Sri Lanka Agriculture Sector Modernisation Project (ASMP)

ENVIRONMENTAL SCREENING REPORT

FOR

CDP № 6 – JAFFNA DISTRICT - SMALL BANANA (AMBUL)

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

Revised: 20 June 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
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
SMP	Social Management Plan
WQI	Water Quality Index

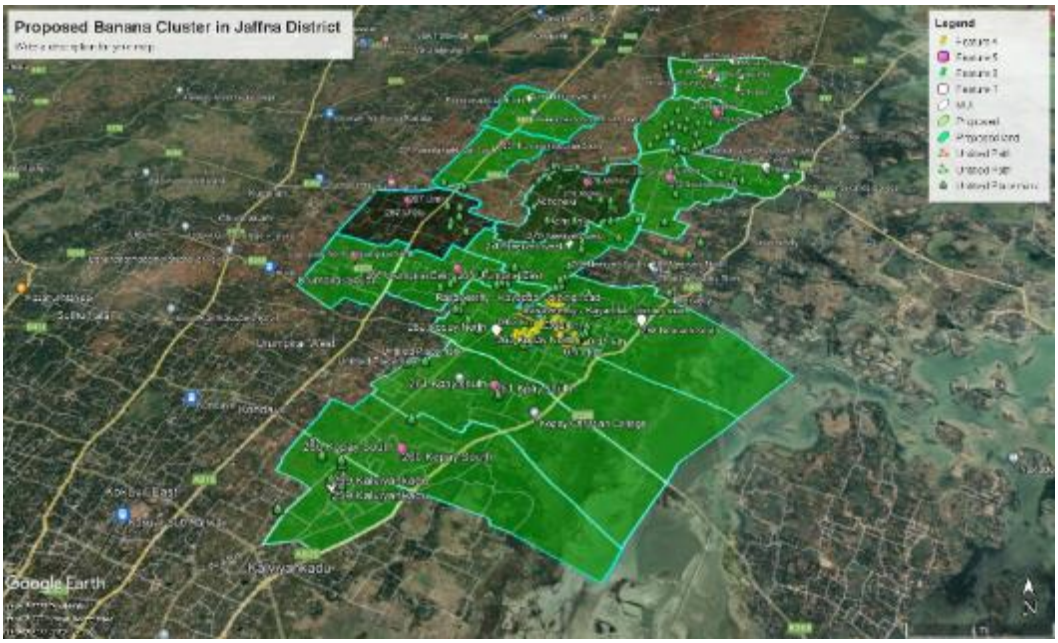
ASMP

ENVIRONMENTAL SCREENING REPORT

1. PROJECT IDENTIFICATION

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

2. PROJECT LOCATION

Location **(Relative to the nearest town, highway)**	The proposed CDP № 6 - Jaffna (Kopai) - Small Banana (Ambul -organic) (henceforth called Jaffna Organic Banana Cluster) is spread over three Divisional Secretariat (DS) areas located in Valikamam East (Kopay), Valikamam South (Uduvil) and Valikamam North (Tellipalai[1]). This cluster covers three out of 15 DS areas, comprising 36 Grama Niladari (GN) divisions out of 435 in the Jaffna District. The selected villages are located about 4km away from Jaffna town. Figure 1 shows the selected areas in the three DSDs.  ***Figure 1*: *Selected farmlands*** Mainly these selected areas can be accessed through AB 16 – Jaffna-Kankasanthurai, AB 18 – Jaffna Palali, AB 20 – Jaffna-Point Pedro, AB 32 – Puttur-Meesalai, B 380 – Chankanai-Puttur, and B 268 – Manippai-Kaithady. Main townships which are falling within these areas are namely Tellipalai, Puttur, Kopay, Achchuveli, and Chunnakam. Palali Airport is located about 2.5km away from Atchuveli. The railway line up to Kankasanthurai is running closer to the project areas in Urumpirai and Chunnakam. It was initially planned to have 500 farmers for this cluster. However, 520 farmers were identified with the assumption that there would be some losses at a later date due to other factors of being ineligible. Farmers identified from Valikamam East and South DS

[1] Also spelt and known as Thellippalai (Tamil: தெல்லிப்பழை Tellippaḻai) and/or Tillypalli (தில்லைப்பள்ளி)

Divisions have existing banana plantations while farmers from Valikamam North were identified for new banana plantations.

The Jaffna Organic Banana Cluster covers an extensive area in the Kopay, Uduvil, and Tellipalai DSs, so farmers were divided into 11 groups to improve field coordination of programs, including conducting awareness and training programmes and selection of farmer representatives, and so forth.

Definition of the project area

(The geographical extent of the project & areas affected during construction)

This cluster encompass lands and beneficiaries in three DS Divisions, namely Valikamam North (Tellipalai), Valikamam East (Kopay) and Valikamam South (Uduvil). The total land area of the cluster including inland water is 190.4 km².

Table 1: Summary of information for farmer group formation in Jaffna Organic Banana Cluster

DS division	ADC area	AI zone	No of farmers	Area (ha)	№ of farmer groups
Valikamam East	Puttur	Puttur	50	20	01
		Avarankal	50	20	01
		Achchuvely	50	20	01
	Urumpirai	Neervely	110	44	02
		Urumpirai	100	40	02
Valikamam South	Uduvil	Punnalaikadduvan	70	28	02
		Chunnakam	50	20	01
Valikamam North	Keerimalai	Vasavilan	15	06	01
		Keerimalai	25	10	
Total			**520**	**207**	**11**

As per the project requirement, the minimum land area which will be cultivated is about 250 acres and the maximum would be about 525 Acres. This estimation is without the impact zone of public infrastructures proposed to be improved. Further, a total of 4km length of rural roads improvement to ease the accessibility to economic infrastructures. Improvements in rural roads will benefit the entire community in the area. Construction of cluster based collection centre, Compost yard, institutional arrangement proposed, capacity building activities, value chain developments, etc are will have a significant positive impact on the area in general.

Adjacent land and features

The area is well known as an important agricultural area in Jaffna District. Table 2 below shows how important the proposed cluster area is in terms of agricultural development within the district.

The main irrigation water source for agriculture is from wells (often hand-dug) but there are comparatively many deep wells in use by farmers in the Valikamam area. There are about 28,000 dug wells in the district; having an average depth of 3 to 5 metres with water being available all year. The main crops in the area are potatoes, tobacco, and red onion. In addition, fruit crops (e.g., banana, grape, and mango) are grown on a commercial scale.

The areas where vegetables, fruits, and other field crops are cultivated are classified as other croplands. About 68% is shown as other croplands within the Jaffna Organic Banana Cluster district. These lands provide a higher agricultural production in the Jaffna District.

Table 2: Land Use Pattern in Cluster area and Jaffna District

Land use	Land area (hectares)					% of the district area
	District	Valikamam East	Valikamam North	Valikamam South	Total	
Built-up areas	690	0	110		110	16
Non-agricultural	390	60	270		330	85
Homesteads	33,720	2,290	2,830	1,520	6,640	20

Coconut	1,470	210			210	14
Mixed trees/other perennials	1,530	70	110		180	12
Paddy	15,520	1,370	460	310	2,140	14
Sparsely used croplands	10,510	710	860	130	1,700	16
Other crops	5,880	2,300	820	890	4,010	68
Dense forests						
Open forests	290					0
Forest cultivations						
Scrublands	6,810	590	180		770	11
Grasslands	10	10			10	100
Wetlands-forest mangroves	20				0	0
Wetlands non-Forest marshes	6,630	1,480			1,480	22
Water bodies	9,610	1,220	10	20	1,250	13
Barren lands	9,450	210			210	2
Total	**102,530**	**10,520**	**5,650**	**2,870**	**19,040**	**19**

Source: ESRI – Wageningen, Survey Department of Sri Lanka, 1989

People in Jaffna District are traditionally farming communities. Their culture is mostly agrarian-based. These traditional farmers have generations of experience with the soil, climate, and agricultural technology that is unique to their production system. They have their cultivation techniques developed by their forefathers and the practices have been time-tested and proven to be more appropriate than modern technologies. Crops like spring onion (red onion), chilies, potatoes, tobacco, vegetables, banana, and grapes are cultivated for commercial purposes.

Other crops cultivation such as paddy, pulses, and coconut are at a substantial level. Palmyra products are also a substantial source of income. Rice is produced during the Maha seasons only under rainfed conditions while vegetables are produced nearly all year round under rain-fed irrigated conditions. There are about 30% of the families from total families are solely dependent on agriculture including livestock and a large share of the population is also involved in home gardening.

3. PROJECT JUSTIFICATION

Need for the project **(What problem is the project going to solve)**	Banana is a healthy fruit item of humans and it is a good source of Manganese, Potassium, and Vitamin C, useful in hemorrhoids, heart health, and blood pressure. Conversion of paddy cultivation to banana was mainly due to easy management and high return of banana when compared to paddy and other farm crops (OFCs). After the establishment of plantations, expenditure on banana cultivation is low and farmers can receive a continuous income from their plantations. Banana is grown rainfed with supplementary irrigation whenever necessary. In general, farmers use both flood irrigation and canal irrigation methods in banana cultivation. Though there are three main banana varieties grown in the district such as Kolikuttu, Sour banana (Ambul), Cavendish, and Itharai, Sour banana is the popular variety that is grown under organic practices. Ambul is highly resistant to Panama disease when compared to Kolikuttu and Seeni. 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 Jaffna. In addition to the demonstration plot (new cultivations), a majority will be existing Banana cultivated lands. There will be about 500 farmers including new Banana Cultivators in Kopay, Uduvil, and Tellipalai in Jaffna. 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 bananas for the export market. The main objective of the subproject is to develop Agriculture-related livelihood by achieving the 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 farmers 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 of GAP by introducing new technologies and enhancing farmers' capacities.
Justification and Alternatives considered **(Different ways to meet the project need and achieve the project purpose)**	Following concerns were focused during selection of Organic Banana Cluster in Jaffna. • 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 Jaffna

Neervely Cooperative Society for Banana Farmers is the base for farmer mobilization and capacity building through a strategic partnership. 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. Geographically, the selected area is the highest potential for Banana cultivation in Jaffna. The area has a long-established history of Banana cultivation.

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 in Kopay, Uduvil, and Tellipalai. 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 Jaffna. 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. 47 of 1980 & its amendments		√		None of the proposed activities are coming under prescribed activities
2	Gazette Notification No 331 of August 18, 1978 of Palmyra Development Board	√			Use of Palmyra cultivated lands for any other purpose is controlled and managed by the Palmyra Development Board. No Palmyra tree cutting allowed without board's approval.
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 Local Authorities in the selected areas.
5	Water Resources Board Act No. 29 of 1964	√			Extraction of ground water should be consented by the WRB
6	Provincial Councils Act. No. 42 of 1987	√			Provincial Agriculture Department consent should be obtained on the activities which will be carried out under this cluster as final responsibility of them is with PAD, Northern Province
7	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

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

Proposed start date	January 2022
Proposed completion date	December 2023
Estimated total cost	LKR 86 million
Present land ownership	Private Farmlands, Lands with Deed and Leased Lands Rural Roads – Local Authorities Collection Centre and Compost Yard – Department of Agriculture

Description of the project

(With supporting material such as maps, drawings, etc attached as required)

Table 3: New and improved quality-enhancing technologies

Main Technology	Practice (s)
Bunch clearing before bagging	• Removing leaves that can damage bunch and bend or removal of placenta leaf
Bagging with plastic bags	• Premature bagging when the bunch is just emerging and the centre flower bud points downward
Bunch clearing after bagging	• De-leafing, de-flowering, de-handing, de-budding
Tagging of the banana bunch with coloured plastic ribbons	• Every week a different coloured ribbon is applied when the lower hands are parallel to the ground. Eight colours are used
Propping and guying	• The banana bunch is propped with wooden poles tied with rope or plastic
Harvesting by dehanding at the mat	• Bunches for dehanding in the field are selected based on age (ribbon colour) and calliper grade to protect the 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
De-latex in the field	• Removed hands from the harvested bunch are placed on banana leaves for de-latex for at least one hour
Transport to packing centre	• Packing the de-latex 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
Postharvest technology	• Field heat removal Line packing Cold chain management Integration of export protocols into standard SOP's
Quality monitoring and evaluation system	• Quality score Tally of defects Value chain feedback loop
Export protocol	• Guidelines to grow, pack and ship bananas for export

Table 4: Improved technology package

Main Technology	Practice (s)	Comments
Variety	• Ambul banana • Kolikuttu banana • Cavendish banana	• Technology is applicable across varieties
Tissue culture planting material	• Ambul banana meristems approximately 40 cm in height with 4 to 5 functional green leaves present	• Banana seedlings purchased from a tissue culture laboratory
"Peeper" planting material	• Ambul 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	• "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

	present to be ready for transplanting	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 leveling 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 leveling using laser leveling machinery, quick water evacuation ditches, surface drainage techniques (removal of wet spots)	• On-farm drainage works avoid water from standing in the field for long periods 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	• Intercropping with short term vegetables	• 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 in this space using the new and improved technology package introduced by the ISP for the particular vegetable
Weeding	• Intercropping prevents weed infestation. Otherwise, mechanical weeding is practiced	• Mechanical weeding is herbicide-free. It is a very environmentally friendly technology
Precision fertilisation	• Fertigation with organic liquid fertilizers supplemented with fertilization	• Formulation of fertilizer regimes based on complete soil tests and foliar analyses

	and/or fertigation with chemical fertilizers	
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 the irrigation system
Labeling for precision agriculture	• Production area blocks and tree tagging labeling	• Production area blocking and tree tagging labeling develop a tree identification nomenclature to find tress quickly to apply precision agriculture practices on a timely basis

Through this process, other farmers gradually adopt new technologies and management practices introduced by ISP. Thereafter, a whole farming community of the area will be producers of high-quality bananas suitable for the export market.

Table 5: Access roads identified for repair in Jaffna, Potato Cluster

№	LOCATION	UNIT	Length
1	Rasavethy - Kayaddai joining road	km	1.00
2	Kayaddai road	Km	0.41
3	Kayaddai - Karunala joining road	Km	0.30
4	Ekakkadai road	Km	0.62
5	Access roads to Collecting centre	Km	0.78
	The total length of roads identified	**km**	**3.11**

Table 6: Summary of Project Interventions in the Cluster

#	Project component	Key Activities	Approx. extent / quantity	Implementation responsibility
1	Cultivation of Banana (Refer table 3 and 4)	Land Preparation Irrigation pipe laying Installation of mini-sprinklers	207ha	ISP PPMU
2	Improvements of Rural Roads (Rehabilitation) (Refer table 5)	Trimming, levelling and compaction of sub grade Supplying and pilling approved gravel Spreading and compaction gravel	5 road sections Total length 3.11km	Contractor LAs Civil Engineer –ISP PPMU Engineer - PMU
3	Construction of Cluster Collection Centre	Laying interlock tiles Widening the existing entrance gate Provision of equipment	1 Collection Centre	Contractor FO Civil Engineer –ISP PPMU Engineer - PMU

	4	Construction of Compost Production Unit	Fencing Construction of building Disposal yards Mixing yards Leachate management	1	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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Nature of Consultations and Inputs Received

Consultations with Environmental and Social Safeguard Specialist/ PMU

However, an institutional mechanism for the Banana Cluster Development has been proposed. Institutional roles in this cluster (Cluster Development Plan (CDP) № 6 - Jaffna - Small Banana (Ambul)) are attached in Annexure 3. Provincial Agriculture Department, consisting of all the line agencies such as irrigation, Agrarian Development, DS and Land), and all the chairmen of farmer organisations have extended cooperation for banana cultivation considering the following reasons.

- Great potential to increase Farmer income with less labour and inputs.
- Effective mechanism to attract young farmers for commercial agriculture.
- Almost all the banana farmers have kept a smaller part of their land for paddy crops for domestic consumption.
- All the banana farmers are members of farmer organisations or successors.

5. DESCRIPTION OF THE EXISTING ENVIRONMENT

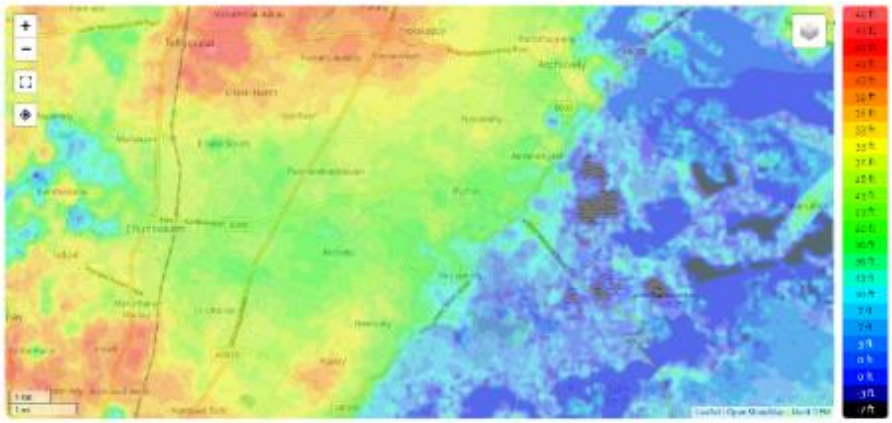
5.1 PHYSICAL FEATURES

Topography and terrain

The terrain of the region is almost flat and of low elevation except in the central part of the western sector in the area around Tellipalai, where the elevation rises to 10.5 m above sea level. From there it slopes gently towards the south and southeast, while to the north the elevation tends to drop abruptly. The elevation of the area is between 5 to 11 metres above mean sea level.

Geologically, the project area belongs to the Limestone of Sri Lanka. Geological units exposed in the Jaffna area are part of a sequence of tertiary aged rocks that rest on a basement of Precambrian crystalline rocks. Jaffna Limestone, which is 50-90 m thick, overlies the Mannar Sandstone and is extensively exposed in the western part of the peninsula in the Chunnakam area and a small area to the west of Point Pedro. The upper surface of the limestone slopes gently to the southeast from the relatively high areas in the northwest where it forms the land surface in the general vicinity of Chunnakam.

Figure 2: Topographic Map of Project Area in Jaffna



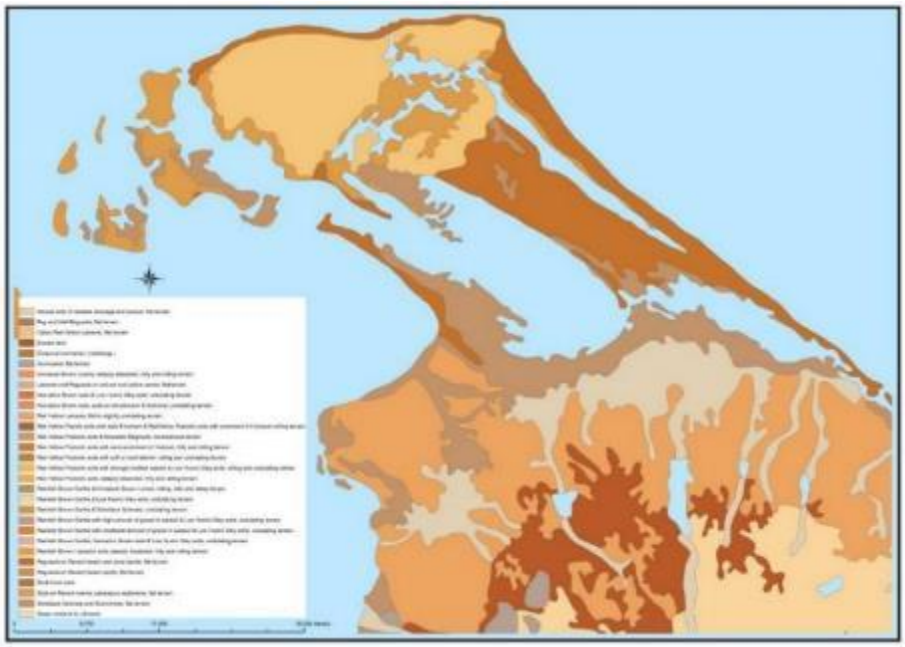
Climate and Meteorology

Other climatic and weather information of the cluster area is also given in the **Error! Reference source not found.** below. More than 65% of the annual rainfall is experienced during the Maha season (October to February) and other seven months remain as dry months and monthly average sunshine hours in this dry period is more than seven hours. It is a best condition for crop production to achieve a highest yield if irrigation is not a limiting factor. Ground water is readily available all year in Jaffna District, so intensive agriculture has a highly potential. The micro irrigation component is a key component of the proposed technological packages for improving crop production, so will be readily adaptable in the area.

Table 7: Monthly Meteorological characteristics in Jaffna District

Parameter	Month of the Year												
	J	F	M	A	M	J	J	A	S	O	N	D	Avg
Rainfall (mm)	79.6	39.4	14.0	51.9	55.6	21.0	26.2	37.0	71.5	272.8	393.3	288.8	
Maximum temp (°C)	28.4	29.8	31.6	32.1	31.3	30.4	30.1	30.1	30.2	29.9	28.9	28.1	30.1
Minimum temperature (°C)	22.3	22.4	24.3	26.8	27.6	27.2	26.6	26.3	26.4	25.4	23.8	22.9	25.2
Daily sunshine (hours)	8.0	9.4	9.4	8.9	8.0	4.7	7.4	7.3	7.3	5.8	5.4	5.3	7.2
Daily evaporation (mm)	3.8	4.3	4.7	5.2	5.6	6.1	5.5	4.7	5.2	3.5	2.8	2.9	4.5
Relative humidity (%)	81	81	77	81	81	81	78	79	81	82	85	85	81.0

Source: Punyawardena, 2003

	The average maximum temperature is about 32.1^{0}C and the average minimum temperature is about 23.2^{0}C. The minimum temperature goes down around 22^{0}C in January and February. This area is also recommended for the potato cultivation as the minimum temperature drops down to around 22^{0}C in January and February.
Soil **(Type and quality)**	The soil is sandy along the coast but sandy clay or clayey sand in the interior with high infiltration rates. The peninsula's overburden mantle is covered with three different types of soils classified according to agricultural suitability. They are: (i) Calcic Red Yellow Latosols; (ii) Solodized Solonetz and Solonchaks; and (iii) Regosols on recent beach sands The dominant soil group of the DL3 agroecological zone is known as the RYL. Soils of the upper part of the soil can and named Red Latosol while the soil in the lower areas is known as yellow latosol. Due to the relative depth of the soil, it is a calcareous soil of limestone with many cracks in the bedrock. This area contains more groundwater than any other part of the island. As a result, even after a light rainfall, a significant volume of water accumulates in the groundwater. Therefore, the cultivation system in DL3 areas is intensive as water for irrigation is readily available for crop cultivations. ***Figure 3: Soils of the Jaffna Peninsula***  Data Source: The National Atlas of Sri Lanka, Second Edition, Survey Department of Sri Lanka, 2007 Another agroecological zone (DL4) makes 13% within the three DSc and has mostly Solanets solarized soils that are not good for crop cultivations. In some places, paddy is being cultivated on Grumusol soils in this agroecological zone. There are very small areas having RYL soils. About 87% of the land area of the cluster area belongs to the DL3 Agroecological Zone (AEZ) and the balance is classified under DL4. The monthly rainfall pattern of this agro-ecological zone (AZE) does not show a bimodal shape like DL1 or DL1b as the first inter-Monsoonal and Southwest Monsoonal rains are not effective to this AZE. Some basic characteristics of these two AEZ

are shown in 8 below. The dominant soil group of the DL3 agro-ecological zone is known as the RYL.

Table 8: Agro-ecological Characteristics of the Cluster Area

Location	Agroecological zone	Land area		Terrain types	Soil types
		ha	% of DS		
Valikamam North	D.L3c	4,668	100	Undulating and Flat	RYL, Regasol
Valikamam South	DL3b	3,625	100	Undulating and Flat	RYL, Regasol
Valikamam East	DL3	6,909	69	Undulating and Flat	RYL, Regasol
	DL4	22.80	31	Undulating and Flat	Soladized solanets, Grumusol

Source: Punyawardena, 2003 *RYL – Red-Yellow Latosol*

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

The main surface water body in the area is Valukai Aru which is closer to Kopay, and Puttur. No, other surface water bodies were encountered within the proposed area. However, no farmer is irrigating farmlands through Valukai Aru. The Valukai Aru is about 14.5 km long and has several regulators across the stream to facilitate flood irrigation of adjoining land, intermittent flood detention in the rainy season, and groundwater recharge. The Valukai Aru Barrage and the Navaly Barrage located upriver from the Valukai Aru Barrage has been converted to hold fresh water and is also major device for rainwater harvesting and rainwater detention.

The Valukai Aru (Araly) Barrage is the salt barrier built at the lowest point of Valukai Aru just before the Aru is discharged into the Araly Lagoon. At Araly, the Jaffna Lagoon is called by another name, the Araly Lagoon. There is a salty marshland adjacent to the Aru which is also fronted by the Araly Lagoon. Mangrove vegetation grows on this marshland. The Navaly Barrage is the next lowest point on the Valukai Aru which is also another salt barrier. The Navaly Barrage is a barrier across the Aru and consists of lock gates. The waters up-river of the Barrage is fresh while down-river it is saline since saline water enters the aru from the lagoon. The barrage has been built to keep the up-river water as freshwater and to prevent saline water intrusion. However, at times of rainfall and floods, the barrage gates are opened. Alongside the aru, irrigation canals drain excess water into the aru and these have lock gates to control the flow. The Navaly Barrage and the pond where the treated effluent from the STP is to be discharged which then flows into the paddy fields are in the Kaddudai area in the Valikamam South West DS Division. Just upstream of the Navaly Barrage, there is a pond, Mutaliyar Kulum. During the dry season, there is only a little water or almost no water in the Navaly Barrage. The farmers upriver of the Navaly Barrage drain excess water from irrigation channels into the aru with lock gates to control the flow.

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

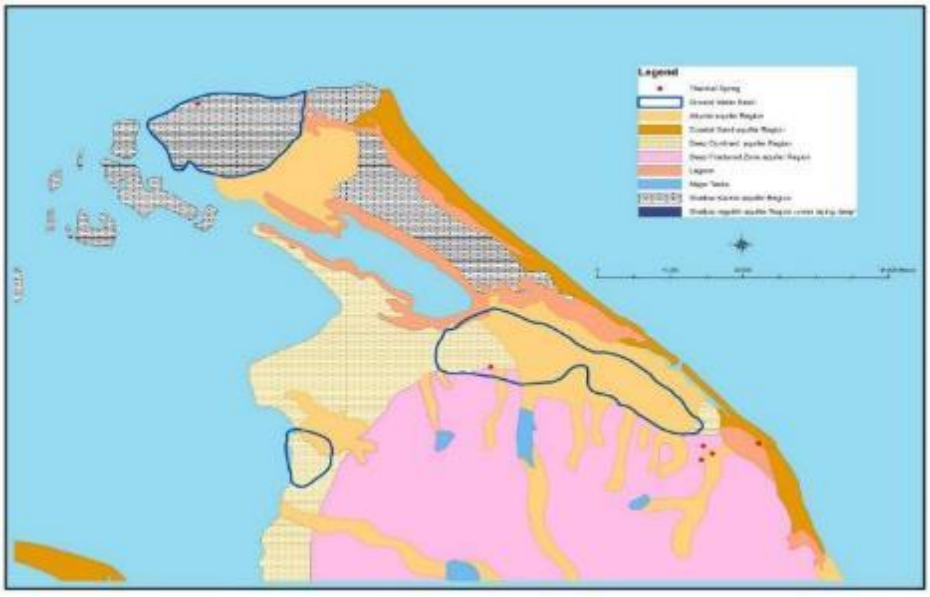
Currently, they are using ordinary dug wells in the farmlands for irrigating the plants. Many farmers have inserted tube wells inside the dug wells to the continuous water supply. However, they are aware of the danger of a change in water quality and quantity in the future. All these wells are domestic wells, and no agro wells are in the area. The depth of these wells varies from 20 feet to 40 feet. They experience a shortage of water from July to September. It is estimated that there are about 30,000 such agro wells throughout the district.

The Famous Nilawarai Underground water well is located within the project area in Nilawarai.

As depicted in the Figure below, there are two types of aquifer present in the Jaffna Peninsula: karstic limestone and sand aquifer. The geology, geomorphology, climatic conditions, and proximity to the ocean combine to create a balanced dynamic groundwater system that is vulnerable to a variety of factors. In the limestone aquifer, the infiltrating rainwater forms freshwater lenses floating on the denser seawater. After infiltration into the ground, there are subterranean flow-through solution channels in the limestone aquifer, draining part of the infiltrated water into the sea. However, the cavernous nature of the limestone provides a large storage reservoir, but its extremely high permeability causes a rapid dissipation of any recharge with rapid movement of freshwater to discharge points around the coastal fringe. Any occurrence of a large body of freshwater is therefore exceptional and its retention depends on the maintenance of stringent conditions.

The shallow aquifers are found in channels and cavities (karsts) in Miocene limestone. A large volume of rainwater and other surface waters infiltrate into these spaces during rainy periods. Of this amount possibly 50% eventually drain to sea outlets while the remainder becomes the most intensively utilized groundwater source in the country, mainly for agriculture and domestic purposes. The thickness of the freshwater bodies ranges from 20m to 30m below ground level in the Puttur, Pannalaikadduvan, and Urali areas. The groundwater table is located at 0m to 3m below ground level. The conductivity is very high. The estimated shallow wells are over 80,000 in number constructed up to depths of 5m to 10m. Over 50% of the wells in the Jaffna Peninsula have high salinity water. Most well-water falls into low to medium sodium and phosphorus content. Nitrate or N levels in most agro-wells are higher than the permissible level. Due to the disposal of sewage from pit-latrines, soakaways, and septic tanks, faecal contaminated groundwater has been reported from several places in the Jaffna Peninsula (JKWSSP, 2015).

Figure 4: Groundwater Aquifers of Jaffna Peninsula



Data Source: The National Atlas of Sri Lanka, Second Edition, Survey Department of Sri Lanka, 2007

<table>
<tr><td>Air quality
(Any pollution issues)</td><td>Based on the air quality monitoring carried out by other development projects has shown that the one-hour average for all the parameters is well below the National Ambient Air Quality Standards. These parameters included Particulate Matter of less than 10 µm in diameter (PM10) Particulate Matter of less than 2.5 µm in diameter PM2.5 Carbon Monoxide (CO), Sulphur Dioxide (SO2), Nitrogen Dioxide (NO2), and Ozone (O3) and their concentrations were very low. The major contributor to pollutants of CO, SO2, and NO2 are the mobile sources.

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, Check the Air Quality in Punnalaikadduvan, Sri Lanka - BreezoMeter shows that the Air Quality Index (AQI) of Ponnalaikadduvan is 62/500 and $PM_{2.5}$ is the dominant pollutant while O_3, PM_{10}, and CO are having lower concentrations than $PM_{2.5}$.</td></tr>
<tr><td colspan="2">5.2 ECOLOGICAL FEATURES – ECOSYSTEM COMPONENTS</td></tr>
<tr><td>Vegetation (Trees, ground cover, aquatic vegetation)</td><td>The project area is mostly confined to semi-urban and rural environments. Hence, most of the habitats which are in the immediate impact zone of the project are highly anthropogenic habitats. Field investigations identified several ecologically important habitats. These include salt marshes, freshwater ponds and canals, remote home gardens, and sub-urban home gardens.

Home Gardens
Home gardens are the vegetation type found immediately around homesteads in towns. These have been subjected to long-term human manipulation. Urban home gardens are characterized by open lands dominated by grasses and weeds such as Lantana Camara, Triumfetta pentandra, and Stachytarpheta urticifolia. Multi-purpose tree species such as Azadirachta indica, Artocarpus heterophyllus, Cocos nucifera, Borassus flabellifer are occasionally found towards the edges of such lands. In addition, the area is mainly covered with vegetable and fruit cultivations. Vegetables such as potato, carrot, beetroot, ladies finger, pumpkin, manioc, radish, cabbage, cucumber, chili, yam, etc, and fruits such as Banana, mango, guava, grapes, etc are being cultivated in these areas. Further, tobacco is observed to be cultivated in many places.

Remote/ Sub-urban Home Gardens
Abandoned remote/ sub-urban home gardens in contrast have substantial tree cover comprising of multi-purpose trees such as Azadirachta indica, Artocarpus heterophyllus, Cocos Nucifera, and Borassus flabellifer. Some of them show signs of a well-developed multi-story home garden structure that existed before abandonment.</td></tr>
<tr><td>Presence of wetlands</td><td>There is no wetlands presence in the project area. However, Salt marshes, Freshwater Marsh/ Abandoned Paddy Fields, Mangroves, Mudflats, etc are can be seen in the district. Within 5km away from the selected areas, these types of special habitats are available along with Valukai Aru.</td></tr>
<tr><td>Fish and fish habitats</td><td>There are no fishing habitats observed within the project area. Limitation of availability of surface water bodies within the area can be recognised as the reason for the not presence of fishing habitats.</td></tr>
<tr><td>Birds (waterfowl, migratory birds, others)</td><td>Bird species found during field visits are given below:

<table>
<tr><th>#</th><th>Common Name</th><th>Scientific Name</th></tr>
<tr><td>1</td><td>Crow - කපුටා</td><td>Corvus brachyrhynchos</td></tr>
<tr><td>2</td><td>Drongo / කවීඩා</td><td>Dicrurus macrocercus</td></tr>
</table>
</td></tr>
</table>

	3	*Magpie Robin / පාන්කිරිත්තා*	*Copsychus saularis*
	4	*Common Tailorbird / බට්ටිච්චා*	*Orthotomus sutorius*
	5	*Spotted Dow / අළුකොබෙයියා*	*Streptopelia chinensis*
	6	*Pigeon / පරෙවියා*	*Columba livia*
	7	*Common Maina / මයිනා*	*Acridotheres tristis*
Presence of special habitat areas (special designations and identified sensitive zones)	Salt marshes, Freshwater Marsh/ Abandoned Paddy Fields, Mangroves, Mudflats, etc are can be seen in the district. Within 5km away from the selected areas, these types of special habitats are available along with Valukai Aru.		
5.3 OTHER FEATURES			
Residential/sensitive areas (e.g., hospitals, schools)	**Health care facilities:** 1. Valikamam North: one Base hospital, two divisional hospitals, one Primary Medical Care Unit (PMCU), one MOH Office, and seven Primary Health Care Centres 2. Valikamam South: five PMCUs, five MOH offices, four public health care centres, one rural ayurvedic hospital (AVH), and three central ayurvedic dispensaries 3. Valikamam East: two divisional hospitals, two central dispensaries, and one ayurvedic dispensary. In all cases, these medical institutions are adequately manned by necessary medical and non-medical staff members, and services are provided to the public. **Schooling:** According to the information provided by Assistant Directors of Planning of the DS Divisions 1. Valikamam North: has 45 schools, but two are not functioning, and three schools are displaced, so located in different locations. The total student population is 9,264 with 765 teachers, so a ratio of 12:1 2. Valikamam South: has 34 schools, but two schools are not functioning. The total student population is 7,423 with 643 teachers, so a ratio of 11.5:1 3. Valikamam East: has 40 schools that are all functioning. Student numbers are 9,439 having 800 teachers, so a ratio of 12:1. All the schools are provincial schools. In addition to schools, there is a National Teachers College and Government Teacher's Training College in the Valikamam East DS division. You find all types of schools other than National Schools in these DS divisions.		
Traditional, economic and cultural activities	Farmers for this traditional Jaffna Organic Banana Cluster have been selected from three DS Divisions in the district having several GN Divisions. Therefore, this section will discuss the demographic characteristics of the DS Divisions instead of GN Divisions. The project has selected 330 farmers from these three DS Divisions for this year's Maha season and planned to increase the number up to 500 farmers in the 2022 season by incorporating more GN Divisions in the future. It has been planned to supply planting materials for all the selected farmers by end of February 2022. Hence, it is justifiable to look at the demographic characteristic at the DS level rather than the GN level. The selected DS Divisions are Valikamam North (Tellipalai), Valikamam South (Uduvil), and Valikamam East (Kopay). Valikamam North DS Division has 45 GN Divisions, comprising 14,522 families and an estimated population of about 45,244 (See Table 7).		

Table 9: Household and Agricultural population in the Banana cluster

Households	Number
Male head	45,335
Female head	10,665
% of female head	23,5
Total	174,964
Agricultural Population	
Male	16,126
Female	6,002
Total	22,128

Source: Statistical Handbook 2021 three DS Divisions.

In discussions with farmers, they highlighted the local and foreign migration of youths who were looking for different types of employment opportunities with soft skills rather than engaging in agriculture. Further, they claimed that the existing agricultural activities do not ensure a consistent and stable monthly income. Modernisation in the agriculture sector would be a key point to get the attraction of the educated youths. As per the information[2], there are 1,949 government and around 779 private employees in Valikamam North and 2,994 government and 1,962 private employees are found in Valikamam South DS Divisions. Further, around 2,632 were found unemployed in two DS Divisions. In Valikamam East you find 3,084 government employees and 1,907 private-sector workers while 2,483 people are unemployed. Table 8 summarises the livelihood situation in all three DS Divisions. The daily wage category includes the farm labour and others who are partially unemployed or underemployed.

There are no published household income and expenditure details specific to the farmers in these DS Divisions or farmers engaged in cultivating banana cultivation. However, there are income data published in different forms in different DS divisions. In Valikamam North 8,597 families are having a monthly income of less than Rs.10,000. There are 10,317 families in Valikamam South and 16,359 families in Valikamam East earning an income less than Rs 10,000 per month. In general, the household income and expenditure statistics in Jaffna District - 2006/07 – 2016, published by the Department of Census & Statistics shows that the mean household monthly income in 2016 in Jaffna is about LKR 47,731 while the mean income per household in Sri Lanka was LKR 62,237. Even though there are no specific family income details relevant to the banana cluster in the Valikamam area, the dependency rate in these three divisions ranges from 36.44% in Valikamam North to 32.48% in Valikamam East which is high compared to the national rate. Farmers do not pay income tax and they never disclose their actual income levels and they do not keep proper accounting or income and expenditure statements for anyone to assess their income over expenditure. The Census & Statistical Department published data showing that the mean per capita income of income receivers in Jaffna is LKR 22,692/= while the median per capita income is LKR 16,000/= in 2016.

In Valikamam East DS division, out of 24,001 families, 9,408 families are receiving “Samurdhi” benefits from the Department of Samurdhi Development and more than 50% of the families are getting Rs 3500/= package while another 22.5% of families are receiving Rs.2,500/= per month. It appears that the “Samurdhi” development programme has not been implemented in the other two DS Divisions because the resettlement activities are still in progress. However, social assistance such as PMA, financial provision for people suffering from certain non-communicable diseases, and elders’ payment by the

	Social Service Department are being provided in all three DS Divisions. As per 'the Spatial Distribution of Poverty in Sri Lanka' published by the Department of Census and Statistics - Sri Lanka in 2015, the estimated headcount poverty index (2012/13) under Sri Lanka's official poverty varies from 0.6% to 21.2% among the DS Divisions in Jaffna District. The selected DS division poverty headcount index falls in the range of 12.5% to 21.2%. It clearly shows the importance of having economically stable agricultural projects in these selected areas. Modernising the farming practices from the land preparation to the marketing of high demanded crops involving youths will create positive impacts on the annual income of farming families. Implementation of banana with suitable inter- cropping cultivation, under the project by targeting export and value-added products to the international market will increase the income of the farmers of selected areas and future expansions will help to reduce the poverty headcount index under the Sri Lankan's poverty line of the selected DS Divisions.
Archaeological resources **(Recorded or potential to exist)**	While the most ancient records of the history of Jaffna are much debated by historians and archaeologists. The city has a rich share of historical and cultural monuments dating back to an ancient kingdom as well as a colonial-era located within the municipal area. Jaffna was occupied by the Portuguese (1617 to 1658) and the Dutch (1658 to 1795) until the British conquest. In the project area, most of the high-priority archaeological, historical and cultural sites are located within the coastal zone. Sites that carry an archaeological value in the Jaffna region were abandoned due to the conflict. Maintenance was not carried out due to the access constraints which arose with security concerns. There are quite several Archaeologically important locations recorded in these three DSDs. Even though there are six Archaeological locations recorded in the area, none of the locations will be affected due to proposed activities. Following locations can be recognized to be located within DSDs: 1. Achchuveli Dutch Fort, Achchuveli 2. Church of the Presentation of the Lord, Myliddy 3. Kadurugoda Vihara 4. Maviddapuram Kandaswamy Temple, Maviddapuram 5. Naguleshwaran Temple 6. Nilavarai Pond Hence, find chance scenarios can be expected and required guidance are provided in the Environmental Management Plan (EMP).

6. DESCRIPTION OF PROPOSED AGRICULTURAL ACTIVITIES

6.1 CULTIVATION	
The existing condition of the crop	Banana land size varies between 0.2 ha to 1 ha (0.5-2 acres) per farmer. Farmers in Jaffna have been cultivating bananas for centuries. The selected land is ploughed with a disc plough attached to a four-wheel tractor and after about 2 weeks, use a tine tiller to get the soil clods into fine particles. Basin-like beds are arranged for easy irrigation and planting that is within each basin. The main source of irrigation for the Jaffna Organic Banana Cluster agro wells or tube wells. Planting fits are fortified with 5 to 6 kg of cow done. In addition, some farmers are using about 150g of Triple

[2] Statistical Handbook, Valikamam North & Valikamam South Divisional Secretariat 2021

	Superphosphate (TSP). The size of the planting hole is 2'x2'x2'. Planting spacing is about 3m by 3m. Planting materials are purchased from nearby farmers or their own. Farmers are using only organic manure every 6 months and not using chemical fertiliser. Plantations are usually renewed every 5 to 6 years; however, some plantations are kept for 10 years or more. This practice has been a reason for the distribution of diseases throughout the field. Plants are irrigated every 6 or 7 days through gravity irrigation. Common Pests and diseases are banana weevil, mealy bugs as pests and Panama disease, Sigatoka and Bunchy top as diseases. Most the farmers are practicing selected vigorous healthy planting materials and neem extract as a natural in pest control. In the case of disease control, they practice using disease-free suckers, drainage improvement, application of lime (1-2kg/pit), and keeping the field clean approaches. Farmers apply pesticides very rarely. In general, farmers do not apply chemicals to control diseases in banana cultivation. As a result, existing Ambul Kathali banana plantations in Jaffna are surviving long periods without serious pests and diseases. Weeds are mostly controlled manually in the early stages of the crop. In mature plantations shade as well as the use of banana residue as mulch helps to keep bananas free of weeds. Harvesting is done every 2 weeks. Harvested bunches are sold at the Chunnakam market by transporting in small trucks or to a collector coming from other districts. Farmgate prices of Kathali banana vary from 35 to 50 LKR per kg. However, in the peak period farm gate prices may go up to 80-100 LKR per kg. The cost of production of bananas is about 20 LKR per kg. In general, the average bunches weight is 15-20 kg. However, in young plantations in first and second bounces average weight may go up to 25-30 kg. Generally, farmers aim to harvest for the festival seasons occurring in mid-April and the end of December by maintaining suckers in their cultivations. Although presently farmers are getting lower prices, they have a good potential to obtain higher prices for their produce if they had won the brand of organic banana in the local and foreign markets. The proposed project is designed to address many of the above issues. According to the high-density cultivation approach specific to this project, the number of suckers planted per unit area will be nearly double than the recommended and it is expected that the yield will increase by about 50 percent. Likewise, it should also be noted that the micro-irrigation system, which can provide water to the plant, is particularly suitable for soils in the project area. Every grower is advised to take care of crop sanitation in the field at all times. From the above details, it can be seen that the products produced under this project are designed and maintained to minimise the harmful effects on the environment, human and animal toxins from the nursery to harvest market preparation. Accordingly, there is a possibility of obtaining a special price for the products produced under this project by earning a name as the least toxic organic food. All banana products grown under the project will be directed to pre-identified specific markets. Accordingly, the existing small market in this area will be replaced by a wider market in the other areas of the country. In addition to growers, other groups will be involved in a variety of value-added product manufacturing-related activities. Therefore, this cluster will play a significant role in changing and upgrading the livelihood of the cluster area. From the above details, it can be seen that the products produced under this project are designed and maintained to minimise the harmful

	effects on the environment, human and animal toxins from the nursery to harvest market preparation. Accordingly, there is a possibility of obtaining a special price for the products produced under this project by earning a name as the least toxic organic food. All banana products grown under the project will be directed to pre-identified specific markets. Accordingly, the existing small market in this area will be replaced by a wider market in the other areas of the country. In addition to growers, other groups will be involved in a variety of value-added product manufacturing-related activities. Therefore, this cluster will play a significant role in changing and upgrading the livelihood of the cluster area.
POLLUTING PROCESSES (POINT SOURCE)	
In cultivation, some key polluting steps, although limited, take 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 the preliminary land preparation stage. Then, shading branches of big trees near the field will be taken place to destroy all alternative hosts for pests and diseases and this will provide the required sunlight for the plants. The 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 minimized due to aeration being improved. Also, Harmful pathogens are destroyed 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 the early stages of the crop. However, some farmers apply weedicides such as glyphosate.
Water requirement	The main source of irrigation for the Jaffna Organic Banana Cluster agro wells or tube wells. Plants are irrigated every 6 or 7 days through gravity irrigation. They are practicing flood irrigation and certain farmers have common wells and they use the wells in rotation. They can pump water continuously for 2-3 hours and thereafter they must stop pumping till the wells are recharged. Many farmers have inserted tube wells inside the dug wells to the continuous water supply. However, they are aware of the danger of a change in water quality and quantity in the future. All these wells are domestic wells, and no agro wells are in the area. The depth of these wells varies from 20 feet to 40 feet. They experience a shortage of water from July to September. The farmers said that they will have to pump 4-5 hours continuously to a half an acre plant for flooding. Farmers are using both electric and kerosene water pumps to pump the water and they are expecting electric water pumps from the project to replace kerosene and old electric pumps currently in use.
Use of fertiliser and pesticides and weedicides	Common Pests and diseases are banana weevil, mealy bugs as pests and Panama disease, Sigatoka and Bunchy top as diseases. Most the farmers are practicing selected vigorous healthy planting materials and neem extract as a natural in pest control. In the case of disease control, they practice using disease-free suckers, drainage improvement, application of lime (1-2kg/pit), and keeping the field clean approaches. Farmers apply pesticides very rarely. In general, farmers do not apply chemicals to control diseases in banana cultivation. As a result, existing Ambul

	Kathali banana plantations in Jaffna are surviving long periods without serious pests and diseases. Weeds are mostly controlled manually in the early stages of the crop. In mature plantations shade as well as the use of banana residue as mulch helps to keep bananas free of weeds. The 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 pests and diseases the recommended pesticides and the fungicides are applied by the framers. IPM of the Jaffna Banana cluster is shown in table 10 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 are sold weighed in the Chunnakam market by transporting in small and large trucks to a collector coming from other districts. Farm gate prices of Kathali banana vary from 35 to 50 LKR per kg. However, in the peak period farm gate prices may go up to 80-100 LKR per kg. The cost of production of bananas is about 20 LKR per kg. In general, the average bunches weight is 15-20 kg. However, in young plantations in first and second bounces average weight may go up to 25-30 kg. Generally, farmers aim to harvest for the festival seasons occurring in mid-April and the end of December by maintaining suckers in their cultivations. However, in young plantations in first and second bounces average weight may go up to 25-30 kg. Farmers aim to harvest for the festival seasons in mid-April and the end of December by maintaining suckers in their cultivations. Though, presently farmers are getting low prices between LKR 25 to 40 per kg, by exporting Ambul banana farmers will certainly get a high price for their products. Export of Ambul banana has not been done yet due to the unavailability of a suitable export protocol.
Postharvest storage and transportation	This banana is mainly used as fresh fruit and maintaining freshness is important and needs to transport immediately to the local market. However, the project expectation is to provide fresh banana fruit to the export market. Therefore, the harvesting should be done by maintaining the required time gap (at least two weeks) before 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's high quality and value. Therefore grading, packing, and transporting should be undertaken with improved technology. These technology facilities will be available for farmers.
Other factors	
Solid waste	The solid organic waste is generated as crop residuals and at the postharvest period and all are biodegradable. However, a compost production unit (See Annexure 6: Compost plant proposal) will be implemented to produce compost using solid waste generated from the post-harvesting processing centre and these organic fertilisers will be used at the 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 reports and relevant EMP and Social Management Plan (SMP) for the post-harvesting processing centre will be developed separately.
Wastewater	The surface runoff will carry the fertilisers and applicable chemicals (pesticides, weedicides, etc.) and the impact is higher due to the flood irrigation system. This will be minimised by introducing water conservation techniques. Further, due to

	the application of the IPM mechanism, soil and ground/surface water pollution will be minimalised. ASMP will conduct awareness creation and training programmes for both farmers as well as the officers regarding the IPM as per the PMP. The proposed application of IPM during the implementation of the banana cluster is given in table 10.

Table 10: ISP of ASMP - Proposed IPM Technologies for Crop Banana in Jaffna (CDP 6)

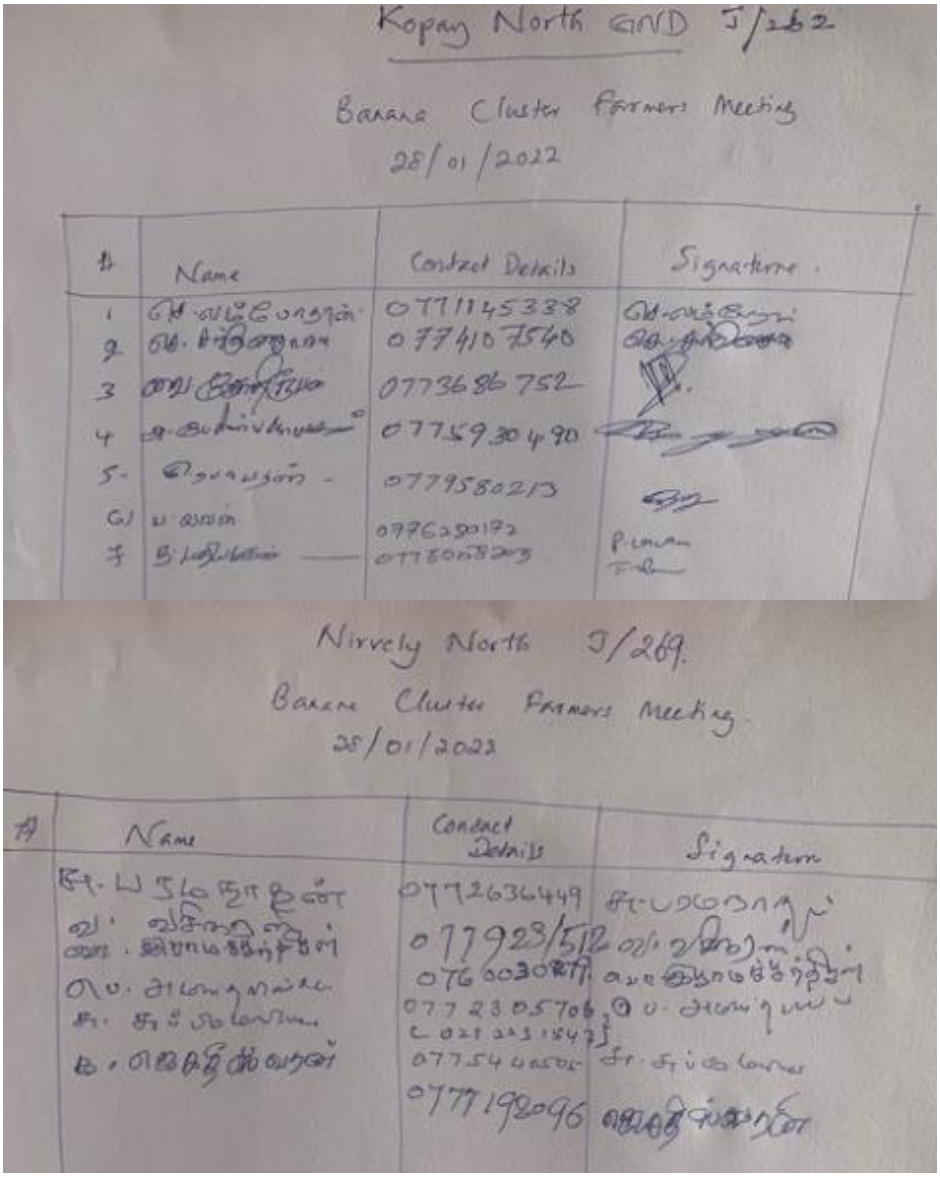
Stages	IPM Practices	Impacts of Implementation	Benefit for farmers
Pre-Land preparation stage	Removal of all shrubs and bushes. Shading branches of big trees near the field are removed	Destroying all alternative hosts for pests and diseases	Future risk of pest damages is minimised
Land preparation stage	Doing 1st ploughing with disk or mouldboard ploughs	• Different stages of pest cycles are destroyed. • Harmful bacteria and microorganisms are destroyed and minimized due to aeration being 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 ploughing with disk or mouldboard ploughs perpendicular to 1st ploughing		
	Disking or harrowing (two perpendicular passes)		
	Flood prevention and Drainage improvements		
Planting stage	Healthy Planting Materials are selected	strong and vigorous Saplings are ensured for planting	A healthy plantation is assured. Cost reduced
	Plant of nonstandard are removed		
	Farmers' production of saplings from peeper suckers are encouraged		
	Saplings of the same height and growth are planted in separate rows	Easy to manage agronomic practices. Uniform plantation is assured	A healthy plantation is assured. Cost reduced
Sapling stage	Daily attention on each and all saplings are assured	Early identification of pest and diseases incidents	A healthy plantation is assured. Cost reduced
	weakened plants are replaced by new saplings	Even plantation is assured	A healthy plantation is assured. Cost reduced
	No water stress is assured	Vigorous growth and Even plantation is assured	A healthy plantation is assured. Cost reduced
	The only correct dose of nutritionally balanced fertilizers will be applied	No unwanted canopy development and vigorous growth is assured	A healthy plantation is assured. Cost reduced
Juvenile stage	Daily attention on all saplings is assured. This procedure is followed in every growth stage of the crop cycle	A healthy crop field is assured	A healthy plantation is assured. Cost reduced
	weakened plant parts are removed and vacancies will be filled		

	Field sanitation is assured by managing garbage in the field		
	Suspicious plants are marked and will be monitored for pests and diseases. Treatment is followed if identified a pest or a disease incident		
	Attacked plants and parts are uprooted and immediately destroyed		
	Intercropping	• Minimize weed control. • No need for weedicide application	additional income
	Micro-irrigation	• Volume of water needed for the effective root zone is assured. • Percolation of irrigated water toward the groundwater is minimized	Easy to handle
	Fertigation with organic liquid fertilizers Formulation of soil nutrient regimes based on complete soil tests and foliar analyses. It will be continued flowering and maturity stages too	The correct dose of nutrients to the plant is assured	Easy to handle
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 flower bud points downward	Bagging protects the banana bunch from physical and pest damage and increases bunch vigour	
	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 increasing the vigour of the bunch	A 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. The risk of pest and disease incidents is minimized.	The expected yield is assured

Harvesting stage	• Bunches for de-handing in the field are chosen based on age (ribbon colour) and calliper grade to protect the 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	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.	The expected yield is assured
	Removed hands from the harvested bunch are placed on banana leaves for de-latex for at least one hour	Fruit arrives free of latex for packing, avoiding the use of large amounts of water for de-latex 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	
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 the value chain	Banana producers will win a brand of quality product suppliers
Transport stage	Packing the de-latex 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 center.	Protects banana hands from damage during transport to packing centre. Possible causes of pest and disease incidents are minimized.	The expected quantity of produce is assured. A reasonable price is 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	Banana producers will win a brand of quality product suppliers

7. PUBLIC CONSULTATION

The consultation was held with the private sector involved in input supplies, marketing, and transportation of agricultural products. Most importantly, attention has been paid to 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.



Kopay North GND J/262

Banana Cluster Farmers Meeting

28/01/2022

#	Name	Contact Details	Signature
1		0771145338	
2		0774107540	
3		0773686752	
4		0775930490	
5		0779580213	
6		0776290192	
7		0776085203	

Nirvely North J/269

Banana Cluster Farmers Meeting

28/01/2022

#	Name	Contact Details	Signature
		0772636449	
		0779281512	
		0760030877	
		0772305706	
		0212213547	
		0775400850	
		0771192096	

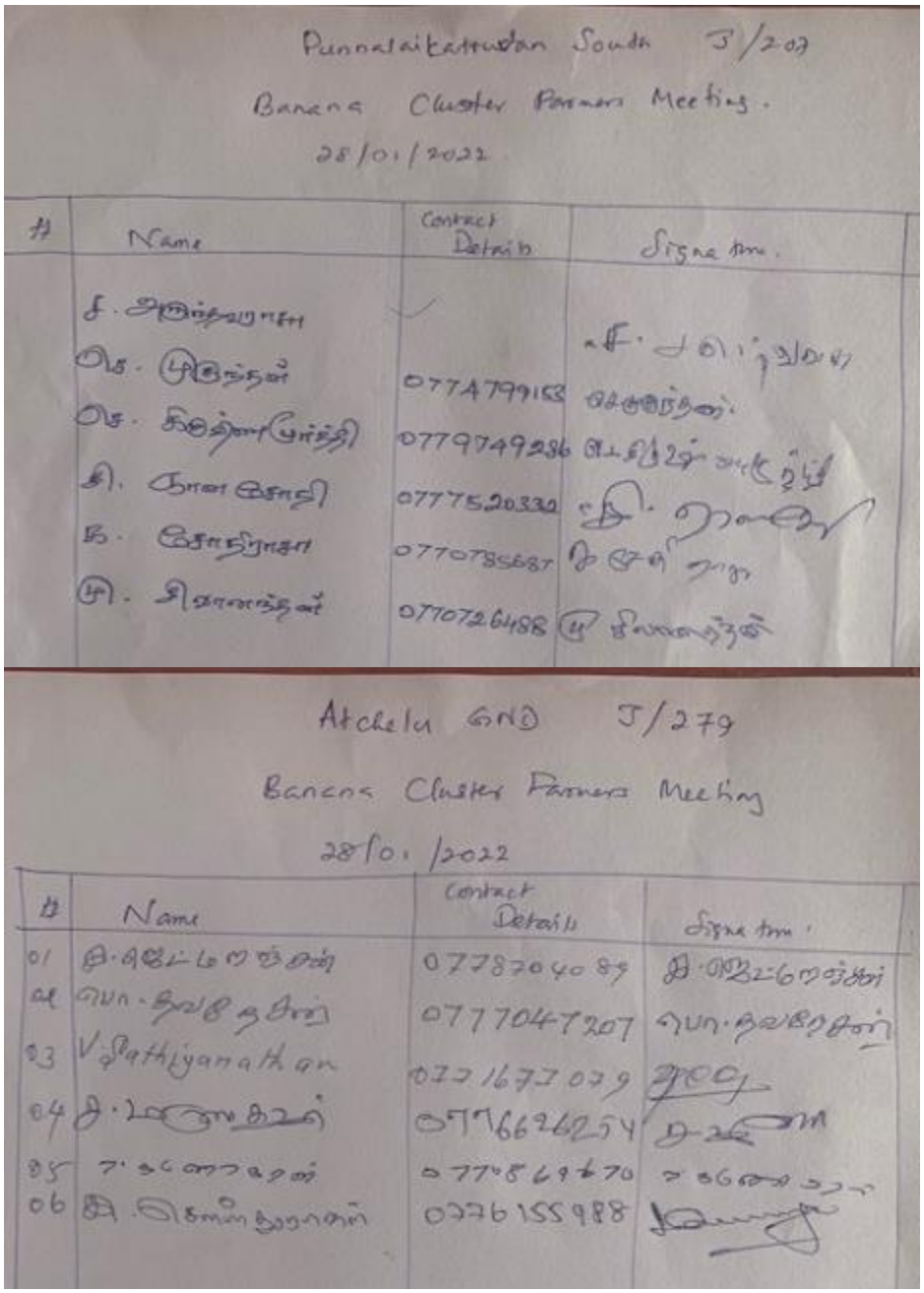


Figure 5: Attendance Sheets of Public Consultations

Table 11: Outcomes of the Public Consultations

#	Farmer's Representation	Summary of Public Consultations
1	Kopay North GN/262 Valikamum East DS Division	The farmers have owned and leased lands and they said that the land ownership is very secure, and they will not face any problem. Currently, they are using ordinary dug wells in the farmlands for irrigating the plants. They are practicing flood irrigation and certain farmers have common wells and they use the wells in rotation. They can pump water continuously for 2-3 hours and thereafter they must stop pumping till the wells are recharged. Many farmers have inserted tube wells inside the dug wells to the continuous water supply. However, they are aware of the danger of a change in water quality and quantity in the future. All these wells are domestic wells, and no agro wells are in the area. The depth of these wells varies from 20 feet to 40 feet. They experience a shortage of water from July to September. The farmers said that they

		will have to pump 4-5 hours continuously to a half an acre plant for flooding and repeat the same in 4-5 days. Farmers are using both electric and kerosene water pumps to pump the water and they are expecting electric water pumps from the project to replace kerosene and old electric pumps currently in use. When we discuss the introduction of new technologies like drip irrigation, they said that the cost of production will be reduced, and water will be saved. They agreed that the quality improvement would enhance the product price. Further, they agreed that the new planting techniques would increase the number of plants per ½ acre from 200 to 560. Moreover, other new technologies such as bagging, cutting, and washing the bunch would improve the size and healthiness of the fruit and fetch a higher price in the market. They welcome the idea of inter-cropping and utilizing the land fully leading to higher income for the farmers. Among the participants, there were two farmers from Kopay Centre J/261. Hence we requested the participants to draw two different community maps to represent their GN divisions When we discussed the present marketing arrangements they said would sell it at the cooperative society and the local markets surrounding the area of production. When the outside buyers come to cooperate, they would get a higher price and they have the bargaining power. But in the local market, the buyers have the power to determine the price. They are very keen on value addition techniques that would help them to get more income, particularly during the surplus periods of production. They mentioned the machine donated by some INGOs for the co-operative society which is not in use because of its non-compliance with the requirement.
2	Neervely North J/269 Valikamaum East DS Division	There are 42 members in the GN division and 32 of them are existing cultivators and 10 members are new farmers some of them will be model farmers who will be provided the complete package of the project from the land preparation to marketing. Other existing farmers will get technical advice to improve the quality of the product. The farmers have both own and lease lands, and they said the land ownership is legally secured. This area also uses domestic dug wells for pumping water to irrigate the crops. These wells are owned by a single farmer and some wells are jointly owned by three to four farmers in the surrounding. Farmers rotate the irrigating time in the Jointly wells. They said that there were no disputes and all respect the traditional arrangements in place. Every four to five days they must irrigate the plants and they do flood irrigation. They agreed that the present system of irrigation would have an impact on the quantity and quality of water in the area. They wish to entertain an alternative system that will ensure continuous water supply without compromising the output of their product. The depth of the wells varies from 20 feet to 30 feet and roughly half of the wells will be filled with water. No water logging issues in the area and any excess water will drain out quickly. They used to cultivate paddy in the low-lying areas closer to the lagoon and other field crops are cultivated in the inland area from March to July. These farmers also mentioned the banana chip-making machine donated by GTZ and UNHCR. They said that the operating cost of the machine was too high, and its capacity is also too high. Once a mechanic came and tried to adjust to meet their requirement, but it failed. Hence.

		The machine is idling and rusting. These farmers are maintaining the crops for 12 to 15 years once it is planted. This period seems to be too long compared to the standard of around 10 years. But the farmers said that they get a good yield up to 15 years if the plants are maintained properly. They said if they get a price of Rs. 40 to Rs 50 per kilo that would be adequate to cover the cost of production and to give them a reasonable income. Price fluctuation is the major issue faced by the farmers.
3	Punnalaikadduwan South J/207 Vallikamam South DS division	Regarding water sources, they have domestic wells and some of the farmers have their well and others shared wells they irrigate in rotation and strictly follow the traditional water-sharing arrangement practiced in the area. They use kerosene and electric water pumps to pump the water. For plantain crops currently, the farmers practicing flood irrigation and they are watering the plants at 4-5 days intervals. The depth of the wells ranges from 30 to 40 feet. During the rainy season, the wells will be with 50 to 75% water and in the dry season, the water level will be low. Many farmers have boreholes inside the wells to draw more underground water. All the farmers are aware of the dangerous change in quantity and quality of the water in the future. They are ready to accept the new irrigation methods without compromising the product output. Since the selected farmers are existing there is no model farmer in the division. Hence, all the selected framers will be eligible for the technical services and new management practices. Farmers said if they maintained properly, they could have the plants for 15-20 years from the first planting. Normally they allow two young plants for a parent one and remove others. All the leaves and stems are cut into small pieces and buried surrounding the existing plants. This is the manure they provide for the plant. Windy season young plants are affected by the virus and matured plants with bunch fell to the ground and damaged. Fungal are another issue that reduces the quality of the fruit. They said this could be prevented easily by bagging. The problem here is the plants are high and they cannot do the bagging from the ground. The district coordinator mentioned that they are thinking of introducing equipment that could be used for bags from the ground. Farmers said if the technique is cheap, they will adopt it. Another issue they indicated is crows stay in the plants and dirty the leaves and bunches. Sometimes they build their nests in the tree and stay day and night. Bats damage the matured and ripe fruits in bunches. They agreed that the bagging of bunches would be a solution for all these issues. Regarding the price, they said it is not stable throughout the year. Normally from January to August, the prices will be high due to high demand in the local market. Temple's annual festivals, other festivals, and functions in Jaffna create demand in these months. Timing for this market is not at all possible because it is a perineal crop. Hence, they said new processing methods and value-added products with a long shelf life should be introduced to ensure stable prices. They also mention that the farmers planted Cavendish variety is getting stable price throughout the year. End of the meeting the team visited a field where a potato-Onion cluster model farmer has planted potatoes in the new method introduced by the project.

4	Atchelu J/279-Valikamum East DS Division	The farmers are cultivating crops in their lands and leased lands. People are cultivating the banana crops in inland areas of ½ an acre to 4 to 5 acres. They said that the land ownership of the cultivated lands is legally very secure. The farmers have their domestic wells and shared wells as water. They face a shortage of water during the dry season and rotate the timing of irrigating the plants, especially in the wells where the water right is shared among the farmers. They follow the traditional rules and ensure that the interest of all the farmers takes care of. They do not use any chemicals in this crop. They use all the leaves and stems of the plants as natural manure along with cow dung. The fertility and the texture of the land are well maintained in the red soil cultivation areas. No wild animal problems in this area but the seasonal wind is causing damage to matured plants from time to time and reduces the income of the farmers. Farmers have insured their plants, but the compensation is not paid promptly, and they have lost interest in ensuring the crops. It was introduced by the Sanasa Development and payment for a nature natural disasters is being done but very slow in processing. They said if they get a price of Rs 45 to 50 per kilo without fluctuating throughout that would be adequate to cover the cost and to earn a reasonable margin for their investment. Since we had our potato cluster meeting also in the same location we have not requested the farmers to draw the community map in this discussion. After finishing the meeting visited two or three existing farmers' fields and saw the sites.

- **Existing issues**

1. Low yield of banana and decline of yield over the years due to poor agronomic practices adopted by farmers
2. Low quality of product and major portions are not suitable for high-end markets due to small finger size, shape, etc.
3. Low productivity of lands, labour, and other inputs
4. Low adaptability of new technologies
5. Excessive flood irrigation creates many problems such as waterlogged conditions, poor crop performances, high disease incidence, and waste of water
6. High risk of soil erosion due to prolonged flood irrigation
7. Poor crop management practices and poor sanitation
8. Bagging of banana bunches is not a common practice
9. Some farmers reuse bags that may contaminate fruit bunches
10. Poor primary post-harvest handling and high wastage
11. Farmers who maintain their banana plantations using only organic fertilizers are not sufficiently aware that they can get a special price for their produce
12. Difficulties in finding labour
13. Most of the youth in the labour force have left the district or gone abroad for employments
14. Reluctance of even the youth in the district to engage in agriculture

Figure 6: Public Consultations with Banana Cluster Farmers

Figure 7: Community Mapping Outcomes

Figure 8: Existing Conditions of Banana Cultivations

Figure 9: Current irrigating practices

Figure 10: Spreading of Invasive Species

Figure 11: Existing Organic Practices

8. ENVIRONMENTAL EFFECTS AND MITIGATION MEASURES

Table 12: 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 flood irrigation system will be changed. Land preparation techniques will focus on reducing the effects of flood irrigation. Land clearance will be there for the civil works such as access roads, 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 the 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?	√		Low	• Land preparation, transportation and Construction of collecting centre 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 areas with the potential for flooding due to lowlands and poor drainage. However, the project will not cause localised flooding, and potentials will be reduced due to proper leveling and making proper drainage systems
8	Will there be any risks and vulnerabilities to public safety due to physical hazards during the 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 shipments/or any other location will be taken place. No creation of significant environmental problems.

№	Screening question	Yes	No	Significance: (low, moderate, high)	Remarks
	cause environmental problems, which could be affected by the project?				• 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 the 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 that could be affected by the project?		√		• No Important or sensitive areas in the area
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?		√		• No records
14	Is the project located in a previously undeveloped area where there will be a loss of greenfield 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?		√		• Removal of trees is not required
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 such locations encountered be disturbing

№	Screening question	Yes	No	Significance: (low, moderate, high)	Remarks
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?		√		No such impact could be anticipated
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	√		Low	• 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 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 subproject 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 have been environmentally polluted

8B. Environmental Management Plan

Table 13: Environmental Management Plan for Proposed Agricultural Activities which ISP/ASMP should implement

№	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 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/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 such as *Parthenium hysterophorus*	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 and Safety 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 14: EMP for Improvements of Rural Farm Access Roads which should be included in the bidding 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	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;

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			1. Immediately stop construction activities. 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.

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			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 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

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			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. 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.

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			2. Any hazardous type of waste shall be dealt with special care and instructions from the LA. 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.

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			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. 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.
	Post construction phase		
12	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 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		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 15: Environmental management plan for Construction of collection centre and Compost Yard

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	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 6)
3	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;

SN	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 of any wastes generated by construction activities in designated sites. • Irrigation works must be planned to be carried out during times of lowest flow
4	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. • 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
5	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
6	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.

SN	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			• 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. • 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.
7	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.
8	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**

SN	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			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. 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,

SN	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			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** 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.
9	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			
10	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.
11	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
12	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
13	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

9. COST OF MITIGATION

Table 16: Environmental mitigation measures and estimated cost

No.	Environmental mitigation measure	Cost (LKR)	Remarks
1	Information Boards, leaflets	250,000.00	Awareness leaflets for organic cultivation practices and IPM
2	On-site first aid facilities	75,000.00	
3	Safety equipment	250,000.00	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	50,000.00	Waste from Polythene bags, vegetation clearing, site preparation, labour camps
6	Training of farmers and village level stakeholders on IPM and new technological applications	250,000.00	Should be scheduled to a few sessions
7	Training and awareness including progress review meetings	10,000.00	Progress Reviews and technical reviews
		10,000.00	Training/motivation programs for female farmers to enhance active participation
		10,000.00	Training on postharvest processing activities (Collection, Selection, storage, transportation, etc.)
8	**Total**	**955,000.00**	

10. CONCLUSION AND SCREENING DECISION

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

Table 17: Summary of environmental effects

Key project activities	Potential environmental effects	Significance of environmental effect with mitigation in place[3]
During Agricultural activities		
• Land preparation • Preparation of pits & planting • Planting materials • Fertiliser in the planting pit • Planting Tools • Planting Aids • Harvesting Crates	No significant negative impacts since new lands are not used for cultivation activities. Water accessibility will be improved	SP
• Introduction of basic flood prevention and drainage field techniques • Site leveling using drone surveying and laser leveling 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	No Land, water air contamination as No Pesticides, weedicides, and fertilizers will be used	SP
Product transportation and storage	No significant impacts	NS
• Introduction of drone technology • Geo-positioning	Less agrochemical contamination on Land, water, and air	SP

[3] 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[3]
• Land surveys for site selection • Levelling for land preparation and drainage • Disease surveys using infra-red photography • Application of pesticides		
• 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, de-budding, bagging, propping, and guying • Fishline de-handing, de-latex 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 and Canals/Drainages)		
• Vegetation clearing	Clearing of vegetation will collect a 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

Key project activities	Potential environmental effects	Significance of environmental effect with mitigation in place[3]
• 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, the 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 lies with the ISP team and is 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 National 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

The 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 constructional impacts are temporary. Even though construction of new wells is not proposed, if any chance a well needs to be constructed, it is required to get water resource board approval with the yield test to implement new water extraction sources such as open wells/agro wells and tube wells. It is recommended to start the project work off-season for upland cultivation and avoid nighttime work. However, it should be noted that the establishment of Postharvest Processing Centre related activities, the establishment of the compost production plant, waste minimisation, Income Generation, and Empowerment pilot project are excluded from this report and those project activities will be separately investigated and reported (refer to Annexure 6). Implementation of the EMP is sufficient to mitigate the identified impacts. 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.

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.

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.

Table 18: Screening Recommendations for each activity

Key recommendations	Actions / Approvals to be attended	Time period to attend each action	Responsibility / Remarks
Construction of Agro Wells	Obtain WRB Recommendations with yield test reports	Before mobilise contractors to construct wells	ISP PPMU Engineer-PMU
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 centre	Construction of Building Fencing of land Landscaping of area Post-harvest operations	During construction Installation of equipments/ machineries During operations	Civil Engineer – ISP Agronomist - ISP PPMU
Construction of compost yard	Construction of Building Fencing of land Landscaping of area Drying and sorting of waste Leachate collection Odor control Operations of composting	During construction Installation of machineries During operations	Civil Engineer – ISP Agronomist - ISP PPMU

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** June 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

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2) Integrated Pest Management Action Plan, Agriculture Sector Modernization Project

3) Cluster Development Plan (CDP) № 6 - Jaffna - Small Banana (Ambul)

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) The National Atlas of Sri Lanka, Second Edition, Survey Department of Sri Lanka, 2007

6) Jaffna-Kilinochchi Water Supply and Sanitation Project, 2015

7) Check the Air Quality in Punnalaikadduvan, Sri Lanka - BreezoMeter

8) Statistical Handbook 2021 three DS Divisions

9) Resource profiles, of all three DSs 2021

10) Statistical Handbook, Valikamam North, Valikamam South and Valikamam East DSs 2020

ANNEXURE 2: BENEFICIARY LIST

No	Name of the Farmer	Gender	NIC	DSD	GN Division	Contact No	Land Extent (lach)	Land Extent (Acre)	Kathali %	Land Extent lach	Land Extent (Acre)	Type of water source	Land coordinates	
													Easting	Northing
1	Thavalingam Mathiyalagan	M	820901800V	Valikamam East	Kopay North	773058203	15	0.94	50	7.5	0.47	Well	396546	1074394
2	Kanagarasa Saravanabavan	M	792224393V	Valikamam East	Kopay North	779688048	20	1.25	50	10	0.63	Well	397900	1074125
3	Sivaprakasam Pathmanathan	M	671373928V	Valikamam East	Kopay North	773145670	26	1.63	50	13	0.81	Well	396485	1074415
4	Sellaiyya Lambotharan	M	733430052V	Valikamam East	Kopay North	771145338	8	0.50	70	5.6	0.35	Well	397747	1074162
5	Sellaiyya Kanthakumar	M	681770119V	Valikamam East	Kopay North	776273197	20	1.25	50	10	0.63	Well	398173	1073648
6	Rasathurai Parameshwaran	M	623183378V	Valikamam East	Kopay North	766362146	13	0.81	50	6.5	0.41	Well	396583	1074541
7	Sivapirakasham Uthayakumar	M	713314463V	Valikamam East	Kopay North	766362146	16	1.00	50	8	0.50	Well	396676	1074205
8	Subramaniyam Kandasamy	M	540624038V	Valikamam East	Kopay North	765477145	40	2.50	50	20	1.25			
9	Annalingam Jeyakumar	M	71283668V	Valikamam East	Kopay North	773056620	24	1.50	70	16.8	1.05	Well	397759	1074076
10	Rasaiah Krishnakumar	M	703491510V	Valikamam East	Kopay North	741331970	20	1.25	50	10	0.63	Well	396574	1074550
11	Kathiravelu Sivasubramaniyam	M	422500383V	Valikamam East	Kopay North	773821291	20	1.25	60	12	0.75	Well	398282	1073877
12	Sangarapillai Baratharasa	M		Valikamam East	Kopay North	773276387	12	0.75	70	8.4	0.53	Well	397588	1073916
13	Shanmugam Thanabalalingam	M	463283222V	Valikamam East	Kopay North	773452500	18	1.13	30	5.4	0.34	Well	398243	1073838
14	Sellaiah Jegatheeswaran	M	740061860V	Valikamam East	Kopay North	773209786	26	1.63	50	13	0.81	Well	397764	1074225
15	Sivakuru Selvarasa	M	540394326V	Valikamam East	Kopay North	770554306	18	1.13	50	9	0.56	Well	398208	1073805
16	Selvarasa Kajanthan	M	890761372V	Valikamam East	Kopay North	771372807	24	1.50	60	14.4	0.90	Well	398220	1073792
17	Selvarasa Arunan	M	781633496V	Valikamam East	Kopay North	777423534	37	2.31	50	18.5	1.16	Well	397472	1073725
18	Theivendram Nishakanthan	M	841641949V	Valikamam East	Kopay North	771630750	12	0.75	40	4.8	0.30	Well	397416	1073960
19	Rasanayagam Paraparan	M		Valikamam East	Urumpirai East	778274564	20	1.25	70	14	0.88	Well	397174	1075783
20	Thambirasa Sivaloganathan	M	512294146V	Valikamam East	Urumbirai East	212054546	8.75	0.55	90	7.875	0.49	Well	396143	1075151

21	Selvaratnam Sanmugarathinam	M	663640160V	Valikamam East	Urumbirai East	770641234	10	0.63	75	7.5	0.47	Well	396435	1075018
22	Kanagaretnam Vijayakanthan	M	632890656V	Valikamam East	Urumpirai East	773127002	1.25	0.08	50	0.625	0.04	Well	396381	1074933
23	Thillainadarasa Sivathasan	M	803032203V	Valikamam East	Urumpirai East	771726680	8	0.50	75	6	0.38	Well	396235	1074857
24	Nagendram Jeyakularasa	M	603074424V	Valikamam East	Kalviyankadu	776319553	12	0.75	40	4.8	0.30	Tube well	395190	1071827
25	Aruchunan Mayuran	M	883334868V	Valikamam East	Kalviyankadu	772823865	10	0.63	50	5	0.31	Tube well	395258	1071581
26	Sivapatham Sivalingam	M	673640230V	Valikamam East	Kopay Center	776944965	16	1.00	80	12.8	0.80	Well	398004	1074104
27	Veeravahu Rasalingam	M	512373453V	Valikamam East	Kopay Center	767317465	24	1.50	50	12	0.75	Well	398222	1073859
28	Sellaiah Satkunarasa	M	631081746V	Valikamam East	Kopay Center	774107540	20.0	1.25	50	10	0.63	Tube well	397133	1072848
29	Arumugam Parameshwary	F	463433402V	Valikamam East	Kopay South	779192526	12.0	0.75	50	6	0.38	Well	395112	1071546
30	Thurairasasingam Ramesh	M	801842860V	Valikamam East	Kopay South	770921654	16.0	1.00	40	6.4	0.40	Well	394534	1071129
31	Rasarathinam Yogarathinarasa	F	623262855V	Valikamam East	Kopay South	776701203	14.0	0.88	70	9.8	0.61	Well	396020	1072457
32	Sivaloganathan Theivarani	M	676900837V	Valikamam East	Kopay South	775177555	12.0	0.75	75	9	0.56	Well	395208	1071755
33	Aruchunan Kokilathasan	M	782153218V	Valikamam East	Kopay South	778365832	15.0	0.94	75	11.25	0.70	Well	394791	1072089
34	Senthamilselvan Pushparani	M		Valikamam East	Kopay South	778365832	24.0	1.50	70	16.8	1.05	Tube well	395242	1071461
35	Ramanathan Sivakumaran	M	773564728V	Valikamam East	Kopay South	771965794	12.0	0.75	50	6	0.38	Well	394941	1071892
36	Shankarapillai Shanthirasoodi	M	670271523V	Valikamam East	Neervely South	772562813	30	0.50	80	24	1.50	Well	398375	1075844
37	Kanapathipillai Sivamoorthy	M	197527801184	Valikamam East	Neervely South	763620082	30	1.88	70	21	1.31	Well	398026	1074876
38	Kathireshu Vairavanathan	F	502463543V	Valikamam East	Neervely South	768353972	20	1.25	80	16	1.00	Well	397941	1074839
39	Manikavashakar Tharmarasha	M	582760462V	Valikamam East	Neervely South	773341004	15	0.94	50	7.5	0.47	Well	399612	1074738
40	Vakeesan Kumulini	F	875301373V	Valikamam East	Neervely South	774832393	8	0.50	75	6	0.38	Well	398033	1074990
41	Muththaiyah Pathmanathan	M	542514060V	Valikamam East	Neervely South	779986410	4	0.25	50	2	0.13	Well	398015	1075002
42	Varatharajeshwaran Jeyarani	M	685620847V	Valikamam East	Neervely South	771630125	20	1.25		0	0.00	Well	398367	1074070
43	Poothathamphy Thanabalasingam	M	610911170V	Valikamam East	Neervely South	766731119	20	1.25	85	17	1.06			
44	Kanakarathinam Kamalenthira	F	751910584V	Valikamam East	Neervely South	775851437	20	1.25	35	7	0.44			

45	Ponnampalam Shanthiran	F	543210951V	Valikamam East	Neervely South	776158751	15	0.94	50	7.5	0.47	Well	397434	1074616
46	Apputhurai Meenambikai	M	537563915V	Valikamam East	Neervely South	776568920	25	1.56	95	23.75	1.48	Well	398342	1073944
47	Nadarasa Kamalambikai	M	588043576V	Valikamam East	Neervely South	776568920	30	1.88	95	28.5	1.78	Well	398332	1073924
48	Raveenthiran Sanjeepan	M	941821812V	Valikamam East	Neervely South	770615360	8	0.50	75	6	0.38	Well	398166	1074375
49	Raveenthiran Vaakeesan	M	198530504305	Valikamam East	Neervely South	777448617	10	0.63	50	5	0.31	Well	398116	1074415
50	Rasharathinam Navarathinam	M	490705740V	Valikamam East	Neervely South	773755455	8	0.50	0	0	0.00			
51	Kumarakuruparan Lavakeesan	M	198622303638	Valikamam East	Neervely South	757424133	16	1.00	5	0.8	0.05	Well	397536	1074688
52	Puvaneswaran Chithra	M	696340692V	Valikamam East	Neervely South	772184377	16	1.00	2	0.32	0.02	Well	398433	1074715
53	Uthayakumar Bhavani	M	707391693V	Valikamam East	Neervely South	769291991	26	1.63	0	0	0.00	Well	398346	1074028
54	Balasubramaniyam Shanthiramohan	M	773510768V	Valikamam East	Neervely South	774550773	10	0.63	0	0	0.00	Well	398081	1075029
55	Vaitheeswaran Yuvatheepan	M	199032400482	Valikamam East	Neervely South	773664365	8	0.50	0	0	0.00	Well	396908	1075171
56	Sivarasha Thishokan	M	199429103133	Valikamam East	Neervely South	777898243	15	0.94	40	6	0.38	Well	398358	1075674
57	Ramanathan Aananthamoorthy	M	773251088V	Valikamam East	Neervely South	764248031	8	0.50	5	0.4	0.03			
58	Selvanayakam Suthaharan	M	853214698V	Valikamam East	Urelu	777421397	20	1.25	5	1	0.06	Well	396311	1076315
59	Santheeswaran Thanushan	F	862813154V	Valikamam East	Urelu	776544393	4	0.25	10	0.4	0.03	Well	396435	1076672
60	Vigneshwaran Gowsikan	M	870200404V	Valikamam East	Urelu	772203110	13	0.81	80	10.4	0.65	Well	396454	1076407
61	Thurairasha Vigneswaran	F	543243507V	Valikamam East	Urelu	778435154	10	0.63	100	10	0.63	Well	396438	1076448
62	Keerthana Jegan	M	936740529V	Valikamam East	Urelu	773814787	18	1.13	80	14.4	0.90	Well	396236	1076699
63	Nagamuththu Rashaiyah	M	462223099V	Valikamam East	Urelu	775827701	32	2.00	90	28.8	1.80	Well	396497	1077175
64	Kirishnan Selvarooban	M	812632450V	Valikamam East	Urelu	774013959	20.0	1.25	75	15	0.94	Well	394997	1077081
65	Amirthalingam Kannathasan	M	653011512V	Valikamam East	Urelu	770856536	20.0	1.25	80	16	1.00	Well	396304	1076209
66	Amirthalingam Amirthayogan	M	602721752V	Valikamam East	Urelu	769269207	8.0	0.50	90	7.2	0.45	Well	396567	1076089
67	Jokarasa Santhiramalar	M	696682844V	Valikamam East	Urelu	774191071	35.0	2.19	70	24.5	1.53	Well	396474	1077200
68	Vaiththilingam Sivanantharajah	F	852545810V	Valikamam East	Achchelu	771538394	8.0	0.50	70	5.6	0.35	Well	399979	1077382

69	Ramalingam Sowntharajan	M	551643670V	Valikamam East	Achchelu	776155988	12.0	0.75	65	7.8	0.49	Well	398936	1076629
70	Kanakasabai Amirthalingam	M	601780682V	Valikamam East	Achchelu	771982976	25.0	1.56	50	12.5	0.78	Well	397891	1077423
71	Rasathurai Pushpakaran	M	823171250V	Valikamam East	Achchelu	775074772	16.0	1.00	70	11.2	0.70	Well	398279	1076333
72	Ponnambalam Radha	F	602211363V	Valikamam East	Achchelu	775803721	28.0	1.75	40	11.2	0.70	Well	397839	1076351
73	Nadarajah Karunakaran	M	840442470V	Valikamam East	Achchelu	770869670	12.0	0.75	70	8.4	0.53	Well	397975	1077741
74	Kanthaiya Annalingam	M	194904303350	Valikamam East	Achchelu		16.0	1.00	50	8	0.50	Well	397723	1077366
75	Ponnuththurai Thavanesan	M	583164669V	Valikamam East	Achchelu	777047207	15.0	0.94	30	4.5	0.28	Well	398881	1076825
76	Thurairajah Nimalan	M	843562337V	Valikamam East	Achchelu	772933958	20.0	1.25	40	8	0.50	Tube well	398849	1076331
77	Poobalarajah Puvaneshvararajah	M	530664147V	Valikamam East	Achchelu	776162306	8.0	0.50	50	4	0.25	Well	398850	1077930
78	Ladsumanan Jedmaranjan	M	693495059V	Valikamam East	Achchelu	778704089	32.0	2.00	70	22.4	1.40	Well	398376	1077709
79	Sivanesan Shanthiradevi	M	485763902V	Valikamam East	Achchelu	774385215	12.0	0.75	50	6	0.38	Well	398725	1076862
80	Sabaratnam Achchuthan	M	800622409V	Valikamam East	Achchelu	777046170	20.0	1.25	50	10	0.63	Well	398879	1076699
81	Suntharam Vilvarajah	M	581062664V	Valikamam East	Achchelu	772153983	9.0	0.56	85	7.65	0.48	Tube well	397634	1076682
82	Bavanantham Ramanantham	M	762211114V	Valikamam East	Achchelu	771746986	10.0	0.63	90	9	0.56	Well	398719	1077330
83	Somasuntharam Sivasubramaniyam	M	195901702561	Valikamam East	Achchelu	771644351	10.0	0.63	85	8.5	0.53	Well	398550	1076917
84	Sinnappa Thirunavukkarasu	M	580211011V	Valikamam East	Achchelu	771262207	12.0	0.75	70	8.4	0.53	Well	398568	1077287
85	Selvaraththinam Navaraj	M	850440417V	Valikamam East	Achchelu	776183242	16.0	1.00	98	15.68	0.98			
86	Kunaraththinam Piratheepan	M	812711334V	Valikamam East	Achchelu	776630471	12.0	0.75	5	0.6	0.04	Well	398060	1077719
87	Kanakasabai Yogalingam	M	730200510V	Valikamam East	Achchelu	779870539	16.0	1.00	25	4	0.25	Well	398037	1077714
88	Thavasi Bali	M	407890302V	Valikamam East	Siruppiddy West	776258785	30.0	1.88	60	18	1.13	Well	399707	1076308
89	Ponnambalam Kantharajah	M	691602788V	Valikamam East	Siruppiddy West	776841343	9.0	0.56	70	6.3	0.39	Well	400062	1077740
90	Pillayan Ruvendra	F	642001728V	Valikamam East	Siruppiddy West	776258785	15.0	0.94	65	9.75	0.61	Tube well	399965	1077000
91	Rasu Karunamoorthy	F	682921870V	Valikamam East		776751681	8.0	0.50	50	4	0.25	Well	402098	1077816
92	Kanthasamy Niththiyananthan	M	902063510V	Valikamam East	Puttur West	772577631	12.0	0.75		0	0.00	Well	400292	1078186

93	Kanthasamy Logeswaran	M	801554121V	Valikamam East	Puttur West	774486123	8.0	0.50	75	6	0.38	Well	400149	1078241
94	Selvanayagam Vimaladevi	M	658244230V	Valikamam East	Puttur West	778186108	10.0	0.63	25	2.5	0.16	Well	400230	1078160
95	Mahadeva Annaladsumi	M	467300458V	Valikamam East	Puttur West	778186108	10.0	0.63		0	0.00	Well	400242	1078193
96	Kanthaiya Balendran	M	611643489V	Valikamam East	Puttur West		8	0.50	75	6	0.38	Well	400002	1075555
97	Kunaraththinam Mahadevan	M	19720450284	Valikamam East	Puttur West	776911089	8	0.50	20	1.6	0.10	Tube well	400984	1077350
98	Sinnakuddi Thiyagarajah	M	573636228V	Valikamam East	Puttur West	765755312	8	0.50	50	4	0.25	Well	400778	1077519
99	Kanthaiya Chandran	M	630542944V	Valikamam East	Puttur West	770266424	8	0.50	50	4	0.25	Well	401115	1077337
100	Iyathurai Alaganathan	M	701801997V	Valikamam East	Navagiri	779865029	8	0.50	40	3.2	0.20	Well	400439	1078287
101	Thiyagarasa Gnaneswaran	M	196817403979	Valikamam East	Navagiri	764459746	8	0.50	60	4.8	0.30	Well	399989	1078870
102	Thilainadaraja Thurairatnam	M	452562537V	Valikamam East	Navagiri	777498307	8	0.50	40	3.2	0.20	Well	400234	1078863
103	Thiyagaraja Nadarajah	M	571700697V	Valikamam East	Navagiri	779228871	8	0.50	75	6	0.38	Well	400275	1079366
104	Moothathamby Ratnasingam	M		Valikamam East	Navagiri	773558631	8	0.50	50	4	0.25	Well	400405	1079098
105	Alaguratnam Subramaniyam	F	531605012V	Valikamam East	Navagiri	775401518	4	0.25	50	2	0.13	Well	400041	1078142
106	Ponnaiyah Balasingam	M	442897621V	Valikamam East	Navagiri	776089784	4	0.25	50	2	0.13	Well	401057	1079288
107	Selvam Vipulananthan	M	650772466V	Valikamam East	Navagiri	775244453	8	0.50	40	3.2	0.20	Well	399995	1078634
108	Velupillai Tharmasri	M	611423535V	Valikamam East	Navagiri	777990009	8	0.50	70	5.6	0.35	Well	400125	1078161
109	Mathiyan Sakunthaladevy	M	196063601769	Valikamam East	Navagiri	775443694	4	0.25	50	2	0.13	Well	399670	1078322
110	Sinnaiyah Rasaiyah	F	472863851V	Valikamam East	Navagiri	779116049	8	0.50	70	5.6	0.35	Well	400512	1078638
111	Iyakkuddi Yogeswaran	M	691660257V	Valikamam East	Navagiri	774107107	4	0.25	60	2.4	0.15	Well	400004	1078857
112	Selvarasa Yogeswaran	F		Valikamam East	Navagiri	779890339	4	0.25	30	1.2	0.08	Well	400902	1079605
113	Jeyaratnam Kantharuban	M	822022936V	Valikamam East	Navagiri	776633937	4	0.25	50	2	0.13	Well	400536	1078382
114	Kajani Prasanna	F	199155703495	Valikamam East	Navagiri	764599667	4	0.25	75	3	0.19	Well	399813	1078546
115	Thiyagarasa Mahendranathan	F	197711903919	Valikamam East	Navagiri	767024598	4	0.25	60	2.4	0.15	Well	399428	1077562
116	Ilayathamby Sulojanadevi	M	755505539V	Valikamam East	Navagiri	767104142	14	0.88	30	4.2	0.26	Tube well	400590	1078973
117	Ranganathan Rakulan	M	821244153V	Valikamam East	Navagiri	776089784	16	1.00	30	4.8	0.30	Well	400804	1078960

118	Shanmugalingam Mahaladsumi	M	567360660V	Valikamam East	Navagiri	779591222	40	2.50	20	8	0.50	Tube well	400333	1078785
119	Sivasothi Gnanamani	M	815662199V	Valikamam East	Navagiri	763948567	20	1.25	25	5	0.31	Tube well	400125	1078971
120	Bastiyanpillai Mariyathas Fubord Lakshan	M	195377502874	Valikamam East	Achchuvely West	712041172	15	0.94	30	4.5	0.28			
121	Kanthasamy Vethesvaran	M	711194061V	Valikamam East	Achchuvely West	761822413	25	1.56	30	7.5	0.47	Well	401877	1079318
122	Phlipaiyah Arudprakasam	M	513121695V	Valikamam East	Achchuvely West	776681921	8.0	1.00	60	4.8	0.30	Well	401599	1080666
123	Ponnuththurai Logeswaran	M	751854200V	Valikamam East	Achchuvely West	776084819	10.0	0.63	50	5	0.31	Well	402108	1079424
124	Balakrishnan Balatheepan	M	813612038V	Valikamam East	Achchuvely West	770761045	8.0	0.50	65	5.2	0.33	Well	402082	1079446
125	Sebastithasan Anton Franchis	M	753053662V	Valikamam East	Achchuvely West	776012995	26.0	1.63	80	20.8	1.30	Tube well	400602	1081274
126	Manikam Nitharshan	M	971883030V	Valikamam East	Urumbirai North	776696574	16.0	1.00	70	11.2	0.70	Well	394307	1075565
127	Kulashekarasingam Srikanthan	M	610081541V	Valikamam East	Neervely North	770690599	8.0	0.50	40	3.2	0.20	Well	400217	1075820
128	Thirugansampanthapillai Thayalini	M	725520964V	Valikamam East	Neervely North	761317640	16.0	1.00	80	12.8	0.80	Tube well	399642	1075614
129	Sithamparapillai Shanthakumar	M	751590725V	Valikamam East	Neervely North	774743150	8.0	0.50	50	4	0.25	Well	399286	1076362
130	Thurairasha Ganavel	M	811545180V	Valikamam East	Neervely North	776062818	40.0	2.50	75	30	1.88	Well	398953	1075938
131	Nadarasa Hariharan	M	198624401249	Valikamam East	Neervely North	773590514	40.0	2.50	90	36	2.25	Well	399871	1075308
132	Subramaniyam Rashaiya	F	501561009V	Valikamam East	Neervely West	773835420	20.0	1.25	50	10	0.63	Well	398159	1075304
133	Santhirasekaram Vithuran	M	960071441V	Valikamam East	Neervely West	776691250	10.0	0.63	75	7.5	0.47	Well	398104	1075934
134	Shenathirasha Pulenthiran	F	652461026V	Valikamam East	Neervely West	779234535	6.0	0.38	50	3	0.19	Well	397638	1075799
135	Pulenthiran Parankunran	M	922421366V	Valikamam East	Neervely West	779597233	35.0	2.19	75	26.25	1.64	Well	397617	1075847
136	Suntharalingam Kabilan	M	933260488V	Valikamam East	Neervely West	777965565	20.0	1.25		0	0.00	Well	397520	1075104
137	Rathinam Suthakaran	M	810141840V	Valikamam East	Neervely West	771630988	30.0	1.88	60	18	1.13	Well	397232	1075093
138	Sinnaiyah Manokaran	M	791771510V	Valikamam East	Neervely West	774186860	20.0	1.25	75	15	0.94	Well	397566	1075121
139	Kirusha Thayaseelan	M	875634453V	Valikamam East	Neervely West	775961049	23.0	1.44	55	12.65	0.79	Well	397333	1075272
140	Muththukrishnan Kanthaiyah	M	562790667V	Valikamam East	Neervely West	779989213	12.0	0.75	70	8.4	0.53	Well	397070	1074911
141	Thampaiyah Selvarasha	M	422895213V	Valikamam East	Neervely South	779688156	22.0	1.38	50	11	0.69	Tube well	397225	1074918

142	Selvarasha Jeyakumar	M	661221895V	Valikamam East	Neervely South	776103428	22.0	1.38	50	11	0.69	Tube well	397144	1074952
143	Selvarasha Selvakumar	M	760974404V	Valikamam East	Neervely South	779051312	22.0	1.38	50	11	0.69	Tube well	397120	1074939
144	Murukuppillai Kirishnamoorthy	M	196501502212	Valikamam East	Neervely South	779847588	13.0	0.81	50	6.5	0.41	Tube well	398503	1074306
145	Viyajakumaran Annalaxmy	F	646471478V	Valikamam East	Neervely West	778133039	24.0	1.50		0	0.00			
146	Kanakashapai Kanthaiyapillai	M	461341322V	Valikamam East	Neervely South	766489178	18.0	1.13		0	0.00			
147	Manikavashakar Sivananthan	M	621642235V	Valikamam East	Urumpirai North	772567282	40.0	2.50	25	10	0.63			
148	Periyathamby Amirthalingam	M	543430870V	Valikamam East	Neervely North	772305706	16.0	1.00	50	8	0.50	Well	399917	1075583
149	Suntharam Subramaniam	M	481074843V	Valikamam East	Neervely North	775440505	24.0	1.50	80	19.2	1.20	Well	398656	1075843
150	Muthuvelu Varatharashan	M	630621968V	Valikamam East	Neervely North	774142023	10.0	0.63	30	3	0.19	Well	399279	1076000
151	Thambirasha Vigneswaran	M	661771070V	Valikamam East	Neervely North	779258959	10.0	0.63	90	9	0.56	Well	399940	1075551
152	Rajeshwary Rathinasabapathi	M	467470256V	Valikamam East	Neervely North	774709573	18.0	1.13	85	15.3	0.96	Well	399468	1075830
153	Sivalinganathan Sumanan	M	812961071V	Valikamam East	Neervely North	773486115	26.0	1.63	60	15.6	0.98	Well	399609	1075900
154	Ponnambalam Ramashanthiran	M	531838661V	Valikamam East	Neervely North	760030279	10.0	0.63		0	0.00	Well	399358	1075844
155	Shabarathinam Vijayarathinam	M	513555318V	Valikamam East	Neervely North	779900035	25.0	1.56	50	12.5	0.78	Well	398075	1076151
156	Sivagnanasuntharam Nanthakumar	M	701520386V	Valikamam East	Achchelu	776513569	4.0	0.25	95	3.8	0.24	Well	399956	1075510
157	Shanmukam Thavalingam	M	641214236V	Valikamam East	Neervely North	774766935	10.0	0.63	60	6	0.38	Well	399315	1075923
158	Rathineshwaran Anoraj	M	892631298V	Valikamam East	Neervely North	766668340	10.0	0.63	70	7	0.44	Well	399255	1076099
159	Vallipuram Vaseekaran	M	763540073V	Valikamam East	Neervely North	779231512	8.0	0.50	75	6	0.38	Tube well	399104	1075794
160	Ponnuththurai Selvarasha	M	501945188V	Valikamam East	Neervely North	779231512	8.0	0.50	40	3.2	0.20	Well	399346	1076219
161	Kathireshu Sivasubramaniam	M	562824405V	Valikamam East	Neervely North	776503115	30.0	1.88	80	24	1.50	Well	398591	1075948
162	Nadarasha Ravichanthiran	M	672932211V	Valikamam East	Vevipuram, Sirupiddy	776087873	10.0	0.63	70	7	0.44	Well	399310	1076774
163	Sriskantharasha Santhiraleela	F	575884474V	Valikamam East	Neervely North	776701282	8.0	0.50	75	6	0.38	Well	399183	1075773
164	Sathasivam Vigneswaran	M		Valikamam East	Neervely North	771539276	9.0	0.56	70	6.3	0.39	Well	399248	1075939

165	Arumugarasha Logeswaran	M	642410598V	Valikamam East	Neervely North	766451394	10.0	0.63	75	7.5	0.47	Well	399288	1075851
166	Shenathirasha Thayaseelan	M	612025762V	Valikamam East	Neervely North	775548856	20.0	1.25	35	7	0.44	Well	399922	1075875
167	Velupillai Vinayamoorthy	M	490262539V	Valikamam East	Neervely North	770562429	14.0	0.88	90	12.6	0.79	Well	399450	1075907
168	Subramaniam Paramanathan	M	550232928V	Valikamam East	Neervely North	778476978	16.0	1.00	90	14.4	0.90	Well	399188	1075815
169	Paramanathan Sujakan	M	942120281V	Valikamam East	Neervely North	772636449	12.0	0.75	80	9.6	0.60	Well	399184	1075854
170	Kathirkamanathan Jegatheeswaran	M	196319302975	Valikamam East	Neervely North	777192096	24.0	1.50	50	12	0.75	Well	399342	1076770
171	Selvaraththinam Partheepan	M	571310546V	Valikamam East	Neervely North	779918356	22.0	1.38	85	18.7	1.17	Well	398676	1075938
172	Partheepan Pratheep	M	912001652V	Valikamam East	Neervely North	768580154	8.0	0.50	20	1.6	0.10	Well	398909	1075797
173	Kanapathipillai Somasekaram	M	581802641V	Valikamam East	Neervely North	779779782	13.0	0.81	75	9.75	0.61	Well	399474	1075847
174	Rathineswaran Vigneswary	F	665851745V	Valikamam East	Neervely North	777196531	25.0	1.56	80	20	1.25	Well	399336	1076159
175	Illaiyathamby Thevarasha	M	730183941V	Valikamam East	Neervely West	774131409	23.0	1.44	70	16.1	1.01			
176	Veerasingam Sivagnanam	M		Valikamam East	Neervely South	212230145	10.0	0.63	70	7	0.44			
177	Kirushnapillai Santhiramohan	M	603463935V	Valikamam East	Urelu	773237529	8.0	0.50	70	5.6	0.35	Well	396376	1076328
178	Amirthananthan Aruljothi	M	595564280V	Valikamam East	Urelu	771906534	16.0	1.00	50	8	0.50			
179	Thampaiyah Thayakuanm	M	195804210012	Valikamam East	Urelu	779599545	10.0	0.63	10	1	0.06	Well	396475	1076651
180	Thampaiyah Ramashanthiran	M	420332564V	Valikamam East	Urelu	774464556	15.0	0.94	35	5.25	0.33	Well	396473	1076538
181	Amirthananthan Arunraj	M	880403222V	Valikamam East	Urelu	773210962	13.0	0.81	10	1.3	0.08	Well	396483	1076670
182	Ponnaiyah Thabhanantham	M	641230448V	Valikamam East	Neervely West	771979615	36.0	2.25	85	30.6	1.91	Well	398430	1075680
183	Poothathamphy Kajan	M	831981610V	Valikamam East	Neervely North	779231580	40.0	2.50	75	30	1.88	Well	399989	1075947
184	Nallaiyah Kaneshalingam	M	431010402V	Valikamam East	Neervely North	212230791	20.0	1.25	20	4	0.25			
185	Kanthasamy Satheeskumar	M		Valikamam East	Neervely West	777238524	4.0	0.25	90	3.6	0.23	Tube well	398529	1076192
186	Kuganeshwaran Jeyan	M	832852988V	Valikamam East	Neervely North	772313191	24.0	1.50	50	12	0.75	Well	398172	1075030
187	Velupillai Kuganeshwaran	M	531840704V	Valikamam East	Neervely North	212230189	21.0	1.31	95	19.95	1.25	Well	398158	1075529
188	Rasha Subramaniam	M	194932510038	Valikamam East	Neervely South	776176920	20.0	1.25	50	10	0.63			

189	Balasingam Kanagarathinam	M	513334010V	Valikamam East	Urelu	771395523	40.0	2.50		0	0.00	Well	396138	1077305
190	Sivakumar Kumuthini	F	848620360V	Valikamam East	Kopay North	764837345	8.0	0.50	70	5.6	0.35	Well	397637	1073859
191	Kanagarathinam Balasingam	M	640071125V	Valikamam East	Kopay North	779417241	10.0	0.63	75	7.5	0.47	Well	397503	1073980
192	Arumugam Nallanathan	M	540155348V	Valikamam East	Kopay North	766031959	15.0	0.94	50	7.5	0.47	Well	396856	1074036
193	Balasingam Reginold	M	197703004912	Valikamam East	Kopay North	769677063	10.0	0.63		0	0.00			
194	Kathiravelu Sivasubramaniyam	M	422500383V	Valikamam East	Kopay North	773821291	20.0	1.25	40	8	0.50	Well	396785	1074934
195	Kaneshalingam Thinesh	M	198832300310	Valikamam East	Kopay North	770417770	15.0	0.94	60	9	0.56	Tube well	397919	1074329
196	Sellaiah Kasipillai	M		Valikamam East	Kopay North	779451255	20.0	1.25	75	15	0.94	Well	3974782	1074782
197	Selathurai Kesavarajan	M	842362334V	Valikamam East	Kopay North	776346753	20.0	1.25	40	8	0.50	Well	396959	1074225
198	Sivakoluunthu Sothilingam	M	552773101V	Valikamam East	Kopay North	775710096	16.0	1.00		0	0.00	Well	396524	1074213
199	Sinnathampy Nageshwaran	M	482650015V	Valikamam East	Kopay North	772784407	8.0	0.50	50	4	0.25	Well	396719	1073975
200	Rathinam Balasingam	M	591426690V	Valikamam East	Kopay North	776478392	12.0	0.75	75	9	0.56	Well	396927	1074254
201	Thanabalasingam Logathas	M	851402780V	Valikamam East	Kopay North	778849664	24.0	1.50	50	12	0.75	Well	397454	1074513
202	Selvaratnam Mohanathan	M	781103721V	Valikamam East	Kopay North	777186729	22.0	1.38	36	7.92	0.50	Well	396871	1074897
203	Vithuraj Rathimala	F	735530992V	Valikamam East	Kopay North	770029843	12.0	0.75	60	7.2	0.45	Well	397526	1074624
204	Subramaniyam Sornalingam	M	722700813V	Valikamam East	Kopay Center	779086452	20.0	1.25	40	8	0.50	Well	396942	1074352
205	Nallaiah Thayaparan	M	742360563V	Valikamam East	Kopay North	774053118	25.0	1.56	50	12.5	0.78	Well	396883	1074033
206	Thanabalasingam Sinthujan	M	942462760V	Valikamam East	Urumbirai East	767600738	16.0	1.00	35	5.6	0.35			
207	S Kayatheepan	M	890742360V	Valikamam East	Kopay North	779580051	20.0	1.25	70	14	0.88	Tube well	398258	1072842
208	Kalaimohan Anjaladevi	F	766264700V	Valikamam East	Urumbirai South	741655861	8.0	0.50	50	4	0.25	Tube well	395869	1073406
209	Sivapatham Nanthini	F	736732351V	Valikamam East	Kopay Center	771249875	10.0	0.63	80	8	0.50	Tube well	397414	1073773
210	Subramaniam Sutharshan	M	791831890V	Valikamam East	Kopay Center	773126616	8.0	0.50	50	4	0.25	Tube well	397588	1072091
211	Chandrsegaram Pirahalathan	M	820172299V	Valikamam East	Kopay North	778449274	20.0	1.25	50	10	0.63	Well	398084	1074142
212	Shanmugam Thanabalalingam	M	463283222V	Valikamam East	Kopay North	773452500	12.0	0.75	58	6.96	0.44	Well	398247	1073845
213	Suganthini Thillainathan	M	778484595V	Valikamam East	Kopay North	761328469	8.0	0.50	100	8	0.50	Well	398009	1074055

214	Sivapatham Sivalingam	M	673640230V	Valikamam East	Kopay Center	776944965	12.0	0.75	80	9.6	0.60	Well	398057	1074112
215	Kesavalingam Valarmathy	M	736340712V	Valikamam East	Kopay Center	778448088	15.0	0.94	75	11.25	0.70	Well	398022	1074042
216	Nadarajah Pathmanathan	M	690934574V	Valikamam East	Kopay North	762281269	10.0	0.63	40	4	0.25			
217	Arumugam Rathinam	M	590400955V	Valikamam East	Kopay North	740761959	20.0	1.25	40	8	0.50	Well	397961	1074443
218	Kumarasamy Piratheepan	M	773460655V	Valikamam East	Kopay North	772145958	13.0	0.81	50	6.5	0.41	Well	396766	1074068
219	Rasathurai Nivashkaran	M		Valikamam East	Kopay North	775160107	9.0	0.56	75	6.75	0.42	Well	396441	1074488
220	Thavalingam Kajendram	M	902562630V	Valikamam East	Kopay North	777064544	30	1.88	80	24	1.50	Well	396849	1074011
221	Tharmalingam Yogeswaran	M	771812732V	Valikamam East	Kopay North	776452466	10	0.63	50	5	0.31	Well	395806	1075093
222	Tharmalingam Kugarajan	M	770214130V	Valikamam East	Kopay North	772733764	28	1.75	40	11.2	0.70	Well	397896	1074622
223	Sivasupaiah Jegarasa	M	772685009V	Valikamam East	Kopay North	776294711	13.5	0.84	50	6.75	0.42	Tube well	397343	1073651
224	Thirunavukarasa Perinpanathan	M	603221443V	Valikamam East	Kopay North	776653089	12	0.75	70	8.4	0.53	Well	396360	1074181
225	Sangarapillai Selvarasa	M	440470394V	Valikamam East	Kopay North	775407770	10	0.63	70	7	0.44	Tube well	397443	1073735
226	Kandasamy Sellakumaran	M		Valikamam East	Kopay North	776081004	15	0.94	50	7.5	0.47			
227	Selvarasa Thayalan	M		Valikamam East	Kopay North	775407770	36	2.25	80	28.8	1.80	Well	397761	1076123
228	Subramaniyam Sivasakthivel	M	750331050V	Valikamam East	Kopay North	772912550	15	0.94	55	8.25	0.52	Tube well	397612	1074047
229	Arulaiah Perinpanayakam	M	590091367V	Valikamam East	Kopay North	775930490	10	0.63	85	8.5	0.53	Well	398228	1073637
230	Kumarasamy Thayaparan	M	710482373V	Valikamam East	Kopay North	779580213	36	2.25	50	18	1.13	Well	397999	1073930
231	V Sothiruban	M		Valikamam East	Kopay North	773686752	16	1.00	70	11.2	0.70	Well	397717	1073840
232	Yogamoorthi Renuka	F	695803389V	Valikamam East	Kopay North	776660684	12	0.75	50	6	0.38	Well	397944	1074249
233	Vellupillai Varnathasan	M	713023663V	Valikamam East	Kopay North	779586696	15	0.94	50	7.5	0.47	Tube well	397570	1073820
234	Srinivasam Krishnathasan	M		Valikamam East	Kalviyankadu	776315964	40	2.50	75	30	1.88			
235	Muththaiyah Lavathas	M	197906304926	Valikamam South	Eeevinai Centre	777168573	16	1.00	10	1.6	0.10	Well	398124	1078998
236	Thangarasa Suganthan	M	197906505826	Valikamam South	Eeevinai Centre	774528131	12	0.75	40	4.8	0.30	Well	398157	1078198
237	Kanagalingam Vimalathasan	M	840965023V	Valikamam South	Eeevinai Centre	779720601	16	1.00	50	8	0.50	Well	398249	1078200
238	Niththiyananthan Paranthaman	M	970373110V	Valikamam South	Eeevinai Centre	763227089	8	0.50	95	7.6	0.48	Well	398273	1079029

239	Thangarasa Nimalan	M	198411003157	Valikamam South	Eeevinai Centre	773333796	20	1.25	50	10	0.63	Well	398466	1078887
240	Ragunathan Ilamurugan	M	19593200266	Valikamam South	Eeevinai Centre	769328649	16	1.00	30	4.8	0.30	Well	397413	1077908
241	Saravanamuthu Kanthasamy	M	572732746V	Valikamam South	Eeevinai Centre	764132354	30	1.88	25	7.5	0.47	Well	397480	1077837
242	Rasenthiram Raviraj	M	197523903010	Valikamam South	Eeevinai Centre	777149188	24	1.50	60	14.4	0.90	Well	398360	1078184
243	Muththu Sriskantharajah	M	631812344V	Valikamam South	Eeevinai Centre	765489118	12	0.75	25	3	0.19	Well	397103	1077049
244	Arudchelvam Balakumar	M	941223850V	Valikamam South	Eeevinai Centre	777896038	16	1.00	40	6.4	0.40	Well	398341	1078138
245	Thambu Kanagalingam	M	592523450V	Valikamam South	Punnalaikadduvan South	769950275	12	0.75	20	2.4	0.15	Well	396762	1077822
246	Thambaiyah Maheswaran	M	451571206V	Valikamam South	Punnalaikadduvan South	773891661	6	0.38	50	3	0.19	Tube well	397137	1078030
247	Antony Albred	M	195417701425	Valikamam South	Punnalaikadduvan South	770208952	8	0.50	75	6	0.38	Well	396825	1077592
248	Saththiyanathan Mangalan	M	822631231V	Valikamam South	Punnalaikadduvan South	777205074	8	0.50		0	0.00	Well	396949	1077952
249	Veluppillai Mahendran	M	513271387V	Valikamam South	Punnalaikadduvan South	772846797	15	0.94	35	5.25	0.33	Well	397585	1077823
250	Sellathurai Thayalan	M	752844836V	Valikamam South	Punnalaikadduvan South	770258702	12	0.75	65	7.8	0.49	Tube well	396986	1077871
251	Aaseervatham Jeevaraththinam	M	740392551V	Valikamam South	Punnalaikadduvan South	770258702	8	0.50	50	4	0.25	Tube well	397121	1077999
252	Erambu Kanakalingam	M	603063767V	Valikamam South	Punnalaikadduvan South	779232478	10	0.63	60	6	0.38	Well	397030	1077758
253	Suppan Nagendram	M	590053872V	Valikamam South	Punnalaikadduvan South	779320892	6	0.38		0	0.00	Well	397488	1078518
254	Sellathurai Vickneswaran	M	751403720V	Valikamam South	Punnalaikadduvan South	776411571	20	1.25	50	10	0.63	Well	396949	1078660
255	Ponnuthurai Balasubramaniam	M	480414608V	Valikamam South	Punnalaikadduvan South	762150401	15	0.94		0	0.00	Tube well	397355	1078176
256	Kumaraguruparan Tharmarani	F	658300750V	Valikamam South	Punnalaikadduvan South	778582438	10	0.63	40	4	0.25	Well	397250	1078275
257	Sabaraththinam Ilangovan	M	822373267V	Valikamam South	Punnalaikadduvan South	773321234	10	0.63	40	4	0.25	Tube well	397016	1078007
258	Kanthasamy Sabeswaran	M	750083013V	Valikamam South	Punnalaikadduvan South	761423905	30	1.88	50	15	0.94	Well	396993	1077769
259	Kamalini Balsubramaniam	F	196478800150	Valikamam South	Punnalaikadduvan South	763884323	16	1.00	30	4.8	0.30	Tube well	397179	1077918
260	Kaddaiyan Raththinasingam	M	540901481V	Valikamam South	Punnalaikadduvan South	779366268	8	0.50	30	2.4	0.15	Well	397148	1078388
261	Sithamparappillai Yoganathan	M	540823693V	Valikamam South	Punnalaikadduvan South	776323175	6	0.38	25	1.5	0.09	Well	396928	1078127

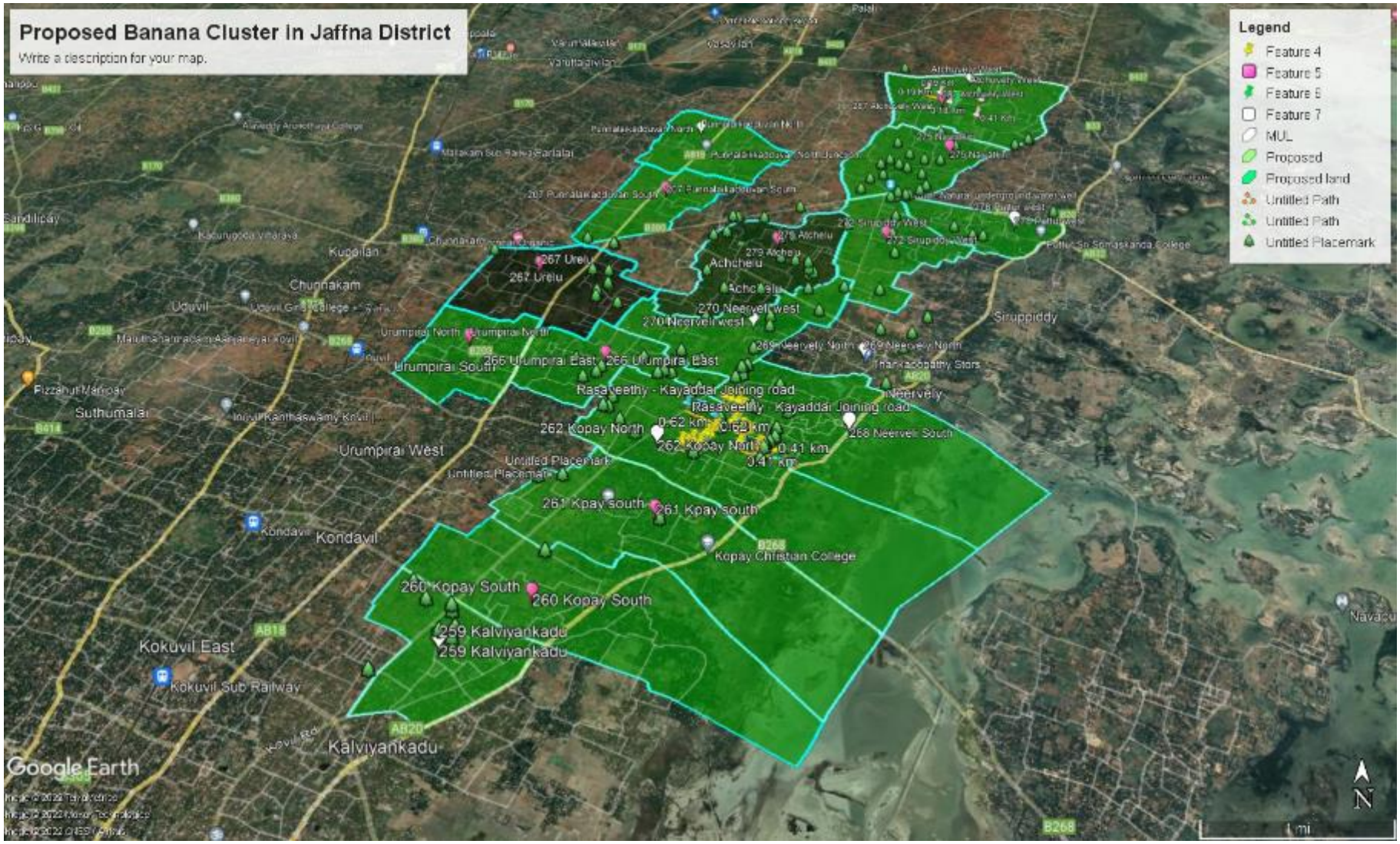
262	Sinnaththambi Selvarasa	M	194709404447	Valikamam South	Punnalaikadduvan South	776621739	8	0.50	35	2.8	0.18	Well	396815	1078325
263	Sivajini Parameswaran	F	747320527V	Valikamam South	Punnalaikadduvan South	775242025	8	0.50	50	4	0.25	Well	396490	1077629
264	Visvalingam Ambalavanar	M	582253293V	Valikamam South	Punnalaikadduvan South	775713328	10	0.63	50	5	0.31	Well	396743	1077849
265	Chelliah Sivarasa	M	650352467V	Valikamam South	Punnalaikadduvan South	771163256	4	0.25	50	2	0.13	Well	397430	1078187
266	Murukaiyah Sivananthan	M	751831552V	Valikamam South	Punnalaikadduvan South	771547551	16	1.00	35	5.6	0.35	Well	396584	1077585
267	Nageswaran Selvaranjini	F	657723760V	Valikamam South	Punnalaikadduvan South	770258702	12	0.75	40	4.8	0.30	Tube well	397095	1077848
268	Karthigesu Muthukumarasuwami	M	611342234V	Valikamam South	Punnalaikadduvan South	772840352	30	1.88	50	15	0.94	Well	396945	1077846
269	Sinnaththambi Shanmuganathan	M	421654190V	Valikamam South	Punnalaikadduvan South	772233283	28	1.75	40	11.2	0.70	Tube well	396959	1077683
270	Sellathurai Ganeshamoorthi	M	643371847V	Valikamam South	Punnalaikadduvan South	771806161	20	1.25	65	13	0.81	Well	396463	1078340
271	Sinnaththurai Gnanasothi	M	652791905V	Valikamam South	Punnalaikadduvan South	777520332	14	0.88	2	0.28	0.02	Well	396859	1077018
272	Sellathurai Krishnamoorthi	M	670152731V	Valikamam South	Punnalaikadduvan South	779749286	9	0.56	50	4.5	0.28	Well	396916	1078661
273	Nagar Amirthalingam	M	195620402245	Valikamam South	Punnalaikadduvan North	771882141	17	1.06	75	12.75	0.80	Well	398774	1079258
274	Sellar Thavarasa	M	5906836671V	Valikamam South	Punnalaikadduvan North	772716264	6	0.38	50	3	0.19	Well	398748	1079180
275	Thuraiyar Jeyasingam	M	197536104249	Valikamam South	Punnalaikadduvan North	775783479	4	0.25	75	3	0.19	Well	398634	1079448
276	Kandiah Srikanthan	M	95909101410	Valikamam South	Punnalaikadduvan North	776400115	8	0.50	90	7.2	0.45	Well	398650	1079435
277	Murukaiya Kunagnanawathi	F	565073788V	Valikamam South	Punnalaikadduvan North	768227850	6	0.38	25	1.5	0.09	Well	398632	1079148
278	Ramesh Karunanithi	M	641071978V	Valikamam South	Punnalaikadduvan North	770826313	4	0.25	75	3	0.19	Well	398547	1079410
279	Arosenthiram Naguleswaran	M	661681381V	Valikamam South	Punnalaikadduvan North	775282246	10	0.63	75	7.5	0.47	Well	398593	1079528
280	Ilaiyavi Kunasingam	F	481032018V	Valikamam South	Punnalaikadduvan North	770826313	8	0.50	65	5.2	0.33	Well	398577	1079400
281	Krishnalingam Prabakaran	M	761862081V	Valikamam South	Punnalaikadduvan North	776176520	8	0.50	75	6	0.38	Well	398384	1079612
282	Sinnappu Panchadcharam	M	561112863V	Valikamam South	Punnalaikadduvan North	776986971	8	0.50	90	7.2	0.45	Well	398136	1079362
283	Ponnuthurai Nanthakopan	M	710720460V	Valikamam South	Punnalaikadduvan North	777159348	8	0.50	50	4	0.25	Well	397540	1080145
284	Arunthavanayakam Pratheepan	M	821635098V	Valikamam South	Punnalaikadduvan North	777958145	4	0.25	50	2	0.13	Tube well	397173	1080052

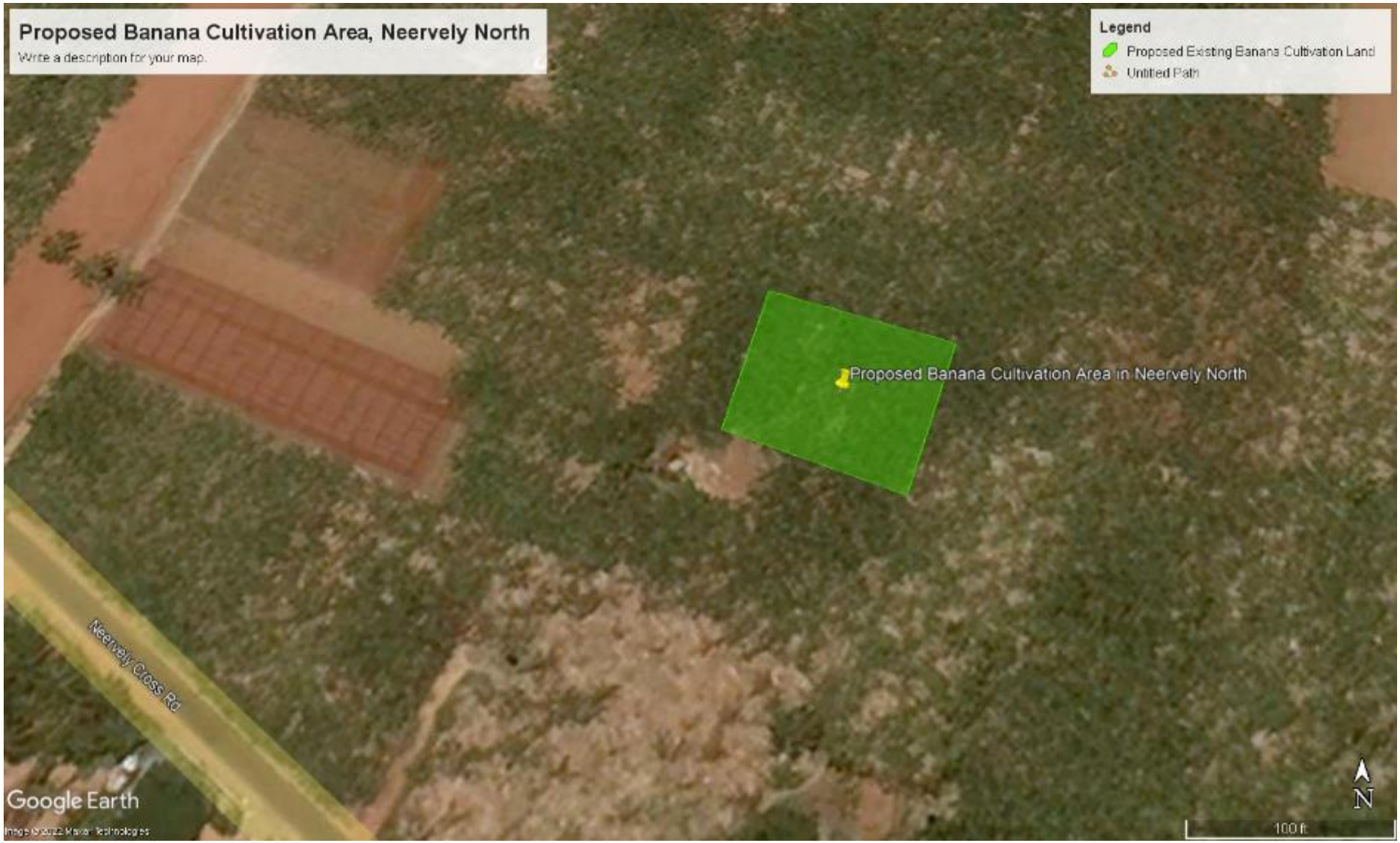
285	Rasarathinam Vishnuranjan	M	762504374V	Valikamam South	Punnalaikadduvan North		4	0.25	50	2	0.13	Well	397621	1079701
286	Muthuthamby Sathiyaparameswaran	M	591264710V	Valikamam South	Punnalaikadduvan North	771303935	11	0.69	75	8.25	0.52	Well	398391	1079056

ANNEXURE 3: INSTITUTIONAL ROLES IN THE BANANA CLUSTER

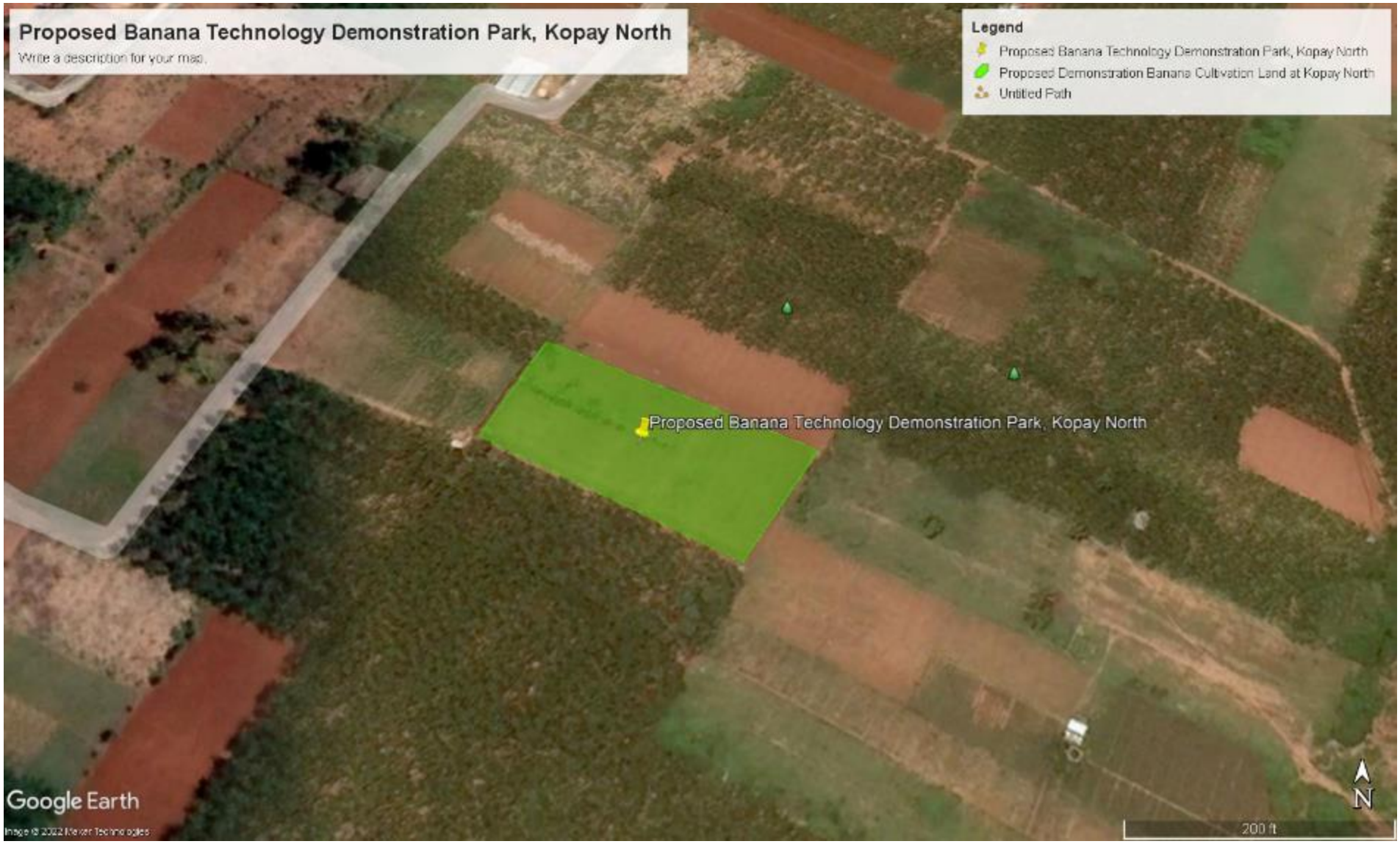
Agency/ private sector	Officer responsible	Expected role in cluster development
Provincial Department of Agriculture (North)	Provincial Director (Agriculture)	Lead and guide relevant officers and FPO. Coordinate all line agencies at the District level
	Deputy Director (Agriculture)	Guide relevant officers and FPO. Provide extension services and inputs. Solving 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
Valikamam North, East and South DSs	3 Divisional Secretaries	Make representation for review committees to assist district director (Agriculture) Settlement of land issues and issue land permits if necessary. Make required services to FPO from other agencies
	3 Land Officers	Settlement of land disputes. Clearing boundary demarcations
	36 Grama Niladaris	Assist to identify eligible legal farmers. Organise farmer meetings
Agrarian Development Department	4 Agrarian Development Officers	Get the involvement for input supplies such as seeds, Organic and Chemical fertilisers, Machinery For effective cooperation from existing FOs 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 Banana Cultivation Area, Neervely North
Write a description for your map.
Legend
Proposed Existing Banana Cultivation Land
Untitled Path
Proposed Banana Cultivation Area in Neervely North
Neervely Cross Rd
Google Earth
N
100 ft


Proposed Banana Cultivation Areas in Ponnalaikadduvan
Write a description for your map
Legend
Proposed Banana Cultivation Areas in Ponnalaikadduvan
Proposed Banana Cultivation Land
Untitled Path
Proposed Banana Cultivation Areas in Ponnalaikadduvan
Google Earth
N
100 ft


Proposed Banana Technology Demonstration Park, Kopay North
Write a description for your map.
Legend
Proposed Banana Technology Demonstration Park, Kopay North
Proposed Demonstration Banana Cultivation Land at Kopay North
Untitled Path
Proposed Banana Technology Demonstration Park, Kopay North
Google Earth
N
200 ft


Proposed Banana Cluster in Atchelu
Write a description for your map.
Legend
Kovil
Proposed
Neelvely Cross Rd
Google Earth
800 ft
N

ANNEXURE 5: COMPOST PLANT PROPOSAL

1. Rationale

Soil productivity and environmental concerns have revived global interest in organic recycling practices such as composting. Composting is considered an attractive option for turning on-farm organic waste materials into a valuable farm resource. However, at the 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 fertilizers in crop production.

The overall decline of soil fertility is a major problem associated with crop production in Sri Lanka. The decline in 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 the 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, the application of organic fertilisers such as compost will be a beneficial effect on crop yield as well as on overall 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 the presence of decomposed organic materials, the 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 the soil will be useful for reducing the incidence of plant diseases. The addition of organic fertilisers suppressed the number 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 reducing the use of chemical fertilisers, and conserve natural resources while helping to recycle wastes.

2. Integrated plant nutrition system

The complementary role that organic and chemical fertilisers play in crop production is a popular fact. 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 the most suitable plant nutrient management system to increase crop yield while maintaining 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 the following steps in all clusters:

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

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

3. Objectives of the compost production programme

- Utilise freely available organic materials for crop production
- Creation of a favourable environment through the recycling of organic waste materials
- Reduce chemical fertiliser use through compost production and use
- Popularise use of 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 a commercial scale
- Emergence of a market for compost
- Initiate a compost sale as a viable business

At present, the number of waste materials that are freely available in clusters could be considered 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 of banana crop production to minimise pests and diseases. Therefore, ISP will undertake compost production in all clusters as an important intervention. This action will ensure an increase the soil fertility in clusters as well as increase crop production and subsequent sustainability of agricultural crop production.

4. Site selection

Generally, the well-chosen site can speed up the composting process. In this regard, the well-drained area of the location is suitable for compost production. Similarly, a shadier spot is more suitable so it does not dry out too quickly. Preparation of compost over soil or grasses is better than a concrete floor, to take advantage of microbes and other decomposers. The site should be selected from a reasonable distance of houses. The selected location should have access to 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, lunchroom, bathroom, etc.

5. Steps of the 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 available in each cluster area
- Selection of suitable sites in each cluster
- Establishment of compost production units in each cluster
- Training of farmers in groups through field demonstrations on the 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 19: List of structures, implements and equipment required for the Compost Production Unit

No.	Item	Number	Estimated Cost (LKR)
1.	Shovel	5	
2.	Pitchfork	5	
3.	Wheelbarrow	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

The heap method is more advantageous than any other method for commercial compost production. Under the 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 of complex compounds such as proteins, fats, cellulose, and hemicellulose in raw materials. In the heap method, the processing time is shorter. In addition, this process destroys harmful pathogens; as well as weed seeds due to undergoing 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 a temperature of 20 - 45^{0}C on the readily available sugars and amino acids. Under such

conditions, they generate heat by their metabolism and raise the temperature to a point where their 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 to 65^{0}C or higher. In many cases, the temperature goes up to 70 - 80^{0}C and this peak heating phase are 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 layers 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 the 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 of about 2 - 2.5m at the base for successful aeration. The sides are tapered so that the top is about 0.5m narrower 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 a sufficient quantity of water and compost activator/inoculant. After formation, the pile is covered with black polythene to retain heat and moisture but leave sufficient space at the bottom for ventilation. The active composting stage is followed by the turning stage, and the pile temperature decreases gradually with time. Therefore, turning/mixing should be done every 3 - 4 weeks interval to activate the decomposition of raw materials. However, a maximum of three turning/mixing steps are recommended during the whole period of the composting process due to the 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 depending on the raw materials used. 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 a 4mm sieve before sending to the market. Mature compost should have a crumbly texture, an earthy smell, and be dark brown or black.

Compost has a 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 the 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, the 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 approval from relevant authorities of the area. Several regulatory regimes come into play before initiating compost production.

b. Manage composting

Managing the composting process involves the balancing of several different variables, all of which impact 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, the 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 is responsible to establish and maintain an operating record for the compost facility. Records are needed about: waste acceptance and disposal, validation and ongoing 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 gardens, etc. The strategy includes product design, pricing, distribution, and promotional strategies. The strategy will be used to market compost to ensure that the 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 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 the price and quality of compost in the local market 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 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 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. 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 the attractiveness of flies. To avoid the problem, the suggestion is to maintain a higher

temperature. Fly larvae are unlikely to survive if the 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, maintaining a high temperature is the most significant factor in causing the death of pathogens too. In addition, steps should be taken to avoid the release of leachate to the environment by avoiding excess water use, constructing a place to collect leachate and reuse it for compost production, etc. As a further safety measure, it is recommended that no compost unit be set up close to a drinking water source. This should prevent any liquid from percolating from the compost heap into the water supply, particularly during the rainy season.

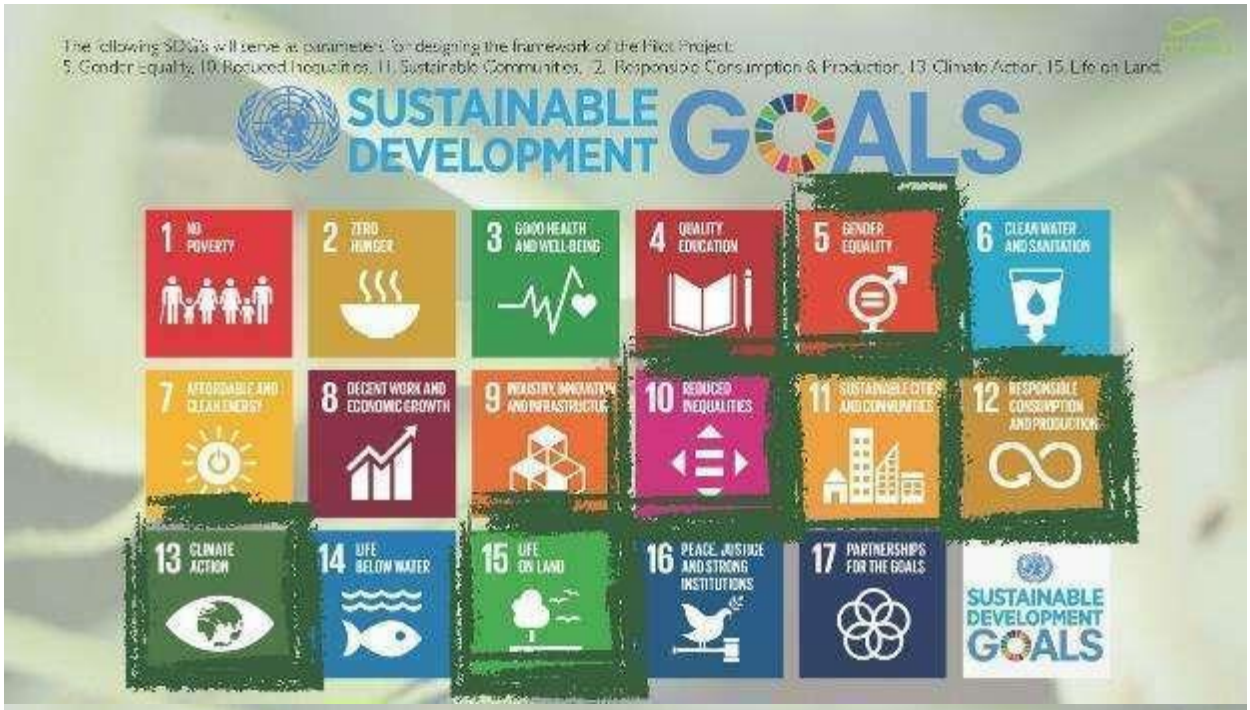
ANNEXURE 6: CONCEPT NOTE OF WASTE MINIMISATION, INCOME GENERATION, AND EMPOWERMENT

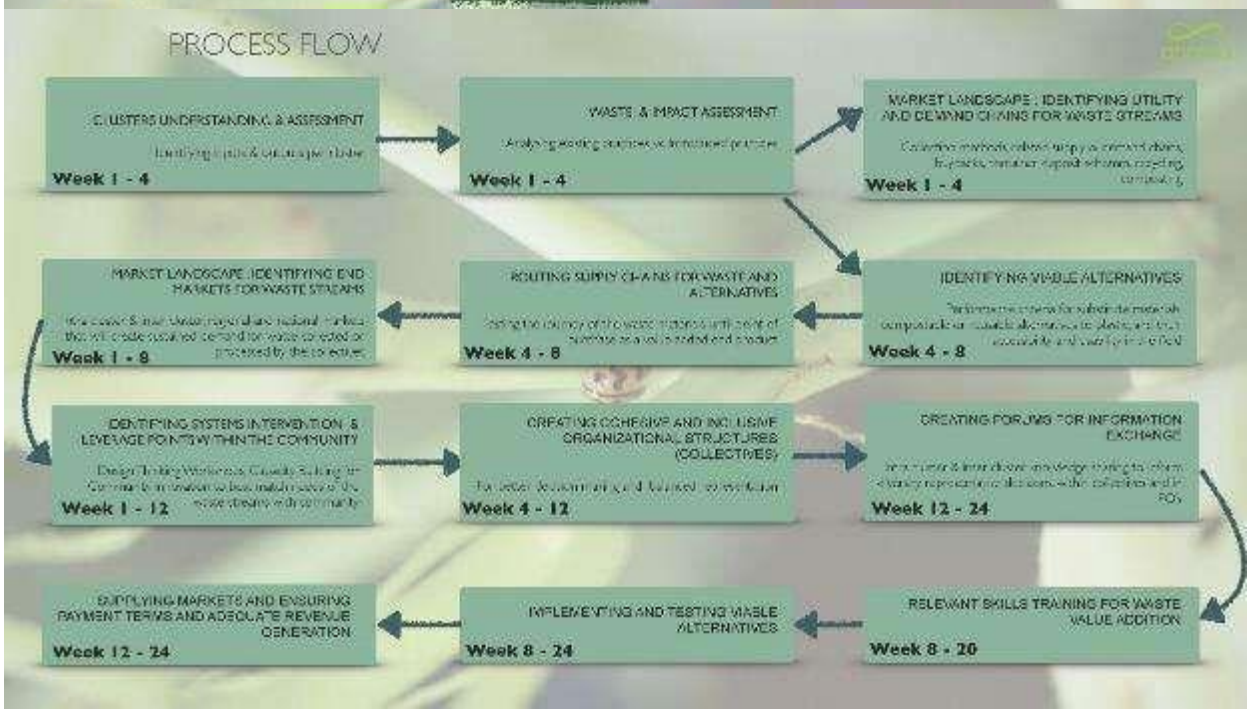

INTRODUCTION

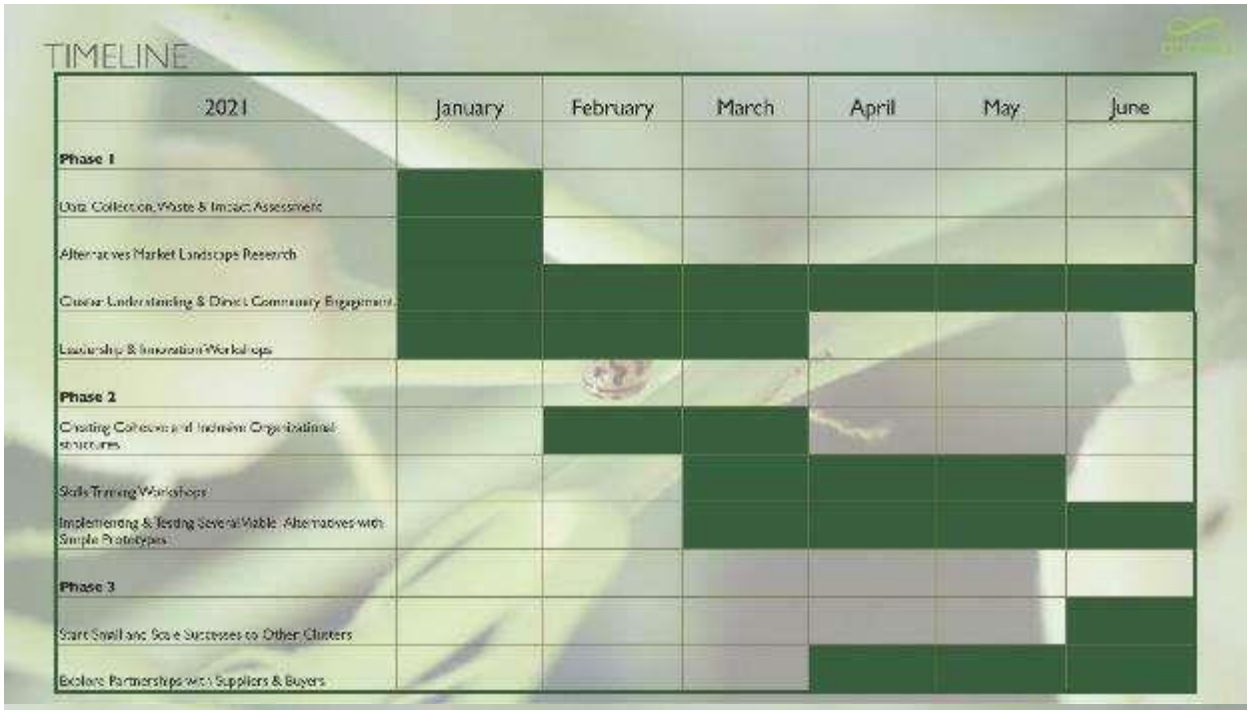

The Pilot project will address the following for introduced ASMP techniques in Guava and Banana Clusters in Anuradhapura North Central Province
OBJECTIVES
1. Reduce Plastic and Hazardous Waste Generated
&
2. Value Addition for Farm By-products
Sourcing Alternative Materials
Income Generation through 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
Route to market of value added waste products mapped and implemented
ASMP Waste Pilot Project able to meet competitive landscape of suppliers of raw materials
Competitive logistics costs met
New products and material feature requirement met
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

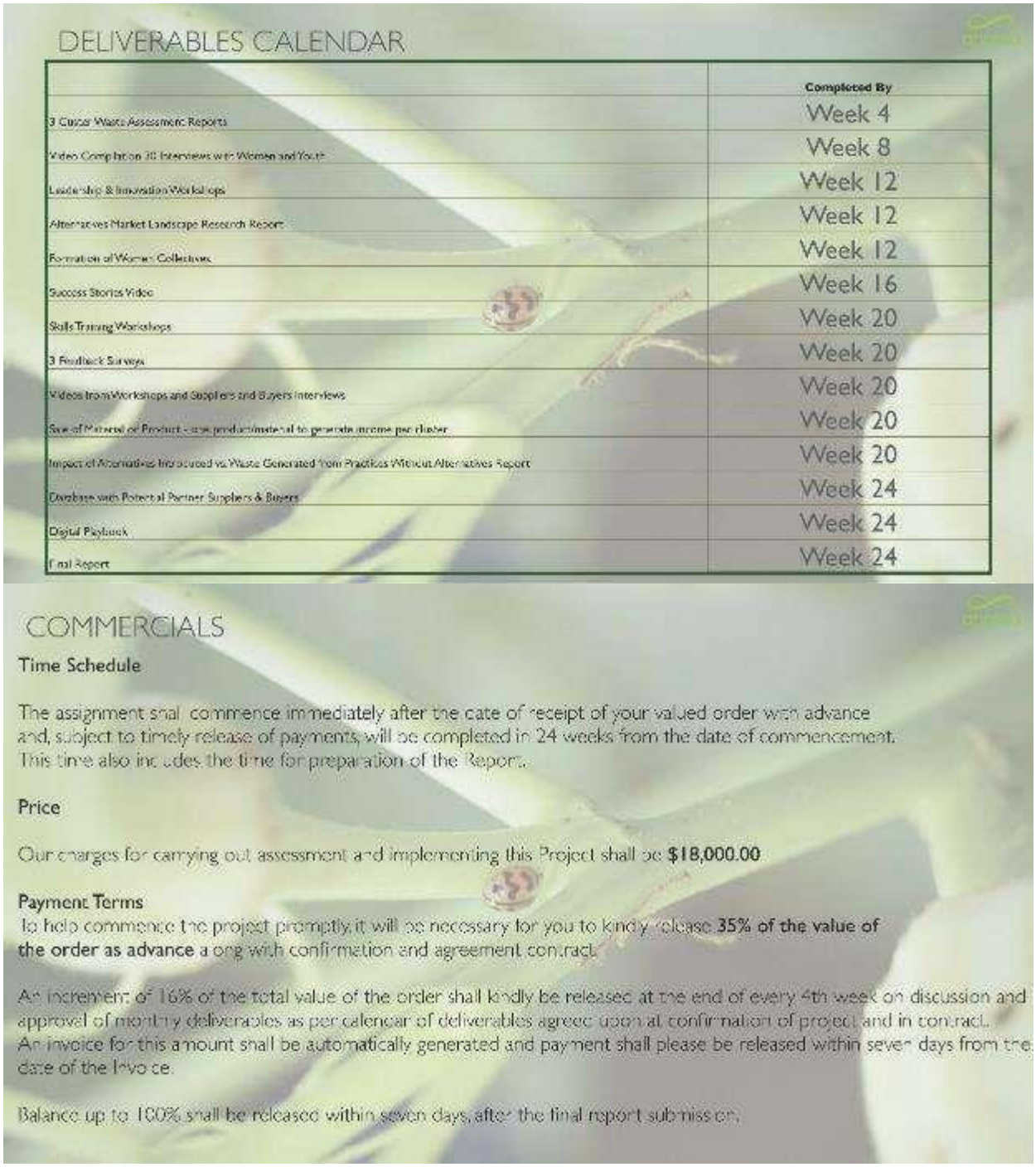

APPROACH
SYSTEMS APPROACH | Making supply chains more responsible, efficient and sustainable, by analysing social and environmental relationships and interactions to enable effective overall outcomes for the system as a whole.
Traditional approaches focus on outcomes of a supply chain in isolated parts. 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 7: 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

ANNEXURE 8: CONCEPTUAL DESIGNS OF INFRASTRUCTURE IMPROVEMENTS