Sri Lanka Agriculture Sector Modernisation Project (ASMP)

ENVIRONMENTAL SCREENING REPORT

FOR

CDP № 9 – CAVENDISH BANANA, BATTICALOA

Prepared for: Democratic Socialist Republic of Sri Lanka, Ministry of Agriculture (MOA)

Revised: 3 July 2022

FCG

NEW ZEALAND G2G KNOW-HOW

InfotechsIDEAS

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TABLE OF ABBREVIATIONS

ADA	Assistant Director of Agriculture
ADO	Agricultural Development Officer
AI	Agriculture Instructor
AQI	Air Quality Index
ARPA	Agriculture Research and Production Assistant
ASMP	Agriculture Sector Modernisation Project
ATDP	Agriculture Technology Demonstration Parks
BS	British Standards
CDP	Cluster Development Plan
CEA	Central Environmental Authority
DOA	Department of Agriculture
DS	Divisional Secretary
EMP	Environmental Management Plan
EMS	Environmental Method Statement
EPL	Environmental Protection Licence
FPO	Farmer Producer Organisation
GAP	Good Agricultural Practices
IPM	Integrated pest management
IPNS	Integrated Plant Nutrition System
ISP	International Service Provider
IUCN	International Union for Conservation of Nature
LA	Local authority
MoD	Ministry of Défense
MOP	Muriate of Potash
O&M	Operation and maintenance
OFC	Other farm crops
PCR	Physical cultural resources
PMC	Project Management Committee
PMP	Pest management plan
PMU	Project Management Unit
RDA	Road Development Authority
RPM	Residential Project Manager
SMP	Social Management Plan
WQI	Water Quality Index

ASMP

ENVIRONMENTAL SCREENING REPORT

1. PROJECT IDENTIFICATION

Project title	Introduction of Improved Technologies to enhance the quality and productivity of Cavendish Banana in Batticaloa District
Project Proponent	Project Management unit, ASMP, Ministry of Agriculture

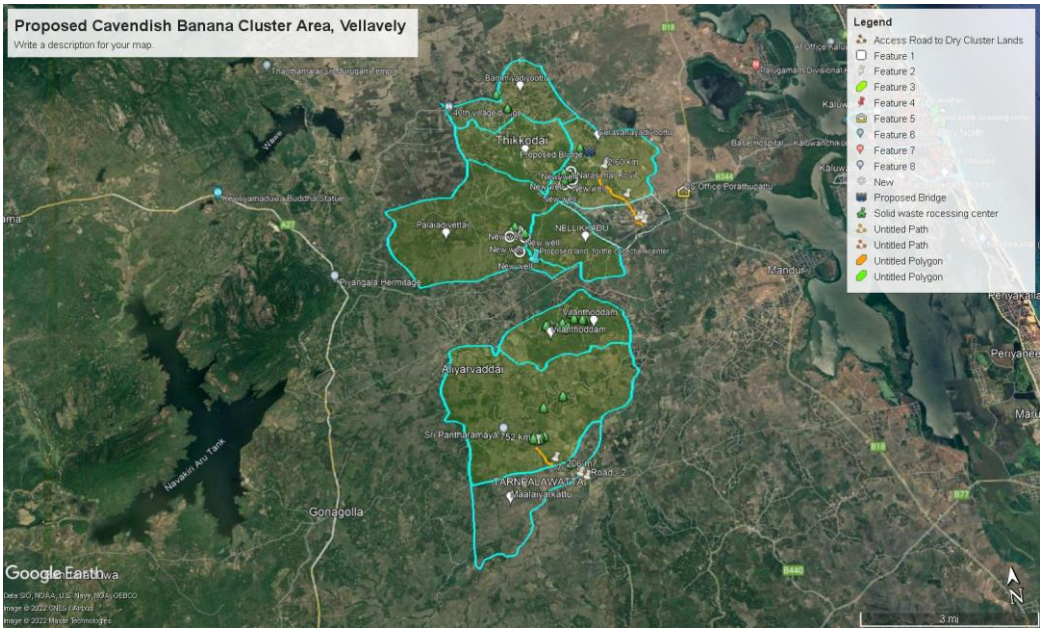
2. PROJECT LOCATION

Location

(Relative to the nearest town, highway)

The cluster encompasses land and beneficiaries in Porathevu Pattu DS Division (Vellaveli) which is located on the South Western Part of the Baticaloa District. Eastern part of the DS boundary is the Manmunai and Eruvil Pattu DS divisianmunai South West DS Division. This DS is covering a land area of 167 sq.km which is about 6.3 percent of the district's total land area. The selected eight Grama Niladhari Disvisions are Malayarkaddu 99H, Anaikaddiyaveli, Palayadivaddai 99B, Sinnawathai 99C, Nellikkadu, Tikkodai 106A, Vemmiyadiyuththu, and Vilanthoddam 99D. Figure 1 shows the selected GNDs in Vellaveli.

Figure 1: Project Area of the Cavendish Banana Cluster in Vellaveli



This area can be accessed through A27 and B18 roads. Nearest city to the area is Kaluwanchikudy which is about 8km away from the area towards the coastal belt.

Definition of project area

(The geographical extent of the project & areas affected

There are 216 farmers selected from eight GNDs in Vellaveli. Total of 43.2ha have been selected for cultivation of Cavendish banana with a minimum of 0.5acre for each farmer.

Table 1: Distribution of sellected farmers

Ag. Service Centre	GN Division	No. of farmers	Extent ha	% of women farmers
Mandur	Maalaiyarkadu	56	11.2	41
	Anaikaddiyaveli	03	0.6	33.33

during construction)

Vellavely	Sinnawattai	33	6.6	42.42
	Vilanthoddam	36	7.2	61.11
	Paalayadivaddai	23	4.6	30.43
	Nellikkadu	04	0.8	00
	Vammiyadiyoothu	20	4	45
Palugaamam	Thikkodai	41	8.2	39
	TOTAL	**216**	**43.2**	**42.59**

Cultivation related impact would be mostly limited to the cultivation lands unless a special incident.

In addition to the proposed cultivations, there are several production infrastructures proposed to be improved. Accordingly, 3.6km of rural roads in three GNDs namely Suruwanayadiyoottu, Sangarapuram and Sinnawattai GN Divisions. In the meantime, about 10m bridge to be rehabilitated. Construction related impacts will be restricted to either side of the proposed road sections. Further, about 21km length of electrical elephant fecing to be erected as listed below:

Table 2: Details of Electric fence

GN Division	Length of the fence (km)
1. Mallaikattu	5.90
2.Sinnwattai	2.20
3. Thikkodai	4.94
4. Villathottum	2.70
5. Vammiyadiyootu	3.00
6. Puliadiwattai	1.60
7. Nellikaddai	0.60
Total	**20.94**

Most importantly, about 35 numbers of Agro wells (shared) to be constructed with the recommendations from Water Resources Board (Annex 6 - Hydrological Report of WRB).

Adjacent land and features

The proposed cluster is located in the Western and Southern part of Vellaveli DS division and encompass 8 GN divisions. Vellaveli DS division covers about 6% of Baticaloa district but entails 21% of the home steads and 17% paddy lands of the district. The DS Division plays an important role in paddy production in the Batticaloa District. Coconut and other palm tree products are the other major products of the DS Division. Developing upland lands for home gardens is problematic due to unsatisfactory drainage of the soil during the Maha season (wet) and the extreme dryness of the Yala season. Sparsely used cropland is presently widely used for low productive chena (Slash and burned) cultivation and can be used for banana cultivation.

Table 3: Land Use Pattern in Cluster area and Baticaloa District

Land use category	Land Extent ha		% of Cluster DS
	Baticaloa District	Porathive Pattu (Vellaveli)	
Build Up area	1370	60	4.4
Homesteads	12288	2034	21.4
Paddy	67320	11439	17
Mixed Trees and other perennials	3570	118	3.3
Coconut	7127	412	5.8
Sparsely used Crop Lands	35153	410	1.2
Other crop lands (palm trees etc)	360	70	19.4

Forests/Forest Cultivations	51730	10	0
Scrublands	33740	850	2.5
Grass lands	15040	320	2.1
Mrshes and Forest Mangroves	1520	312	20.5
Water Bodies	24400	566	2.3
Barren and unutilised Lands	12470	109	0.9
	266088	**16710**	**6.3**

Source: Resource Profile 2020, Baticaloa District and Vellaveli DS

Forest covers 41% of the total land area and the agricultural land covers 37% of the total land area in the district. The rest of the land covers by the home Garden, water bodies, wet-lands, and Non-Agricultural lands. Total land area of the selected GN divisions is 46.32 km^2 and high land crops and paddy are cultivated including fruit crops such as banana, lemon, and papaya. As per the resource profile of Porathivu Pattu DS division, lime and banana are the dominant fruit crops cultivated in the homestead gardens in the selected GN divisions and the second priority was given for Papaya cultivation while other crops such as Mung bean, Cowpea, ground nut and maize cultivation are also found in the selected area. The area is often faced elephant threats and they are approaching the from Navagiriya area.

In particular to the selected GNDs, mostly the adjoining lands are cultivated paddy and OFC. Very low density of houses and cultivated lands in the selected areas. There are livestock farms and animal raring in the area. There are number of streams passing through the selected areas. Further more, there are low lands which highly susceptible to flooding in the area. Most of these lands are irrigated through Navagiriya Scheme coming under DS Senanayake Reservoir. Andella Oya is flowing through the cluster area up to Batticaloa lagoon.

3. PROJECT JUSTIFICATION

Need for the project

(What problem is the project going to solve)

This crop was introduced by the DOA as a pilot project in selected area and it was a good alternative crops for farmers to get maximum output from their uplands. Though there are three main banana varieties grown in the district such as Ambul, Seeni and Kolikuttu. Cavendish banana variety can be grown in Batticaloa due to its tolerant to Panama disease when compared to other varieties targeting export market. Accordingly, this project should be taken forward by overcoming the following problems and challenges.

1. Low yield of banana presently farmers are experiencing in their homegarden cultivations due to poor agronomic practices being adopted.
2. Reluctant to adopt new technologies.
3. Commercial cultivation is new to them and the proposed Cavendish variety also new to them.
4. Presently experiencing flooding method of irrigation for crop productions creates many problems such as waterlogged conditions, poor crop performances, high disease incidence and waste of water.
5. High risk of soil erosion due to prolonged flood irrigation.
6. Poor crop management practices and poor sanitation.
7. No attention on pre or post harvesting quality improvement activities.

After establishment of plantations, expenditure on banana cultivation is low and farmers are able to receive continuous income from their plantations. Banana is grown rainfed with supplementary irrigation whenever necessary. In general,

	farmers are using flood irrigation methods in banana cultivation where high amount of water will be used. The proposed project is designed as a model for primary value addition, collecting centre and productivity enhancement by using new technology with sprinkler irrigation and construction of collecting centre. New cultivation of banana land is going to be selected for sprinkler irrigation systems to reduce water issues in some areas and value addition activities will implemented for existing orchard in cluster area. This sprinkler irrigation system will be powered by renewable energy through the solar panel system, and it will reduce the energy cost. Agriculture Technology Demonstration Parks (ATDPs) will support farmers to: (a) develop professional producer associations; (b) achieve economies of scale in production and exports; (c) improve marketing and value addition; and (d) achieve greater efficiency in the provision of technical and other support services. Farmers are expected to directly benefit through improved production capacity and input supply/management, better and more efficient technologies for production and postharvest, improved market linkages as well as opportunities for value addition. Furthermore, farmers would benefit from capacity building through farmer business and marketing training. The business opportunity identified with farmers and agribusiness is the modernisation of existing and renewed plantation of Ambul banana, for export to the Middle East.
Purpose of the project **(What is going to be achieved by carrying out the project)**	A total of 50 technology demonstration plots will be established for bananas in Vellaveli. There are 216 farmers in Vellaveli 8 GNDs, out of which 50 number of leading farmers will be selected with existing plantations in most suitable locations with maximum exposure to large number of farmers in each GNDs. The technology package and other management practices will be introduced to the selected group. This group will provide the foundation to initiate quick marketing of high-quality banana for export market. The main objective of the subproject is to develop Agriculture-related livelihood by achieving below objectives. • To introduce new technologies to increase yield • Land preparation • Water conservation/Management • Disease control • Use of weedicides, pesticides • Enhancement of productivity and Quality of banana • To minimise postharvest losses • To increases sustainable farm income • Create new employment opportunities • Identify international market opportunities • Postharvest processing facilities The famers who are engaging with farming activities in the project's intervention area will follow the Good Agricultural Practices (GAP) introduced by the DOA. ASMP will facilitate to implement GAP by introducing new technologies and enhancing farmers' capacities.
Project Justification and Alternatives considered **(Different ways to meet the project**	The Department of Agriculture, Batticaloa proposed Vellaveli as a Banana Cluster to be established. Vellaveli has a established ground nut farmer organisation already. At present, there are no commercial level banana cultivations in the district or in the cluster area. The existing banana is at homegarden level and are not using any new technologies. Therefore, new project will be "entirely new one" to the beneficiaries.

need and achieve the project purpose)

Therefore, the project should start from the beginning to inculcate the beneficiaries in banana cultivation and its new technologies. Following concerns were focused during selection of Cavendish Banana Cluster in Vellaveli.

- Great potential to increase farmer income with less labour and inputs.
- Ability to save water in the reservoir for next seasonal cultivation and minimise water crisis during Yala season.
- Effective mechanism to attract young farmers for commercial agriculture.
- Almost all the banana farmers have kept smaller part of their land for paddy crop for domestic consumption.
- All the banana farmers are members of farmer organisations or successors
- Requirement for disturbing new lands are not triggered as existing cultivation will be sufficient to upgrade
- Ability to cater the continuous supply of Banana to export market
- Soil characteristics such as pH, water holding capacity, electrical conductivity and organic matter contents favours banana cultivation in Vellaveli

There are experienced banana farmers and majority farmers in Vellaveli rely on agricutlure for livelihood. Most of the farmers have large scale, low flat farmer-based lands with plenty of water with less drainage concerns. Since it consists with already established farmlands, no clearance of new lands are required and anticipated site specific negative environmental impacts are found. Hence, the selected area is highly supportive to meet the project needs within short period of time without negative environmental impacts.

On-farm technology package with control/prevention of Panama Disease and the Banana Bunchy Top Virus to be introduced. Further, crop management by fruit age control using coloured ribbons, oriented to export will be used. New and improved quality enhancing technologies and Productivity Enhancing Technologies such as drone technology, water conserving and low pressure drip and mini sprinkler irrigation systems, basic flood prevention and drainage field techniques, new planting patterns with high population densities, precision fertilisation techniques, pest and disease control based on integrated pest management (IPM) practices and modern spray techniques and precision agriculture practices to be introduced to meet the expected project out comes. All these technological applications will prevent excess use of water, and also it will reduce the impact cause by the use of chemical fertilizers. Hence, technological applications of the proposed project will reduced the existing environmental impacts.

The “no-action” alternative would mean that no Banana Cluster Development undertake by the ASMP and hence no financial, technical and market support for the existing banana Cultivators and other agriculture farmers in Vellaveli. Therefore, conventional farm practices, low productivity, low quality and low income will continue to dominate the economy of the farmers and agriculture sector will not develop in Batticaloa. It will also continue the same agricultural practices and existing environmental impacts such as high water usage, use of chemical fertilizers will be continued.

Legal framework and WB Safeguards Policies

According to the nature of project activities, following local legal framework and WB safeguards policies will be applicable:

#	Permit/Clearance	YES	NO	TBD	Remarks
1	The National Environmental Act. No.		√		None of the proposed activities are coming under prescribed activities

	47 of 1980 & its amendments				
2	Agrarian Development Act of No 46 of 2000 and 2011 (Section 32)	√			Agricutlure developments in the area should be consented by the Agrarian Development Department.
3	The Mines and Mineral Act No.33 of 1992	√			Improvements of rural roads and other proposed infrastructure activities may require extraction of soil and rocks. Soil and rocks should be purchased from GSMB permitted borrow pits and quarries.
4	Local Authorities Acts	√			Improvements of rural roads, waste disposal should be approved by the Porathivu Pattu Pradeshiya Sabha.
5	Water Resources Board Act No. 29 of 1964	√			Extraction of ground water should be concented by the WRB
6	Soil Conservation (Amendment)Act No. 24 of 1996	√			Any activity which increases the erosion of soil or potentials for activate erosion potential need to take maximum mitigation measures to control soil erosion and apply soil conservation measures wherever applicable
7	The Fauna & Flora Protection Ordinance Act No. 49 of 1993 & its amendments	√			Any cluster activity or infrastructure development closer to a protected area or outside which hinders wildlife movements restrictions should be adhered to FFPO measures

World Bank safeguards policies triggered by the project

Safeguard Policies Triggered by the Project	**Yes**	**No**
Environmental Assessment (OP/BP/GP 4.01)	[**x**]	[]
Natural Habitats (OP/BP 4.04)	[]	[**x**]
Pest Management (OP 4.09)	[x]	[]
Physical Cultural Resources(OP 4.11)	[]	[**x**]
Involuntary Resettlement (OP/BP 4.12)	[]	[**x**]
Indigenous Peoples (OD 4.20, being revised as OP 4.10)	[]	[x]
Forests(OP/BP 4.36)	[]	[x]
Safety of Dams (OP/BP4.37)	[]	[x]
Projects on International Waterways (OP/BP/GP 7.50)	[]	[x]

4. PROJECT DESCRIPTION

<table>
<tr><td>Proposed start date</td><td>August 2021</td></tr>
<tr><td>Proposed completion date</td><td>August 2023</td></tr>
<tr><td>Estimated total cost</td><td>LKR 153,357,044 million</td></tr>
<tr><td>Present land ownership</td><td>Private Farmlands, majority are permits given by Divisional Secretariat of Vellaveli and less number of deed lands
Roads - Poraithivu Pattu Pradeshiya Sabha
Collection Centres – Divisional Secretary, Vellaveli</td></tr>
<tr><td>Description of the project
(With supporting material such as maps, drawings etc attached as required)</td><td>There are proposed agriculture productivity improvements, infrastructure improvements such as rural roads, irrigation infrastrctures such as bridges, elephant fence, agro wells under this cluster. Details of the proposed activities are given below:
Table 4: Good Agriculture Practice for cavendish banana
<table>
<tr><th>Main Technology</th><th>Practice (s)</th><th>Comments</th></tr>
<tr><td>Bunch clearing before bagging</td><td>• Removing leaves that can damage bunch and bending or removal of placenta leaf</td><td>• Bunch clearing practices protect the bananas from mechanical damage by removing potential causes of damage</td></tr>
<tr><td>Bagging with plastic bags</td><td>• Premature bagging when the bunch is just emerging and the centre flower bud points downward</td><td>• Bagging protects the banana bunch from physical and pest damage and increases bunch vigour</td></tr>
<tr><td>Bunch clearing after bagging</td><td>• De-leafing, de-flowering, dehanding, de-budding</td><td>• Bunch clearing practices protect the bananas from mechanical damage by removing potential causes of damage and increase the vigour of the bunch</td></tr>
<tr><td>Tagging of the banana bunch with coloured plastic ribbons</td><td>• Every week a different coloured ribbon is applied when the lower hands are parallel to the ground. Eight colours are used</td><td>• Tagging of the banana bunch fixes the age of the fruit. At tagging, the age is 1 week
• The count of bunches tagged develops a true fruit inventory that needs to be maintained and managed
• The fruit inventory 13 weeks before harvest improves marketing and selling practices to maximise pricing for farmers and maintains quality and shelf life</td></tr>
<tr><td>Propping and guying</td><td>• The banana bunch is propped with wooden poles tied with rope or plastic</td><td>• Propping protects the banana bunch avoiding field losses of fruit</td></tr>
<tr><td>Harvesting by dehanding at the mat</td><td>• Bunches for dehanding in the field are selected based on</td><td>• Dehanding at the mat avoids the handling of whole bunches after</td></tr>
</table></td></tr>
</table>

	age (ribbon colour) and calliper grade to protect quality, prevent ripening and turnings during transport and extend shelf life • Hands are removed from the bunch using a fish line (100 test) that cuts and seals the crown properly with no additional trimming required	harvest and brings only good hands to the packing centre for packing • All organic matter waste remains in the field as organic fertiliser. Prolongs life and usefulness of harvested of the mother plant
De-latexing in the field	• Removed hands from harvested bunch are placed on banana leaves for de-latexing for at least one hour	• Fruit arrives free of latex for packing, avoiding the use of large amounts of water for de-latexing purposes • A dry packing procedure can then be applied that requires less investment in packing infrastructure • Small farmers can easily pack bananas with minimum infrastructure
Transport to packing centre	• Packing the de-latexed hands into 20-kg plastic trays lined with foam. One bunch, one crate • Colour ribbon tied securely to crate to allow for inventory management at packing centre	• Protects banana hands from damage during transport to packing centre
Postharvest technology	• Field heat removal Line packing Cold chain management Integration of export protocols into standard SOP's	• These practices are utilised to preserve optimum quality and shelf life throughout value chain
Quality monitoring and evaluation system	• Quality score Tally of defects Value chain feedback loop	• The quality monitoring and evaluation system provides data for quality management and creates a feedback mechanism to correct quality problems to ensure and maintain high banana quality throughout the value chain
Export protocol	• Guidelines to grow, pack and ship bananas for export	• The export protocol ensures bananas arrive in optimum biological and commercial condition to international markets

Table 5: Improved technology package

Main Technology	Practice (s)	Comments
Variety	Cavendish banana	

	Tissue culture planting material		• Banana seedlings purchased from a tissue culture laboratory
	"Peeper" planting material	• Banana seedlings developed from "peepers" taken from the production field and grown for 3 months following nursery practices • Peepers should reach approximately 40 cm of height, with 4 to 5 functional green leaves present to be ready for transplanting	• "Peeper" planting material is an option for farmers when tissue culture meristems are not readily available • Peepers" are very small followers without green leaves found in the proximity of the mother plant
	Land preparation	• Deep ploughing using mouldboard plough • Application of compost • Deep ploughing again using mouldboard plough (perpendicular to first ploughing) • Disking or harrowing (two perpendicular passes) • Micro levelling to facilitate drainage works	• Improved land preparation practices
	Mini-sprinkler irrigation systems	• Computer controlled heads for water application scheduling supported by fertility sensors and soil moisture sensors • Precision fertigation with liquid organic compounds • Precision application of liquid pesticides * Anti-clogging flushing components	• Mini-sprinkler systems create a waterhead that allows the wetting front to reach the depth of the feeder roots of fruit trees • Irrigation scheduling based evapotranspiration measurements
	Flood prevention and drainage field techniques	• Site levelling using laser levelling machinery, quick water evacuation ditches, surface drainage techniques (removal of wet spots)	• Onfarm drainage works avoid water from standing in the field for long periods of time preventing waterlogging
	Precision planting	• Construction type twine to demarcate planting rows, planting templates with plant spacing measurements	• Practical tools and aids assure accurate precise field layout and measurements of planting distances to assure desired population densities which are the foundation of productivity
	Double row planting system	• Bananas are planted in two double rows 1 m apart • The spacing for bananas within a double row is 1.75 m • An alley, 4 m wide, separates the double rows	• This double row planting pattern accommodates 2,400 banana plants per hectare 960 per acre) and it is suitable for multiple cropping
	Multiple cropping		• The alley of the Double row planting system can be used for intercropping vegetables with fruit trees • In most cases, three beds of vegetables can be planted is this space using the new

		and improved technology package introduced by the ISP for the particular vegetable
Weeding		• Mechanical weeding is herbicide free. It is a very environmentally friendly technology
Precision fertilisation	• Fertigation with organic liquid fertilisers supplemented with fertilisation and/or fertigation with chemical fertilisers	• Formulation of fertiliser regimes based on complete soil tests and foliar analyses
IPM	• Pest population and pest damage assessment surveys to evaluate pest and disease intensity/quantity factors for damage prevention and to determine pest populations threshold status for rational application of pesticides • Prevention and management of Fusarium wilt (Panama disease) • Control of Sigatoka disease and other pre and postharvest diseases	• IPM practices are combined with modern spray techniques when necessary i.e. ultra low volume spray using drones • Pesticide application through irrigation system
Labelling for precision agriculture	• Production area blocks and tree tagging labelling	• Production area blocking and tree tagging labelling develop a tree identification nomenclature to find tress quickly to apply precision agriculture practices on a timely basis

Table 6: Proposed Rural Roads in the Vellaveli Cluster

#	DESCRIPTION	Unit	Qty.
1	Rehabilitation of road in Sangarapuram and Sinnawattai GN Divisions. (Two separate stretches) Construction of Grewal paved carriage way.	Km	0.96
2	Rehabilitation of road in Suruwanayadiyoottu GN division. Construction of Grewal paved carriage way.	Km	2.64
3	Proposed bridge across the Irrigation canal in Surawanayadiyoottu GN Division.	Item	1

Table 7: Summary of Project Interventions in the Cluster

#	Project component	Key Activities	Approx. extent / quantity	Implementation responsibility
1	Cultivation of Cavendish Banana (Refer table 4 and 5)	Land Preparation Irrigation pipelaying Installation of mini-sprinklers	43.2ha	ISP PPMU DOA ASD
2	Improvements of Rural Roads (Rehabilitation) (Refer table 6)	Trimming, levelling and compaction of sub grade Supplying and pilling approved gravel	3 road sections Total length 3.6km	Contractor LAs Civil Engineer –ISP PPMU Engineer - PMU

			Spreading and compaction garvel		
	3	Rehabilitation of Bridge	Base construction Pilling Bridge construction	1	Contractor Civil Engineer –ISP PPMU Engineer - PMU
	4	Construction of Agro wells	WRB reports Excavation Disposal of excavated materials Wall constructions	35	Contractor FO Civil Engineer –ISP PPMU Engineer - PMU
	5	Construction of Collection centres and Compost Production Unit	Fencing Constrution of builing Disposal yards Mixing yards Leachat management	1 Large Collection centre 2 mini collection centre 1 Compost yard	Contractor FO Civil Engineer –ISP PPMU Engineer - PMU
	6	Erection of Elephant fence (Suppling and fixing Hanging type electric fence with GI posts, two horizontal power cables and hanging wires at 750mm centre. Rate includes energizer with all other accessories and jungle clearing)	Clearing of vegetation Erection of fence Energizing of fence Maintanance	21km length	Contractor FO Civil Engineer –ISP PPMU Engineer - PMU

Project management team

A PMU was established under the Ministry of Agriculture to implement proposed project activities.

Contact Persons

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5. DESCRIPTION OF THE EXISTING ENVIRONMENT

5.1 PHYSICAL FEATURES

Topography and terrain	Geologically, the project area belongs to the Vijayan Complex of Sri Lanka and the elevation of the selected area is lying between 4-34m AMSL. The topography of the DS varies from flat to undulating. Generally a gentle slope (slope <30%) and the relief is <20m. It consists of undulating plains and alluvial flats watered by rivers from the mountains of Uva province. This topographical plain leads to areas being vulnerable to flooding during the heavy rain periods in November and December and is considered as a most flood prone area of the district.
Climate and Meteorology	More than 65% of the annual rainfall is during the Maha season (October to February) and other 7 months remain as dry months. Appropriate drainage conditions of upland cultivations during this period is required. Daily average sunshine in the dry period is more than 7 hrs. It is a best condition for crop production to achieve a highest yield if irrigation is not a limiting factor. With year-round ground water availability assured in selected cluster area, intensive agriculture is highly potential. Table 8: Monthly Agro Ecological Characteristic Variation in Baticaloa District

Parameter	Month of the Year													Wether Station
	J	F	M	A	M	J	J	A	S	O	N	D	Avg	
Rainfall mm	209	108	71	44	40	34	36	40	78	172	354	390	131	Baticaloa

Max.Temperature C	29	30	31	33	34	35	34	34	32	30	30	29	32		Baticaloa
Min.Temperature C	24	25	25	26	26	27	27	26	26	25	25	24	26		Baticaloa
No of Rainy Days - 2019	7	13	2	2	2	0	2	2	6	13	17	17	7		Baticaloa
Daily Sunshine hours	6.2	7.4	9.1	7.9	8.5	7.2	8.1	8.5	7.9	7.0	5.7	5.3	7		Aralaganvila
Daily Evaporation mm	3.3	3.7	4.7	4.3	5.2	5.9	6.6	6.3	5.8	4.7	3.4	3.1	4.8		Aralaganvila
Relative Humidity %	79	81	74	71	71	64	66	65	75	81	81	85	74		Baticaloa

The average maximum temperature is about 32^{0}C and the average minimum temperature is about 26^{0}C. The minimum temperature goes down around 22^{0}C in January and February.

Soil

(Type and quality)

The project area falls into dry zone low country of Sri Lanka and DL2B Agro-ecological zone. The dominant two great soil group can be identified in the DS area Redish Brown Earth with Solanets Soladize soils in undulating terrain form one and Redish Brown Earth with Non Calcic Brown soils and Low Humic Gley soils in undulating terrain form the other. More than 70% of these soil areas has been asweddumized and developed for paddy cultivation.

Table 9: Agro Ecological Characteristics of the Cluster Area

	AEZ	Land Extent		Great Soil Groups
		sq.km	% to DS	
Porathevu Pattu	DL2b	156	100	-RBE with Solanets and Soladize soils -RBE with NCB and LHG soils
Total Area		156		

RBE-Redish Brown Earth, LHG-Low Humic Gley soil, NCB - Non Calcic Brown soils

Source: Punyawardana, 2003

The depth of top soil is moderate and the possible soil erosion is low.

Surface water

(Sources, distance from the site, local uses and quality)

Surface water resources within the selected area are only streams and minor tanks. All these streams are fed by Navagiriyawa Tank belongs to the Irrigation Department which is minimum of 5km away from the area. In addition, Batticaloa lagoon which is about 58km long extends upto Mandur which is about 2-3km away from the area. Another perennial stream flowing through the cluster is Andella Oya which flows to Batticaloa lagoon upto Mandur from Nawagiriya. In addition, there are many streams fed by DS Senanayake Irrigation Scheme in almost all the villages in the Cluster which people are using for both Agriculture and domestic purposes.

Quality: Water quality of streams are fair and less salinity levels and in addition to agriculture, people use them for bathing and most domestic purposes. However, lagoon water with a high salinity levels and do not use for any activity.

Ground water

(Sources, distance from the site, local uses and quality)

Ground water levels in the area is fairly high which lies about 10-20feet. Even the researchs related to ground water level changes in the area confirms the area with irrigation streams are less subjected to the changes in ground water levels but closer to the lagoon the changes in water levels is high and during dry season very low water levels.

Air quality

(Any pollution issues)

Any major air pollution sources in the vicinity of the project site are not recorded. Small-scale industries and traffic may cause air pollution within the area. However, https://www.breezometer.com/air-quality-map/air-

quality/sri-lanka/palachcholai shows that the Air Quality Index (AQI) of Palacholai is 30/500 and $PM_{2.5}$ is the dominant pollutant while O_3, PM_{10} and CO are having lower concentration than $PM_{2.5}$.

5.2 ECOLOGICAL FEATURES – ECOSYSTEM COMPONENTS

Vegetation

(Trees, ground cover, aquatic vegetation)

There are no forest reserved nearby the selected areas. But, in general the area has significant amount of shrubs and secondary forest patches. None of the lands are within those forest patches. However, a significant diversity of the floral diversity can be seen. Recoreded floral species during field visits are listed below:

Table 10: Floral species recorded in the selected lands

Common English Name	Scientific Name	Conservation status according to the National red list 2020
Floriculture Plants (In front of house purpose)		
1. Chineses hibiscus	*Hibiscus rosa-sinensis L.*	-
2. Marigold	*Tagetes erecta L.*	-
3. Chrysanthemum	*Chrysanthemum indicum L.*	-
4. Sunflower	*Helianthus Annuus*	-
5. Wild Jasmine	*Jasminum angustifolium*	LC
6. Anthurium	*Anthurium andraeanum*	-
7. Fish tail palm	*Caryota urens*	LC
8. Silver Fittonia	*Fittonia albivenis*	-
Medicinal Plants		
9. Holy Basil/ Sacred Basil	*Ocimum tenuiflorum L.*	-
10. Aloevera	*Aloe barbadensis Mill.*	-
11. Corn mint	*Mentha canadensis L.*	-
12. Lemon Grass	*Cymbopogon citratus*	-
13. Vitex negundo (Nika – Sinhala Name)	*Vitex negundo*	LC
Fencing Plants		
14. Spiny Bamboo	*Bambusa bambos*	LC
15. Gliricidia	*Gliricidia sepium*	-
Lianas Plants		
16. Thunbergia Plants	*Thunbergia fragrans*	LC
17. Common Rattan	*Calamus rotang*	NT
Other Field Crops		
18. Chillie	*Capsicum annum*	-
19. Finger Millet	*Eleusine coracana*	-
20. Maize/ Corn	*Zea mays*	-
21. Green gram	*Vigna radiata*	-
22. Ground nut	*Arachidna hypogaea (L.)*	-
23. Black-eyed pea	*Vigna unguiculata*	-
24. Black gram	*Vigna mungo*	-
25. Betle	*Piper betle*	-
26. Ginger	*Zingiber officinale*	-
27. Sugercane	*Saccharum officinarum*	-
28. Tumeric	*Curcuma longa L.*	-
Fruits		

29. Banana	*Musa spp.*	-
30. Mango (Vilad)	*Mangifera zeylanica*	-
31. Mango (Kartha kolumpan)	*Mangifera indica*	-
32. Papaw	*Carica papaya*	-
33. Lime	*Citrus aurantifolia*	-
34. Jak	*Artocarpus heterophyllus*	-
35. Pine apple	*Ananas comosus*	-
36. Sweet orange	*Citrus sinensis*	-
37. Pomagranate	*Granatum punicum*	-
38. Wood apple	*Limonia acidissima*	LC
39. Guava	*Psidium guajava*	-
40. Passion fruit	*Passiflora edulis*	-
41. Water melon	*Citrullus lanatus*	-
42. Grapes	*Vitis vinifera*	-
43. Bilimbi	*Averrhoa bilimbi*	-
44. Coconut	*Cocos nucifera*	-
45. Palmyra	*Borassus flabellifer*	-
46. Cashew	*Anacardium occidentale*	-
47. Star Fruit	*Averrhoa carambola*	-
48. Sweet lemon	*Citrus mitis*	-
Other big trees		
49. Bengal flag	*Ficus fergusonii*	LC
50. Neem	*Brucea javanica*	LC
51. Teak	*Tectona grandis*	-
52. Siris Tree	*Albizia lebbeck*	NT
Vegetable Crops		
53. Brinjol	*Solanum melongena*	-
54. Okra	*Abelmoschus esculantus*	-
55. Long beans	*Vigna unguiculata*	-
56. Tomato	*Solanum lycopersicum*	-
57. Bitter goard	*Momordica charantia*	-
58. Snake guard	*Trichosanthes cucumerina*	-
59. Capsicum	*Capsicum annuum*	-
60. Pumpkin	*Cucurbita maxima*	-
61. Cucumber	*Cucumis sativus*	-
62. Luffa	*Luffa acutangula*	-
63. Winged bean	*Psophocarpus tetragonolobus*	-
64. Drunstick	*Moringa oleifera*	-
65. Bottle guard	*Lagenaria siceraria*	-
66. Ash guard	*Benincasa hispida*	-
Roots and Tubers		
67. Manioc (Kirikavadi)	*Manihot esculenta*	-
68. Sweet Potato	*Ipomoea batatas*	-
69. Chinese Potatoe (Sinhala Name – Innala)	*Plectranthus rotundifolius*	-

	70. Tannia	*Xanthosoma sagittifolium*	-
	Leafy Vegetables		
	71. Amaranthus	*Amararanthus viridis*	-
	72. Pennywort/ Spadeleaf/ Indian Pennywort	*Centella asiatica*	LC
	73. Kankun	*Ipomoea aquatica*	-
	74. Hummingbird tree	*Sesbania grandiflora*	-
	75. Curry leaves	*Murraya koenigii*	LC
	76. Pandon Leaves	*Pandanus amaryllifolius*	-

Presence of wetlands	There are no designated wetlands within the selected cluster area. However, Vellavely is consist of many wetlands. Batticaloa lagoon extending upto Vellavely which has created many wetlands in the area. In addition, presence of low lands have led to many wetlands. The Vellaveli area can be recognised as a flood potential area where mostly with a small rain all road networks get flooded. Even research papers related to flood in Batticaloa have recognised the that Vellavely area is prone to flood.
Fish and fish habitats	Batticaloa lagoon extend its length up to the boarder of Ampara where it ends up at Vellaveli area. Other than that there are plenty of streams and micro tanks belongs to Agrarian Development Department which have created a favourable environment as fish habitat. People in the area engaged in inland water fishing as an industry and as household consumption using these available water sources including Batticaloa lagoon which provides a favourable environment for prawn cultivation as well.
Birds (waterfowl, migratory birds, others)	As mentioned above, Batticaloa lagoon is extending up to Vellavely area and there are many low lands which are frequently flooding. Therefore presence of aquatic bird species such as cranes, storks, and Pond herons are can be observed very frequently. In addition, following common bird species can be identified in the area: 1. Parrots 2. Common Mynah 3. yellow-billed babbler 4. Peacock 5. Common Tailerbird 6. Bats 7. Common Buzzards 8. Lesser Whistling Duck 9. Indian Spot-billed Duck 10. Asian Pygmy Goose 11. Sri Lanka Spurfowl 12. Greater Coucal 13. Blyth's Reed Warbler

Presence of special habitat areas (special designations and identified sensitive zones)	The Batticaloa lagoon is a special habitat present in the area. With the level of salinity in the water and soil, distribution of mangroves in the area is high and observed many distructions of such habitats and convereted to paddy areas. These highly disturbed esturine mangrove associated marshy lands were observed closer to the lagoon.
5.3 OTHER FEATURES	
Residential/sensitive areas **(e.g., hospitals, schools)**	In the Poraithivu Pattu DS division there is a MOH office and family welfare officers in all 43 GN divisions are functioning to look after the health of the people. There are a central dispensary and clinic centres in the division. According to the information provided by DS office, there are 33 schools available in the DS division covering all the 43 GN divisions, and a Zonal Education Office functioning in the area to manage these schools. As per the classification of state schools all categories of schools are found in the DS division.
Traditional, economic and cultural activities	The Vellavely Cavendish Banana Cluster (CDP-9) selected 5GN divisions has a population about 5.465 in 1672 households. 330 households are headed by women and 776 people are in the 20-29 age group. There are 237 Buddhists, 29 Roman Catholics and 52 Non-RC with the remainder being Hindus. Almost all are Tamils and around 99.9% of total population are Hindus.

Table 11: No. of Families and population breakdown with gender

(GN Nos)	No of Families	Population	Male	Female
99H	203	652	323	329
99B	260	857	420	437
99C	410	1,405	754	651
106A	582	1,846	898	948
99D	217	705	350	355

Source: Resource profile, Vellavely Divisional Secretariat 2020

All cluster divisions have a high share of self-employed in their population but 42% of the self employed are daily wage workers. Crop and animal farmers make up 34% of the self employed while the rest are foreign employees. The project will create employment opportunities for people as well as opportunities for daily wage workers to become farmers. Further, there will be employment opportunities at the post harvesting processing centres. Development of banana cultivation will be a good prospect for youths and women.

The household income and expenditure statistics, published by Department of Census & Statistics, shows that the household mean monthly income in 2016 of Batticaloa District was about LKR 40,356. Even though there are no specific family income details relevant to the Cluster, it may be assumed that this data provides an overview of the income and employment situation in the selected GN divisions. From the Samurdhi information, it can be concluded that the majority of the families are living below poverty line in the selected GN divisions. Out of 1,672 families in the selected GNDs, 1,197 are receiving "Samurdhi" benefits from Department of Samurdhi Development: about 25.7% of the total population. Estimates from the 2012/13 HIES revealed, that high poverty incidence is also concentrated in some parts of Northern and Eastern provinces, particularly in Mannar, Mullaitivu, and Batticaloa districts. As per 'the Spatial Distribution of Poverty in Sri Lanka' published by Department of Census and Statistics - Sri Lanka in 2015, estimated head count

	index (2012/13) under Sri Lanka's official poverty line is 19.4 in Batticaloa District. In the same report the DS division wise spatial distribution of poverty has also been mapped and the Vellavely Divisional Secretariat is shown in darkest red indicating the poverty rates between 24.7-45.1 percent.
Archaeological resources **(Recorded or potential to exist)**	Piyangala is located closer to Palayadivetti which is about 2km away. Other than that, there are no archaeological important locations observed within the cluster area.

6. DESCRIPTION OF PROPOSED AGRICULTURAL ACTIVITIES

6.1 CULTIVATION

Existing condition of the crop

There are no seasonal crop cultivations in Yala (Dry Season) mainly due to the lack of rainfall during this period. Most of irrigable paddy lands also considered to be not suitable for such crops due to poor drainage conditions. However, some farmers who can cultivate their highlands using water pump irrigation adopt a different farming style. They start their cultivation in mid-February and comtinue up August of Septembe which are dry months. Farmers in this district cultivate chillies and groundnuts according to this cultivation pattern. The use of this system of cultivation in the Vellaveli area is less, but steps will be taken to expand the cultivation of chili as an intercrop in the proposed Cavendish banana cultivation lands. Groundnut cultivation is also an important seasonal crop in the district but lesser in the cluster area. Below table shows the extent of Banana cultivation in Batticaloa district and how it has drastically dropped.

	Year 2020 (ha)	**Year 2020 (ha)**	**Year 2020 (ha)**
Banana	178	18	10.1

Presently, the banana cultivations mentioned are almost homegarden level. Commercial banana plantations are almost non-existent in the entire district. However, it is expected that other banana growers will use the new cultivation techniques introduced by the proposed Cavendish banana cultivation project to maintain their crops as commercial production units.

In general, farmers use both flood irrigation and canal irrigation methods in banana cultivation. During the rice growing season water is issued frequently targeting rice cultivation in the area. During the off-season water is issued for banana and OFC every 10 days. Banana farmers get water at free of charge as rice farmers.

Though there are three main banana varieties grown in the district such as Ambul, Seeni and Kolikuttu, Ambul is the most common banana variety grown in the area. It has the lowest price in the local market. In general, lands are not prepared by ploughing or disking for initiation of the banana cultivation due to paddy soil.

POLLUTING PROCESSES (POINT SOURCE)

In cultivation some key polluting steps, although limited, takes place; mainly in the cultivating and post harvesting phases.

Land preparation for cultivation	Removal of all shrubs and bushes is the first step. Manual weed control is the best method at preliminary land preparation stage. Then, shading branches of big trees near the field will be taken place to destroy all alternative host for pest and diseases and this will provide required sun light for the plants. First soil preparation step is ploughing with disc or board ploughs and compost will be added. Second deep

	ploughing is taking place perpendicular to the 1st ploughing. Lastly, the flood prevention and drainage improvements and these steps destroy pest cycles in different stages. Harmful bacteria and microorganisms are destroyed and minimise due to aeration is improved. Also, Harmful pathogens are destroyed also due to exposing soils to sunlight. This will minimise future pest and disease incidences and damages. They place the sword suckers in planting holes at a depth of 1 or 1.5 ft. Before planting, basal fertiliser is not applied to the hole and after 1.5 to 2 months later with the appearance of a leaf, paddy fertiliser mixture or banana fertiliser mixture is applied. However, some farmers Diazinon insecticide is placed in the planting hole to control the banana weevil attacks in young suckers. Weeds are mostly controlled manually in early stages of the crop. However, some farmers apply weedicides such as glyphosate.
Water requirement	Main source of water is agro wells. According to the farmers, availability of water throughout the year is guaranteed in the wells. In general, farmers use both flood irrigation and canal irrigation methods in cultivation. Main canal water in the area is from Nawagiriya Tank which distribute water for Paddy. During the rice growing season water is issued frequently targeting rice cultivation in the area. Raised beds are prepared after planting because there are concerns with too much of water due to paddy lands. Banana is grown rainfed with supplementary irrigation whenever necessary. As a perennial fruit crop which has a high water requirement, the banana is more suitable for Vellaveli as water is available throughout the year. Introduction of water conserving and low pressure drip and mini sprinkler irrigation systems powered by solar panels is one objective of the project.
Use of fertiliser and pesticides and weedicides	Farmers will use 450g of fertiliser mixture per plant prepared by mixing of 120g Urea, 80g Triple Superphosphate (TSP) and 250 of Muriate of Potash (MOP). The farmers will be encouraged to apply organic fertiliser for banana cultivation. No chemicals will be applied to the planting hole at planting. However, some farmers Diazinon insecticide is placed in the planting hole to control the banana weevil attacks in young suckers. After planting, they apply fertiliser every 1.5 - 2 months. In established plantations, fertiliser is applied every 2 - 3 months. Weeds are mostly controlled manually in early stages of the crop. However, some farmers apply weedicides such as Round Up. In mature plantations shade as well as use of banana residue as mulch help to keep bananas free of weeds. Mealy bugs could be considered as a common pest in banana cultivation but are considered not serious. Thrips and red rust thrips are not prominent. However, due to poor crop management Sigatoka fungus effects on older leaves. In general, farmers do not apply chemicals to control diseases in banana cultivation. As a result, existing banana plantations in Batticaloa are surviving long period without serious pests and diseases. To control pest and diseases, there are several crop management methods apart from pesticide application. They are: • Covering the banana fruit at early stage • Use improved varieties of banana resistance to pest and diseases • Select healthy budded plants from DOA certified nursery • Keep the hygienic condition of the land • Weed control • Implement Pest and disease control based on IPM practices and modern spray techniques Use of organic manure before planting.

	High amount of nitrogen fertiliser (urea) may increase the susceptibility to pests. Therefore, excessive use of nitrogen fertiliser must be avoided Use of mini-sprinkler irrigation methods International standard IPM framework of the world bank is encouraged to control the pest and diseases in the crop management as per the pest management plan (PMP) prepared for ASMP and for both pest and diseases the recommended pesticides and the fungicides are applied by the framers. IPM of the Cavendish Banana cluster is shown in Table 12 and that should be implemented during the cultivation process. These agrochemicals are recommended by the pesticides register of DOA and PMP as well.
Harvesting	Fruiting commences at 10 to 12 months of age of plants and time is taken to fruit maturity about 70 - 100 days. Harvesting is done every 2 weeks. Harvested bunches will be sold for export market collectors. Farm gate prices of Ambul banana varies from LKR 25 to 40 per kg. However, in peak period farm gate price may go up to LKR 80-100 per kg. The cost of production of banana is about LKR 20 per kg. In general, the average bunches weight is 15 – 20 kg. However, in young plantations in first and second bunces average weight may go up to 25-30 kg. Farmers aim to harvest for the festival seasons in mid-April and end of December by maintaining suckers in their cultivations. Though, presently farmers are getting low price between LKR 25 to 40 per kg, by exporting Ambul banana farmers will certainly get high price for their products. Export of Ambul banana has not been done yet due to unavailability of suitable export protocol.
Postharvest storage and transportation	This banana is mainly used as the fresh fruit and maintain of freshness is important and need to transport immediately to the local market. However, project expectation is to provide fresh banana fruit to the export market. Therefore, the harvesting should be done by maintaining required time gap (at least two weeks) prior to the shipment day. Grading and packing of the fruit are an essential part during the postharvest period as it helps to cut down the losses and increase the fruit high quality and value. Therefore grading, packing, and transporting should be undertaken with improved technology. These technology facilities will be available for farmers. At the same time, banana farmers use to send their products to market as bulk and it is directly affected on the market price. Just after the harvest, farmers pack the banana in the bags and send to market. Due to overweight, handling of bags is difficult, and it make high postharvest losses. Postharvest losses are a national crisis and it directly decrease the quality and the quantity of harvest and ultimate result is the decreasing of farmers' income.
Other factors	
Solid waste	The solid organic waste is generated as crop residuals and at postharvest period and all are biodegradable. However, compost production unit (See Annexure 5: Compost plant proposal) will be implemented to produce compost using solid waste generated from post harvesting processing centre and these organic fertilisers will be used at land preparation stage. Used polythene bags during cultivation will have to be disposed safely in consultation with Pradeshiya Sabha. Reuse and recycling of polythene should be encouraged among farmers. Proper segregation and collection should be done at the field level. Screening report and relevant EMP and Social Management Plan (SMP) for the post harvesting processing centre will be developed separately.
Wastewater	Surface runoff will carry the fertilisers and applicable chemicals (pesticides, weedicides etc.) and impact is higher due to flood irrigation system. This will minimise by introducing water conservation techniques. Further, due to application of IPM

	mechanism, soil and ground/surface water pollution will be minimalised. ASMP will conduct the awareness creation and training programmes for both farmers as well as the officers regarding the IPM as per the PMP. Proposed application of IPM during implementation of banana cluster is given in table 12.

Table 12: ISP of ASMP - Proposed IPM Technologies for Crop Banana in Batticaloa (CDP 9)

Stages	IPM Practices	Impacts of Implementation	Benefit for farmers
Pre Land preparation stage	Removal of all shrubs and bushes. Shading branches of big trees near the fields are removed	Destroying of all alternative host for pest and diseases	Future risk of pest damages are minimised
Land preparation stage	Doing 1st ploghing with disk or mould board ploghs	• Different stages of pest cyles are destroyed. • Harmfull bacteria and micro organisms are desroyed and minimize due to aration is improved. • Also, Harmful pathogens are destroyed also due to exposing soils to sunlight.	Future pest and disease incidences and damages are minimized. Cost reduced.
	Adding Compost		
	Doing 2nd deep ploghing with disk or mould board ploghs perpendicular to 1st ploghing		
	Disking or harrowing (two perpendicular passes)		
	Flood prevention and Drainage improvements		
Planting stage	Healthy Planting Materials are selected	strong and vigorous Saplings are enssured for planting	A healthy plantation is assured. Cost reduced
	Plant of non standerd are removed		
	Tissue cultured saplings will be supplied from recognized nursary men		
	Saplings of same hight and growth are planted in separate same rows	Easy to manage agronomic practices.Uniform plantation is assured	A healthy plantation is assured. Cost reduced
Sapling Growing stage	Daily attention on each and every saplings are assured	Early identification of pest and diseases incidents	A healthy plantation is assured. Cost reduced
	weakend plants are replaced by new saplings	Even plantation is assured	
	Care will be assured to to have no waterstress	Vigorous growth and Even plantation is assured	
	Only correct dose of nutritionally balanced fertilizers will be applied	No unwanted canopy development and vigorous growth is assured	
Juvenile stage	Daily attention on evry saplings are assured. This procedure is folloewed in every growth stages of the crop cycle	A healthy crop field is assured	A healthy plantation is assured. Cost reduced

	weakend plant parts are removed and vacancies will be filled		
	All new suckers emerged inner simi circles of the double rows are removed. Do not allowed to grow new suckers even in outer semi circles up to 3 to 4 month after planting.	Energy of the plants' are not wasting for unnecessary sucker growth.	
	Only one vigorous daughter in the outer semi circles are allowed to grow only after 3 to 4 month.		
	Field sanitation is assured by managing garbage in the field		
	Suspicious plants are marked and will be monitored for pest and diseases. Treatment are followed if identified a pest or a desease incident		
	Attacked plants and parts are uprooted and immediately destroyed		
	Intercropping	• Minimize the weed control. • No need to weedicide application	additional income
	Micro irrigation	• Volume od water need for the effective root zone is assured. • Percolation of irrigated water toward the ground water is minimized	Easy to handle. Less labor need
	Fertigation with organic liquid fertilizers supplemented with fertilization and/or fertigation with chemical fertilizers. Formulation of fertiliser regimes based on complete soil tests and foliar analyses. It will be continued flowering and maturity stages too	Correct dose of nutrient to the plant is assure	Easy to handle. Fertilizer wastage is minimized

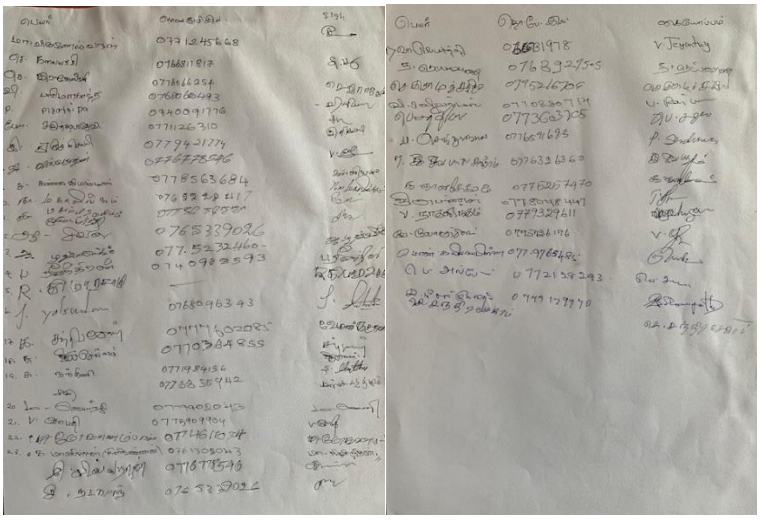
Flowering stage	Bunch clearing before bagging. Removing leaves that can damage bunch and bending or removal of placenta leaf	Bunch clearing practices protect the bananas from mechanical damage by removing potential causes of damage	A healthy plantation is assured. Cost reduced
	Bagging with plastic bags. Premature bagging when the bunch is just emerging and the the flower bud points downward	Bagging protects the banana bunch from physiscal and pest damage and increases bunch vigor	
	Bunch clearing after bagging. De-leafing, de-flowering, de-handing, de-budding	Bunch clearing practices protect the bananas from mechanical damage by removing potential causes of damage and increase the vigor of the bunch	Healthy crop is assured
Maturity stage	The banana bunch is propped with wooden poles tied with rope or plastic	Propping protects the banana bunch avoiding field losses of fruit or bunches. Risk of pest and disease incidents are minimized.	Expected yield is assured
Harvesting stage	• Bunches for de-handing in the field are chosen based on age (ribbon colour) and caliper grade to protect quality, prevent ripes and turnings during transport and extend shelf life • Hands are removed from the bunch using a fish line (100 test) that cuts and seals the crown properly with no additional trimming required	De-handing at the mat avoids the handling of whole bunches after harvest and brings only good hands to the packing center for packing. All organic matter waste remains in the field as organic fertilizer.	Expected yield is assured
	Removed hands from harvested bunch are placed on banana leaves for de-latexing for at least one hour ina shady place in the field to reduce the field heat.	Fruit arrives free of latex for packing, avoiding the use of large amounts of water for de-latexing purposes. A dry packing procedure can then be applied that requires less investment in packing infrasctruture. Small farmers can easily pack bananas with minimum infrastructure	Post harvesting cost reduced

Post Harvesting and storage	Field heat removal Line packing Cold chain management Integration of export protocols into standard SOP	These practices are utilized to preserve optimum quality and shelf life throughout value chain	Bananan producers will won a brand of quality product suppliers
Transport stage	Packing the de-latexed hands into 20-kg plastic trays lined with foam. One bunch, one crate. Color ribbon tied securely to crate to allow for inventory management at packing center.	Protects banana hands from damage during transport to packing center. Possible cause of pest and desease incidents are minimized.	Expected quantity of produce is assured. Reasonable price ia assured.
Marketing stage	Export protocol, guidelines to grow, pack and ship bananas for export	The export protocol ensures bananas arrive in optimum biological and commercial condition to international markets	Bananan producers will won a brand of quality product suppliers

7. PUBLIC CONSULTATION

Consultation was held with the private sector involved in input supplies, marketing and transportation of agricultural products. Most importantly, attention has been paid on the existing situation of farmer organisations and their role and functions in irrigation management and decision making. Community consultations were conducted by ISP-ASMP. Following concerns were arisen during the discussions held with farmers in the selected area.

Figure 2: Attendance Sheets of Community Consultation



Further, there were points highlighted during the discussions such as use of weedicide, poor and inefficient land utilisation pattern, attention for micronutrient fertilisers and knowledge of farmers for IPM mechanism for better crop production.

The majority of the community is willing to support the project activities as they will benefit from the proposed sub project directly. Extensive social screening has been covered under the Social Safeguard component.

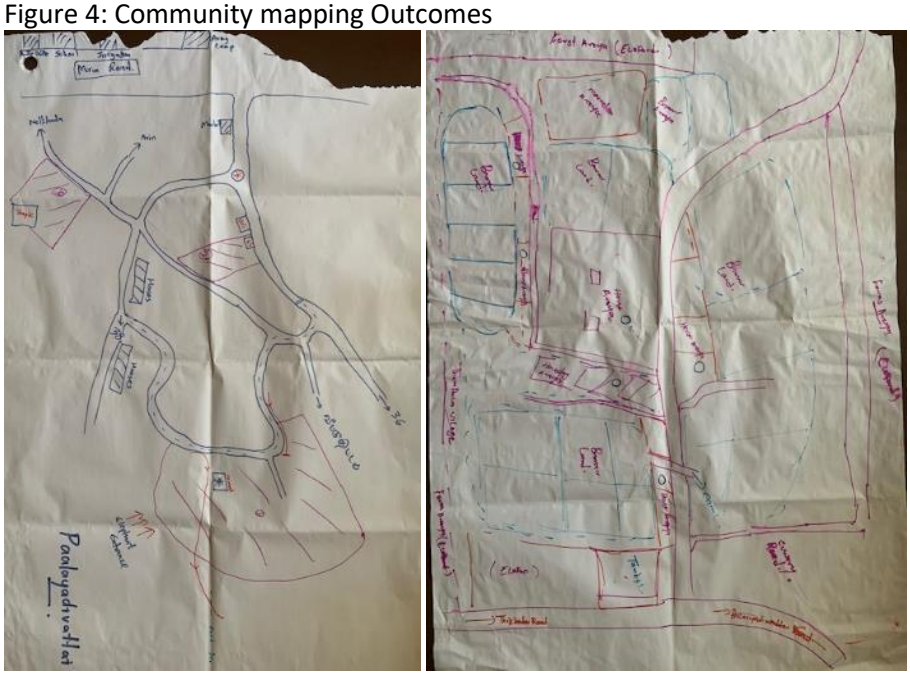
Figure 3: Community mapping activities

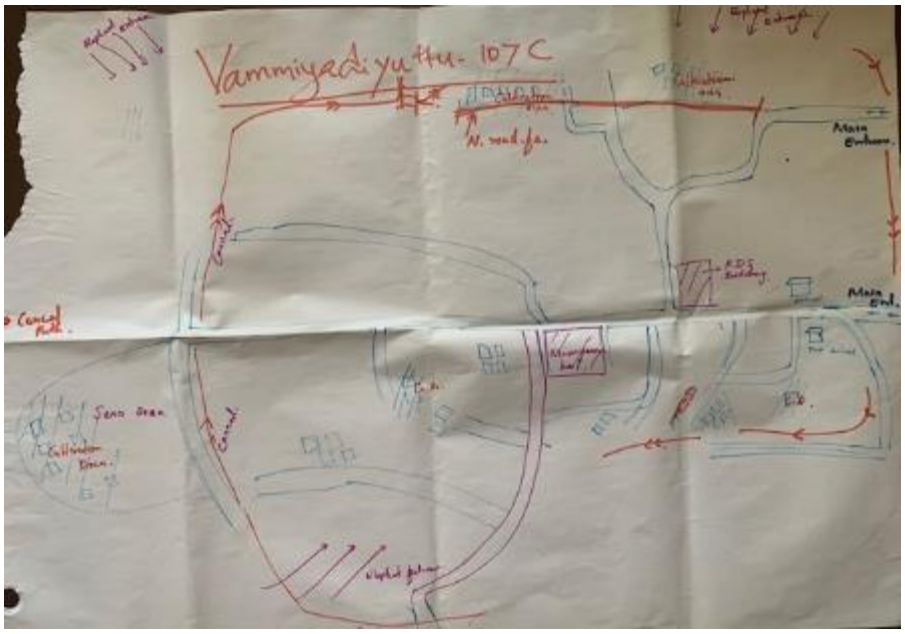
At present there are no commercial type banana cultivations in the district or in the cluster area. They do banana only in home gardens and are not using any new technologies. Therefore, new project will be "entirely new one" to the beneficiaries.

Therefore, the project should start from the beginning to inculcate the beneficiaries in banana cultivation and its new technologies. Accordingly, this project should be taken forward by overcoming the following problems and challenges.

1. Low yield of banana presently farmers are experiencing in their home garden cultivations due to poor agronomic practices being adopted.
2. Reluctant to adopt new technologies.
3. Commercial cultivation is new to them and the proposed Cavendish variety also new to them.
4. Presently experiencing flooding method of irrigation for crop productions creates many problems such as waterlogged conditions, poor crop performances, high disease incidence and waste of water.
5. High risk of soil erosion due to prolonged flood irrigation.
6. Poor crop management practices and poor sanitation.
7. No attention on pre or post harvesting quality improvement activities.
8. Difficulties in finding labor.
9. Most of the youth in the labor force have left the district or gone abroad for employments.
10. Even the youth living in the district are reluctant to choose agriculture as their main livelihood.
11. Unavailability as well as unbearable prices of chemical fertilizers and pesticides.
12. problems of using machineries in crop production activities under present crisis of fuel shortage.

Figure 4: Community mapping Outcomes





- Existing environmental issues

Some farmers were raised their existing issues related to the agricultural activities during the public consultation such as floods and accessibility difficulties. There were many locations identified in the area having floods during monsoons and damage to roads. Most of these roads are belongs to Porathivu Pattu Pradeshiya Sabha. All these roads to be developed to ensure the smooth transportation of goods.

In the area, major concern discussed was elephant threat who are roaming in the area. Proper measures should be taken before establish any crop to make it sustainable. Further, there are other wild animal issues such toque macaque, wildbows, Porcupine, etc

Figure 5: Existing Condition of the proposed cultivation lands








Figure 6: Existing Agro Wells

8. ENVIRONMENTAL EFFECTS AND MITIGATION MEASURES

Table 13: 8a. Screening for Potential Environmental Impacts

№	Screening question	Yes	No	Significance: (low, moderate, high)	Remarks
1	Will construction and operation of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.?)	√		Low-moderate	• Existing land preparation and irrigation system will be changed. Land preparation techniques will focus on reducing the effects of irrigation. Land clearance will be there for the civil works such as access roads, bridge, elephant fence, collection centre, and organic production unit. Construction of post harvesting processing centre requires a separate screening report, EMP and SMP reports will be developed for the post harvesting processing centre. No significant disturbances for any existing land use, or waterbodies and no negative impact causes are anticipated
2	Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?	√		Moderate	• Pesticides, weedicides, fertilisers and some additional chemicals will be used and there is a possibility to have chronic impacts due to the long-term usage. However, proposed techniques will reduce the amount of chemicals and fertilisers use and modern techniques/methods will be introduced to increase the productivity by other means. • In terms of public infrastructure development, handling, storage, transportation and use of substances which will be harmful for human health such as cement
3	Will the Project produce solid wastes during construction or operation?	√		Moderate - High	• During the operation solid organic waste will be produced as crop residuals. Crop residual will be used for the compost production unit. • Use polythene bags during cultivation should be safely disposed. Recycling of polythene bags should be encouraged. Pradeshiya Polythene collectors can be used to dispose polythene • However, development of infrastructure will create solid waste during clearing and grubbing, construction, etc which need to handle with care, but quantum would be small

№	Screening question	Yes	No	Significance: (low, moderate, high)	Remarks
4	Will the Project release pollutants or any hazardous, toxic or noxious substances to air?	√		Moderate	• Pesticides, weedicides will be used and released to the air. Possibility to have impacts to other flora & fauna. However, the project is not encouraged to use harmful pesticides and weedicides during the cultivations • Further, infrastructure development activities will also create emission of dust during clearing and grubbing, construction, etc which need to be mitigated by good engineering practices. However, since small-scale infrastructure development, no significant pollution expected during construction
5	Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?	√		Moderate	• Land preparation, transportation and Construction of collecting centre, construction of bridge, construction of compost yard may create noise and vibration impacts and it can be mitigated through proper implementation of EMP. • Similar noise and vibration will create during proposed infrastructure development which will also be mitigated by adhering to EMP
6	Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into surface waters, groundwater or coastal wasters?	√		Moderate	• All chemicals used, including pesticides and weedicides during cultivation, may contaminate land or water. However, the project does not encourage to use harmful chemicals for the cultivation. In addition, pollutants during infrastructure development will have an impact on surface and ground water in surrounding areas if not properly managed
7	Will the project cause localised flooding and poor drainage during construction? Is the project area located in a flooding location?	√		Low	• There are many natural flooding areas identified in the area. However, the project will not cause localised flooding
8	Will there be any risks and vulnerabilities to public safety due to physical hazards during construction or operation of the Project?	√		Low	• No medium and large scale infrastructure development envisaged and hence, no severe health and safety hazard identified. Better hazard identification and prevention and corrective measures during construction will eliminate the risk associate
9	Are there any transport routes on or around the location which are susceptible to congestion or which	√		Low	• Banana transportation from cultivated lands to post harvesting storages and transportation from post harvesting storages to

№	Screening question	Yes	No	Significance: (low, moderate, high)	Remarks
	cause environmental problems, which could be affected by the project?				shipments/or any other location will be taken place. No creation of significant environmental problems. • However, improvements to existing road network will create some form of traffic during construction which can be reduced or prevented by adhering to proper traffic management plan during construction
10	Are there any routes or facilities on or around the location which are used by the public for access to recreation or other facilities, which could be affected by the project?		√		• No recreational or other facilities will be disturbed
11	Are there any areas or features of high landscape or scenic value on or around the location which could be affected by the project?		√		• There are no areas or features with high landscape or scenic value on or around the location
12	Are there any other areas on or around the location which are important or sensitive for reasons of their ecology e.g. wetlands, watercourses or other water bodies, the coastal zone, mountains, forests which could be affected by the project?		√		• Important or sensitive areas were not found except Batticaloa Lagoon esturine and will not be affected
13	Are there any areas on or around the location which are used by protected, important or sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, migration, which could be affected by the project?		√		
14	Is the project located in a previously undeveloped area where there will be loss of green field land		√		• No new lands will be used for cultivation and only existing banana farmers will be engaged. Infrastructure development will not be undertaken newly and only improvements to the existing structures will be undertaken
15	Will the project cause the removal of trees in the locality?	√		Low	• Removal of trees in few locations including farmlands, proposed Collection centre and elephant fencing area

№	Screening question	Yes	No	Significance: (low, moderate, high)	Remarks
16	Are there any areas or features of historic or cultural importance on or around the location which could be affected by the project?		√		No features of historic importance have been identified within the study area
17	Are there existing land uses on or around the location e.g. home gardens, other private property, industry, commerce, recreation, public open space, community facilities, agriculture, forestry, tourism, mining or quarrying which could be affected by the project?	√		Low	• Individual sprinkler systems will be installed on private lands and some of existing paddy lands will convert for the banana cultivation
18	Are there any areas on or around the location which are densely populated or built up, which could be affected by the project?		√		• Densely populated or built up areas will not be affected by the project
19	Are there any areas on or around the location which are occupied by sensitive land uses e.g. hospitals, schools, places of worship, community facilities, which could be affected by the project		√		• Sensitive land uses in or around the project site will not be negatively affected by the project. There will be improvements on Road network and canals which positively affected to the livelihood of selected areas
20	Are there any areas on or around the location which contain important, high quality or scarce resources e.g. groundwater, surface waters, forestry, agriculture, fisheries, tourism, minerals, which could be affected by the project?		√		• Existing agricultural practices will be improved by the sub project activities and no negative impacts are anticipated
21	Are there any areas on or around the location which are already subject to pollution or environmental damage e.g. where existing legal environmental standards are exceeded, which could be affected by the project?		√		• There are no areas around the location where legal environmental standards have been exceeded or has been environmentally polluted

8B. Environmental Management Plan

Table 14: EMP for mitigating environmental impacts during agricultural activities

№	Potential environmental impacts and risk level	Key project activities causing the impact	Mitigation measures proposed and action to be implemented by the contractor
1	Public complaints and lack of community support for the project implementation	Information Disclosure among Stakeholders Community Outreach activities including training Institutional development based on farmer organisations	• Strengthen institutional development component and proper awareness and community leadership • Discussions should be conducted with the beneficiary farmers including women, and youth • The beneficiary farmers selection based on the criteria which were developed at stakeholders meeting and identifying of beneficiary farmers were undertaken transparently • Residents in the area will be briefed of the project, purpose and design and outcomes with comprehensive discussion • Communication and training activities focusing women, youth and farmers who are poor in communication • The Farmers should take note of all impacts, especially temporary issues and safety hazards that will be of concern to the cropping pattern of the farmers. All possible impacts will be mitigated as stipulated in the EMP to mitigate them • The Farmers will maintain a log of any grievances/complains and actions taken to resolve them • A copy of the EMP should be available at all times at the project supervision office on site
2	Lack of knowledge on basic harvest and postharvest practices lead to low quality of product and high amount of waste	Introduction of bagging Use of harvesting crates Mechanical scarring and bruising quality defects Cleaning the selected product Storing the harvested product before delivery to the packing facility Selecting the best product for packing	• Maintain good hygiene and good housekeeping • Practical training for the selected farmers on basic harvest and postharvest practices to protect the quality of the product and to assure the packing facility receives only clean and viable product • Harvest maturity index by age and calliper • Use of Discarded poor quality fruit and other waste organic materials in the field to leave as organic fertiliser or use for compost production • Avoiding mechanical scarring and bruising quality defects • Provide packaging materials and storage facilities • Establishment of temporary packing facilities

№	Potential environmental impacts and risk level	Key project activities causing the impact	Mitigation measures proposed and action to be implemented by the contractor
		Discarding poor quality fruit and other waste organic materials in the field	
3	Activities related to installation of sprinkler irrigation systems	Installation of sprinklers systems Fixing water pumps and electricity supply Plumbing works	• Carry out installation works during off cultivation seasons • Solid waste generation during installation should be minimised and disposed generated waste with care • Potential damages to pipe system should be minimised by burying or covering the pipe distribution

4	Exposing and damaging of physical cultural resources (PCR)	Site preparatory work	• Upon discovery of physical cultural material during project implementation work, the following should be carried out:
			  • Immediately stop construction activities
			  • With the approval of the resident engineer delineate the discovered site area
			  • Secure the site to prevent any damage or loss of removable objects. In case of removable antiquities or sensitive remains, a night guard should be present until the responsible authority takes over
			  • Through the resident engineer, notify the responsible authorities, the Department of Archaeology and local authorities within 24 hours
			  • Submit a brief chance find report, within a specified time period, with date and time of discovery, location of discovery, description of finding, estimated weight and dimension of PCR and temporary protection implemented
			  • Responsible authorities would be in charge of protecting and preserving the site before deciding on the proper procedures to be carried out
			  • An evaluation of the finding will be performed by the Department of Archaeology who may decide to either remove the PCR deemed to be of significance, further excavate within a specified distance of the discovery point and conserve on site, and/or extend/reduce the areas demarcated by the contractor etc. This should ideally take place within about 7 days
			  • Construction work could resume only when permission is given from the Department of Archaeology after the decision concerning the safeguard of the heritage is fully executed

№	Potential environmental impacts and risk level	Key project activities causing the impact	Mitigation measures proposed and action to be implemented by the contractor
5	Spreading of Invasive Alien Species	Vegetation clearing Cultivation of banana	• Provide DOA certified banana variety only to farmers • Good housekeeping • Manual and integrated weed control • Prevent weed spreading via organic manure (Compost) by periodic inspection and manual removal after application
6	Contamination of water, land and air during usage of chemicals (pesticides, weedicides.)	Land preparation Vegetation clearing Use of fertilisers Use of chemicals for specific requirements	• Adherence to IPM standards of the WB, IPM action plan of ASMP and standards • Introduce technological methods to reduce dosage amounts • Awareness on usage time, handling and storage • Guidance on suitable time for the usage of chemicals • Promote organic fertilisers • Formulation of fertiliser regimes based on complete soil tests and foliar analysis
7	Impaired water quality	Cultivation of banana	• Excess water extraction is to be cut down to preserve ground water table • Proper introduction of drip irrigation practices instead of flood irrigation to preserve water and use of modern techniques as discussed in the CDP for reduce water consumption
8	Solid Waste Disposal	Discarding poor quality fruits Organic materials in the field (Bunch clearing, de-flowering, de-handing, de-leafing, debudding, bagging, propping and guying) Waste from weed control activities Polythene bags	• Burnt to maintain the farmlands' hygienic condition • Use postharvest waste for compost production • Implement waste minimisation as proposed in pilot activity of minimisation of waste generation, income generation and empowerment • Make a safe disposal system for polythene bags in consultation with Pradeshiya Sabha. Reuse and recycling should be encouraged as much as possible. Until safe disposal, proper segregation and collection should be done by the farmers
9	Spread of crop related diseases among other flora species	Throughout the cultivation period	• Use of drone technology to conduct disease surveys using infra-red photography • Provide technical guidance on application of chemicals including dosage, suitable time and frequency • Use of chemicals using drone technology • Pest and disease control based on IPM practices and modern spray techniques • Pest population and pest damage surveys to assess pest threshold status for application of pesticides
10	Health hazard	Use of agrochemicals (fertilisers, pesticides, weedicides etc.)	• Carry out proper hazardous identification and risk assessment of all proposed activities including snake bites related hazards

№	Potential environmental impacts and risk level	Key project activities causing the impact	Mitigation measures proposed and action to be implemented by the contractor
		Snake Bites	• Training and awareness on safe chemical handling • Use drone technology to spray chemicals • Implement proper health and safety protocols by elimination, substitution, engineering controls, administrative control and provide personal protection equipment (PPEs). Provided necessary PPEs (basic should include gloves, goggles, masks and protective clothing) • Availability of first-aid facilities • A safety inspection checklist should be prepared taking into consideration what the workers are supposed to be wearing and monitored • Pest and disease control according to the international standard including IPM frame work of the world bank and pest management action plan prepared by ASMP • Formulation of fertiliser regimes based on complete soil tests and foliar analysis • Pest population and pest damage surveys to assess pest threshold status for application of pesticides

Table 15: EMP for Improvements of Rural Farm Access Roads and Bridge

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
1	Public complaints and lack of community support for the project implementation	Information Disclosure among Stakeholders	1. Discussions should be conducted with the project affected persons. 2. Residents in the area have to be briefed of the project, purpose and design and outcomes via a documented community consultation session ***-This should be done immediately once the contractor is mobilised.*** 3. The contractor should take note of all impacts, especially access issues and safety hazards that will be of concern to the residents and take necessary measures as stipulated in the EMP to mitigate them. 4. The contractor will maintain a log of any grievances/complains and actions taken to resolve them. 5. A copy of the EMP should be available at all times at the project supervision office on site.
2	Exposing and damaging of physical cultural resources	Site preparatory work	Upon discovery of physical cultural material during project implementation work, the following should be carried out; 1. Immediately stop construction activities.

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			2. With the approval of the resident engineer delineate the discovered site area. 3. Secure the site to prevent any damage or loss of removable objects. In case of removable antiquities or sensitive remains, a night guard should be present until the responsible authority takes over. 4. Through the Resident Engineer, notify the responsible authorities, the Department of Archaeology and local authorities within 24 hours. 5. Submit a brief chance find report, within a specified time period, with date and time of discovery, location of discovery, description of finding, estimated weight and dimension of PCR and temporary protection implemented. 6. Responsible authorities would be in charge of protecting and preserving the site before deciding on the proper procedures to be carried out. 7. An evaluation of the finding will be performed by the Department of Archaeology who may decide to either remove the PCR deemed to be of significance, further excavate within a specified distance of the discovery point and conserve on site, and/or extend/reduce the areas demarcated by the contractor etc. This should ideally take place within about 7 days. 8. Construction work could resume only when permission is given from the Department of Archaeology after the decision concerning the safeguard of the heritage is fully executed.
3	Over extraction of natural resources	Material Sourcing	1. The contractor is required to ensure that sand, aggregates and other quarry material is sourced from licensed sources. The contractor is required to maintain the necessary licenses and environmental clearances for all burrow and quarry material they are sourcing –including soil, fine aggregate and coarse aggregate. 2. Sourcing of any material from protected areas and/or designated natural areas, including tank beds, are strictly prohibited. 3. If the contractor uses a non-commercial burrow/quarry sites, the sites should be remediated accordingly once material sourcing has been completed. 4. The contractor should submit in writing all the relevant numbers and relevant details of all pre-requisite licenses etc. and report of their status accordingly.
4	Impact on habitats of fauna and flora	Vehicle and machinery movements Site preparation including tree removal (if any)	1. The contractor shall make every effort to avoid removal and/or destruction of trees, including those of religious, cultural and aesthetic significance. 2. If such action is unavoidable, the Engineer shall be informed in advance to verify and report on the technical justification for the trees that will be required to be removed.

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			• The following steps are to be followed if trees are identified for removal during the renovation. • Identify and document the number of trees that will be affected with girth size and species type. • Trees shall be removed from the construction sites before commencement of construction with prior permission from the concerned department (LA). • Compensatory plantation by way of Re-plantation of at least twice the number of trees cut should be carried out in the project area. • The contractor shall adhere to the guidelines and recommendations made by the Central Environmental Authority (CEA), if any with regard to felling of trees and removal of vegetation. • Removed trees of economic value must be handed over to the State Timber Corporation.
5	Air Pollution including dust generation that can affect nearby vegetation	Site Preparation activities, setting up of material storage yards, and removal of vegetation Transport of construction material and storage on site	1. In the **construction method statement**, the contractor should clearly designate areas for maintaining material stock piles, waste stock piles, labour camps and vehicle maintenance yards. These dust emitting sources should be located away from human activity and natural drainage paths as much as possible. 2. Stock piles should be suitably covered to minimise washing off. 3. The site should be wetted at least 2/3 times a day during dry weather to keep dust levels low. 4. Transporting out debris to be carried out with minimal use of heavy transport vehicles and taking due care to avoid unwanted damages to existing structures. 5. Until removal to arranged disposal sites, waste shall be held stockpiled in a place with minimal interference with local drainage paths and obstruction to local traffic, local residents. 6. There should be no burning of wastes on site.
6	Noise Pollution & Vibration that can affect nearby structures	Operation of construction equipment and machinery. Material storage and transport.	1. Working time for noise/vibration generation activities should be restricted and carried out only from 6.00 am to 6.00 pm. 2. All equipment and machinery should be operated of noise not to exceed 75 dB (during construction) as practical as possible. Regularly maintenance of all construction vehicles and machinery to meet noise control regulations stipulated by the CEA in 1996 (Gazette Extra Ordinary, No 924/12). 3. If the construction activities happen during the night time, it is necessary to maintain the noise level at below 50 dB.

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			4. Use of mechanically driven saw blades for tree felling will make the noise levels restrict to only a short period of time. 5. Construction equipment and machinery should be maintained in good condition. Contractor shall submit the list of high noise/vibration generating **machinery & equipment** to the PMU for approval. Material procurement should be carried out only from places where environmental clearance or environmental protection license is obtained.
7	Traffic Congestion and public inconvenience	Increased construction vehicle traffic causing congestion on Access Roads and impact on the transport.	1. Speed limits and operating times for the construction vehicles should be imposed. 2. Travel route for construction vehicles should be designed to avoid areas of congestion. 3. All roads and access sites must be restored to their original state as soon as possible 4. If project works occur after dark, a lighting system should be maintained such that vehicles and pedestrians can clearly see the construction area. 5. Public should informed properly on the inconvenience made during construction. 6. During construction, proper safety measures and barricade systems should be introduced for traffic management.
8	Siltation of adjoining canals Blocking of surface drainage paths leading to localised flooding and ponding of water	Embankment construction Site Preparation including provision of access roads, material/waste piles	1. Until transported out to arranged disposal sites, debris and waste from site preparation work shall be stockpiled in a place with minimal interference with local drainage paths and obstruction to traffic and local residents. The contractor shall identify areas for stockpiling material and waste. 2. Construct silt-traps where necessary to avoid siltation field canals along the roads 3. The stockpiles should be suitably covered to minimise wash-offs to nearby waterways/ drains. 4. If impacts to surface drainage cannot be avoided leading to ponding of rain water and inconvenience to people, the contractor must provide an adequate surface drainage system to safely remove water from the site to roadside drains to avoid on site ponding or flooding.
9	Solid Waste Disposal	Site clearing Construction debris Unsuitable soil	1. The contractor shall make a list of all types of waste resulting from the construction activity, and obtain direction from the LA on possible disposal sites for each waste type. 2. Any hazardous type of waste shall be dealt with special care and instructions from the LA.

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			3. The contractor shall document all types and quantities of waste generated and removed from the site and the disposal locations. 4. The contractor shall remove waste from the site each day and dispose of the waste in the LA approved site/s.
10	Public/occupational safety hazard	Site clearing, storage of equipment, material etc Increased traffic of heavy vehicles for material transportation Noise and vibration of construction machinery	**Training** 1. The contractor must ensure that all workers, including managers are trained on occupational health and public safety risks and mitigation measures for the site, prior to commencement of construction. **Personal Protective Equipment** 2. All workers will be provided with necessary PPEs (basic should include safety helmet, protective footwear and high visibility jackets). 3. In addition, the contractor shall maintained in stock at the site office, gloves, ear muffs, goggles, dust masks, safety harness and any other equipment considered necessary. 4. A safety inspection checklist should be prepared taking into consideration what the workers are supposed to be wearing and monitored. **Site Delineation and Warning Signs** 5. The entire construction site should be delineated using devices such as cones, lights, tubular markers, orange and white strips and barricades to inform oncoming vehicular traffic and pedestrians in the area about work zones. 6. Dangerous warning signs should be raised to inform public of particular dangers and to keep the public away from such hazards. 7. Overloading of vehicles with materials should be controlled 8. Construction wastes should be removed as much as possible within 24 hours from the site to ensure public safety. 9. The safety inspection checklist must look to see that the delineation devices are used, whether they are appropriately positioned, if they are easily identifiable and whether they are reflective. **Equipment safety** 10. Work zone workers use tools, equipment and machinery that could be dangerous if used incorrectly or if the equipment malfunctions. Inspections must be carried out to test the equipment before it is used, so that worker safety can be secured. Inspections should look for evidence of wear and tear, frays, missing parts and mechanical or electrical problems.

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			Emergency Procedures 11. An emergency aid service must be in place in the work site. 12. During health and safety training, site staff should be properly briefed as to what to do in the event of an emergency, such as who to notify and where to assemble in an emergency. This information must be conveyed to employees by the site manager on the first occasion a worker visits the site. **Information management** 13. Develop and establish contractor's own procedure for receiving, documenting and addressing complaints from the affected public and nearby communities. 14. Provide advance notice to local communities by way of information boards or leaflet about the schedule of construction activities, interruption to services and access etc.
11	Access restrictions and public inconvenience	Site Preparation activities Vehicle and machinery movements	1. Prior consultation and consent should be taken from relevant authorities and should conduct work with a minimum disturbance to public. 2. Provision of access during designated times of day or where possible provides temporary access paths for users/ staff within the premises.
12	Spreading COVID 19 virus	All activities	• take all necessary precautions to maintain the health and safety of all Staffs including labourers • The contractor must ensure that all workers, including managers, are well trained on COVID 19 safety precautions published by the health ministry. • appoint a health and safety officer at site, who will have the authority to issue directives for the purpose of maintaining the health and safety of all personnel authorized to enter and or work on the site and to take protective measures to prevent accidents • ensure suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics • Follow all necessary guidance stipulated under Interim Guidance on COVID-19 Version 1- April 2020 (see Annex 8)
	Post construction phase		
13	Clearing/Closure of Construction Site/Labour Camps		1. Contractor to prepare site restoration plans for approval by the engineer. The plan is to be implemented by the contractor prior to demobilization. This includes burrow sites and storage yards as well. 2. On completion of the works, all temporary structures will be cleared away, all rubbish cleared, excreta or other disposal pits or trenches filled in and effectively

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			sealed off and the site left clean and tidy, at the contractor's expenses, to the entire satisfaction of the engineer.
14	Environmental Enhancement/ Landscaping		1. Landscape plantation, including turfing shall be taken up as per either detailed design or typical design guidelines given as part of the Bid Documents. 2. The contactor also shall remove all debris, piles of unwanted earth, spoil material, away from the site and disposed at locations designated or acceptable to the Engineer or as per the stipulated waste management criteria of this EMP.

Table 16: Environmental management plan for Construction of collection centre and Compost Yard which should be included in the bidding documets

SN	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
1	Public complaints and lack of community support for the project implementation	• Information Disclosure among Stakeholders • Community Outreach activities including training	• Discussions should be conducted with the beneficiary farmers including women, and youth • The beneficiary farmers selection based on the criteria which were developed at stakeholders meeting and identifying of beneficiary farmers were undertaken transparently • Residents in the area will be briefed on the project, purpose and design, and outcomes with a comprehensive discussion • Communication and training activities focusing on women, youth, and farmers who are poor in communication • The contractor should take note of all impacts, especially temporary issues and safety hazards that will be of concern to the cropping pattern of the farmers. All possible impacts will be mitigated as stipulated in the EMP to mitigate them • The contractor will maintain a log of any grievances/complaints and actions taken to resolve them • A copy of the EMP should be available at all times at the project supervision office on site
2	Removal of trees	• Clearing of lands	1. The farmer shall make every effort to avoid removal and/or destruction of trees, including those of religious, cultural and aesthetic significance. 2. If such action is unavoidable, the Engineer shall be informed in advance to verify and report on the technical justification for the trees that will be required to be removed. • The following steps are to be followed if trees are identified for removal during the renovation

SN	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			• Identify and document the number of trees that will be affected with girth size & species type • Trees shall be removed from the construction sites before commencement of construction with prior permission from the concerned department (LA) • Compensatory plantation by way of Re-plantation of at least twice the number of trees cut should be carried out in the project area • The contractor shall adhere to the guidelines and recommendations made by the CEA, if any with regard to felling of trees and removal of vegetation • Removed trees of economic value must be handed over to the State Timber Corporation
3	Spreading COVID 19 virus	• All activities	• take all necessary precautions to maintain the health and safety of all Staffs including labourers • The contractor must ensure that all workers, including managers, are well trained on COVID 19 safety precautions published by the health ministry. • appoint a health and safety officer at site, who will have the authority to issue directives for the purpose of maintaining the health and safety of all personnel authorized to enter and or work on the site and to take protective measures to prevent accidents • ensure suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics • Follow all necessary guidance stipulated under Interim Guidance on COVID-19 Version 1-April 2020 (see Annex 8)
4	Water Quality	• Spill out of fuels and lubricants from machinery	• Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets • Prioritize re-use of excess spoils and materials in the construction works. • Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies; • Place storage areas for fuels and lubricants away from any drainage leading to water bodies; • Dispose of any wastes generated by construction activities in designated sites. • Irrigation works must be planned to be carried out during times of lowest flow
5	Spreading of Invasive Alien Species	• Vegetation clearing • Material transportation • Desilting	• Close monitoring of transportation, storage of borrowing material for the spread of any invasive species must be done. • Vehicles should be covered during transportation of cleared vegetation to and from the construction site.

SN	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			• Borrow material to be brought from properly identified borrow pits and quarry sites, the sites should be inspected in order to ensure that no invasive plant species are being carried with the burrowing material. • Washing the vehicles should be conducted periodically to prevent carrying any invasive species • The construction site should be inspected periodically to ensure that no invasive species are establishing themselves at the site. • Good housekeeping
6	Noise Pollution & Vibration that can affect nearby structures	• Operation of equipment and machinery. • Material storage and transport • Use of hammer type pile driving will generate high noise and vibration.	• Working time for noise/vibration generation activities should be restricted and carried out only from 6.00 am to 6.00 pm. • All equipment and machinery should be operated of noise not to exceed 75 dB (during construction) as practical as possible. Regularly maintenance of all construction vehicles and machinery to meet noise control regulations stipulated by the CEA in 1996 (Gazette Extra Ordinary, No 924/12). If the construction activities happen during the night-time, it is necessary to maintain the noise level at below 50 db. • Use of mechanically driven saw blades for tree felling will make the noise levels restricted to only a short period of time. • Construction equipment and machinery should be maintained in good condition. The contractor shall submit the list of high noise/vibration generating machinery & equipment to the PE for approval
7	Air Pollution including dust generation that can affect nearby vegetation and households	• Site Preparation activities setting up of material storage yards, and removal of vegetation • Transport of construction material and storage on site	• In the construction method statement, the contractor should clearly designate areas for maintaining material stockpiles, waste stockpiles, labor camps, and vehicle maintenance yards. These dust-emitting sources should be located away from human activity and natural drainage paths as much as possible. • All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations. • Stockpiled soil and sand shall be slightly wetted before loading, particularly in windy conditions. • The site should be wetted at least 2/3 times a day during dry weather to keep dust levels low. • Vehicles transporting soil, sand, and other construction materials shall be covered. Limitations to the speeds of such vehicles are necessary. Transport through densely populated areas should be avoided.

SN	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			• Regular and proper maintenance of construction vehicles and machinery to avoid air emissions. • There should be no burning of wastes on-site. • Until removal to arranged disposal sites, waste from demolition shall be held stockpiled in a place with minimal interference with local drainage paths and obstruction to traffic, local residents.
8	Solid Waste Disposal	• Site clearing • Construction waste • Waste from labour resting areas	• The contractor shall make a list of all types of waste resulting from the construction activity, and obtain direction from the LA on possible disposal sites for each waste type. • Any hazardous type of waste shall be dealt with special care and instructions from the LA. • The contractor shall document all types and quantities of waste generated and removed from the site and the disposal locations. • The contractor shall remove waste from the site each day and dispose of the waste in the LA-approved site/s.
9	Public/occupational safety hazard	• Site clearing, storage of equipment, material etc. • Increased traffic of heavy vehicles for material transportation • Noise and vibration of construction machinery	**Training** 1. The contractor must ensure that all workers, including managers, are trained on occupational health and public safety risks and mitigation measures for the site, prior to commencement of construction. **Personal Protective Equipment** 2. All workers will be provided with necessary PPEs (basic should include a safety helmet, protective footwear, and high visibility jackets). 3. In addition, the contractor shall maintain in stock at the site office, gloves, ear muffs, goggles, dust masks, safety harness, and any other equipment considered necessary. 4. A safety inspection checklist should be prepared to take into consideration what the workers are supposed to be wearing and monitoring. **Site Delineation and Warning Signs** 5. The entire construction site should be delineated using devices such as cones, lights, tubular markers, orange and white stripes, and barricades to inform oncoming vehicular traffic and pedestrians in the area about work zones. 6. All digging and installation work items that are not accomplished should be isolated and warned of by signposts and flash lamps in the night-time. 7. Dangerous warning signs should be raised to inform the public of particular dangers and to keep the public away from such hazards.

SN	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			8. Trenches should be progressively rehabilitated once work is completed. 9. Overloading of vehicles with materials should be controlled 10. Construction wastes should be removed as much as possible within 24 hours from the site to ensure public safety. 11. The safety inspection checklist must look to see that the delineation devices are used, whether they are appropriately positioned if they are easily identifiable, and whether they are reflective. **Equipment safety** 12. Work zone workers use tools, equipment, and machinery that could be dangerous if used incorrectly or if the equipment malfunctions. Inspections must be carried out to test the equipment before it is used so that worker safety can be secured. Inspections should look for evidence of wear and tear, frays, missing parts, and mechanical or electrical problems. **Emergency Procedures** 13. An emergency aid service must be in place on the worksite. 14. During health and safety training, site staff should be properly briefed as to what to do in the event of an emergency, such as who to notify and where to assemble in an emergency. This information must be conveyed to employees by the site manager on the first occasion a worker visits the site. **Construction camps** 15. Construction camps should have adequate sanitation facilities for construction workers to control the transmission of infectious diseases. 16. Avoid housing workers in camps and provide socio-economic benefits locally by employing local people. If there is no alternative to employing workers from elsewhere, locate accommodation camps away from communities on land acquired from willing sellers. Provide labour camps with adequate sanitation, waste disposal, and health facilities according to labour laws. Clear work campsites after use and reinstate vegetation. Conduct programs to raise worker awareness of HIV/AIDS. **Information management**

SN	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			17. Develop and establish the contractor's own procedure for receiving, documenting, and addressing complaints from the affected public and nearby communities. 18. Provide advance notice to local communities by way of information boards or leaflets about the schedule of construction activities, interruption to services and access, etc.
10	Mosquito breeding places and spreading vector borne diseases	• Temporary water ponding due to construction	• Water pocketing should be avoided specially during rainy season • Temporary pond should be filled as soon as possible • Construction equipment and tanks should be emptied immediate after the construction concluded for the day
Post construction phase			
11	Solid waste	Operational stage crops related waste, general household waste & machinery parts.	• Any hazardous type of waste shall be dealt with special care and instructions from the LA. • The farmer societies shall document all types and quantities of waste generated and removed from the site and the disposal locations. • The farmer societies shall remove waste from the site each day and dispose of the waste in the LA approved site/s.
12	Environmental Enhancement/ Landscaping		• Landscape plantation, including turfing shall be taken up as per either detailed design or typical design guidelines given as part of the Bid Documents. • The contactor also shall remove all debris, piles of unwanted earth, spoil material, away from the site and disposed at locations designated or acceptable to the Engineer or as per the stipulated waste management criteria of this EMP
13	Greenhouse gas emission	Use of electricity during processing activities (Electricity usage for machineries)	• The farmer society shall use eco-friendly practices • The farmer society shall get recommendation for the efficient machineries by experts • Conservation practices for electricity should be followed options such as use of Solar power
14	Contamination of Soil and Water Resources due to discharge of wastewater	Discharges of wastewater	• Wastewater generate should not be discharged to outside site • Primary trapping and treatment methods can be followed

Table 17: Environmental management plan for agro well construction activities which should be included in the tender documents

№	Potential environmental impacts and risk level	Key project activities causing the impact	Mitigation measures proposed and action to be implemented by the contractor
1	Public complaints and lack of community support for the project implementation	• Information Disclosure among Stakeholders	• Obtain yield test from WRB and make it available at the site • Discussions should be conducted with the users. • Residents in the area have to be briefed of the project, purpose and design and outcomes via a documented community consultation session ***-This should be done immediately once the contractor is mobilised.*** • The contractor should take note of all impacts, especially access issues and safety hazards that will be of concern to the residents and take necessary measures as stipulated in the EMP to mitigate them. • The contractor will maintain a log of any grievances/complains and actions taken to resolve them. • A copy of the EMP should be available at all times at the project supervision office on site
2	Exposing and damaging of physical cultural resources	• Site preparatory work • Excavations	Upon discovery of physical cultural material during project implementation work, the following should be carried out; • Immediately stop construction activities. • With the approval of the resident engineer delineate the discovered site area. • Secure the site to prevent any damage or loss of removable objects. In case of removable antiquities or sensitive remains, a night guard should be present until the responsible authority takes over. • Through the Resident Engineer, notify the responsible authorities, the Department of Archaeology and local authorities within 24 hours. • Submit a brief chance find report, within a specified time period, with date and time of discovery, location of discovery, description of finding, estimated weight and dimension of PCR and temporary protection implemented. • Responsible authorities would be in charge of protecting and preserving the site before deciding on the proper procedures to be carried out. • An evaluation of the finding will be performed by the Department of Archaeology who may decide to either remove the PCR deemed to be of significance, further excavate within a specified distance of the discovery point and conserve on site, and/or extend/reduce the areas demarcated by the contractor etc. This should ideally take place within about 7 days. • Construction work could resume only when permission is given from the Department of Archaeology after the decision concerning the safeguard of the heritage is fully executed.

№	Potential environmental impacts and risk level	Key project activities causing the impact	Mitigation measures proposed and action to be implemented by the contractor
3	Air Pollution including dust generation that can affect nearby vegetation and households	• Excavation • Excavated material stockpiles • Transport of construction material and storage on site •	• In the **construction method statement**, the contractor should clearly designate areas for maintaining material stockpiles, waste stockpiles, etc. These dust emitting sources should be located away from human activity and natural drainage paths as much as possible • All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations • Stockpiled shall be covered properly, particularly in windy conditions • The site should be wetted at least 2/3 times a day during dry weather to keep dust levels low • Vehicles transporting soil, sand and other construction materials shall be covered. Limitations to speeds of such vehicles necessary. Transport through densely populated area should be avoided • Regular and proper maintenance of construction vehicles and machinery to avoid air emissions • There should be no burning of wastes on site • Until removal to arranged disposal sites, waste from demolition shall be held stockpiled in a place with minimal interference with local drainage paths and obstruction to traffic, local residents
4	High Noise & Vibration levels that can affect nearby structures, wildlife and human settlements	• Excavations • Transport of construction material and storage on site	• Working time for noise/vibration generation activities should be restricted and carried out only from 6.00 am to 6.00 pm • All equipment and machinery should be operated of noise not to exceed 75 dB (during construction) as practical as possible. Regularly maintenance of all construction vehicles and machinery to meet noise control regulations stipulated by the CEA in 1996 (Gazette Extra Ordinary, No 924/12). If the construction activities happen during the night time, it is necessary to maintain the noise level at below 50 dB • Use of mechanically driven saw blades for tree felling will make the noise levels restrict to only a short period of time • Construction equipment and machinery should be maintained in good condition. The contractor will submit the list of high noise/vibration generating **machinery and equipment** to the project engineer (PE) for approval
5	Blocking of surface drainage paths leading to localised flooding and ponding of water	• Site preparation • Exacavation • Stockpiles	• Until transported out to arranged disposal sites, debris and waste from site preparation work and desilting shall be stockpiled in a place with minimal interference with local drainage paths and obstruction to traffic and local residents. The contractor shall identify areas for stockpiling material and waste. • The stockpiles should be suitably covered to minimise wash-offs to nearby waterways. • If impacts to surface drainage cannot be avoided leading to ponding of rain water and

№	Potential environmental impacts and risk level	Key project activities causing the impact	Mitigation measures proposed and action to be implemented by the contractor
			inconvenience to people, the contractor must provide an adequate surface drainage system to safely remove water from the site to canal to avoid on site ponding or flooding. • Proper planning to avoid construction during rainy season. • Preventing total blockage of streams/ providing alternative drainage path during construction
6	Soil erosion, sedimentation of nearby waterbodies and low lying areas	• Site preparation • Excavation • Stockpiles	• Soil stockpiles and other construction material should not be placed within the bed or banks of the tanks or canal. • Installing and maintaining permanent erosion and sediment control measures such as silt traps to avoid sediment runoff into tank and nearby waterways
7	Damage to wildlife Specially impacts to elephants roaming in the area	• Vegetation clearing • Exacation • Machinery movements	Department of Wildlife and Forest Department consents and recommendations should be obtained and incorporated construction before start work. • Excavated areas should be properly fenced or covered to avoid falling elephants and other wild animals • Speed limits and operating times for the construction vehicles should be imposed. • Due consideration should be given to carefully clearing of vegetation avoiding destruction of habitats of fauna. • The desilted matter shall immediately be disposed of to pre-decided disposal sites. • The contractor will take reasonable precaution to prevent workmen or any other persons from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body and hunting of any animal. • If any wild animal is found near the construction site at any point of time, the contractor will immediately upon discovery thereof acquaint the Engineer and carry out the Engineer's instructions for dealing with the same. • The Engineer will report to the nearby Forest Department /Department of Wild Life Conservation (range office or divisional office) and will take appropriate steps/ measures, if required in consultation with the forest officials. • It is recommended to do the project work day time only. • The contractor should ensure elephant access to water is not blocked during activities.
8	Impaired water quality	• Site Preparation • Excavation • Excavated material stockpiles	• Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets • Prioritize reuse of excess spoils and materials in the construction works • Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;

№	Potential environmental impacts and risk level	Key project activities causing the impact	Mitigation measures proposed and action to be implemented by the contractor
			• Place storage areas for fuels and lubricants away from any drainage leading to water bodies; • Dispose any wastes generated by construction activities in designated sites • Irrigation works must be planned to be carried out during times of lowest flow
9	Solid Waste Disposal	• Site clearing • Exacation	• The contractor shall make a list of all types of waste resulting from the construction activity, and obtain direction from the LA on possible disposal sites for each waste type including excavated soil (unsuitable) • Any hazardous type of waste shall be dealt with special care and instructions from the LA. • The contractor shall document all types and quantities of waste generated and removed from the site and the disposal locations. • The contractor shall remove waste from the site each day and dispose of the waste in the LA approved site/s
10	Public/occupational safety hazard	• Site clearing, storage of equipment, material etc • Noise and vibration of construction machinery • Exacation	**Training** • The contractor must ensure that all workers, including managers are trained on occupational health and public safety risks and mitigation measures for the site, prior to commencement of construction. **Personal Protective Equipment** • All workers will be provided with necessary PPEs (basic should include safety helmet, protective footwear and high visibility jackets). • Gloves, ear muffs, goggles, dust masks, safety harness and any other equipment considered necessary should be maintained in stock at the site office. • A safety inspection checklist should be prepared taking into consideration what the workers are supposed to be wearing and monitored. **Site Delineation and Warning Signs** • The entire construction site should be delineated using devices such as cones, lights, tubular markers, orange and white strips and barricades to inform oncoming vehicular traffic and pedestrians in the area about work zones. • Dangerous warning signs should be raised to inform public of particular dangers and to keep the public away from such hazards. • Overloading of vehicles with materials should be controlled • Construction wastes should be removed as much as possible within 24 hours from the site to ensure public safety.

№	Potential environmental impacts and risk level	Key project activities causing the impact	Mitigation measures proposed and action to be implemented by the contractor
			• The safety inspection checklist must look to see that the delineation devices are used, whether they are appropriately positioned, if they are easily identifiable and whether they are reflective. **Equipment safety** • Work zone workers use tools, equipment and machinery that could be dangerous if used incorrectly or if the equipment malfunctions. Inspections must be carried out to test the equipment before it is used, so that worker safety can be secured. Inspections should look for evidence of wear and tear, frays, missing parts and mechanical or electrical problems. **Emergency Procedures** • An emergency aid service must be in place in the work site. • During health and safety training, site staff should be properly briefed as to what to do in the event of an emergency, such as who to notify and where to assemble in an emergency. This information must be conveyed to employees by the site manager on the first occasion a worker visits the site. **Information management** • Develop and establish contractor's own procedure for receiving, documenting and addressing complaints from the affected public and nearby communities. • Provide advance notice to local communities by way of information boards or leaflet, during village committees about the schedule of construction activities, interruption to services and access etc.
11	Spreading COVID 19 virus	• All activities	• take all necessary precautions to maintain the health and safety of all Staffs including labourers • The contractor must ensure that all workers, including managers, are well trained on COVID 19 safety precautions published by the health ministry. • appoint a health and safety officer at site, who will have the authority to issue directives for the purpose of maintaining the health and safety of all personnel authorized to enter and or work on the site and to take protective measures to prevent accidents • ensure suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics • Follow all necessary guidance stipulated under Interim Guidance on COVID-19 Version 1- April 2020 (see Annex 8)
	Post construction phase		

№	Potential environmental impacts and risk level	Key project activities causing the impact	Mitigation measures proposed and action to be implemented by the contractor
12	Clearing/ closure of construction site		• Contractor to prepare site restoration plans for approval by the engineer. The plan is to be implemented by the contractor prior to demobilization. This includes burrow sites and storage yards as well • On completion of the works, all temporary structures will be cleared away, all rubbish cleared, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the contractor's expenses, to the entire satisfaction of the engineer
13	Environmental enhancement/ Landscaping		• Landscape plantation, including turfing shall be taken up as per either detailed design or typical design guidelines given as part of the bid documents • The contactor also shall remove all debris, piles of unwanted earth, spoil material, away from the site and disposed at locations designated or acceptable to the Engineer or as per the stipulated waste management criteria of this EMP

Table 18: Environmental management plan for establishment of elephant fence which should be included in the tender documents

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
1	Removal of trees	▪ Clearing of lands	1. The farmer shall make every effort to avoid removal and/or destruction of trees, including those of religious, cultural and aesthetic significance. 2. If such action is unavoidable, the Engineer shall be informed in advance to verify and report on the technical justification for the trees that will be required to be removed. • The following steps are to be followed if trees are identified for removal during the renovation • Identify and document the number of trees that will be affected with girth size & species type • Trees shall be removed from the construction sites before commencement of construction with prior permission from the concerned department (LA) • Compensatory plantation by way of Re-plantation of at least twice the number of trees cut should be carried out in the project area • The contractor shall adhere to the guidelines and recommendations made by the CEA, if any with regard to felling of trees and removal of vegetation • Removed trees of economic value must be handed over to the State Timber Corporation

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
2	Public/occupational safety hazard	▪ Installation of elephant fence	**Training** 1. The contractor must ensure that all workers, including managers are trained on occupational health and public safety risks and mitigation measures for the site, prior to commencement of construction. **Personal Protective Equipment** 2. All workers will be provided with necessary PPEs (basic should include safety helmet, protective footwear and high visibility jackets). 3. In addition, the contractor shall maintained in stock at the site office, gloves, ear muffs, goggles, dust masks, safety harness and any other equipment considered necessary. 4. A safety inspection checklist should be prepared taking into consideration what the workers are supposed to be wearing and monitored. **Site Delineation and Warning Signs** 5. Precautions for electrocution 6. Dangerous warning signs should be raised to inform public of particular dangers and to keep the public away from such hazards. 7. Overloading of vehicles with materials should be controlled 8. Construction wastes should be removed as much as possible within 24 hours from the site to ensure public safety. 9. The safety inspection checklist must look to see that the delineation devices are used, whether they are appropriately positioned, if they are easily identifiable and whether they are reflective. **Equipment safety** 10. Work zone workers use tools, equipment and machinery that could be dangerous if used incorrectly or if the equipment malfunctions. Inspections must be carried out to test the equipment before it is used, so that worker safety can be secured. Inspections should look for evidence of wear and tear, frays, missing parts and mechanical or electrical problems. **Emergency Procedures** 11. An emergency aid service must be in place in the work site.

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			12. During health and safety training, site staff should be properly briefed as to what to do in the event of an emergency, such as who to notify and where to assemble in an emergency. This information must be conveyed to employees by the site manager on the first occasion a worker visits the site. **Information management** 13. Develop and establish contractor's own procedure for receiving, documenting and addressing complaints from the affected public and nearby communities. 14. Provide advance notice to local communities by way of information boards or leaflet about the schedule of construction activities, interruption to services and access etc.
3	Access restrictions and public inconvenience	▪ Site Preparation activities ▪ Vehicle and machinery movements ▪ Noise, vibration, dust and waste piling	Prior consultation and consent should be taken from relevant authorities and should conduct work with a minimum disturbance to public.
4	Spreading COVID 19 virus	▪ All activities	• take all necessary precautions to maintain the health and safety of all Staffs including labourers • The contractor must ensure that all workers, including managers, are well trained on COVID 19 safety precautions published by the health ministry. • appoint a health and safety officer at site, who will have the authority to issue directives for the purpose of maintaining the health and safety of all personnel authorized to enter and or work on the site and to take protective measures to prevent accidents • ensure suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics • Follow all necessary guidance stipulated under Interim Guidance on COVID-19 Version 1- April 2020 (see Annex 8)
	Post construction phase		
5	Routine Maintanance		• Routine clearance/maintenance of electrical fence corridor • Maintanance of energizing system (solar system)

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
6	Environmental Enhancement/ Landscaping		• Landscape plantation, including turfing shall be taken up as per either detailed design or typical design guidelines given as part of the Bid Documents. • The contactor also shall remove all debris, piles of unwanted earth, spoil material, away from the site and disposed at locations designated or acceptable to the Engineer or as per the stipulated waste management criteria of this EMP

9. COST OF MITIGATION

Table 19: Environmental mitigation measures and estimated cost

No.	Environmental mitigation measure	Cost (LKR)	Remarks
1	Information Boards, leaflets	60,000.00	Awareness leaflets for organic cultivation practices and IPM
2	On-site first aid facilities	50,000.00	
3	Safety equipment	150,000.00	Personal protection equipment should be provided for road and canal renovation activities
4	Dust suppression	50,000.00	Need to be done during road and canal renovation activities
5	Waste removal from site	75,000.00	Waste from vegetation clearing, site preparation, labour camps
6	Training of farmers and village level stakeholders on IPM and new technological applications	200,000.00	Should be scheduled to a few sessions
7	Trainings and awareness including progress review meetings	10,000.00	Progress Reviews and technical reviews
		10,000.00	Training/motivation programmes for female farmers to enhance active participation
		10,000.00	Trainings on postharvest processing activities (Collection, Selection, storage and transportation etc.)
8	**Total**	**615,000.00**	

10. CONCLUSION AND SCREENING DECISION

Assuming that all mitigation measures are implemented as proposed, the following effects can be predicted

Table 20: Summary of environmental effects

Key project activities	Potential environmental effects	Significance of environmental effect with mitigation in place[1]
During Agricultural activities		
• Land preparation • Fencing (if applicable) • Land preparation • Micro levelling • Drainage Labour • Raised Beds • Preparation of pits & planting • Planting materials	No significant negative impacts since new lands are not used for the cultivation activities. Water accessibility will be improved	SP
• Introduction of basic flood prevention and drainage field techniques • Site levelling using drone surveying and laser levelling machinery • Quick water evacuation ditches • Surface drainage techniques (removal of wet spots)	Less water consumption, less soil erosion	SP
• Use of fertilisers and chemicals • Mechanical Weeding • Insect Control • Sigatoka Fungus Control • Nematode Control • Other Spray	Land, water an air contamination	NS
Product transportation and storage	No significant impacts	NS

[1] NS - Effect not significant, or can be rendered insignificant with mitigation, SP - Significant positive effect, SN - Significant negative effect, U - Outcome unknown or cannot be predicted, even with mitigation

Key project activities	**Potential environmental effects**	**Significance of environmental effect with mitigation in place[1]**
• Introduction of drone technology • Geo-positioning • Land surveys for site selection • Levelling for land preparation and drainage • Disease surveys using infra-red photography • Application of pesticides	Less agro-chemical contamination on Land, water, and air	SP
• New and improved quality enhancing technologies • Introduction of coloured plastic ribbons to fix the age of the fruit • Bunch clearing, de-flowering, de-handing, de-leafing, debudding, bagging, propping and guying • Fish line de-handing, delatexing in the field, disposal of organic waste in the plantation, prolonging the usefulness of the mother plant • Field heat removal • Line packing technology cold chain management	Solid waste generation	SN
• Introduction of water conserving and low pressure drip and mini sprinkler irrigation systems • Computer controlled heads for water application scheduling supported by fertility sensors, soil moisture sensors and irrigation friendly double row planting • Precision fertigation with liquid organic compounds • Precision application of liquid pesticides • Anti-clogging flushing components	No such harm, less use of water and Less contamination of agro-chemicals on Land, air and water	SP
Infrastructure Activities (Renovation of roads,bridge, Construction of Collection centres, Compost yard, elephant fence and agro wells)		

Key project activities	**Potential environmental effects**	**Significance of environmental effect with mitigation in place[1]**
• Vegetation clearing	Clearing of vegetation will collect significant amount of waste which will lead to several environmental issues such as blockage of drainage, siltation of downstream, damage to habitats, spreading of invasive species etc	NS
• Material transportation and storage	Emission of dust, generation of noise, disturbance to natural drainage, traffic congestion, public inconvenience	NS
• Embankment Construction	Emission of dust, generation of noise and vibration, disturbances/blockage of natural drainage paths, public inconvenience	NS
• Disposal of waste	Pollution of waterways, blockage of drainage, siltation of downstream and damage to habitats	NS
• Wastewater	The proposed agricultural activities will be undertaken using only organic fertiliser and IPM practices. Therefore, application of chemical fertiliser, pesticides and insecticides will be minimised. Hence the soil and ground/surface water will not be polluted	NS

11. EMP IMPLEMENTATION RESPONSIBILITIES AND COSTS

The overall responsibility of ensuring compliance with safeguard requirements lie with the ISP team and supervised by the PMU while the contractor will be responsible for implementing the provisions of the EMP. In addition, the ISP will be directly responsible for reviewing the proposed design to ensure that all design related mitigation measures mentioned herein are implemented with the support and supervision of the PMU. The overall supervision will be carried out by the in-house staff of the PMU supported by the Provincial Deputy Project Director who is responsible for the overall supervision of the proposed project. Any consequent design modification will be reflected in the project cost.

Environmental monitoring will be carried out largely through visual observations and compliance monitoring using the checklist provided in the Environmental Management Framework (EMF) by the Environmental and Social Safeguards Specialist of ISP and Provincial Deputy Project Director's Office of the PMU and the contractor jointly. The Environmental and Social Safeguards Specialist of ISP will need to visit the site on a monthly or quarterly and report on issues and performance on EMP implementation to the PMU. The Cost of Environmental compliance monitoring would be borne by the ISP project implementation cost.

12. SCREENING DECISION RECOMMENDATION

Majority of the potential adverse effects can be classified as general agricultural activities and construction related impacts and can be mitigated on site with proper engineering interventions. These potential impacts are temporary in nature.

However, farmers required excavate agro wells only at the locations recommended by the WRB as Annex VI. Further, in case of using Navagiriya Tank water, required to get a consent letter from department irrigation granting permission to access water from the Nawagiriya Irrigation Scheme. It is recommended to start the project work off-season for upland cultivation and avoid night time work. Plastic and polythene waste is significant during cultivation and post-harvest. Hence, safe disposal system for polythene should be arranged. Reuse and recycling of polythene bags should be encouraged. Pradeshiya Sabha polythene collectors can be used for disposal of polythene waste. Implementation of the EMP is sufficient to mitigate the identified impacts.

In addition, following recommendations are proposed based on the activities:

Agriculture activities: Proper implementation of Integrated Pest Management practices proposed above should be highly encouraged and use of chemical fertilizers should be avoided. Water conservation practices such as proposed micro sprinkling should be encouraged and farmers should be educated on the benefits of the same. Reuse/recycling of fruit bags is recommended up to maximum possible. Failing with, proper segregation, collection and disposal of waste through LA's collectors is recommended. Organic solid waste should be directed to the compost facility as much as possible.

Post harvesting practices at the collection centre: Degradable wastes and non-degradable waste should be segregated properly and degradable can be directed to the compost while non-degradable should be reuse, and recycle as much and if not disposed through LA. Domestic wastewater should be soaked through pits without discharging to adjoining drains. Removal of Trees are discouraged at the maximum level. In case of removal of trees (above 150mm girth), compensatory tree planting should be carried out in minimum of double the number of trees which will be removed. For removal of trees, consent should be obtained from Local Authority, Environmental and Social Safeguards Specialist-PMU-ASMP and ISP-National Safeguards Specialist with proper details such as number of trees, list of tree species, girth, height, etc. Required to implement mitigation measures proposed in the EMP properly.

Improvements of Rural roads: Implementation of the Environmental Management Plan will be sufficient to mitigate the identified impacts and EMP shall be updated with detailed designs of infrastructure improvements. Health and Safety proactive measures should be implemented by the contractors. Siltation of adjoining drains, canals, streams, etc will be significant as roads will be basically earth filling and should implement mitigation measures proposed in the EMP. Avoid construction of lengthy sections at a time to avoid disturbances to the public. Proper traffic arrangements including diversions, signs, etc should be available. Construction activities should be restricted to 0600-1800hours to avoid inconvenience to the general public. Disposal of soil abruptly should be avoided which can leads to many environmental issues. Maximum of 250m stretch should be open at a time for construction to minimise the public convenience.

Construction of Elephant Fence: New method introduced by the Department of Wildlife Conservation (DWLC) in erecting elephant fence should be constructed. Elephant fence design should be approved by DWLC. Use biological fences and ditches outside the electrical fence as much as possible to reduce the pressure on the electrical fence.

Table 21: Screening Recommendations for each activity

Key recommendations	Actions / Approvals to be attended	Time period to attend each action	Responsibility / Remarks
Construction of Agro Wells	Excavation should be strictly adhered to the recommended locations by the WRB	During excavation	ISP PPMU Engineer-PMU WRB
Use of Nawagiriya Water	Obtain written consent from the Department of Irrigation - Nawagiriya	In case of use of Nawagiriya water	ISP FO PPMU
Disposal of Waste (Plastics and polythene)	Start collection and segregation of waste Reuse and Recycle Dispose through LAs Implement Waste Minimization Programme	During harvesting During harvesting time	FOs ISP PPMU ISP PPMU
Integrated Pest Management Practices	Implement IPM activities proposed above at each stage	From land preparation onwards	National and International Agronomist – ISP Agronomist – PPMU
Construction of rural roads	Construction of silt-traps where drains and canals are adjoining which has the potential for siltation	During construction of rural roads	Civil Engineer – ISP PPMU
Construction of Collection Centres and Compost yard	Lands should be properly obtained from the DS	Before start construction	ISP PPMU PMU DS
Removal of Trees	Local Authority approval should be obtained	Before removal of trees	ISP PPMU
Erection of Elephant fence	Obtain concent from DWLC Arrange proper maintenance of fence and corridor	Before construction During Operations	Engineer – ISP PPMU Engineer – PMU MASL

13. DETAILS OF PERSONS RESPONSIBLE FOR THE ENVIRONMENTAL SCREENING

Screening report completed by **J.A.P. Jayaweera** National Safeguards Specialist ISP/ASMP ***Name/Designation/Contact information***	**Date** July 2022  ***Signature***
Screening report reviewed by **D.M. Sanjaya Bandara** Environment and Social Safeguard Specialist Agriculture Sector Modernization Project ***Name/Designation/Contact information***	**Date** August 2022 
Screening report Approved by **Dr. Rohan Wijekoon** Project Director Agriculture Sector Modernization Project ***Name/Designation/Contact information***	**Date** August 2022 

ANNEXURE 1: LIST OF REFERENCES

1) Resource Profile 2020, Baticaloa District and Vellaveli DS

2) ISP District Coordinator, Mullaitivu

3) Land Use Policy Planning Department (LUPPD), 2016

4) Punyawardana, B.V.R., Bandara, T.M.J., Munasinghe, M.A.K., Banda N.J. and Pushpakumara, S.M.V. (2003). Agro-ecological regions of Sri Lanka. Natural Resources Management Centre, Department of Agriculture, Peradeniya, Sri Lanka

5) Draft Cluster Development Plan – CDP 9 – Cavendish Banana Cluster in Vellaveli

6) https://www.breezometer.com/air-quality-map/air-quality/sri-lanka/palachcholai

ANNEXURE 2: BENEFICIARY LIST

Index No	Name of the Farmer	Gender (M/F)	NIC	GN Division (Adress)	Mobile TP	Land Extent (ac)	Ownership	Availability of water annually	Irrigation system	Water resource	GPS Coordinates/ Land location		GPS Coordinates/ Water source location	
MALAIYARKADU											Easting	Northing	Easting	Northing
1	Kumaarthambi Maheswaran	M	196331804160	Malaiyarkadu	776459128	1/2	Deed land	Yes	Manually	Tube well	575982	822169	575954	822182
2	Maheshwaran Patkunam	M	751751826V	Malaiyarkadu	741799288	1/2	Deed land	Yes	Manually	Well				
3	Samithampi Kanagarathinam	M	432362442V	Malaiyarkadu	779713877	1/2	Deed land	Yes	Manually	Well of other				
4	Inthirani Paramalingam	F	666475330V	Malaiyarkadu	771330217	1/2	Permit land	Yes	Manually	Drain water	575433	823837		
5	Thangarasa Kanesamoorthi	M	660882723V	Malaiyarkadu	779698524	1/2	Deed land	Yes	Manually	Well	576438	824112	576450	824103
6	Radnasingam Ponnathurai	M	601642794V	Malaiyarkadu	773066181	1/2	Deed land	Yes	Manually	Well	576574	824615	576563	824602
7	S.Moganasuntharam	M	730223374V	Malaiyarkadu	766345986	1/2	Deed land	Yes	Manually	Well	576423	822316	576383	822355
8	Sarawanamuthu Hemamalini	F	197684502920	Malaiyarkadu	769094196	1/2	Deed land	Yes	Manually	Well	576056	822020		
9	Kanakarathinam Veeramani	M	830701087V	Malaiyarkadu	770413111	1/2	Deed land	Yes	Manually	Well	575986	823311	575968	823292
10	Kaathamuthu Nadaraja	M	560283598V	Malaiyarkadu	771413560	1/2	Permit land	Seasonally	Manually	Drain water	575051	822997		
11	Nadarasa Jayadhaas	M	940113113V	Malaiyarkadu	750748989	1/2	Permit land	Yes	Manually	Well				
12	Thaivanaayakam Yuvarasa	M	700333841V	Malaiyarkadu	779493954	1/2	Permit land	Yes	Manually	Well	575101	822950		
13	Velupillai Kunavathi	F	587234432V	Malaiyarkadu	768728382	1/2	Permit land	Seasonally	Manually	Rain water	575151	822997		
14	K.Tharshini	F	197860203645	Malaiyarkadu	772925479	1/2	Permit land	Seasonally	Manually	Rain water	575038	823051		
15	V.Pakavathi	F	556433356V	Malaiyarkadu	754138427	1/2	Permit land	Seasonally	Manually	Drain water				
16	Nadarasa Suresh	M	8890152317V	Malaiyarkadu	752005953	1/2	Permit land	Seasonally	Manually	Drain water				

17	Kovinthapillai Poopalapilai	M	592361450V	Malaiyarkadu	758149266	1/2	Permit land	Yes	Manually	Well of other	575230	823002		
18	V.Punithavathi	F	637454188V	Malaiyarkadu	_	1/2	Permit land	Seasonally	Manually	Drain water				
19	T.Meharasa	M	196914603893	Malaiyarkadu	760524414	1/2	Permit land	Seasonally	Manually	Drain water	575344	823013		
20	Poopaalapilai Puvaneswari	F	837623600V	Malaiyarkadu	764180775	1/2	Permit land	Seasonally	Manually	Drain water	575230	823028		
21	Sarawanamuthu Selvaraja	M	622273543V	Malaiyarkadu	772320679	1/2	Permit land	Seasonally	Manually	Drain water	575326	823053		
22	K.Neelakunaratinam	M	197708401172	Malaiyarkadu	772850103	1/2	Permit land	Seasonally	Manually	Drain water	575186	822952		
23	Puwanasingam Prabaharan	M	842401364V	Malaiyarkadu	762452849	1/2	Permit land	Yes	Manually	well	575017	822987	575032	822993
24	T.Kumuthini	F	888012320V	Malaiyarkadu	_	1/2	Permit land	Seasonally	Manually	Drain water				
25	Samithambi Mohanasunthari	F	707990457V	Malaiyarkadu	778367528	1/2	Permit land	Yes	Manually	A.Puddle	575620	821821		
26	Kopaalapillai Jayavani	M	19794003440	Malaiyarkadu	765561086	1/2	Permit land	Seasonally	Manually	Drain water				
27	Iraasathurai Kunasekaram	M	197329001400	Malaiyarkadu	758632860	1/2	Permit land	Seasonally	Manually	Drain water	575369	823873		
28	S.Santhakumar	M	196018802736	Malaiyarkadu	_	1/2	Permit land	Seasonally	Manually	Drain water				
29	Radnasingam Uthayakumar	M	652092500V	Malaiyarkadu	766019048	1/2	Deed land	Yes	Manually	A.Puddle	576413	824648	576435	824609
30	Nallathambi Dilli	F	755373529V	Malaiyarkadu	757270008	1/2	Permit land	Seasonally	Manually	Rain water	575682	821702		
31	Maanikkam Thevarasa	M	196504604966	Malaiyarkadu	762860304	1/2	Deed land	Yes	Manually	Well	575712	821549	575696	821479
32	Ratnam Janamma	F	656354445V	Malaiyarkadu	763725040	1/2	Deed land	Seasonally	Manually	Small Puddle				
33	A.Arasaretnam	M	812821270V	Malaiyarkadu	762322901	1/2	Deed land	Yes	Manually	Well	575651	821718		
34	Pillayanthambi Yokeswaran	M	700901173V	Malaiyarkadu	776789640	1/2	Permit land	Yes	Manually	Well				
35	K.Yogarasa	M	581502559V	Malaiyarkadu	779158135	1/2	Permit land	Seasonally	Manually	Drain water				
36	Saamithambi Yashotha	F	946741671V	Malaiyarkadu	774192434	1/2	Deed land	Yes	Manually	well	576175	821812	576209	821801
37	V.Prashanan	M	912550397V	Malaiyarkadu	761561050	1/2	Permit land	Yes	Manually	well				
38	Kumarasuwami Saarathevi	F	715773325V	Malaiyarkadu	754138427	1/2	Deed land	Yes	Manually	well	576191	821831		

39	Ganaseharam Sulojini	F	200263310295	Malaiyarkadu	769255014	1/2	Deed land	Yes	Manually	Small well				
40	T.Thangavadivel	M	651703570V	Malaiyarkadu	771239637	1/2	Deed land	Seasonally	Manually	Drain water				
41	Kumarasuwami Ganasekaram	M	650403827V	Malaiyarkadu	763725040	1/2	Permit land	Seasonally	Manually	Small well				
42	Kaalithasan Thayaledsumi	F	715873788V	Malaiyarkadu	768752707	1/2	Deed land	Seasonally	Manually	Rain water				
43	Yoharasa Rusiganthi	F	905573284V	Malaiyarkadu	774828727	1/2	Deed land	Seasonally	Manually	Well				
44	R.Viththiya	F	806371939V	Malaiyarkadu	778960126	1/2	Deed land	Yes	Manually	Well				
45	Vithahamuthu Srikothandan	M	196018802736	Malaiyarkadu	779038328	1/2	Permit land	Seasonally	Manually	Drain water	575397	823807		
46	Nagarsa Vithahan	M	8203334411V	Malaiyarkadu	772595589	1/2	Deed land	Yes	Manually	Well	575682	821667	575691	821669
47	Sountharajan Sasikumar	M	198513704957	Malaiyarkadu	771223560	1/2	Permit land	Seasonally	Manually	Drain water	575427	823822		
48	M.Selvarasa	M	741831996V	Malaiyarkadu	_	1/2	Permit land	Seasonally	Manually	Drain water	575850	823608		
49	Nallathambi Paranchothi	F	786074070V	Malaiyarkadu	779449057	1/2	Leasehold	Seasonally	Manually	Rain water	575683	821676		
SINNAWATTAI														
50	S.Kokularani	F	757200686V	Sinnawattai	776930974	1/2	Deed land	Yes	Manually	Well				
51	K.Jeevakaran	M	860103893V	Sinnawattai	775023887	1/2	Permit land	Seasonally	Manually	Rain water				
52	Kanthaya Sivarasa	M	196305203508	Sinnawattai	7632266073	1/2	Permit land	Seasonally	Manually	Drain water				
53	T.Jesuthan	M	970231536V	Sinnawattai	756796186	1/2	Permit land	Seasonally	Manually	Rain water	576032	823880		
54	T.Sutharsini	F	888284303V	Sinnawattai	7652237667	1/2	Permit land	Seasonally	Manually	Rain water	575983	823853		
55	Adputharaja Lojini	F	199867302896	Sinnawattai	752577603	1/2	Deed land	Yes	Manually	well of other				
56	M.Santhamalar	F	73183730V	Sinnawattai	766837390	1/2	Permit land	Seasonally	Manually	Rain water	576008	823832		
57	Saravanamuthu Kuthusuwaman	M	551311554V	Sinnawattai	774088464	1/2	Deed land	Yes	Manually	Well				
58	Veluppilai Sivakumar	M	751543301V	Sinnawattai	763555621	1/2	Deed land	Yes	Manually	Well of other				
59	Thillayanparam Iyankeshvaran	M	_	Sinnawattai	761016745	1/2	Deed land	Yes	Manually	well				
60	Krishnapilai Thankarasa	M	196201605506	Sinnawattai	759227486	1/2	Permit land	Seasonally	Manually	Small well				

61	Veluppilai Rasalakshmi	F	805924829V	Sinnawattai	765939962	1/2	Permit land	Seasonally	Manually	Drain water				
62	Aariyaradnam Nakarathnam	M	593004600V	Sinnawattai	760047386	1/2	Permit land	Seasonally	Manually	Drain water				
63	Sarawanamuthu Susan	M	903373342V	Sinnawattai	769939328	1/2	Permit land	Seasonally	Manually	Drain water	576008	824119		
64	Sarawanamuthu Suventhiran	M	–	Sinnawattai	778934574	1/2	Permit land	Yes	Manually	Well	576021	824087	576034	824099
65	Sarawanamuthu Sujeevan	M	941034756V	Sinnawattai	759825982	1/2	Permit land	Seasonally	Manually	Drain water	575999	824148		
66	Savarathnam Thayanithi	F	657273333V	Sinnawattai	762609826	1/2	Deed land	Seasonally	Manually	small well	574999	824304		
67	Sivakuru Makeshwari	F	196476703473	Sinnawattai	764162167	1/2	Permit land	Seasonally	Manually	Rain water				
68	Thampiyappa Krishnapilai	M	196233403979	Sinnawattai	764457168	1/2	Deed land	Yes	Manually	Agro well				
69	ThankarasaThiropatatha	F	195971210047	Sinnawattai	776372834	1/2	Permit land	Seasonally	Manually	Rain water				
70	Thampipilai Yoharani	F	845303800V	Sinnawattai	767407957	1/2	Permit land	Seasonally	Manually	Drain water				
71	Singaravel Priyadharshini	F	898270963V	Sinnawattai	775223405	1/2	Deed land	Yes	Manually	Well				
72	Markakandu Baby	F	647713661V	Sinnawattai	774274493	1/2	Permit land	Seasonally	Manually	Drain water				
73	Kanthayya Parameshvaran	M	611035004V	Sinnawattai	_	1/2	Deed land	Seasonally	Manually	Rain water				
74	Thambipilai Karunainathan	M	691234037V	Sinnawattai	774991702	1/2	Deed land	Seasonally	Manually	Drain water				
75	Sarawanamuthu Sivamani	M	196274710099	Sinnawattai	759485555	1/2	Permit land	Yes	Manually	Drain water				
76	Aarumugam Kumaarasuwami	M	–	Sinnawattai	755194895	1/2	Deed land	Yes	Manually	Well	577211	825327	577259	825352
77	Thambipilai Inthirani	F	198068503240	Sinnawattai	_	1/2	Deed land	Yes	Manually	Drain water				
VILANTHODDAM														
78	Jayaweerasingam Jayakumaran	M	612773785V	Vilanthoddam	773551653	1/2	Deed land	Yes	Manually	Agro well	576314	826214		
79	K.Seethapillai	F	518243497V	Vilanthoddam	773551653	1/2	Deed land	Yes	Manually	well of other				
80	Thachanamoorthi Saraswathi	F	675434581V	Vilanthoddam	774111996	1/2	Deed land	Yes	Manually	Well	576148	826118		

81	Samithambi Palasubramaniyam	M	662162108V	Vilanthoddam	774670459	1/2	Deed land	Yes	Manually	Drain water				
82	A.Thangathurai	M	611573936V	Vilanthoddam	753999306	1/2	Permit land	Seasonally	Manually	Rain water				
83	Puwaneshwari Rawinthiran	F	677864591V	Vilanthoddam	_	1/2	Deed land	Yes	Manually	Well				
84	Kunchithambi Jayaseelan	M	721034194V	Vilanthoddam	758801987	1/2	Deed land	Seasonally	Manually	Rain water	575827	826195		
85	Somanaathan Alaguraaja	M	531894561V	Vilanthoddam	776671630	1/2	Deed land	Seasonally	Manually	Puddle				
86	Muuthathambi Paranthaaman	M	593643590V	Vilanthoddam	772074411	1/2	Deed land	Yes	Manually	Drain water	576605	826484		
87	Suntharalingam Santhrathevi	F	705403490V	Vilanthoddam	755806298	1/2	Deed land	Yes	Manually	Drain water	576671	826304		
88	Krishnapilai Kopaalapillai	M	655004375V	Vilanthoddam	754732323	1/2	Deed land	Seasonally	Manually	Rain water	576910	826241		
89	K.Suntharalinkam	M	560482981V	Vilanthoddam	775335708	1/2	Deed land	Seasonally	Manually	Drain water				
90	Thambipillai Nageshvari	F	687334230V	Vilanthoddam	757737714	1/2	Deed land	Seasonally	Manually	Drain water	576924	826254		
91	N.Nishanthini	F	977103844V	Vilanthoddam	750966906	1/2	Deed land	Yes	Manually	Well				
92	Padkunanaathan Thaiventhiran	M	803331685V	Vilanthoddam	758707846	1/2	Deed land	Seasonally	Manually	well of other				
93	Vellayapillai Murukamoorthi	M	581194846V	Vilanthoddam	759510020	1/2	Deed land	Yes	Manually	Well	577021	826227	577014	826297
94	Thambipillai Thavamani	M	728644753V	Vilanthoddam	755164749	1/2	Deed land	Seasonally	Manually	Drain water	576948	826265		
95	N. Sathiyanaathan	M	_	Vilanthoddam	756964633	1/2	Permit land	Seasonally	Manually	well of other				
96	M.Santhrathevi	F	675924767V	Vilanthoddam	752590081	1/2	Deed land	Yes	Manually	Small well				
97	Veerasingam Keetha	F	896834258V	Vilanthoddam	752590081	1/2	Deed land	Yes	Manually	Well	576456	826089		
98	Vairamuthu Panchavarnam	F	565183907V	Vilanthoddam	754510342	1/2	Deed land	Yes	Manually	Agro well	576393	826025		
99	Saamiththampi Ranjitham	F	576762976V	Vilanthoddam	752029470	1/2	Permit land	Yes	Manually	Tube well				
100	Kaalikutty Karunaiamma	F	607834148V	Vilanthoddam	752263901	1/2	Permit land	Yes	Manually	Well				
101	Arasarathinam Arasamma	F	555704534V	Vilanthoddam	752029470	1/2	Deed land	Yes	Manually	Agro well	575904	826169	575935	826154
102	Sanmukarasa Lohithamalar	F	777754769V	Vilanthoddam	758711459	1/2	Deed land	Yes	Manually	Well				

103	Kanakarathnam Ravinthiran	M	722512472V	Vilanthoddam	760509983	1/2	Deed land	Yes	Manually	Well				
104	Kopaalapillai Nishanthini	F	937103824V	Vilanthoddam	758707347	1/2	Deed land	Yes	Manually	Well				
105	Raasan Kayalvili	F	_	Vilanthoddam	758711459	1/2	Deed land	Seasonally	Manually	Drain water				
106	Santhirapillai Ambikavathi	F	657544442V	Vilanthoddam	757278435	1/2	Deed land	Seasonally	Manually	Well	575839	826209	575855	826222
107	Arasaradnam Barathini	F	938624283V	Vilanthoddam	_	1/2	Deed land	Seasonally	Manually	Near well	575872	826214		
PAALAYADIVADDAI														
108	Parinpam Jeevaradnam	M	720443260V	Paalaiyadivaddai	766502858	1/2	Permit land	Seasonally	Manually	Drain water	575481	829186		
109	Navathepan Ambika	F	928360261V	Paalaiyadivaddai	754381393	1/2	Permit land	Seasonally	Manually	Drain water				
110	Kannapar Poopalapillai	M	512493009V	Paalaiyadivaddai	761792948	1/2	Permit land	Seasonally	Manually	Drain water	575161	829207		
111	Sellayya Mokanarasa	M	651863490V	Paalaiyadivaddai	758238184	1/2	Permit land	Seasonally	Manually	Drain water	575519	829200		
112	Kannamuthu Somasuntharam	M	196523103280	Paalaiyadivaddai	774041714	1/2	Permit land	Yes	Manually	Agro well				
113	Maanikkapodi Poopalaradnam	M	603233557V	Paalaiyadivaddai	755954506	1/2	Permit land	Seasonally	Manually	Drain water	575352	829324		
114	Sanmukarasa Rawichanthiran	M	800842093V	Paalaiyadivaddai	752619273	1/2	Permit land	Seasonally	Manually	rain water				
115	Rasavaruvatham Vavikaran	M	880652710V	Paalaiyadivaddai	757019483	1/2	Permit land	Seasonally	Manually	Drain water	575440	829276		
116	Kannapar Paakiyarasa	M	196307503686	Paalaiyadivaddai	751700870	1/2	Permit land	Seasonally	Manually	Drain water	575476	829245		
117	Sivalingam Arichchanthrakumar	M	800670080V	Paalaiyadivaddai	766795291	1/2	Deed land	Yes	Manually	Agro well	575568	829357	575549	829359
118	Kannapar Thilahawathi	F	698244364V	Paalaiyadivaddai	754745550	1/2	Permit land	Yes	Manually	Well	575890	828351		
119	Thirunaavukkarasu Yujenthini	F	887851670V	Paalaiyadivaddai	757676090	1/2	Permit land	Seasonally	Manually	Drain water	575348	829164		
120	Vairamuthu Visvalingam	M	196516202883	Paalaiyadivaddai	765715468	1/2	Permit land	Seasonally	Manually	Drain water	575322	829372		
121	Vellakkutti Vijayaradnam	M	195922903277	Paalaiyadivaddai	750382029	1/2	Leasehold	Seasonally	Manually	rain water				
122	Eliventhan Vijayalogini	F	977273978V	Paalaiyadivaddai	759622487	1/2	Permit land	Seasonally	Manually	Drain water	575268	829202		

123	Sanmuham Selvarasa	M	560983514V	Paalaiyadivaddai	752169008	1/2	Leasehold	Yes	Manually	Agro well				
124	Kanthappan Alaguraja	M	_	Paalaiyadivaddai	_	1/2	Permit land	Seasonally	Manually	Drain water				
125	Nadarasa Thusanthini	F	867560602V	Paalaiyadivaddai	750382029	1/2	Permit land	Seasonally	Manually	Drain water	575530	829145		
126	Thavarasa kosalashevi	F	_	Paalaiyadivaddai	788771793	1/2	Permit land	Seasonally	Manually	Drain water	575398	828690		
127	Sanmukarasa Kalaivaani	F	_	Paalaiyadivaddai	762558252	1/2	Permit land	Seasonally	Manually	Drain water	575439	829310		
128	Ravichchandran Sinthuja	F	916622040V	Paalaiyadivaddai	750997526	1/2	Permit land	Seasonally	Manually	Drain water	575322	829209		
129	Vadivelu Nadarasa	M	532184169V	Paalaiyadivaddai	754257930	1/2	Deed land	Seasonally	Manually	Drain water	575597	828323		
130	Seeniththambi Paalenthiran	M	_	Paalaiyadivaddai	752642119	1/2	Permit land	Seasonally	Manually	Drain water				
131	Vijayaradnam Prakaash	M	200002502650	Paalaiyadivaddai	761348188	1/2	Permit land	Seasonally	Manually	Drain Water	575528	829173		
132	Sellayya Pathmanathan	M	_	Paalaiyadivaddai	767852289	1/2	Permit land	Seasonally	Manually	Drain Water	575590	829118		
133	Archunan Thayaparan	M	810263130V	Nellikkadu	778455536	1/2	Deed land	Seasonally	Manually	Drain water				
134	Eakaambaram Thavarasa	M	651684153V	Nellikkadu	773697613	1/2	Deed land	Seasonally	Manually	Drain water				
135	Maanikkapodi Subaskaran	M	832182770V	Nellikkadu	779931552	1/2	Deed land	Seasonally	Manually	Drain water				
136	Aarumugam Thankarasa	M	_	Nellikkadu	779931552	1/2	Permit land	Seasonally	Manually	Drain water				
THIKKODAI														
137	Vellupillai Santhanappillai	M	717743911V	Thikkodai	752837149	1/2	Deed land	Yes	Manually	Well				
138	Senapathi Sathiyaraj	M	883631412V	Thikkodai	756323664	1/2	Permit land	Seasonally	Manually	Drain water	577263	831027		
139	Naahamani Manoharan	M	692563581V	Thikkodai	759237812	1/2	Permit land	Seasonally	Manually	Drain water	577384	830994		
140	Krishna Renuka	M	956614236V	Thikkodai	750369935	1/2	Permit land	Seasonally	Manually	Drain water	577204	830740		
141	Amarasingam Saanthakumaari	F	687273206V	Thikkodai	756842846	1/2	Permit land	Seasonally	Manually	Rain water	577198	830997		
142	Thangavadivelu Santhiramathi	F	656563737V	Thikkodai	762296061	1/2	Permit land	Yes	Manually	Well				

143	Thangavadivelu Tharshini	F	915812457V	Thikkodai	775168636	1/2	Permit land	Seasonally	Manually	Well of other	577286	830784		
144	Raamarpillai Puwaneshwari	F	666783620V	Thikkodai	755885195	1/2	Permit land	Seasonally	Manually	Rain water	577205	830740		
145	Ponnuthurai Maanikkavaasam	M	195723603015	Thikkodai	753991018	1/2	Deed land	Yes	Manually	Well	577035	830926		
146	Yoharaja Ajantha	F	199563004733	Thikkodai	753991018	1/2	Permit land	Seasonally	Manually	Well of other				
147	M. Rawichchandran	M	_	Thikkodai	_	1/2	Permit land	Seasonally	Manually	Well of other				
148	Paakiyarasa Mohan	M	870192347V	Thikkodai	751311870	1/2	Permit land	Yes	Manually	Well				
149	Krishti Nikshanbarath	M	860233843V	Thikkodai	755139406	1/2	Permit land	Yes	Manually	Well				
150	Navaradnam Rekka	F	955193857V	Thikkodai	755134406	1/2	Permit land	Seasonally	Manually	Rain water				
151	Seenithambi Prashanth	M	972821128V	Thikkodai	779115309	1/2	Permit land	Seasonally	Manually	Rain water	577026	830674		
152	Veluppilai Thevaki	F	697284028V	Thikkodai	751430302	1/2	Permit land	Seasonally	Manually	Drain water				
153	Naahappan Thankamma	F	596873847V	Thikkodai	759622487	1/2	Permit land	Yes	Manually	Well				
154	Senapathi Anushiya	F	200157103610	Thikkodai	752706252	1/2	Permit land	Seasonally	Manually	Rain water	577184	830733		
155	Somasuntharam Subaharan	M	_	Thikkodai	75933818	1/2	Permit land	Seasonally	Manually	Rain water				
156	Paakiyarasa Makeshwari	F	197680793910	Thikkodai	751311870	1/2	Permit land	Seasonally	Manually	Drain water				
157	Thewarasa Vimaleshwaran	M	199015702879	Thikkodai	_	1/2	Permit land	Seasonally	Manually	Drain water				
158	Mahenthiran Prathipan	M	880170228V	Thikkodai	770031305	1/2	Permit land	Seasonally	Manually	Drain water	577173	830962		
159	Kethiswaran Jagathiswaran	M	199819202697	Thikkodai	774849571	1/2	Permit land	Seasonally	Manually	Drain water				
160	Vaithiyalingam Sasikaran	M	912173291V	Thikkodai	758836646	1/2	Permit land	Seasonally	Manually	Drain water				
161	Sanmukarasa Uthayaraj	M	902971181V	Thikkodai	767435543	1/2	Permit land	Seasonally	Manually	Drain water				
162	N. Paakiyarsa	M	553294331V	Thikkodai	754160274	1/2	Permit land	Seasonally	Manually	Drain water				
163	Kanapathipillai Amurtheswari	F	658094661V	Thikkodai	769244448	1/2	Permit land	Seasonally	Manually	Drain water	577354	831078		
164	Perinpam Jeevaradnam	M	850480478V	Vivehananthapuram	758658033	1/2	Permit land	Seasonally	Manually	Drain water				

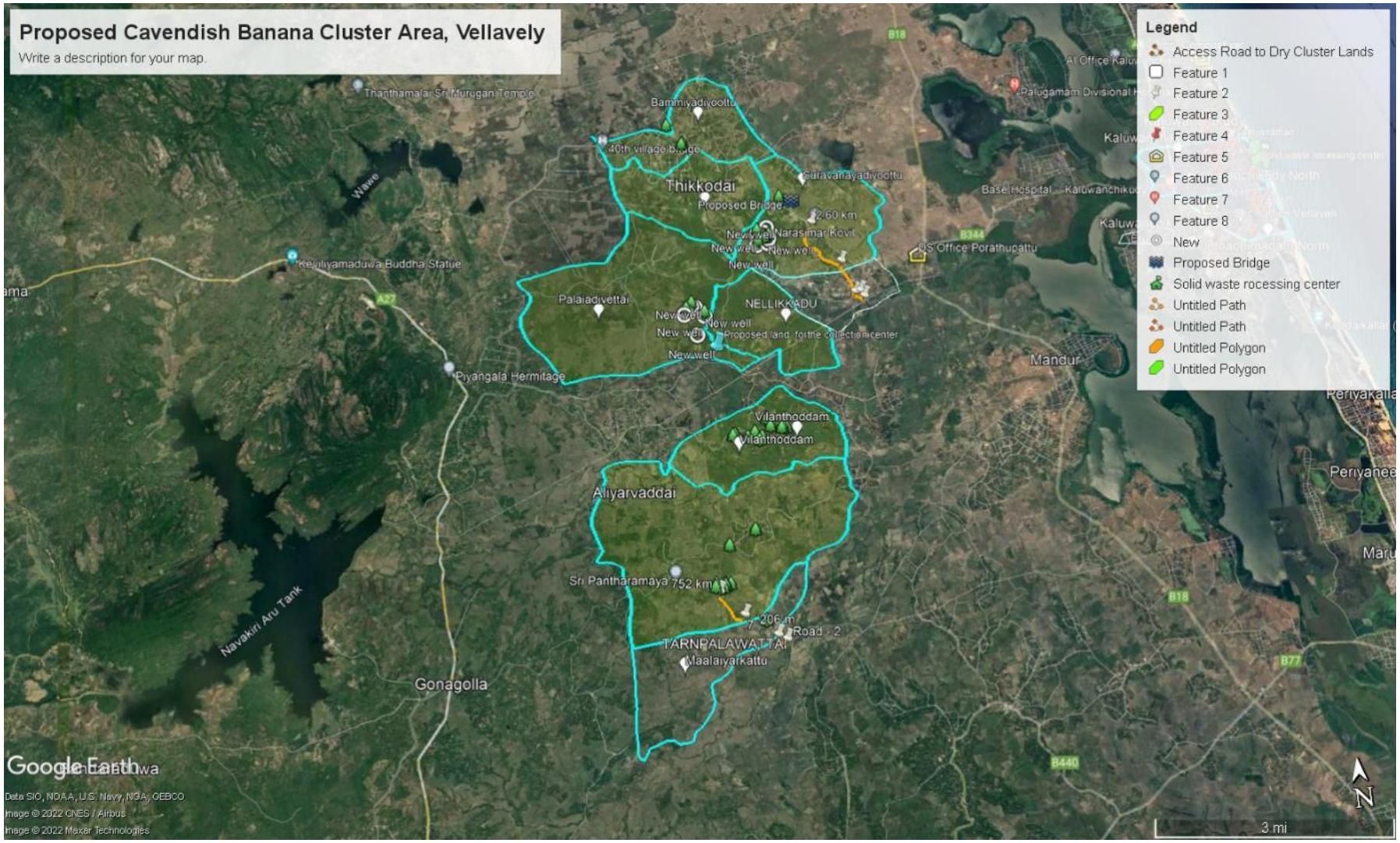
165	Paalasuntharam Thaiventhiran	M	197831904830	Thikkodai	763239839	1/2	Permit land	Yes	Manually	A.Puddle	577660	831692		
166	Mayilvaahanam Nirmalanathan	M	820594355V	Thikkodai	772714002	1/2	Permit land	Seasonally	Manually	Drain water				
167	Irasharadnam Kanakaradnam	M	440481655V	Thikkodai	772028372	1/2	Permit land	Seasonally	Manually	Drain water				
168	Neermuharaja Prema	F	198461903332	Vivehananthapuram	762451114	1/2	Permit land	Yes	Manually	A.Puddle	578003	831334		
169	Kumarpodi Yoharasa	M	19870102095	Thikkodai	776894057	1/2	Permit land	Seasonally	Manually	Drain water	577924	831378		
170	Kovintharaja Vithiya	F	906123665V	Thikkodai	768303288	1/2	Permit land	Seasonally	Manually	Drain water				
171	Vasantharapillai Susihala	F	676534342V	Thikkodai	768303288	1/2	Permit land	Seasonally	Manually	Drain water				
172	Naagan Guvaalingam	M	691443426V	Thikkodai	779725344	1/2	Permit land	Yes	Manually	A.Puddle				
173	Savuntharraja Urithirakumar	M	822533280V	Thikkodai	766324885	1/2	Permit land	Seasonally	Manually	Drain water				
174	Yoharasa Malar	F	905013548V	Thikkodai	774942537	1/2	Permit land	Seasonally	Manually	Drain water				
175	Thankathurai Visiththiran	M	200307100300	Thikkodai	754346449	1/2	Permit land	Seasonally	Manually	Drain water				
176	Thavakumar Jayanthimalar	F	875452266V	Thikkodai	761954539	1/2	Permit land	Seasonally	Manually	Drain water				
177	Kulenthiran Srikaanthan	M	199124303064	Thikkodai	777665687	1/2	Permit land	Seasonally	Manually	Drain water				
178	Kaneshalingam Satheeswaran	M	199027329500	Thikkodai	755102764	1/2	Permit land	Seasonally	Manually	Drain water				
179	Prathifan Rufini	F	905845047V	Thikkodai	760568625	1/2	Permit land	Seasonally	Manually	Drain water				
180	Maanikkam Kathirkaamam	M	196609704490	Thikkodai	740312125	1/2	Permit land	Seasonally	Manually	Drain water				
181	Thankavel Dilakshana	F	986510206V	Thikkodai	756083030	1/2	Permit land	Seasonally	Manually	Drain water				
182	Thavarasa Janusha	F	997901401V	Thikkodai	776849305	1/2	Permit land	Seasonally	Manually	Drain water				
183	Vellachi Kopaalasingam	F	_	Thikkodai	776057494	1/2	Permit land	Seasonally	Manually	Drain water				
VAMMIYADIYOOTHU														
184	Aarumuham Kanthappodi	M	812931628V	Vammiyadiyoothu	779503313	1/2	Deed land	Yes	Manually	Well				

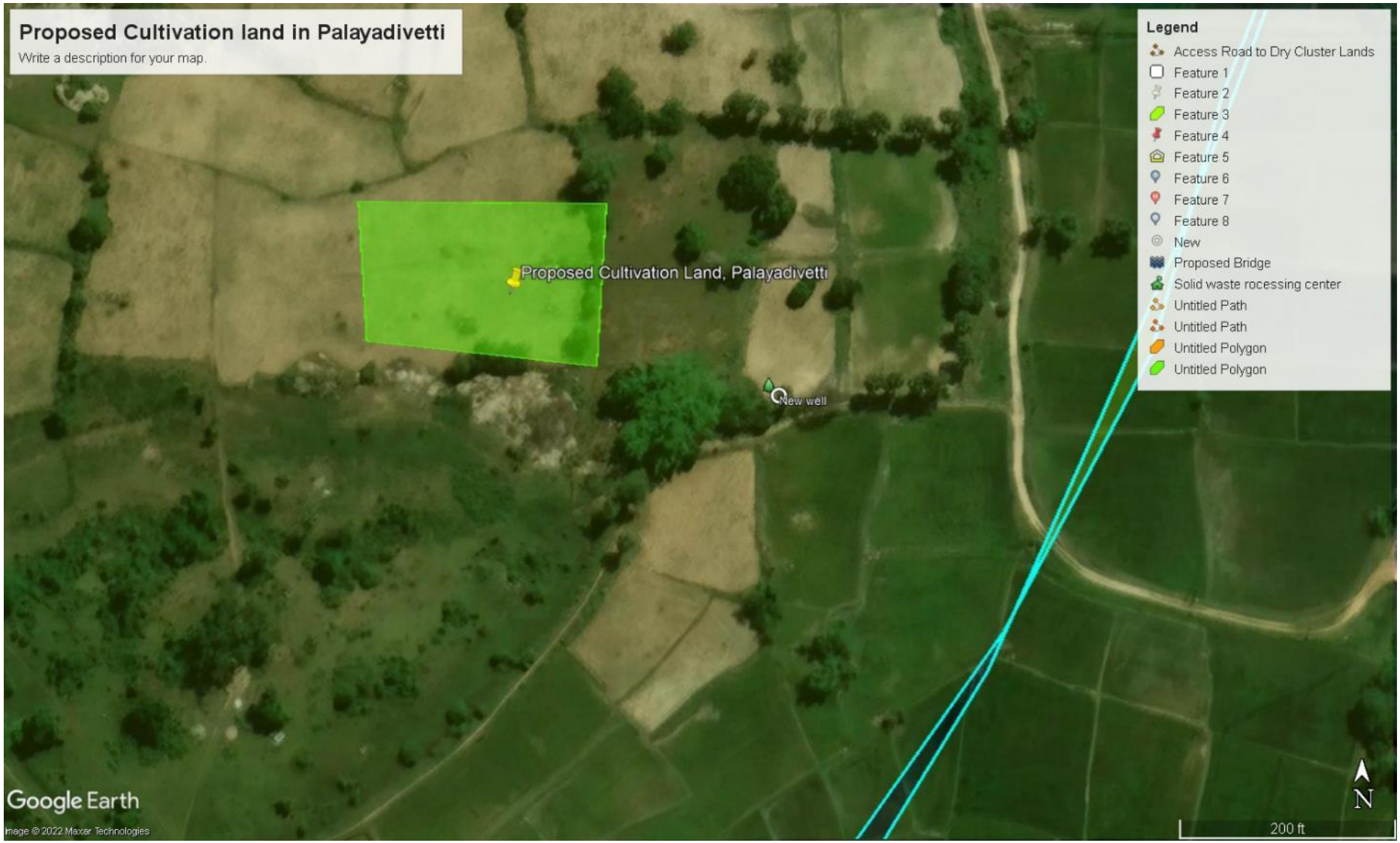
185	Kaneshapillai Prabaharan	M	802033893V	Vammiyadiyoothu	775151710	1/2	Permit land	Yes	Manually	Well				
186	S. Thavanganasuntharam	M	813291126V	Vammiyadiyoothu	760226587	1/2	Permit land	Yes	Manually	A.Puddle	575439	833377		
187	Kanapathipillai Yamuna	F	736392976V	Vammiyadiyoothu	778387117	1/2	Deed land	Yes	Manually	A.Puddle	575615	833332		
188	Maarkandu Sivagaanam	M	861183955V	Vammiyadiyoothu	770620643	1/2	Deed land	Seasonally	Manually	Rain water	575591	833299		
189	Arulampalam Sumathi	F	828315234V	Vammiyadiyoothu	761919312	1/2	Permit land	Seasonally	Manually	Drain water				
190	Poopalapilai Kalaivaani	F	656493526V	Vammiyadiyoothu	752980002	1/2	Permit land	Seasonally	Manually	Rain water				
191	Alaguthurai Prabaharan	M	800165059V	Vammiyadiyoothu	774060710	1/2	Deed land	Yes	Manually	A.Puddle				
192	Thavarasa Suntharamma	F	818380240V	Vammiyadiyoothu	_	1/2	Permit land	Seasonally	Manually	rain water				
193	Nithiyanathan Santhirakala	F	198261203931	Vammiyadiyoothu	767250319	1/2	Permit land	Seasonally	Manually	Drain water				
194	Sabapathi Yohendran	M	812123505V	Vammiyadiyoothu	771397295	1/2	Permit land	Seasonally	Manually	Drain water				
195	Thampirasa Pushparaja	M	751241283V	Vammiyadiyoothu	775618758	1/2	Permit land	Yes	Manually	Well				
196	Sinathurai Ratnasingam	M	N5675626	Vammiyadiyoothu	_	1/2	Permit land	Seasonally	Manually	Drain water				
197	Irashayya Thevarasa	M	691246386V	Vammiyadiyoothu	752910770	1/2	Permit land	Seasonally	Manually	Drain water				
198	Maanikkapodi Viswalingam	M	582644195V	Vammiyadiyoothu	762041165	1/2	Deed land	Yes	Manually	well	575299	833822	575268	833803
199	K. Thineswari	F	958627358V	Vammiyadiyoothu	750635215	1/2	Deed land	Yes	Manually	A.Puddle				

ANNEXURE 3: INSTITUTIONAL ROLES IN CAVENDISH BANANA CLUSTER

Agency/ Private sector	Officer Responsible	Expected role in cluster development
Provincial Department of Agriculture (North)	Provincial Director (Agriculture)	Lead and provide guidance to relevant officers and FPO. Coordinate all line agencies at District level
	Deputy Director(Agriculture)	Provide guidance to relevant officers and FPO. Provide extension services and inputs. Solving of farmer problems. Coordinate all line agencies at Cluster level
	8 Agriculture Instructors	Maintain close link with Farmers in the cluster area. Training of farmers Play the role of farmer Facilitator.
Divisional Secretariates (Valikamam North, East and South)	3 Divisional Secretaries	Make representation for review committees to assist DD (Agriculture) Settlement of land issues and issue land permits if necessary. Make required services to PFO from other agencies.
	3 Land Officers	Settlement of land disputes. Clearing boundary demarcations.
	36 Grama Niladaris	Assist to identify eligible legal farmers. Organize farmer meetings.
Agrarian Development Department	4 Agrarian Development Officers	Get the involvement for input supplies such as seeds, Organic and Chemical fertilizers, Machineries For effective cooperation from existing Farmer Organizations Gather Agrarian related farmer information.
Research Centre, Thinnaveli	Deputy Director, Pathologist, Entomologist and Soil scientist, Irrigation Agronomist	Provide research Support to farmers when a problem emerged.

ANNEXURE 4: PROJECT AREA MAPS




Proposed Cultivation land in Palayadivetti
Write a description for your map.
Proposed Cultivation Land, Palayadivetti
New well
Legend
Access Road to Dry Cluster Lands
Feature 1
Feature 2
Feature 3
Feature 4
Feature 5
Feature 6
Feature 7
Feature 8
New
Proposed Bridge
Solid waste rocessing center
Untitled Path
Untitled Path
Untitled Polygon
Untitled Polygon
Google Earth
Image © 2022 Maxar Technologies
N
200 ft


Proposed Demonstration Plot at Sinnaiwatte
Write a description for your map.
Legend
Access Road to Dry Cluster Lands
Feature 1
Feature 2
Feature 3
Feature 4
Feature 5
Feature 6
Feature 7
Feature 8
New
Proposed Bridge
Solid waste rocessing center
Untitled Path
Untitled Path
Untitled Polygon
Untitled Polygon
Proposed Demonstration Plot at Sinnaiwatte
Google Earth
Image © 2022 Maxar Technologies
N
100 ft


Proposed Cultivation Land at Vemmiadiyuththu
Write a description for your map.
Legend
Access Road to Dry Cluster Lands
Feature 1
Feature 2
Feature 3
Feature 4
Feature 5
Feature 6
Feature 7
Feature 8
New
Proposed Bridge
Solid waste rocessing center
Untitled Path
Untitled Path
Untitled Polygon
Untitled Polygon
Proposed Cultivation Land at Vemmiadiyuththu
Google Earth
300 ft
N


Proposed Cultivation Land at Thumpalai
Write a description for your map.
Legend
Access Road to Dry Cluster Lands
Feature 1
Feature 2
Feature 3
Feature 4
Feature 5
Feature 6
Feature 7
Feature 8
New
Proposed Bridge
Solid waste rocessing center
Untitled Path
Untitled Path
Untitled Polygon
Untitled Polygon
New well
Thumpalai Cavendish Banana Cluster
New well
Google Earth
Image © 2022 Maxar Technologies
N
200 ft

ANNEXURE 5: COMPOST PLANT PROPOSAL

1. Rationale

Soil productivity and environmental concerns have revived global interest in organic recycling practices such as composting. Composting considered as an attractive option for turning on-farm organic waste materials into a valuable farm resource. However, at present quality of organic fertilisers could be considered as one of the most limiting resources in crop production. In this respect compost plays an important role to mitigate and solve the problem of inadequacy of suitable organic fertilisers in crop production.

Over- all decline of soil fertility is a major problem associated with crop production in Sri Lanka. Decline of soil fertility is mainly due to depletion of soil organic matter, loss of plant nutrients, etc. Organic matter decline takes place due to soil erosion, decomposition due to high soil temperatures and low attention to organic fertiliser added to soil. Low organic matter content in soil has created several problems such as yield decline and yield stagnation even in all crop sectors. It is a well-known fact that the cation exchange capacity of many Sri Lankan soils is low chiefly due to low organic matter content. Under such conditions, retention of plant nutrients is low and subsequently chemical fertiliser efficiency will decrease. Thus, many agricultural farming systems are becoming non-profitable to farmers even though heavy investments in many other farming activities. Hence, application of organic fertilisers such as compost will be a beneficial effect on crop yield as well as on over all soil fertility. In addition, compost could be considered as the most suitable organic fertiliser for crop production when compared to many other organic fertilisers due to its number of characteristics such as presence of decomposed organic materials, ready availability of plant nutrients, absence of weed seeds and pathogens, high efficiency, low volume etc. One of the important contributions of compost is the high organic matter fraction, which improves the physical conditions of poor soils such as soil structure, texture, tilth, water holding capacity etc. In addition, compost also improves the chemical and biological properties of soils. Compost carries small quantities of growth promoting substances similar in nature to hormones. The application of organic fertilisers such as compost to soil will be useful for reducing the incidence of plant diseases. Addition of organic fertilisers suppressed the numbers of plant parasitic nematodes. However, in the recent past, most people were unaware that using composts is an effective way to increase healthy plant growth; help to save money by reduce the use of chemical fertilisers, and conserve natural resources while helping to recycle wastes.

2. Integrated plant nutrition system

The complementary role which organic and chemical fertilisers play in crop production is a popular fact. In order to improve soil fertility, it is important to follow environmentally friendly plant nutrition management practices under what has been termed the Integrated Plant Nutrition System (IPNS). This concept advocates the balanced use of both organic and chemical fertilisers for crop production. IPNS is considered as the most suitable plant nutrient management system to increase the crop yield while maintaining the good soil fertility. Since compost is one of the most important components of the IPNS technology production of compost will be an immense benefit for the development of the country. Therefore, ISP will undertake following steps in all clusters:

1. Promote manufacturing of compost using available raw materials in cluster areas.
2. Promote utilisation of compost and liquid organic fertilisers and reduce the use of chemical fertilisers through IPNS.

Farmers in Sri Lanka are used to apply only chemical fertiliser for their cultivations which has been a contributory factor towards gradual decline of fertility in soil. This situation is adversely affecting crop production in all clusters. Hence, the utilisation of organic fertiliser in addition to the chemical fertiliser is essential for successful crop production in clusters. In this regard, it is necessary to increase the overall organic fertiliser production in all clusters as well as in throughout the country. The objective of this programme is to encourage farmers to produce total requirement of compost within the cluster areas because transport of compost from long distance is not economical. Therefore, it is expected to encourage some producers to make large scale productions on commercial basis.

3. Objectives of the compost production programme

- Utilise freely available organic materials for crop production
- Creation of a favourable environment through recycling of organic waste materials
- Reduce chemical fertiliser use through compost production and use
- Popularise use organic fertiliser in addition to chemical fertilisers for crop production
- Increase chemical Fertiliser Use Efficiency
- Improve soil fertility and maintain sustainability
- Popularise quality compost production
- Minimise environmental pollution
- Economical crop production
- Minimise chemical fertiliser use
- Popularise proper waste management system
- Introduce compost production on commercial scale
- Emergence of a market for compost
- Initiate a compost sale as a viable business

At present the amount of waste materials which are freely available in clusters could be considered as important resources for successful compost production. They are rich in plant nutrients. In general, banana waste materials available in Rajanganaya and Jaffna are high in potassium. Waste minimisation is a very important aspect in banana crop production to minimise pest and diseases. Therefore, ISP will undertake compost production in all clusters as an important intervention. This action will ensure increase the soil fertility in clusters as well as increase crop production and subsequent sustainability of agricultural crop production.

4. Site selection

Generally, well-chosen site can speed up the composting process. In this regard, well-drained area of the location is suitable for compost production. Similarly, shadier spot is more suitable so it does not dry out too quickly. Preparation of compost over soil or grasses is better than concrete floor, to take advantage of microbes and other decomposers. Site should be selected from reasonable distance of houses. The selected location should have access roads, electricity, water sources (well), area for unloading raw materials and loading final product, parking access, production area, processing area, storage facilities, small management room, changing room, lunch room, bathroom etc.

5. Steps of compost production process

1. Collection of raw materials
2. Production of compost
3. Drying
4. Crushing
5. Sieving
6. Packaging
7. Distribution
8. Marketing

6. Main activities under the compost production programme in clusters:

- Selection of farmers or FPOs those who can do compost production
- Registration of compost production in relevant authorities
- Collection of information on raw- materials availability in each cluster areas
- Selection of suitable sites in each cluster
- Establishment of compost production units in each cluster
- Training of farmers in groups through field demonstrations on complete package of the compost production
- Educate farmers on quick compost production technologies, maintenance of the quality, storage, stocks, run as a business etc.

- Arrange compost production with individuals or FPOs
- Laboratory testing of produced compost samples for quality testing
- Design bags with brand names and other relevant details
- Guide for marketing of compost

7. Buildings, Tools and Equipment Required for Compost Production Unit (100 t/month)

Table 22: List of structures, implements and equipment Required for the Compost Production Unit

No.	Item	Number	Estimated Cost (LKR)
1.	Shovel	5	
2.	Pitch fork	5	
3.	Wheel barrow	5	
4.	2 wheel tractor	1	
5.	Boots	10 pairs	
6.	Water pump 1”	1	
7.	1” hose pipes	200m	
8.	Chipper/ Shredder	1	
9.	Black polythene (Gauge 750, 3ft width and double)	500kg	
10.	Compost turner	1	
11.	Rotary Sieve	1	
12.	Weighing machine up to 100kg	1	
13.	Manual Bag closer/ stitcher machine	2	
14.	Small truck (Optional)	1	
15.	Printed bags 25kg and 50kg	10,000 each	
16.	Compost Aerator (Optional)	1	
17.	Compost thermometer (Optional)	1	
18.	Drying, processing and sieving hut 15m x 20m	1	
19.	Storage building with basic office room, changing room and toilet 20m x40m	1	
20.	Miscellaneous items		

8. Method of compost production by the heap method

Heap method is more advantageous than any other methods for commercial compost productions. Under heap method aerobic composting takes place in the presence of Oxygen. In this process, aerobic microorganisms break down organic matter and produce carbon dioxide, ammonia, water, heat and humus, the relatively stable organic end product. The heat generated accelerates the breakdown complex compounds such as proteins, fats, cellulose and hemi-cellulose in raw materials. In heap method the processing time is shorter. In addition, this process destroys harmful pathogens; as well as weed seeds due to undergo sufficiently high temperature. Therefore, aerobic composting is considered more efficient and effective than anaerobic composting for agricultural production.

The aerobic composting process starts with the formation of the pile. First, mesophilic organisms multiply rapidly with the temperature of 20 - 45^{0}C on the readily available sugars and amino acids. Under such

conditions, they generate heat by their own metabolism and raise the temperature to a point where their own activities become suppressed. Then some thermophilic fungi and several thermophilic bacteria under the temperature range 50 - 70^{0}C or more continue the process, raising the temperature up to 65^{0}C or higher. In many cases, the temperature goes up to 70 - 80^{0}C and this peak heating phase is important for the quality of the compost as the heat kills pathogens and weed seeds.

The general process of producing compost involves piling the organic waste in long rows. The heap is usually started with 20-30 cm layer of different raw materials. Alternate layers should be placed with different raw materials available in the area in the heap. The manure, dung and animal urine are excellent for composting due to high nitrogen content and less C/N ratio. The application of Eppawala rock phosphate is also an important step in compost production. It is well-known fact that quality of compost could be improved when rock phosphate is added. Different raw materials are placed until the pile is 1.5 - 2.0m high. It is advisable to maintain the width about 2 - 2.5m at the base for successful aeration. The sides are tapered so that the top is about 0.5m narrower in width than the base. The substrates should be piled loosely in a compost heap to provide better aeration within the heap. After 3-4 layers of raw materials normally apply sufficient quantity of water and compost activator/inoculant. After formation, the pile is covered with black polythene to retain heat and moisture but leave a sufficient space at the bottom for ventilation. The active composting stage is followed by turning stage, and the pile temperature decreases gradually with the time. Therefore, turning/mixing should be done every 3 - 4 weeks interval to activate the decomposition of raw materials. However, maximum three turning/mixing steps are recommended during the whole period of the composting process due to high labour involvement for this process. At each turning, the material is mixed thoroughly and moistened with water and apply compost activator/inoculant such as the Trichoderma spp. of fungus. In general, the C/N ratio should be maintained with carbonaceous and nitrogenous materials for successful decomposition. Under such conditions, compost can be typically produced within 8-12 weeks depend on raw materials used. In reasonably mature compost contains a wide range of particle sizes from fine grains to partly decomposed twigs and un-compostable fragments from refuse. Therefore, compost may need sieving by 4mm sieve before sending to the market. Mature compost should have a crumbly texture, an earthy smell and be dark brown or black in colour.

Compost has high market share in a growing market. Produced compost in the cluster has the option to sell directly to the end users such as cluster farmers and other farmers in the area. The government's stance on promoting local, organic fertiliser is a favourable signal for businesses venturing into the industry. Since, organic fertiliser is a major requirement for high productivity of crops and can be considered an essential product. Disposal of banana waste is a major challenge for many banana farmers, due to the costs and logistics involved; with almost all farmers just dumping it inside their farms. Inefficient disposal of crop waste and other waste materials has a severe impact on the crop and the environment. Hence, production of compost using waste materials can mitigate the disposal problem as well to obtain useful organic fertilisers for crop production. In addition, this will be an additional venture for FPOs and cluster farmers.

9. Management of compost production unit

a. Approvals

Before initiating the compost facility, the person or FPO shall obtain the approval from relevant authorities of the area. A number of regulatory regimes come into play prior to initiate compost production.

b. Manage composting

Managing the composting process involves the balancing of a number of different variables, all of which impact on the others. These interactions therefore need to be managed. Operators need to encourage the right conditions to aid microbial growth and activity. A careful balance of these variables results in a quality product, in minimum time, and considerably reduces the potential environmental impacts from the composting activity.

c. Compost quality

Quality Management systems play a fundamental part in good processing and product. Hence, person or FPO responsible for compost production in clusters shall produce compost that meets the standards established by Sri Lanka Standards Institution in 2019. In this regard, regular testing of compost samples should be undertaken.

d. Record keeping

The person or FPO responsible to establish and maintain an operating record for the compost facility. Records are needed in relation to: waste acceptance and disposal, validation and on-going assessment of process monitoring and sample testing, traceability, environmental monitoring and dispatched material.

10. Marketing

The marketing strategy has to be prepared to market the compost in various market segments such as farmers, nurseries, institutions, home garden etc. The strategy includes product design, pricing, distribution and promotional strategies. The strategy will be used to market compost in order to ensure that activity is sustainable.

Overall, this activity has the success in demonstrating the application of composting technology to process the market waste. Both technical and financial feasibility of the application of this technology on a large scale will be demonstrated. Since, compost has high demand in many crop sectors it indicates that the production can be done in a sustainable manner which has additional advantages for the community.

The compost marketing and distribution system in Sri Lanka is a free enterprise mainly in the hands of the private sector. The present marketing channels through, which compost flow from the producer to the farmers and end users throughout the country consist of three main levels of handlers namely: Producers, Distributors and Dealers/ Retailers.

Establishing a price for a product is one of the most important marketing decisions. In a developing market or in a competitive market pricing is an important element in a marketing strategy. The pricing system should cover the cost of the product and the cost of marketing the product. However, it should be noted that price and quality of compost in local market is vary drastically. The sales promotion and market development activities should be done to stimulate demand and thus increase sales of the product. In marketing terms, compost has to compete with the chemical fertilisers in an effort to grab a part of the latter's market. Therefore, promotional activities should be done to show the importance of usage of organic fertiliser in combination with chemical fertilisers as basal dose for annual crops and for perennial crops basal as well as for top dressings.

The means of promoting the sales of organic fertilisers include the followings:

- Training farmers, extension officers, traders and other relevant target groups
- Field demonstrations, field days, field tours etc.
- Outdoor advertising / Billboards
- Use mass media for various promotional activities
- Poster displays in strategic places
- Distribution of samples for trial use
- Granting of promotional discounts on purchases
- Arrange credit facilities

11. Environmental impact

The unit will be established to minimise the environmental impact. In order to reduce the environmental impact, measures will be taken to minimise odour, dust, leachate etc. Breakdown of organic matter by aerobic oxidation produces no odours. It is important therefore, to supply sufficient air during the composting process. Another important aspect of some of the materials that can be used in composting is their attractiveness of flies. To avoid the problem, the

suggestion is to maintain higher temperature. Fly larvae are unlikely to survive if temperature is above 55^0C. In addition, by turning the heap and placing the outer material in the hot central region many of the larvae will be destroyed; satisfactory fly control is possible by proper turning. Similarly, maintain the high temperature is the most significant factor in causing the death of pathogens too. In addition, steps should be taken to avoid release of leachate to the environment by avoiding excess water use, construction a place to collect leachate and reuse for compost production etc. As a further safety measures, it is recommended that no compost unit be set up close to drinking water source. This should prevent any liquid percolating from the compost heap into the water supply, particularly during the rainy season.

ANNEXURE 6: WRB HYDROLOGICAL REPORT

WATER RESOURCES BOARD

MINISTRY OF WATER SUPPLY

HYDROGEOLOGICAL AND GEOPHYSICAL INVESTIGATIONS AT MALAYARKATTU CLUSTER, VELLAWELI DIVISIONAL SECTRATERIEAT AREA, BATTICALOA

(PM/E/BAT/2022/02)

May 2022

WATER RESOURCES BOARD
PROVINCIAL OFFICE (NC/C),
KORAKAHAWEWA,
ANURADHAPURA

Tel	**: 025 2053005**
Fax	**: 025 2053005**
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HYDROGEOLOGICAL AND GEOPHYSICAL INVESTIGATIONS AT MALAYARKATTU CLUSTER

1. Introduction

Provincial Project Management Unit in Eastern Province of Ministry of Agriculture is implementing agriculture activities under Agriculture Modernization Project at Malayarkattu cluster for the identified potentiality of crop Cavendish Banana. In this regard, management of the project has decided to construct 35 nos common Agro-wells to obtain water for Cavendish Banana crops cultivation ad proposal of the project has mentioned that the each well should cater for 3-4 famers to 0.5 acres/ famer.

It is therefore R.Gnnachelvam, Provincial Deputy Project Director, Agriculture Sector Modernization Project, Eastern Province, Batticaloa was request from Water Resources Board to conduct detailed hydrogeological and geophysical investigations for select 35 agro wells at selected lands in Malayarkattu.

Detailed hydrogeological and geophysical investigations were carried out on 25th to 29th April 2022, 18 & 19 May 2022 to identify the availability and potential of groundwater for construct 35 Agro wells at Malayarkattu.

Figure 1: Investigated Site on Google Earth

2. Study area

The Studied area is located at Batticaloa District in Eastern Province. Locally it is belongs to Vellavely DSD area. Figure 2 is showing the general land use pattern of the area. According to the map and field observations, it is noted some investigated lands are used for cultivation purpose and some lands are abandoned lands. Less population density can be observed in this area due to paddy cultivation is the major income path of this area. Due to this, most of the lands are utilized for paddy cultivations and settlements are located away from the project area.

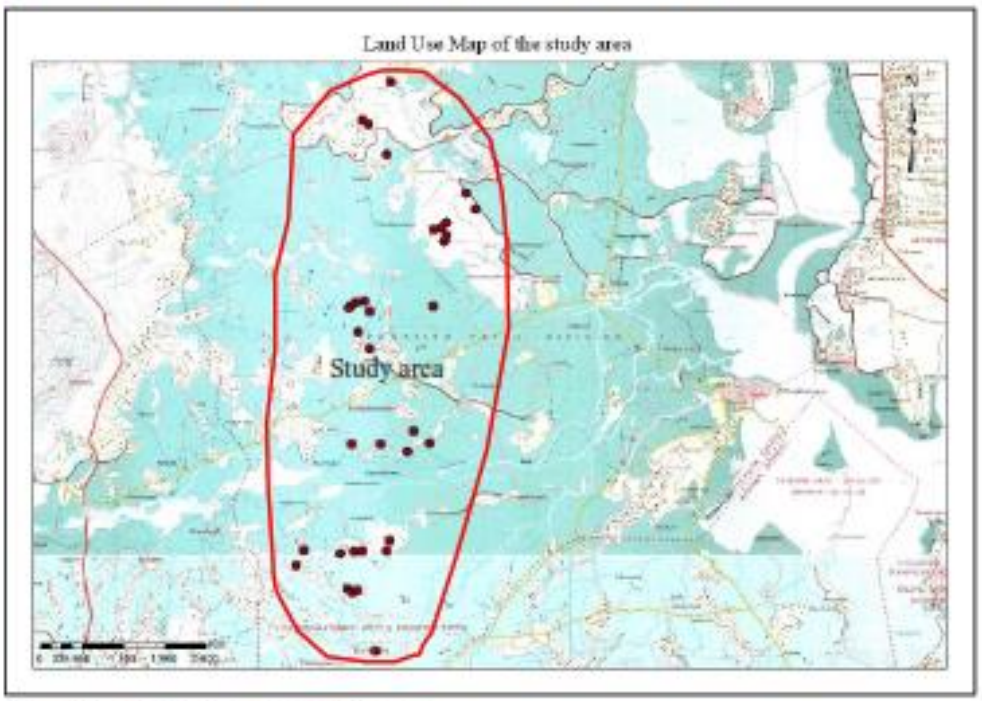

Figure 2: Land Use Map of the study area

Some investigated lands are located near to the forest areas and some lands are located near to the paddy fields. Vellavely DS area is located in around 6 Km away from the lagoon area. It is therefore, influence of lagoonal water to groundwater of the area is not significant.

3. Geomorphology, Geology and Hydrogeology

Geomorphologicaly, the site is located at nearly flat area and covered with light brown sandy soil. Geologicaly, the area is belonging to Vijayan Complex of Sri Lanka and major rock type is Granite gneiss.

According to the Geology map of the study area, this investigated area covered by three rock types as Hornblende Biotite gneiss and Biotite gneiss minoritized by Granitic Gneiss basement rock.

Some rock outcrops are identified during the field visit of the project area instead of the literature surveys. Overburden thickness of the area is ranging between 5.00m to 15.00m. Major River basin of the area is Andella Oya and all hydrological and hydrogeological setup is based on the main river and precipitation of the area. Measured insitu Electrical Conductivity(EC) parameter of shallow aquifer of the study area is within SLS portable water standards. EC of the water in those wells are recorded below 700 µs/cm. Geological setup of the study and surrounding area shown by Figure 3.

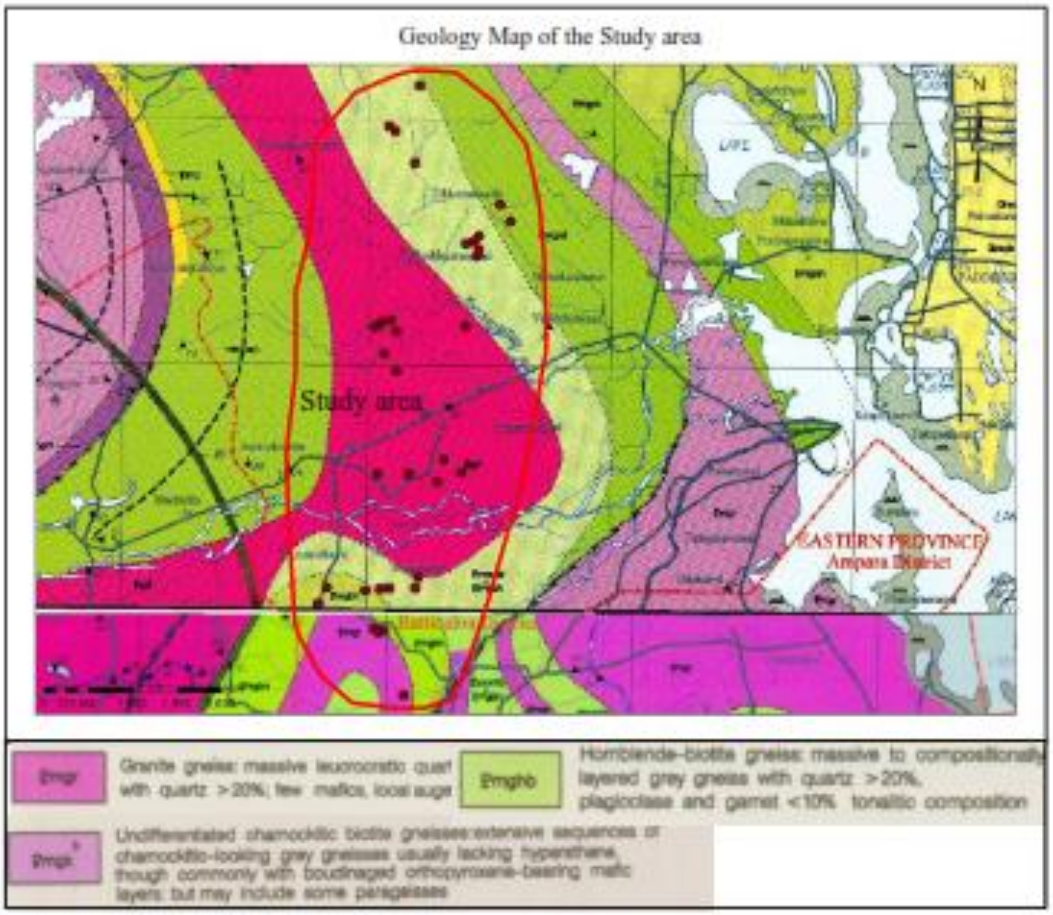

Figure 3: Geology Map of the study area

This area is belonging to low country dry zone according to the Agro – Ecological regions of Sri Lanka. Annual rainfall of the area is around 1664 mm and maximum precipitation occurred in month of December and lowest in month of June. Figure 4 is illustrating the annual rainfall pattern of the area.

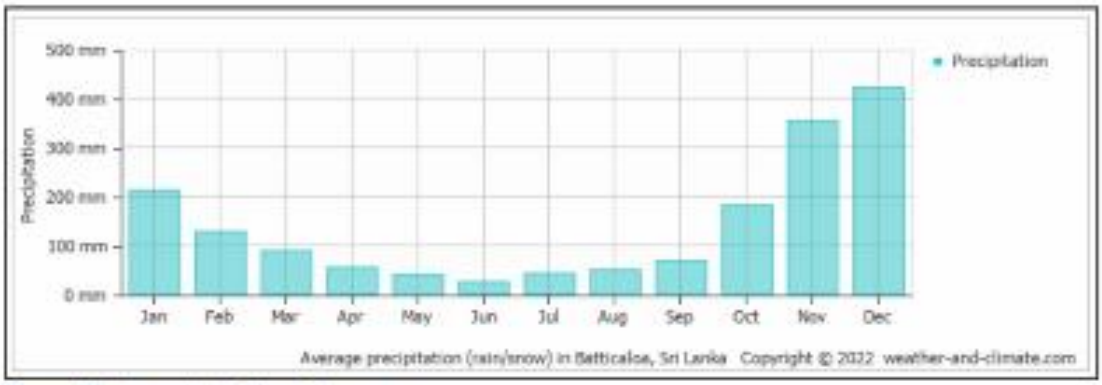

Figure 04: Annual rainfall of the area

4. Methodology

Prior to carry out the field investigations a preliminary desk study was conducted using available topographical, geological and geo-structural maps and previous data to review in order to obtain baseline information on the hydrogeology of the study area.

The resistivity method is one of the most important survey techniques on the ground water exploration activities that have been applied to carry out the geophysical survey. The aim of the geophysical survey was to determine the sub surface conditions including structural weak zones, thickness of soil overburden, weathered rock and to observe changes in the quality of groundwater with depths. The instrument called "Terra meter" is used to obtain the apparent resistivity values of the sub surface formation according to "**Schlumberger**" electronic configuration and carry out several numbers of moderately deep geo electrical vertical resistivity sounding to cover the study area.

Figure 05: Conducting hydrogeological investigation

5. Results, Conclusions and Recommendations

Based on the investigations, it has been revealed that the overburden thickness of the study area is ranging from 6.00 – 15.00 meters below ground level. After that hard rock is encounting with moderate fracture intensity.

According to the hydrogeological and geophysical investigations, 23 locations were selected out of 35 numbers of sites as most favorable sits for dug well construction. This area is located within dry zone of Sri Lanka. It is therefore, most of the dug wells are dried up during the dry spell of the area (April to September). In this setup, moderately favorable 7 numbers of locations were selected. These locations are not guaranteed for dry period of the area and those wells will be dried up or water level of proposed wells will be depleted in significant level. 5 numbers of sites were rejected because of overburden thickness of these lands are less than 5.00 m and those are not favorable for construct large diameter agro wells to fulfill water requirement of agricultural lands.

All technical details of the agro wells are attached in the appendix 01 and selected locations are show in the appendix 02.

Summary of the investigated locations are in table 2 and details are as follows.

Table 2: Summary of the investigated locations.

No	Location		Coordinates	Description
01	Paalayadivattai GN Division (99B)	Mr. Pathmanathan	7.5003343, 81.685214	Suitable for well construction
02		Mr. Paakiyarasa	7.5025672, 81.684234	Suitable for well construction
03		Mr. Visvalingam	7.502463, 81.68220	**Not Suitable for well construction**
04		Mr. Kaneshapillai	7.501472, 81.68144	**Not Suitable for well construction**
05		Mr. Poopalapillai	7.501062, 81.68109	Suitable for well construction
06		Mr. Nadarasa	7.493089, 81.685164	Suitable for well construction
07		Mrs. Kosalathewi	7.496360, 81.68308	Suitable for well construction
08		Mrs.Santhiramathi	7.515412, 81.70050	Suitable for well construction
09		Mrs.Santhanapillai	7.517038, 81.69960	Suitable for well construction
10		Mrs.Renuka	7.514308, 81.70027	Suitable for well construction

11	Thikkodai GN Division (106A)	Mr.Maanikkavaasakam	7.516636, 81.69823	Suitable for well construction
12		Mr.Nacsan barath	7.514252, 80.69792	Suitable for well construction
13		Mr.Sathiyaraj	7.518002, 81.70055	Suitable for well construction
14		Mr.Sathiyamoorthi	7.531593, 81.68881	**Not Suitable for well construction**
15		Mr.Thaiventhiran	7.523627, 81.70391	**Not Suitable for well construction**
16		Mr.Guvaalingam	7.520780, 81.70634	**Not Suitable for well construction**
17	Villanthottam GN Division (99D)	Mr. Krishnapillai kopalapillai	7.474261, 81.69715	Suitable for well construction
18		Mrs. Veerasingam keetha	7.472425, 81.69275	Suitable for well construction
19		Mrs.Ambika	7.474029, 81.68749	Suitable for well construction
20		Mr.Paranthaaman	7.476552, 81.69394	Suitable for well construction
21		Mr.Aanantham	7.474122, 81.68159	Suitable for well construction
22	Vammiyadiyoothu GN Division(107C)	Mr.Sivajaanam	7.452742, 81.68383	Suitable for well construction
23		Mr.Thavajaanasuntharam	7.538435, 81.68399	Suitable for well construction
24		Mr.Thiyaharaja	7.537695, 81.68519	Suitable for well construction
25	Sinnawattai GN Division (99C)	Mr.Suventhiran	7.454876, 81.68912	Suitable for well construction
26		Mr.Jeevaharan	7.445445, 81.68044	Suitable for well construction
27		Mr.Punniyamoorthi	7.452281, 81.67930	Suitable for well construction
28		Mrs.Maalini	7.452989, 81.67212	Suitable for well construction
29		Mr.Senaradna Bandara	7.449967, 81.67059	Suitable for well construction
30		Mr.Jesuthan	7.452872, 81.68859	Suitable for well construction
31		Mr.Sasikumar	7.452614, 81.68198	Suitable for well construction
32		Mr.Prabaharan	7.445317, 81.68081	Suitable for well construction

33	Maalayarkadu GN Division (99E)	Mr.Poopalapillai	7.444574, 81.68173	Suitable for well construction
34		Mr.Meharasa	7.444977, 81.68279	Suitable for well construction
35		Mrs.Jaanammah	7.432872, 81.68625	Suitable for well construction

Once the completion of well constructions, wells should be utilized under conditions given by the special gazette number 2010/23 accordingly published by Water Resources Board act number 29th of 1964. In this context, it should be conduct detailed pumping test program in order to evaluate safe extraction limits of wells.

Since it is not able to assure the water quality before construct the wells, the quality of water should be analyzed after the completion of wells in order to determine the suitability for drinking or required purposes.

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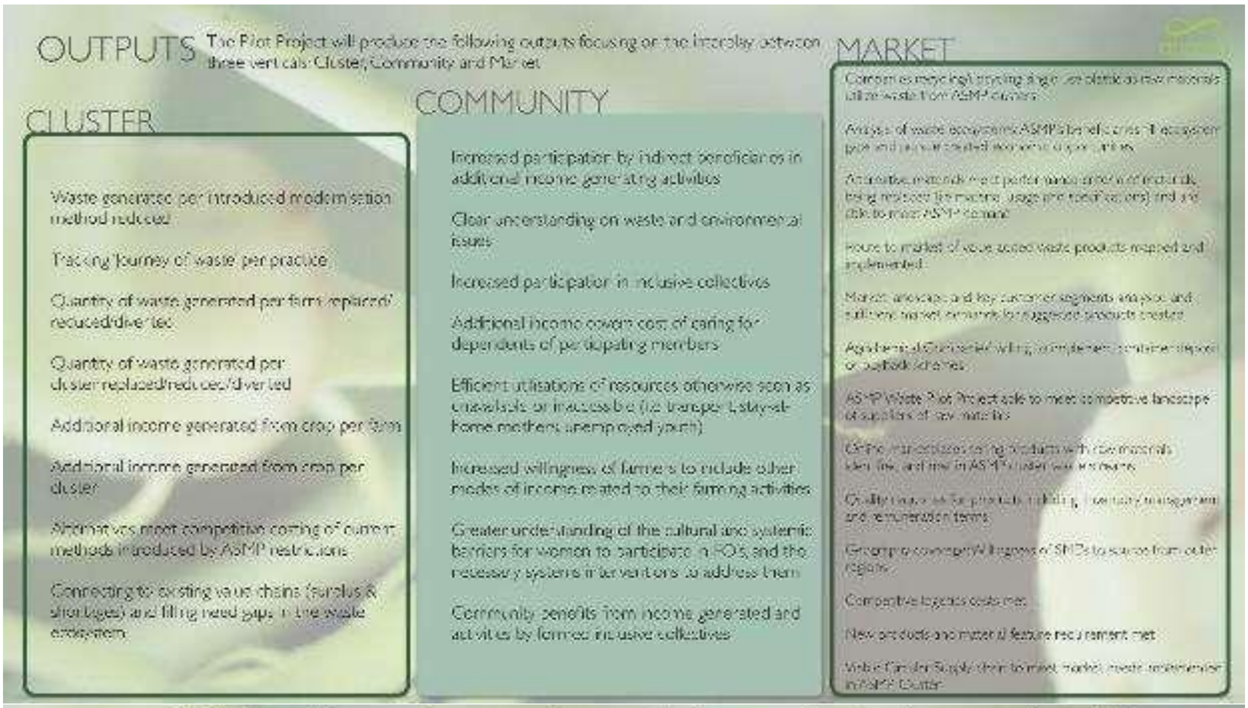
L.J.M.U.S.K.Jayasundara
Hydrogeologist,
16.06.2022

ANNEXURE 7: CONCEPT NOTE OF WASTE MINIMISATION, INCOME GENERATION AND EMPOWERMENT

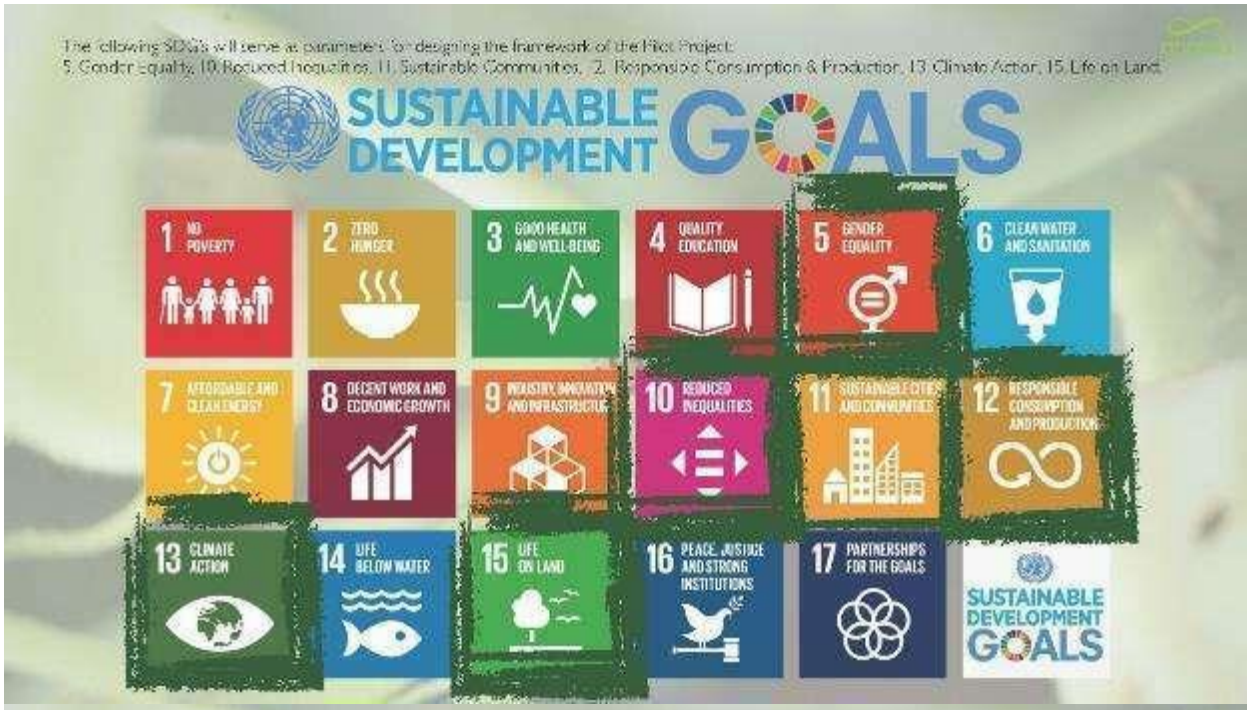

INTRODUCTION

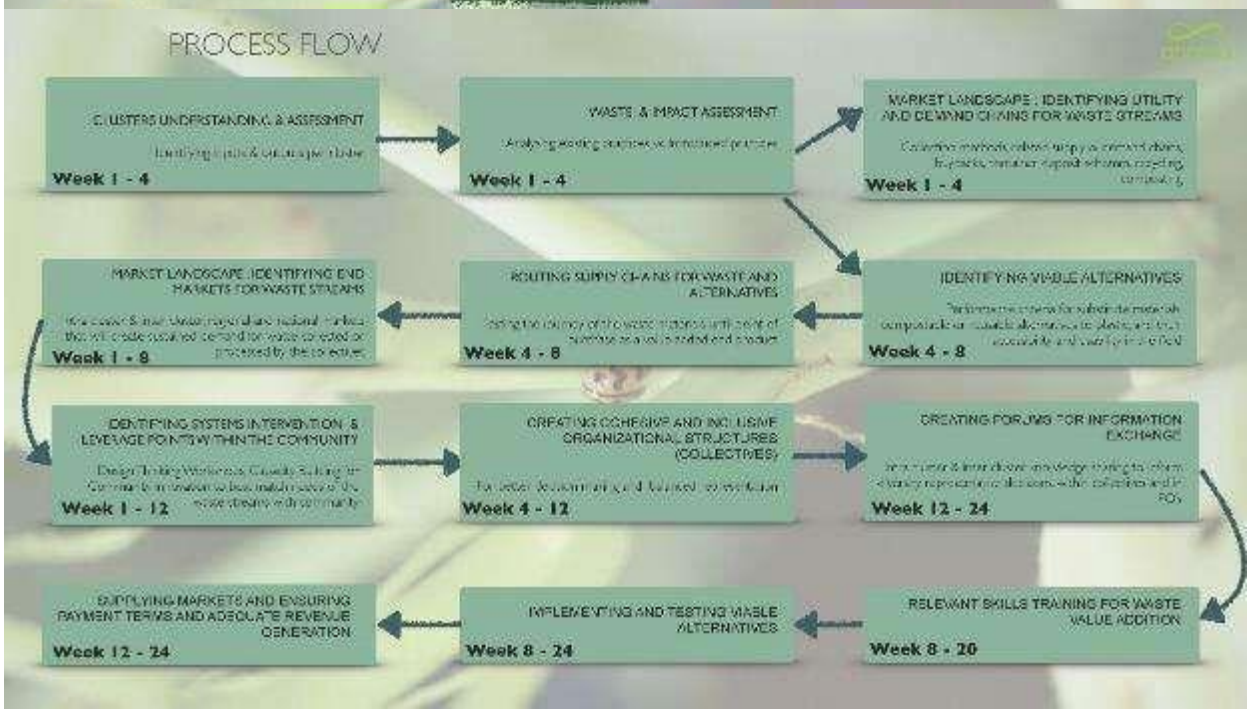

The Pilot project will address the following for introduced ASMP techniques in Guava and Banana Clusters in Anuradhapura North Central Province
OBJECTIVES
1. Reduce Plastic and Hazardous Waste Generated
&
2. Value Addition for Farm By-products
Sourcing Alternative Materials
Income Generation through Circular Supply Chains
Women & Youth Empowerment

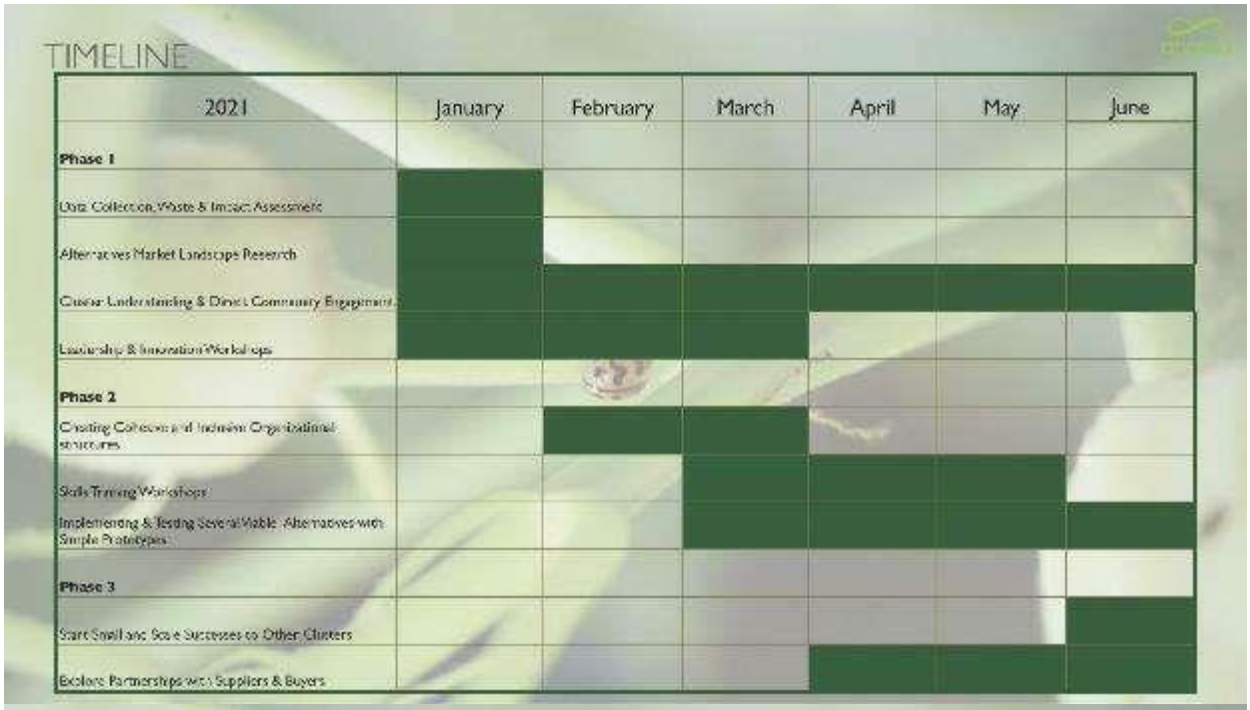

OUTPUTS The Pilot Project will produce the following outputs focusing on the interplay between three verticals: Cluster, Community and Market
CLUSTER
Waste generated per introduced modernisation method reduced
Tracking journey of waste per practice
Quantity of waste generated per farm replaced/ reduced/diverted
Quantity of waste generated per cluster replaced/reduced/diverted
Additional income generated from crop per farm
Additional income generated from crop per cluster
Alternatives meet competitive costing of current methods introduced by ASMP restrictions
Connecting to existing value chains (surplus & shortages) and filling need gaps in the waste ecosystem
COMMUNITY
Increased participation by indirect beneficiaries in additional income generating activities
Clear understanding on waste and environmental issues
Increased participation in inclusive collectives
Additional income covers cost of caring for dependents of participating members
Efficient utilisations of resources otherwise seen as unavailable or inaccessible (i.e transport, stay-at-home mothers, unemployed youth)
Increased willingness of farmers to include other modes of income related to their farming activities
Greater understanding of the cultural and systemic barriers for women to participate in FO's and the necessary systems interventions to address them
Community benefits from income generated and activities by formed inclusive collectives
MARKET
Companies recycling/ recycling single use plastic as raw materials utilize waste from ASMP clusters
Alternative materials meet performance criteria of materials being replaced (ie machine usage and specifications) and are able to meet ASMP demand
Route to market of value added waste products mapped and implemented
Market landscape and key customer segments analysis and sufficient market demands for suggested products created
Agrochemical Companies willing to implement container deposit or buyback schemes
ASMP Waste Pilot Project able to meet competitive landscape of suppliers of raw materials
Quality requirements for products including inventory management and remuneration terms
Geographic coverage/Willingness of SMEs to source from outer regions
Competitive logistics costs met
New products and material feature requirement met
Viable Circular Supply chain to meet market needs implemented in ASMP Cluster


INPUTS The Pilot Project will demonstrate income generating opportunities from waste and farm by-products generated by the ASMP and develop an implementation plan to create circular supply chains and increase self-employment of women and youth within the clusters.
ALTERNATIVE MATERIALS
Introduce low-cost, local, scalable alternative materials to replace proposed single use plastic technologies
Implementing circular supply chains to reduce waste streams
Reversing degradation and depletion of natural environment (i.e soil and water) by transitioning to materials that are regenerative i.e compostability
Providing skills training to women to produce alternative products from within clusters (intra cluster) and regionally (inter cluster)
Raising awareness among farmers and community about plastic pollution and the benefits of environmental stewardship
INCOME GENERATION THROUGH EXISTING SUPPLY CHAINS FOR EMPOWERED COMMUNITY ECONOMIES
Introducing additional revenue streams through existing supply chains i.e collection for recycling or compostability, buyback schemes, deposit schemes, banana fiber end products etc.
Increasing women's participation, representation, decision making in FO's to tap into unutilised potential of community members by introducing additional revenue
Addressing underrepresentation of demographics involved in FO's (i.e women and youth) in Collectives with inverse demographic ratios
Defining highly productive, functional management structures within collectives for shared ownership (horizontal ownership and management structures)
Improving critical thinking skills and design capabilities through Workshops equipping them to discern inadequate methods, conceptualize and implement solution-oriented ideas

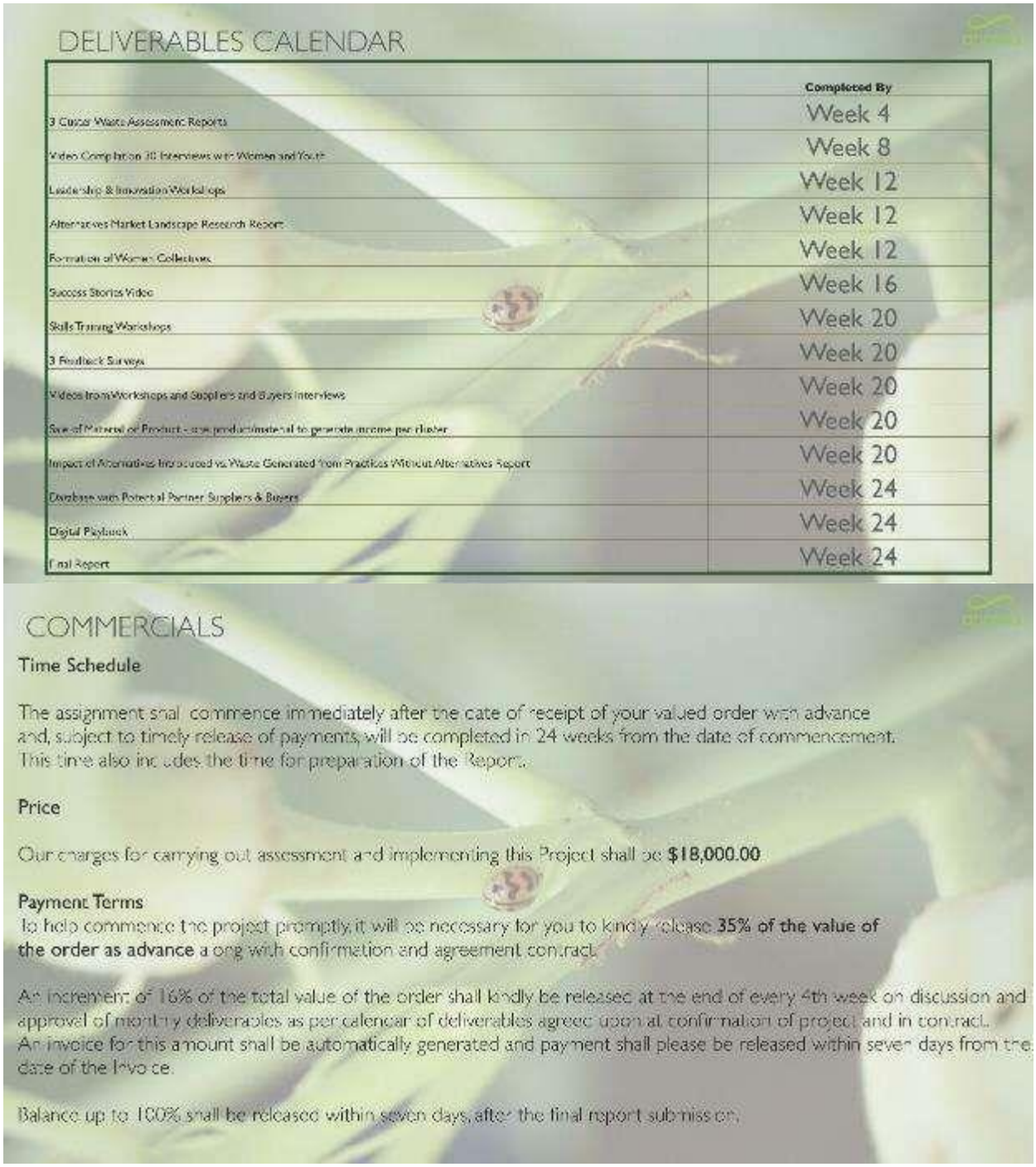

APPROACH
SYSTEMS APPROACH | Making supply chains more responsible, efficient and sustainable, by analysing social and environmental relationships and interactions to enable effective overall outcomes for the system as a whole.
Traditional approaches focus on outcomes of a supply chain in isolated parts. This can lead to outcomes that deplete the value and integrity of the whole supply network. Our approach aims to break down supply chains and their waste streams in order to holistically design, manage and integrate effective parts in a whole functioning system which will protect the natural environment and enhance the social bonds within a community.
HARNESSING EXISTING SUPPLY CHAINS | To establish income generation projects for women and youth, we will connect them to existing supply chains and create a more resource efficient economy
The development of new products and entry into new markets can be resource intensive. Alternatively, we will explore potential partnerships with existing SME's to promote and develop products based on their extensive market experience and data.
DESIGN THINKING | To empower the local community to understand their wants, needs and constraints, we will provide them with frameworks for creative problem solving with design thinking methodologies.
Local community members often best understand the situation on the ground. Providing frameworks for analyzing the root causes of the problems, rather than the symptoms, enables members of the collective to understand for themselves how best to address the problems and embed the solutions.
APPROACH
LEADERSHIP FOR INNOVATION | To create a sense of agency that enables creative problem seeking and solving, we will organize leadership workshops and trainings targeted at women and youth that will drive innovation with available resources, consensus building and crowdsourcing solutions.
This will include creative visual techniques such as storytelling, theatre and video. This will facilitate innovating with the community, not for the community.
COMMUNITY BUILDING | To build more knowledgeable, skilled and connected communities, we will work with stakeholders to design and implement centrally guided, locally led organizational structures.
The collectives aim to facilitate communication, build trust, enhance transparency in decision making, and promote collaboration across supply networks both inter and intra-clusters. Community participation methods empower people to creatively develop skills and strengthen ties through collective activities for public works.


The following SDGs will serve as parameters for designing the framework of the Pilot Project:
5. Gender Equality, 10.Reduced Inequalities, 11. Sustainable Communities, 12. Responsible Consumption & Production, 13.Climate Action, 15.Life on Land
SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS


PROCESS FLOW
CLUSTERS UNDERSTANDING & ASSESSMENT
Week 1 - 4
WASTE & IMPACT ASSESSMENT
Week 1 - 4
MARKET LANDSCAPE : IDENTIFYING UTILITY AND DEMAND CHAINS FOR WASTE STREAMS
Week 1 - 4
IDENTIFYING VIABLE ALTERNATIVES
Week 4 - 8
ROUTING SUPPLY CHAINS FOR WASTE AND ALTERNATIVES
Week 4 - 8
MARKET LANDSCAPE: IDENTIFYING END MARKETS FOR WASTE STREAMS
Week 1 - 8
IDENTIFYING SYSTEMS INTERVENTION & LEVERAGE POINTS WITHIN THE COMMUNITY
Week 1 - 12
CREATING COHESIVE AND INCLUSIVE ORGANIZATIONAL STRUCTURES (COLLECTIVES)
Week 4 - 12
CREATING FORUMS FOR INFORMATION EXCHANGE
Week 12 - 24
RELEVANT SKILLS TRAINING FOR WASTE VALUE ADDITION
Week 8 - 20
IMPLEMENTING AND TESTING VIABLE ALTERNATIVES
Week 8 - 24
SUPPLYING MARKETS AND ENSURING PAYMENT TERMS AND ADEQUATE REVENUE GENERATION
Week 12 - 24


TIMELINE
2021
January
February
March
April
May
June
Phase 1
Data Collection, Waste & Impact Assessment
Alternatives Market Landscape Research
Cluster Understanding & Direct Community Engagement
Leadership & Innovation Workshops
Phase 2
Creating Cohesive and Inclusive Organizational structures
Skills Training Workshops
Implementing & Testing Several Viable Alternatives with Simple Prototypes
Phase 3
Start Small and Scale Successes to Other Clusters
Explore Partnerships with Suppliers & Buyers


DELIVERABLES
ALTERNATIVES
Report: 3 Cluster Waste Assessment Reports
Report: Proposed alternative materials/waste solution per implementation method including life cycle and supply chain
Video: Success stories in the region for implementation of alternatives
Database: End markets and potential partners
Sourcing: Connecting farmers with sufficient supply of alternative materials
Report: Impact of alternatives introduced vs. waste generated from practices without alternatives
EMPOWERMENT
Workshops: Leadership and Innovation 6x3 hr
Workshops: Skills training workshops 6 per cluster by SME partners/specialists according to market needs
Videos: 3 (one per cluster) on Innovation and Leadership made with workshop participants
Organization: Formation of collectives per cluster with inclusive ownership models
Video: 30 interviews conducted with women and youth
Feedback Surveys: 3 conducted to assess community engagement
Digital Playbook: Guidelines on workshops and qualitative and quantitative results to be replicated in other clusters
INCOME
Report: Market landscape
Report: Buyers per cluster to purchase waste collected including price and KG's
Proof of Market Entry: one product/material to generate income per cluster
Payment Confirmation: for KG's collected and bought
Video: supplier and buyers interviews on implemented supply chain
Final Report



DELIVERABLES CALENDAR

	Completed By
3 Cluster Waste Assessment Reports	Week 4
Video Compilation 30 Interviews with Women and Youth	Week 8
Leadership & Innovation Workshops	Week 12
Alternatives Market Landscape Research Report	Week 12
Formation of Women Collectives	Week 12
Success Stories Video	Week 16
Skills Training Workshops	Week 20
3 Feedback Surveys	Week 20
Videos from Workshops and Suppliers and Buyers Interviews	Week 20
Sale of Material or Product - use product/material to generate income per cluster	Week 20
Impact of Alternatives Introduced vs. Waste Generated from Practices Without Alternatives Report	Week 20
Database with Potential Partner Suppliers & Buyers	Week 24
Digital Playbook	Week 24
Final Report	Week 24

COMMERCIALS

Time Schedule

The assignment shall commence immediately after the date of receipt of your valued order with advance and, subject to timely release of payments, will be completed in 24 weeks from the date of commencement. This time also includes the time for preparation of the Report.

Price

Our charges for carrying out assessment and implementing this Project shall be **$18,000.00**

Payment Terms

To help commence the project promptly, it will be necessary for you to kindly release **35% of the value of the order as advance** along with confirmation and agreement contract.

An increment of 16% of the total value of the order shall kindly be released at the end of every 4th week on discussion and approval of monthly deliverables as per calendar of deliverables agreed upon at confirmation of project and in contract. An invoice for this amount shall be automatically generated and payment shall please be released within seven days from the date of the Invoice.

Balance up to 100% shall be released within seven days, after the final report submission.

ANNEXURE 8: INTERIM GUIDELINES ON COVID-19 OF WORLD BANK

ESF/SAFEGUARDS INTERIM NOTE: COVID-19 CONSIDERATIONS IN CONSTRUCTION/CIVIL WORKS PROJECTS

This note was issued on April 7, 2020 and includes links to the latest guidance as of this date (e.g. from WHO). Given the COVID-19 situation is rapidly evolving, when using this note it is important to check whether any updates to these external resources have been issued.

1. INTRODUCTION

The COVID-19 pandemic presents Governments with unprecedented challenges. Addressing COVID-19 related issues in both existing and new operations starts with recognizing that this is not business as usual and that circumstances require a highly adaptive responsive management design to avoid, minimize and manage what may be a rapidly evolving situation. In many cases, we will ask Borrowers to use reasonable efforts in the circumstances, recognizing that what may be possible today may be different next week (both positively, because more supplies and guidance may be available, and negatively, because the spread of the virus may have accelerated).

This interim note is intended to provide guidance to teams on how to support Borrowers in addressing key issues associated with COVID-19, and consolidates the advice that has already been provided over the past month. As such, it should be used in place of other guidance that has been provided to date. This note will be developed as the global situation and the Bank's learning (and that of others) develops. This is not a time when 'one size fits all'. More than ever, teams will need to work with Borrowers and projects to understand the activities being carried out and the risks that these activities may entail. Support will be needed in designing mitigation measures that are implementable in the context of the project. These measures will need to take into account capacity of the Government agencies, availability of supplies and the practical challenges of operations on-the-ground, including stakeholder engagement, supervision and monitoring. In many circumstances, communication itself may be challenging, where face-to-face meetings are restricted or prohibited, and where IT solutions are limited or unreliable.

This note emphasizes the importance of careful scenario planning, clear procedures and protocols, management systems, effective communication and coordination, and the need for high levels of responsiveness in a changing environment. It recommends assessing the current situation of the project, putting in place mitigation measures to avoid or minimize the chance of infection, and planning what to do if either project workers become infected or the work force includes workers from proximate communities affected by COVID-19. In many projects, measures to avoid or minimize will need to be implemented at the same time as dealing with sick workers and relations with the community, some of whom may also be ill or concerned about infection. Borrowers should understand the obligations that contractors have under their existing contracts (see Section 3), require contractors to put in place appropriate organizational structures (see Section 4) and develop procedures to address different aspects of COVID-19 (see Section 5).

2. CHALLENGES WITH CONSTRUCTION/CIVIL WORKS

Projects involving construction/civil works frequently involve a large work force, together with suppliers and supporting functions and services. The work force may comprise workers from international, national, regional, and local labor markets. They may need to live in on-site accommodation, lodge within communities close to work sites or return to their homes after work. There may be different contractors

permanently present on site, carrying out different activities, each with their own dedicated workers. Supply chains may involve international, regional and national suppliers facilitating the regular flow of goods and services to the project (including supplies essential to the project such as fuel, food, and water). As such there will also be regular flow of parties entering and exiting the site; support services, such as catering, cleaning services, equipment, material and supply deliveries, and specialist sub-contractors, brought in to deliver specific elements of the works.

Given the complexity and the concentrated number of workers, the potential for the spread of infectious disease in projects involving construction is extremely serious, as are the implications of such a spread. Projects may experience large numbers of the work force becoming ill, which will strain the project's health facilities, have implications for local emergency and health services and may jeopardize the progress of the construction work and the schedule of the project. Such impacts will be exacerbated where a work force is large and/or the project is in remote or under-serviced areas. In such circumstances, relationships with the community can be strained or difficult and conflict can arise, particularly if people feel they are being exposed to disease by the project or are having to compete for scarce resources. The project must also exercise appropriate precautions against introducing the infection to local communities.

3. DOES THE CONSTRUCTION CONTRACT COVER THIS SITUATION?

Given the unprecedented nature of the COVID-19 pandemic, it is unlikely that the existing construction/civil works contracts will cover all the things that a prudent contractor will need to do. Nevertheless, the first place for a Borrower to start is with the contract, determining what a contractor's existing obligations are, and how these relate to the current situation.

The obligations on health and safety will depend on what kind of contract exists (between the Borrower and the main contractor; between the main contractors and the sub-contractors). It will differ if the Borrower used the World Bank's standard procurement documents (SPDs) or used national bidding documents. If a FIDIC document has been used, there will be general provisions relating to health and safety. For example, the standard FIDIC, Conditions of Contract for Construction (Second Edition 2017), which contains no 'ESF enhancements', states (in the General Conditions, clause 6.7) that the Contractor will be required:

- to take all necessary precautions to maintain the health and safety of the Contractor's Personnel
- to appoint a health and safety officer at site, who will have the authority to issue directives for the purpose of maintaining the health and safety of all personnel authorized to enter and or work on the site and to take protective measures to prevent accidents
- to ensure, in collaboration with local health authorities, that medical staff, first aid facilities, sick bay, ambulance services and any other medical services specified are available at all times at the site and at any accommodation
- to ensure suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics

These requirements have been enhanced through the introduction of the ESF into the SPDs (edition dated July 2019). The general FIDIC clause referred to above has been strengthened to reflect the requirements of the ESF. Beyond FIDIC's general requirements discussed above, the Bank's Particular Conditions include a number of relevant requirements on the Contractor, including:

- to provide health and safety training for Contractor's Personnel (which include project workers and all personnel that the Contractor uses on site, including staff and other employees of the Contractor and Subcontractors and any other personnel assisting the Contractor in carrying out project activities)
- to put in place workplace processes for Contractor's Personnel to report work situations that are not safe or healthy
- gives Contractor's Personnel the right to report work situations which they believe are not safe or healthy, and to remove themselves from a work situation which they have a reasonable justification to believe presents an imminent and serious danger to their life or health (with no reprisal for reporting or removing themselves)
- requires measures to be in place to avoid or minimize the spread of diseases including measures to avoid or minimize the transmission of communicable diseases that may be associated with the influx of temporary or permanent contract-related labor
- to provide an easily accessible grievance mechanism to raise workplace concerns

Where the contract form used is FIDIC, the Borrower (as the Employer) will be represented by the Engineer (also referred to in this note as the Supervising Engineer). The Engineer will be authorized to exercise authority specified in or necessarily implied from the construction contract. In such cases, the Engineer (through its staff on site) will be the interface between the PIU and the Contractor. It is important therefore to understand the scope of the Engineer's responsibilities. It is also important to recognize that in the case of infectious diseases such as COVID-19, project management – through the Contractor/subcontractor hierarchy – is only as effective as the weakest link. A thorough review of management procedures/plans as they will be implemented through the entire contractor hierarchy is important. Existing contracts provide the outline of this structure; they form the basis for the Borrower to understand how proposed mitigation measures will be designed and how adaptive management will be implemented, and to start a conversation with the Contractor on measures to address COVID-19 in the project.

4. WHAT PLANNING SHOULD THE BORROWER BE DOING?

Task teams should work with Borrowers (PIUs) to confirm that projects (i) are taking adequate precautions to prevent or minimize an outbreak of COVID-19, and (ii) have identified what to do in the event of an outbreak. Suggestions on how to do this are set out below:

- The PIU, either directly or through the Supervising Engineer, should request details in writing from the main Contractor of the measures being taken to address the risks. As stated in Section 3, the construction contract should include health and safety requirements, and these can be used as the basis for identification of, and requirements to implement, COVID-19 specific measures. The measures may be presented as a contingency plan, as an extension of the existing project emergency and preparedness plan or as standalone procedures. The measures may be reflected in revisions to the project's health and safety manual. This request should be made in writing (following any relevant procedure set out in the contract between the Borrower and the contractor).

- In making the request, it may be helpful for the PIU to specify the areas that should be covered. This should include the items set out in Section 5 below and take into account current and relevant

guidance provided by national authorities, WHO and other organizations. See the list of references in the Annex to this note.

- The PIU should require the Contractor to convene regular meetings with the project health and safety specialists and medical staff (and where appropriate the local health authorities), and to take their advice in designing and implementing the agreed measures.

- Where possible, a senior person should be identified as a focal point to deal with COVID-19 issues. This can be a work supervisor or a health and safety specialist. This person can be responsible for coordinating preparation of the site and making sure that the measures taken are communicated to the workers, those entering the site and the local community. It is also advisable to designate at least one back-up person, in case the focal point becomes ill; that person should be aware of the arrangements that are in place.

- On sites where there are a number of contractors and therefore (in effect) different work forces, the request should emphasize the importance of coordination and communication between the different parties. Where necessary, the PIU should request the main contractor to put in place a protocol for regular meetings of the different contractors, requiring each to appoint a designated staff member (with back up) to attend such meetings. If meetings cannot be held in person, they should be conducted using whatever IT is available. The effectiveness of mitigation measures will depend on the weakest implementation, and therefore it is important that all contractors and sub-contractors understand the risks and the procedure to be followed.

- The PIU, either directly or through the Supervising Engineer, may provide support to projects in identifying appropriate mitigation measures, particularly where these will involve interface with local services, in particular health and emergency services. In many cases, the PIU can play a valuable role in connecting project representatives with local Government agencies, and helping coordinate a strategic response, which takes into account the availability of resources. To be most effective, projects should consult and coordinate with relevant Government agencies and other projects in the vicinity.

- Workers should be encouraged to use the existing project grievance mechanism to report concerns relating to COVID-19, preparations being made by the project to address COVID-19 related issues, how procedures are being implemented, and concerns about the health of their co-workers and other staff.

5. WHAT SHOULD THE CONTRACTOR COVER?

The Contractor should identify measures to address the COVID-19 situation. What will be possible will depend on the context of the project: the location, existing project resources, availability of supplies, capacity of local emergency/health services, the extent to which the virus already exist in the area. A systematic approach to planning, recognizing the challenges associated with rapidly changing circumstances, will help the project put in place the best measures possible to address the situation. As discussed above, measures to address COVID-19 may be presented in different ways (as a contingency plan, as an extension of the existing project emergency and preparedness plan or as standalone procedures). PIUs and contractors should refer to guidance issued by relevant authorities, both national

and international (e.g. WHO), which is regularly updated (see sample References and links provided in the Annex).

Addressing COVID-19 at a project site goes beyond occupational health and safety, and is a broader project issue which will require the involvement of different members of a project management team. In many cases, the most effective approach will be to establish procedures to address the issues, and then to ensure that these procedures are implemented systematically. Where appropriate given the project context, a designated team should be established to address COVID-19 issues, including PIU representatives, the Supervising Engineer, management (e.g. the project manager) of the contractor and sub-contractors, security, and medical and OHS professionals. Procedures should be clear and straightforward, improved as necessary, and supervised and monitored by the COVID-19 focal point(s). Procedures should be documented, distributed to all contractors, and discussed at regular meetings to facilitate adaptive management. The issues set out below include a number that represent expected good workplace management but are especially pertinent in preparing the project response to COVID-19.

(a) ASSESSING WORKFORCE CHARACTERISTICS

Many construction sites will have a mix of workers e.g. workers from the local communities; workers from a different part of the country; workers from another country. Workers will be employed under different terms and conditions and be accommodated in different ways. Assessing these different aspects of the workforce will help in identifying appropriate mitigation measures:

- The Contractor should prepare a detailed profile of the project work force, key work activities, schedule for carrying out such activities, different durations of contract and rotations (e.g. 4 weeks on, 4 weeks off).
- This should include a breakdown of workers who reside at home (i.e. workers from the community), workers who lodge within the local community and workers in on-site accommodation. Where possible, it should also identify workers that may be more at risk from COVID-19, those with underlying health issues or who may be otherwise at risk.
- Consideration should be given to ways in which to minimize movement in and out of site. This could include lengthening the term of existing contracts, to avoid workers returning home to affected areas, or returning to site from affected areas.
- Workers accommodated on site should be required to minimize contact with people near the site, and in certain cases be prohibited from leaving the site for the duration of their contract, so that contact with local communities is avoided.
- Consideration should be given to requiring workers lodging in the local community to move to site accommodation (subject to availability) where they would be subject to the same restrictions.
- Workers from local communities, who return home daily, weekly or monthly, will be more difficult to manage. They should be subject to health checks at entry to the site (as set out above) and at some point, circumstances may make it necessary to require them to either use accommodation on site or not to come to work.

(b) ENTRY/EXIT TO THE WORK SITE AND CHECKS ON COMMENCEMENT OF WORK

Entry/exit to the work site should be controlled and documented for both workers and other parties, including support staff and suppliers. Possible measures may include:

- Establishing a system for controlling entry/exit to the site, securing the boundaries of the site, and establishing designating entry/exit points (if they do not already exist). Entry/exit to the site should be documented.
- Training security staff on the (enhanced) system that has been put in place for securing the site and controlling entry and exit, the behaviors required of them in enforcing such system and any COVID - 19 specific considerations.
- Training staff who will be monitoring entry to the site, providing them with the resources they need to document entry of workers, conducting temperature checks and recording details of any worker that is denied entry.
- Confirming that workers are fit for work before they enter the site or start work. While procedures should already be in place for this, special attention should be paid to workers with underlying health issues or who may be otherwise at risk. Consideration should be given to demobilization of staff with underlying health issues.
- Checking and recording temperatures of workers and other people entering the site or requiring self-reporting prior to or on entering the site.
- Providing daily briefings to workers prior to commencing work, focusing on COVID-19 specific considerations including cough etiquette, hand hygiene and distancing measures, using demonstrations and participatory methods.
- During the daily briefings, reminding workers to self-monitor for possible symptoms (fever, cough) and to report to their supervisor or the COVID-19 focal point if they have symptoms or are feeling unwell.
- Preventing a worker from an affected area or who has been in contact with an infected person from returning to the site for 14 days or (if that is not possible) isolating such worker for 14 days.
- Preventing a sick worker from entering the site, referring them to local health facilities if necessary or requiring them to isolate at home for 14 days.

(c) GENERAL HYGIENE

Requirements on general hygiene should be communicated and monitored, to include:

- Training workers and staff on site on the signs and symptoms of COVID-19, how it is spread, how to protect themselves (including regular handwashing and social distancing) and what to do if they or other people have symptoms (for further information see WHO COVID-19 advice for the public).
- Placing posters and signs around the site, with images and text in local languages.
- Ensuring handwashing facilities supplied with soap, disposable paper towels and closed waste bins exist at key places throughout site, including at entrances/exits to work areas; where there is a toilet, canteen or food distribution, or provision of drinking water; in worker accommodation; at waste stations; at stores; and in common spaces. Where handwashing facilities do not exist or are not adequate, arrangements should be made to set them up. Alcohol based sanitizer (if available, 60-95% alcohol) can also be used.
- Review worker accommodations, and assess them in light of the requirements set out in IFC/EBRD guidance on Workers' Accommodation: processes and standards, which provides valuable guidance as to good practice for accommodation.
- Setting aside part of worker accommodation for precautionary self-quarantine as well as more formal isolation of staff who may be infected (see paragraph (f)).

(d) CLEANING AND WASTE DISPOSAL

Conduct regular and thorough cleaning of all site facilities, including offices, accommodation, canteens, common spaces. Review cleaning protocols for key construction equipment (particularly if it is being operated by different workers). This should include:

- Providing cleaning staff with adequate cleaning equipment, materials and disinfectant.
- Review general cleaning systems, training cleaning staff on appropriate cleaning procedures and appropriate frequency in high use or high-risk areas.
- Where it is anticipated that cleaners will be required to clean areas that have been or are suspected to have been contaminated with COVID-19, providing them with appropriate PPE: gowns or aprons, gloves, eye protection (masks, goggles or face screens) and boots or closed work shoes. If appropriate PPE is not available, cleaners should be provided with best available alternatives.
- Training cleaners in proper hygiene (including handwashing) prior to, during and after conducting cleaning activities; how to safely use PPE (where required); in waste control (including for used PPE and cleaning materials).
- Any medical waste produced during the care of ill workers should be collected safely in designated containers or bags and treated and disposed of following relevant requirements (e.g., national, WHO). If open burning and incineration of medical wastes is necessary, this should be for as limited a duration as possible. Waste should be reduced and segregated, so that only the smallest amount of waste is incinerated (for further information see WHO interim guidance on water, sanitation and waste management for COVID-19).

(e) ADJUSTING WORK PRACTICES

Consider changes to work processes and timings to reduce or minimize contact between workers, recognizing that this is likely to impact the project schedule. Such measures could include:

- Decreasing the size of work teams.
- Limiting the number of workers on site at any one time.
- Changing to a 24-hour work rotation.
- Adapting or redesigning work processes for specific work activities and tasks to enable social distancing, and training workers on these processes.
- Continuing with the usual safety trainings, adding COVID-19 specific considerations. Training should include proper use of normal PPE. While as of the date of this note, general advice is that construction workers do not require COVID-19 specific PPE, this should be kept under review (for further information see WHO interim guidance on rational use of personal protective equipment (PPE) for COVID-19).
- Reviewing work methods to reduce use of construction PPE, in case supplies become scarce or the PPE is needed for medical workers or cleaners. This could include, e.g. trying to reduce the need for dust masks by checking that water sprinkling systems are in good working order and are maintained or reducing the speed limit for haul trucks.
- Arranging (where possible) for work breaks to be taken in outdoor areas within the site.
- Consider changing canteen layouts and phasing meal times to allow for social distancing and phasing access to and/or temporarily restricting access to leisure facilities that may exist on site, including gyms.

- At some point, it may be necessary to review the overall project schedule, to assess the extent to which it needs to be adjusted (or work stopped completely) to reflect prudent work practices, potential exposure of both workers and the community and availability of supplies, taking into account Government advice and instructions.

(f) PROJECT MEDICAL SERVICES

Consider whether existing project medical services are adequate, taking into account existing infrastructure (size of clinic/medical post, number of beds, isolation facilities), medical staff, equipment and supplies, procedures and training. Where these are not adequate, consider upgrading services where possible, including:

- Expanding medical infrastructure and preparing areas where patients can be isolated. Guidance on setting up isolation facilities is set out in WHO interim guidance on considerations for quarantine of individuals in the context of containment for COVID-19). Isolation facilities should be located away from worker accommodation and ongoing work activities. Where possible, workers should be provided with a single well-ventilated room (open windows and door). Where this is not possible, isolation facilities should allow at least 1 meter between workers in the same room, separating workers with curtains, if possible. Sick workers should limit their movements, avoiding common areas and facilities and not be allowed visitors until they have been clear of symptoms for 14 days. If they need to use common areas and facilities (e.g. kitchens or canteens), they should only do so when unaffected workers are not present and the area/facilities should be cleaned prior to and after such use.
- Training medical staff, which should include current WHO advice on COVID-19 and recommendations on the specifics of COVID-19. Where COVID-19 infection is suspected, medical providers on site should follow WHO interim guidance on infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected.
- Training medical staff in testing, if testing is available.
- Assessing the current stock of equipment, supplies and medicines on site, and obtaining additional stock, where required and possible. This could include medical PPE, such as gowns, aprons, medical masks, gloves, and eye protection. Refer to WHO guidance as to what is advised (for further information see WHO interim guidance on rational use of personal protective equipment (PPE) for COVID-19).
- If PPE items are unavailable due to world-wide shortages, medical staff on the project should agree on alternatives and try to procure them. Alternatives that may commonly be found on constructions sites include dust masks, construction gloves and eye goggles. While these items are not recommended, they should be used as a last resort if no medical PPE is available.
- Ventilators will not normally be available on work sites, and in any event, intubation should only be conducted by experienced medical staff. If a worker is extremely ill and unable to breathe properly on his or her own, they should be referred immediately to the local hospital (see (g) below).
- Review existing methods for dealing with medical waste, including systems for storage and disposal (for further information see WHO interim guidance on water, sanitation and waste management for COVID-19, and WHO guidance on safe management of wastes from health-care activities).

(g) LOCAL MEDICAL AND OTHER SERVICES

Given the limited scope of project medical services, the project may need to refer sick workers to local medical services. Preparation for this includes:

- Obtaining information as to the resources and capacity of local medical services (e.g. number of beds, availability of trained staff and essential supplies).
- Conducting preliminary discussions with specific medical facilities, to agree what should be done in the event of ill workers needing to be referred.
- Considering ways in which the project may be able to support local medical services in preparing for members of the community becoming ill, recognizing that the elderly or those with pre-existing medical conditions require additional support to access appropriate treatment if they become ill.
- Clarifying the way in which an ill worker will be transported to the medical facility, and checking availability of such transportation.
- Establishing an agreed protocol for communications with local emergency/medical services.
- Agreeing with the local medical services/specific medical facilities the scope of services to be provided, the procedure for in-take of patients and (where relevant) any costs or payments that may be involved.
- A procedure should also be prepared so that project management knows what to do in the unfortunate event that a worker ill with COVID-19 dies. While normal project procedures will continue to apply, COVID-19 may raise other issues because of the infectious nature of the disease. The project should liaise with the relevant local authorities to coordinate what should be done, including any reporting or other requirements under national law.

(h) INSTANCES OR SPREAD OF THE VIRUS

WHO provides detailed advice on what should be done to treat a person who becomes sick or displays symptoms that could be associated with the COVID-19 virus (for further information see WHO interim guidance on infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected). The project should set out risk-based procedures to be followed, with differentiated approaches based on case severity (mild, moderate, severe, critical) and risk factors (such as age, hypertension, diabetes) (for further information see WHO interim guidance on operational considerations for case management of COVID-19 in health facility and community). These may include the following:

- If a worker has symptoms of COVID-19 (e.g. fever, dry cough, fatigue) the worker should be removed immediately from work activities and isolated on site.
- If testing is available on site, the worker should be tested on site. If a test is not available at site, the worker should be transported to the local health facilities to be tested (if testing is available).
- If the test is positive for COVID-19 or no testing is available, the worker should continue to be isolated. This will either be at the work site or at home. If at home, the worker should be transported to their home in transportation provided by the project.
- Extensive cleaning procedures with high-alcohol content disinfectant should be undertaken in the area where the worker was present, prior to any further work being undertaken in that area. Tools used by the worker should be cleaned using disinfectant and PPE disposed of.
- Co-workers (i.e. workers with whom the sick worker was in close contact) should be required to stop work, and be required to quarantine themselves for 14 days, even if they have no symptoms.

- Family and other close contacts of the worker should be required to quarantine themselves for 14 days, even if they have no symptoms.
- If a case of COVID-19 is confirmed in a worker on the site, visitors should be restricted from entering the site and worker groups should be isolated from each other as much as possible.
- If workers live at home and has a family member who has a confirmed or suspected case of COVID-19, the worker should quarantine themselves and not be allowed on the project site for 14 days, even if they have no symptoms.
- Workers should continue to be paid throughout periods of illness, isolation or quarantine, or if they are required to stop work, in accordance with national law.
- Medical care (whether on site or in a local hospital or clinic) required by a worker should be paid for by the employer.

(i) CONTINUITY OF SUPPLIES AND PROJECT ACTIVITIES

Where COVID-19 occurs, either in the project site or the community, access to the project site may be restricted, and movement of supplies may be affected.

- Identify back-up individuals, in case key people within the project management team (PIU, Supervising Engineer, Contractor, sub-contractors) become ill, and communicate who these are so that people are aware of the arrangements that have been put in place.
- Document procedures, so that people know what they are, and are not reliant on one person's knowledge.
- Understand the supply chain for necessary supplies of energy, water, food, medical supplies and cleaning equipment, consider how it could be impacted, and what alternatives are available. Early pro-active review of international, regional and national supply chains, especially for those supplies that are critical for the project, is important (e.g. fuel, food, medical, cleaning and other essential supplies). Planning for a 1-2 month interruption of critical goods may be appropriate for projects in more remote areas.
- Place orders for/procure critical supplies. If not available, consider alternatives (where feasible).
- Consider existing security arrangements, and whether these will be adequate in the event of interruption to normal project operations.
- Consider at what point it may become necessary for the project to significantly reduce activities or to stop work completely, and what should be done to prepare for this, and to re-start work when it becomes possible or feasible.

(j) TRAINING AND COMMUNICATION WITH WORKERS

Workers need to be provided with regular opportunities to understand their situation, and how they can best protect themselves, their families and the community. They should be made aware of the procedures that have been put in place by the project, and their own responsibilities in implementing them.

- It is important to be aware that in communities close to the site and amongst workers without access to project management, social media is likely to be a major source of information. This raises the importance of regular information and engagement with workers (e.g. through training, town halls, tool boxes) that emphasizes what management is doing to deal with the risks of COVID-19. Allaying fear is an important aspect of work force peace of mind and business continuity. Workers should be given an opportunity to ask questions, express their concerns, and make suggestions.

- Training of workers should be conducted regularly, as discussed in the sections above, providing workers with a clear understanding of how they are expected to behave and carry out their work duties.
- Training should address issues of discrimination or prejudice if a worker becomes ill and provide an understanding of the trajectory of the virus, where workers return to work.
- Training should cover all issues that would normally be required on the work site, including use of safety procedures, use of construction PPE, occupational health and safety issues, and code of conduct, taking into account that work practices may have been adjusted.
- Communications should be clear, based on fact and designed to be easily understood by workers, for example by displaying posters on handwashing and social distancing, and what to do if a worker displays symptoms.

(k) COMMUNICATION AND CONTACT WITH THE COMMUNITY

Relations with the community should be carefully managed, with a focus on measures that are being implemented to safeguard both workers and the community. The community may be concerned about the presence of non-local workers, or the risks posed to the community by local workers presence on the project site. The project should set out risk-based procedures to be followed , which may reflect WHO guidance (for further information see WHO Risk Communication and Community Engagement (RCCE) Action Plan Guidance COVID-19 Preparedness and Response). The following good practice should be considered:

- Communications should be clear, regular, based on fact and designed to be easily understood by community members.
- Communications should utilize available means. In most cases, face-to-face meetings with the community or community representatives will not be possible. Other forms of communication should be used; posters, pamphlets, radio, text message, electronic meetings. The means used should take into account the ability of different members of the community to access them, to make sure that communication reaches these groups.
- The community should be made aware of procedures put in place at site to address issues related to COVID-19. This should include all measures being implemented to limit or prohibit contact between workers and the community. These need to be communicated clearly, as some measures will have financial implications for the community (e.g. if workers are paying for lodging or using local facilities). The community should be made aware of the procedure for entry/exit to the site, the training being given to workers and the procedure that will be followed by the project if a worker becomes sick.
- If project representatives, contractors or workers are interacting with the community, they should practice social distancing and follow other COVID-19 guidance issued by relevant authorities, both national and international (e.g. WHO).

6. EMERGENCY POWERS AND LEGISLATION

Many Borrowers are enacting emergency legislation. The scope of such legislation, and the way it interacts with other legal requirements, will vary from country to country. Such legislation can cover a range of issues, for example:

- Declaring a public health emergency
- Authorizing the use of police or military in certain activities (e.g. enforcing curfews or restrictions on movement)
- Ordering certain categories of employees to work longer hours, not to take holiday or not to leave their job (e.g. health workers)
- Ordering non-essential workers to stay at home, for reduced pay or compulsory holiday

Except in exceptional circumstances (after referral to the World Bank's Operations Environmental and Social Review Committee (OESRC)), projects will need to follow emergency legislation to the extent that these are mandatory or advisable. It is important that the Borrower understands how mandatory requirements of the legislation will impact the project. Teams should require Borrowers (and in turn, Borrowers should request Contractors) to consider how the emergency legislation will impact the obligations of the Borrower set out in the legal agreement and the obligations set out in the construction contracts. Where the legislation requires a material departure from existing contractual obligations, this should be documented, setting out the relevant provisions.

KfW DEG COVID-19 Guidance for employers, issued on 31 March 2020

CDC Group COVID-19 Guidance for Employers, issued on 23 March 2020

INTERIM GUIDANCE ON COVID-19 **VERSION 1: APRIL 7, 2020**

ANNEX

WHO Guidance

Advice for the public

WHO advice for the public, including on social distancing, respiratory hygiene, self-quarantine, and seeking medical advice, can be consulted on this WHO website:
https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public

Technical guidance

Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected, issued on 19 March 2020

Coronavirus disease (COVID-19) outbreak: rights, roles and responsibilities of health workers, including key considerations for occupational safety and health, issued on 18 March 2020

Risk Communication and Community Engagement (RCCE) Action Plan Guidance COVID-19 Preparedness and Response, issued on 16 March 2020

Considerations for quarantine of individuals in the context of containment for coronavirus disease (COVID-19), issued on 19 March 2020

Operational considerations for case management of COVID-19 in health facility and community, issued on 19 March 2020

Rational use of personal protective equipment for coronavirus disease 2019 (COVID-19), issued on 27 February 2020

Getting your workplace ready for COVID-19, issued on 19 March 2020

Water, sanitation, hygiene and waste management for COVID-19, issued on 19 March 2020

Safe management of wastes from health-care activities issued in 2014

Advice on the use of masks in the community, during home care and in healthcare settings in the context of the novel coronavirus (COVID-19) outbreak, issued on March 19, 2020

ILO GUIDANCE

ILO Standards and COVID-19 FAQ, issued on March 23, 2020 (provides a compilation of answers to most frequently asked questions related to international labor standards and COVID-19)

MFI GUIDANCE

IDB Invest Guidance for Infrastructure Projects on COVID-19: A Rapid Risk Profile and Decision Framework

KfW DEG COVID-19 Guidance for employers, issued on 31 March 2020

CDC Group COVID-19 Guidance for Employers, issued on 23 March 2020