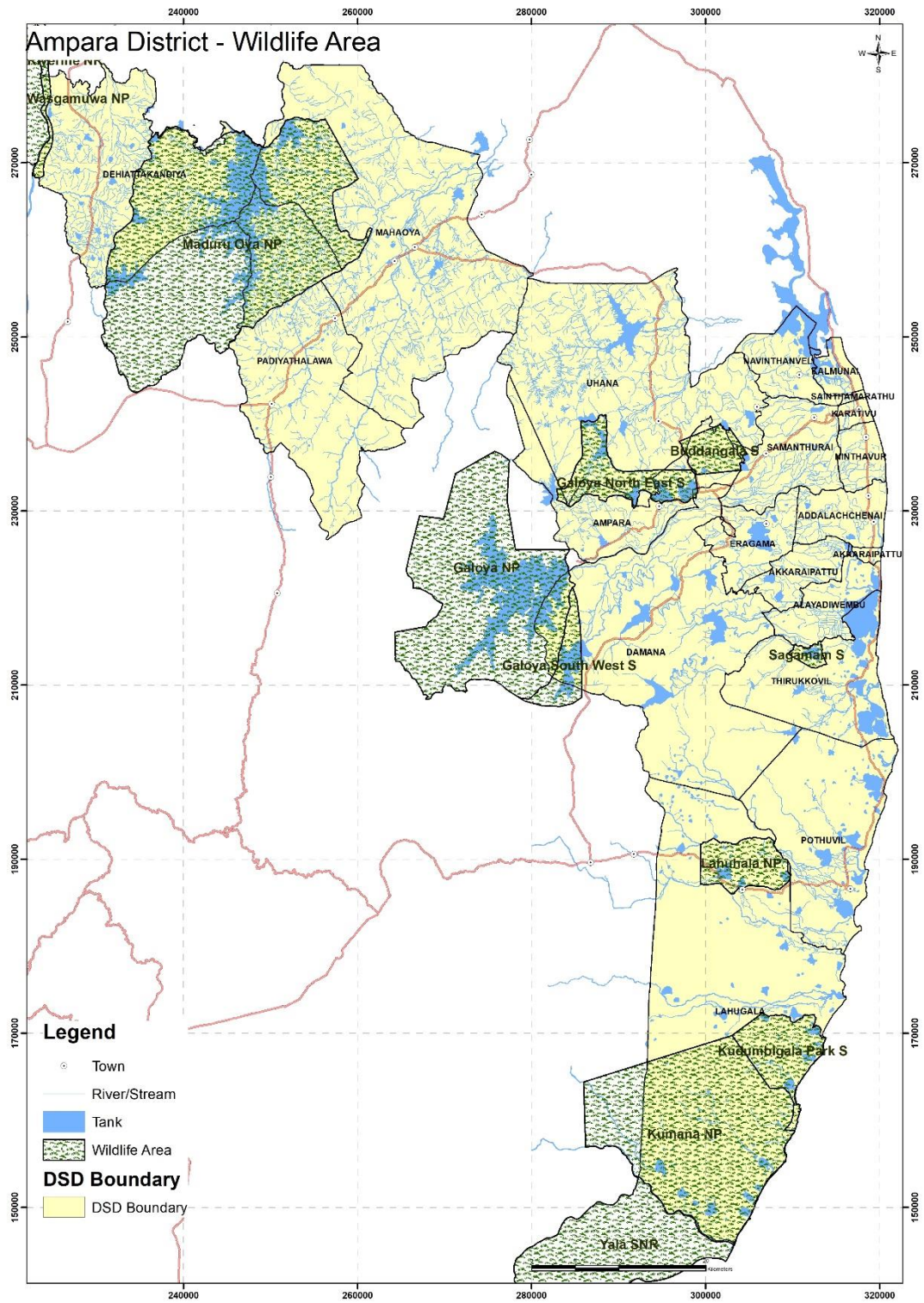


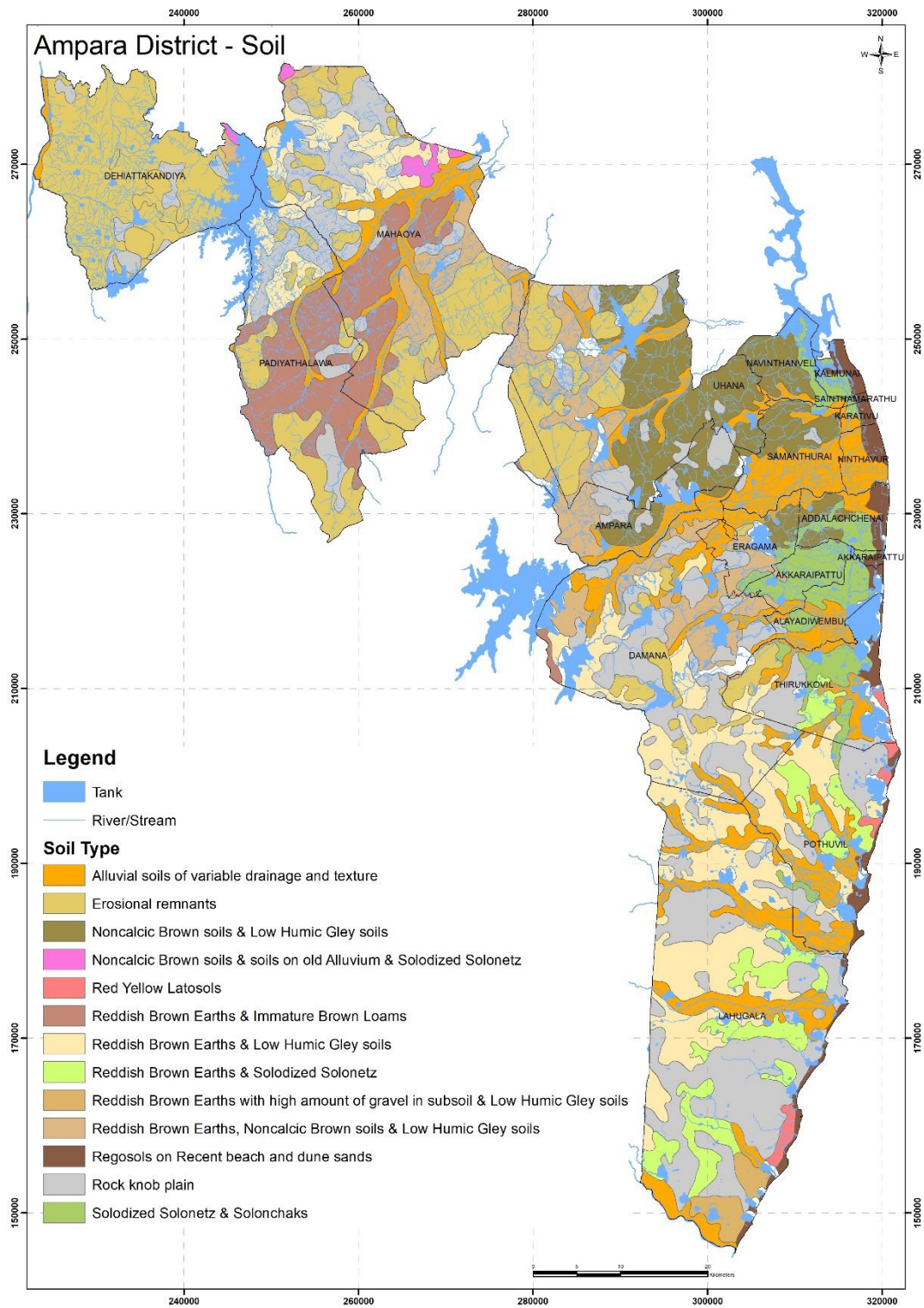


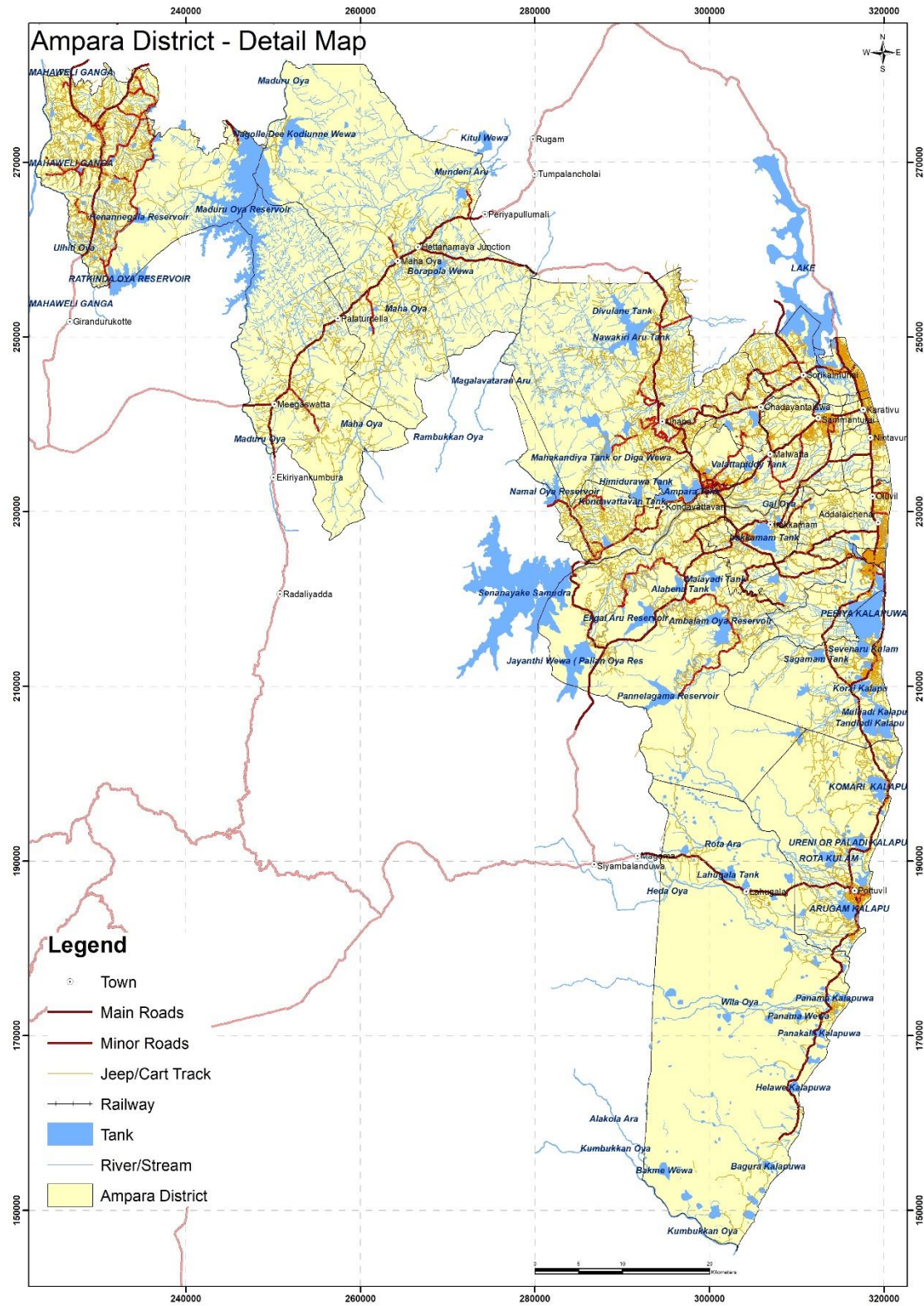














Hybrid Maize Seed Production - Machinery & Infrastructure Requirement for a Cluster

Machinery Description	General Output		Machinery Requirement (Nos)		Approximate Unit Price (Rs/unit) - As at mid August 2022	Expenditure - Rs.	
	Machine Output	Extent/Day/Machine	1st Phase - 50 Acre Seeds	2nd Phase (Total) - 500 Acre Maize Seeds (Extra Machinery Requirement)		1st Phase - 50 Acre Seeds	2nd Phase (Total) - 500 Acre Maize Seeds (Extra Machinery Requirement)
<b>Land Preparations</b>							
Mould Board Plough -Only for Hard Soil - 1.5 hour/Acre	1.5 hour/Acre	4 Acre/Day	1	3	500,000.00	500,000.00	1,500,000.00
Disc Plough (coupled with 45 HP 4 Wheel Tractor ) - 2 discs	1.5 hour/Acre	4 Acre/Day	3	15	270,000.00	810,000.00	4,050,000.00
Disc Harrow - 14 discs (coupled with 45 HP tractor)	1 hour/Acre	6 Acre/Day	3	12	320,000.00	960,000.00	3,840,000.00
Ridge Former	1.5 hour/Acre	4 Acre/Day	3	15	225,000.00	675,000.00	3,375,000.00
<b>Field Maintenance</b>							
Sprinklers - ( 5 m x 5m ) - 2m height, adjustable	600 - 750 ml/h at 1.5 to 2 bar pressure		50	450	800,000.00	40,000,000.00	360,000,000.00
Electric/ solar/ Engine operated Water Pumps			50	450	200,000.00	10,000,000.00	90,000,000.00
Construction of Pump House & Water Tank - Padiyathalawa.						15,000,000.00	
Highland Seeder - 2nos. - with FMRC Recommendation		6 Acre/Day	2	12	1,200,000.00	2,400,000.00	14,400,000.00
Inter Cultivator Machine - 2nos. - self propelled power weeder.		2 Acre/Day	5	35	250,000.00	1,250,000.00	8,750,000.00
<b>Processing Machineries -</b>							
Sheller Machine - with FMRC Recommendations	1 MT/hour	8 MT/Day	1		500,000.00	500,000.00	-
Seed cleaning and grading machine with winnowing facility.	1 MT/hour	8 MT/Day	1		1,500,000.00	1,500,000.00	-
Maize Seed dryer - Batch type	3 MT/batch	6 MT/Day	1		9,000,000.00	9,000,000.00	-
Maize Seed Coating Machine	1 MT/hour	12 MT/Day		1	15,000,000.00		15,000,000.00
Electronic Weighing Scales			3	2	125,000.00	375,000.00	250,000.00
Bag Closer Machine			1		40,000.00	40,000.00	-
<b>Processing and Storing Facilities</b>							
Processing Centre along with Storing Facility - 50' x 100'			1			50,000,000.00	
Poly Tunnel Dryer - Maize Cob drying - 30' x 100'			1			12,000,000.00	
Electric Fence				1 Item		3,000,000.00	6,000,000.00
Road Rehabilitation				1 Item		2,000,000.00	10,000,000.00
Moisture Analyzers - to be used in fields and processing centre			3	7		600,000.00	1,300,000.00
<b>Total Expenditure - Rs.</b>						<b>150,610,000.00</b>	<b>518,465,000.00</b>

Note:

1st Phase - Maize seed production is going to be commenced with 50 acres per cluster.  
 It is assumed that 500 acres per cluster including the initial 50 acres could be used for Maize seed production at the 2nd Stage.  
 The machinery requirement is ascertained by assuming that selected farmers are closed by.

Total Machinery and Infrastructure Requirement for three clusters

Machinery Description	Machinery Requirement/ Cluster		Total Machinery Requirement (Nos) - 3 clusters		Approximate Unit Price (Rs/unit) - As at mid August 2022	Total Expenditure (3 clusters) - Rs.	
	1st Phase - 50 Acre Seeds	2nd Phase - 500 Acre Maize Seeds (Extra Machinery Requirement)	1st Phase - 3 x (50 Acre Seeds )	2nd Phase - 3 x (500 Acre Maize Seeds) - Extra Machinery Requirement		1st Phase - 3 x (50 Acre Seeds )	2nd Phase - 3 x (500 Acre Maize Seeds) - Extra Machinery Requirement
<b>Land Preparations</b>							
Mould Board Plough -Only for Hard Soil	1	3	3	9	500,000.00	1,500,000.00	4,500,000.00
Disc Plough (coupled with 45 HP 4 Wheel Tractor ) - 2 discs	3	15	9	45	270,000.00	2,430,000.00	12,150,000.00

Disc Harrow - 14 discs (coupled with 45 HP tractor)	3	12	9	36	320,000.00	2,880,000.00	11,520,000.00
Ridge Former	3	15	9	45	225,000.00	2,025,000.00	10,125,000.00
<b>Field Maintenance</b>							
Sprinklers - ( 5 m x 5m ) - 2m height, adjustable	50	450	150	1350	800,000.00	120,000,000.00	1,080,000,000.00
Electric/Solar/ Engine operated Water Pumps	50	450	150	1350	200,000.00	30,000,000.00	270,000,000.00
Construction of Pump House & Water Tank - Padiyathalawa.						15,000,000.00	
Highland Seeder - 2nos. - with FMRC Recommendation	2	12	6	36	1,200,000.00	7,200,000.00	43,200,000.00
Inter Cultivator Machine - 2nos. - self propelled power weeder.	5	35	15	105	250,000.00	3,750,000.00	26,250,000.00
<b>Processing Machineries -</b>							
Sheller Machine - with FMRC Recommendations	1		3	0	500,000.00	1,500,000.00	-
Seed cleaning and grading machine with winnowing facility.	1		3	0	1,500,000.00	4,500,000.00	-
Maize Seed dryer - Batch type	1		3	0	9,000,000.00	27,000,000.00	-
Maize Seed Coating Machine		1		3	15,000,000.00		45,000,000.00
Electronic Weighing Scales	3	2	9	6	125,000.00	1,125,000.00	750,000.00
Bag Closer Machine	1		3	0	40,000.00	120,000.00	-
<b>Processing and Storing Facilities</b>							
Processing Centre along with Storing Facility - 50' x 100'	1		3	0	50,000,000.00	150,000,000.00	-
Poly Tunnel Dryer - Maize Cob drying - 30' x 100'	1		3	0	12,000,000.00	36,000,000.00	-
Electric Fence				1 Item		9,000,000.00	18,000,000.00
Road Rehabilitation				1 Item		6,000,000.00	30,000,000.00
Moisture Analyzers			9	21		1,800,000.00	3,900,000.00
<b>Total Expenditure - Rs.</b>						<b>421,830,000.00</b>	<b>1,555,395,000.00</b>