Sri Lanka Agriculture Sector Modernisation Project (ASMP)

ENVIRONMENTAL SCREENING REPORT

FOR

CDP № 11 – JAFFNA DISTRICT – POTATO AND ONION

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

Revised: 21 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

ASMP

ENVIRONMENTAL SCREENING REPORT

PROJECT IDENTIFICATION

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

PROJECT LOCATION

Location

(Relative to the nearest town, highway)

The Jaffna Potato Cluster is located in three DSs: Valikamam East (Kopay), Valikamam North (Tellippalai) and Valikamam South (Uduvil). These three DSs have 37 Grama Niladari (GN) divisions. The selected villages are located about 4km away from Jaffna town. Figure 1 shows the selected areas in the three DSDs.

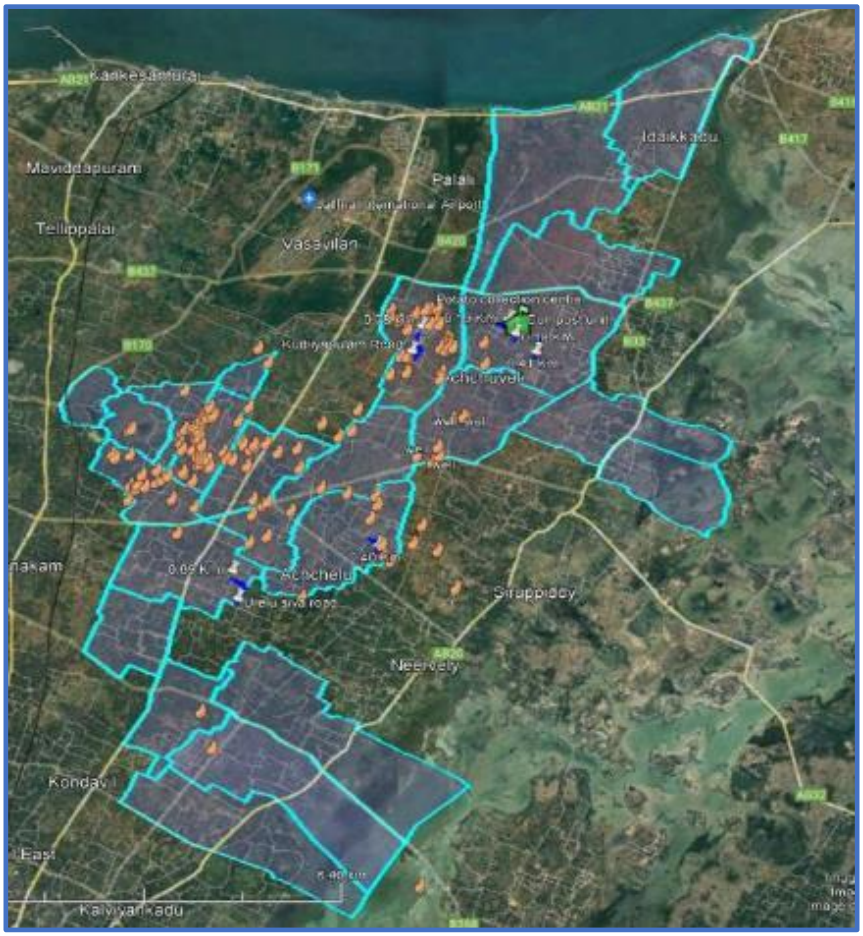


Figure 1**: **Selected farmlands

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, 543 farmers were identified who are scattered within these three DSs with the assumption that there would be some losses at a later date due to other factors of being ineligible.

Definition of the project area

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

This cluster encompasses several sections of land and beneficiaries in three DS divisions of Valikamam North (Tellippalai), Valikamam East (Kopay) and Valikamam South (Uduvil). The total land area of the cluster including inland water is 19,040 ha.

Table 1: Basic information on the areas and number of farmers identified for the cluster

No	DS division	ADC	GN division	Village	No. of farmers selected	Extent under crop ha
1	Valikamam East	Puttur	Achelu	Achelu	40	13.6
			Siruppiddy west	Siruppiddy west	12	3.12
			Avarankal west	Avarankal west	6	1.21
			Navakiri	Navakiri	98	34.3
			Achchuvely West	Achchuvely West	63	20.8
			Achchuvely North	Achchuvely North	3	0.6
			Idaikaadu	Idaikaadu	4	1.26
			Valalai	Valalai	19	4.38
			Pathameni	Pathameni	55	17.6
			Thampalai	Thampalai	2	1.2
		Urumpirai	Neervely south	Neervely south	12	5.0
			Urelu	Urelu	21	4.8
			Nervely north	Nervely north	3	1.2
			Urumpirai North	Urumpirai North	2	0.8
			Neervely west	Neervely west	9	3.6
			Kopay North	Kopay North	25	1.74
			Kopay South	Kopay South	14	5.6
			Urumpirai South	Urumpirai South	2	0.9
			Urumbirai East	Urumbirai East	4	1.7
			Kopay Centre	Kopay Centre	2	0'5
			Urumpirai west	Urumpirai west	1	0.5
2	Valikamam South	Uduvil	Kuppilan south	Kuppilan south	11	1.56
			Kuppilan North	Kuppilan North	4	0.86
			Punnalaikadduvan south	Punnalaikadduvan south	18	4.48
			Eevenai	Eevenai	5	1.0
			Earlalai Centre	Earlalai Centre	1	6.0
			Earlalai East	Earlalai East	32	11.0
			Earlalai west	Earlalai west	10	1.62
			Earlalai south	Earlalai south	20	3.6
			Kuppilan North	Kuppilan North	1	0.3
			Earlalai Centre	Earlalai Centre	3	0.4
			Earlalai East	Earlalai East	3	0.6
3	Valikamam North	Keerimalai	Vasavilan	Vasavilan	38	7.6
	Total				543	174 ha

Source: Agrarian Services Department, Jaffna

Even though the suggested number of farmers is 500 for the cluster, 543 farmers were identified assuming that there would be some drop out due to inability to fulfil the

eligibility requirements. The PPMU has already selected 150 farmers to cultivate potato on about 60 ha and taken steps to commence the cultivation during 2021/22 Maha Season. From next season onwards, all farmers would cultivate the entire extent in the cluster area under this programme. Due to the unavailability of suitable lands and conversion of some lands for other crops, there is a problem of meeting the required area under the project as planned.

As per the project requirement, the minimum land area which will be cultivated is about 270 acres and the maximum would be about 543 Acres. This estimation is without the impact zone of public infrastructures proposed to be improved. Further, a total of 3.65km length rural roads will be improved to ease the accessibility to economic infrastructures. Improvements in rural roads will benefit the entire community in the area. Improvements to the existing collection centre, 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 proposed cluster has three DSs that have 37 GN divisions. **Error! Reference source not found.**below indicates how important the proposed cluster area is in the sector of agricultural development in Jaffna District. Non-home garden lands where vegetables, fruits and other field crops are cultivated are classified as other crop lands. **Error! Reference source not found.**below shows that 68% of these lands in the district are located in this cluster area.

Table 2: Land use pattern in cluster area and Jaffna District

Description	Land area (ha)					% of district area
	Jaffna District	Kopay	Tellippalai	Uduvil	Cluster total	
Built-up areas	690	0	110	0	110	16
Non-agriculture	390	60	270	0	330	85
Homesteads	33,720	2,290	2,830	1,520	6,640	20
Coconut	1,470	210	0	0	210	14
Mixed trees/other perennials	1,530	70	110	0	180	12
Paddy	15,520	1370	460	310	2,140	14
Sparsely used crop lands	10,510	710	860	130	1,700	16
Other crops	5,880	2,300	820	890	4,010	68
Dense forests	0	0	0	0	0	
Open forests	290	0	0	0	0	0
Forest cultivations	0	0	0	0	0	
Scrublands	6,810	590	180	0	770	11
Grass lands	10	10	0	0	10	100
Wetlands – forest mangroves	20	0	0	0	0	0
Wetlands – non-forest marshes	6,630	1,480	0	0	1,480	22
Water bodies	9,610	1,220	10	20	1,250	13
Barren lands	9,450	210	0	0	210	2
Total	**10,2530**	**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. 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.

PROJECT JUSTIFICATION

Need for the project **(What problem is the project going to solve)**	The annual domestic potato production which is generally about 80,000 tons is about 40% of the domestic consumption requirement of 200,000 tons. The balance requirement is about 120,000 tons is imported annually incurring a foreign exchange cost of about SLRs. 5,100mn. The potato extent and production of Sri Lanka have been stagnating with slight annual variations over the recent years. The average productivity of potatoes in Sri Lanka has been stagnating around 16 t/ha which is below the average yields of the neighboring countries. Relatively low productivity increases the price of local potatoes than the imported products and the farmers have to compete with the low price imported potatoes. Local potato farmers get at risk of price fluctuation during the harvesting period and economic losses are happen as the result of this market behavior. The low productivity directly affects the increase of the cost of production resulting in less profit margin to the potato farmers. This document introduces the proposed technologies and infrastructure to both increase and process of production of potatoes and onions for the national market (import substitution) and to also deliver quality products that meets the proposed local market's requirements. Furthermore, the proposed technology will reduce the level of water use, use of chemical and increase land use practices. Of particular importance is to establish, assist and provide support through farmers' organisations that are to be self-managed, but with external assistance for start-up and when required afterwards. The management of farmers' organisations will be important to ensure that the farmers' products meet the required quality standards in the quantities required and within the essential timeframe. Establishment of PUC will ensure the sustainability of the proposed investment in the cluster and empowerment of farmers including female and youths in the cluster. This CDP is prepared under ASMP Component 2, which is for productivity enhancement, diversification and demonstration to support smallholder farmers to produce competitive and marketable commodities, improve their ability to respond to market requirements and move towards an increase in commercialisation. 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.

Purpose of the project **(What is going to be achieved by carrying out the project)**	This CDP is prepared under ASMP, which is for productivity enhancement, diversification and demonstration to support smallholder farmers to produce competitive and marketable commodities, improve their ability to respond to market requirements and move towards an increase in commercialisation.[1] The main objective of the subproject is to develop Agriculture-related livelihood by achieving below objectives: • Introduce new technologies to increase yield • Land preparation • Water conservation/Management • Disease control • Use of weedicides, pesticides • Enhancement of productivity and Quality of chilli • To minimise postharvest losses • To increases sustainable farm income • Create new employment opportunities • Identify international market opportunities 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 d. achieve greater efficiency in the provision of technical and other support services. Farmers are expected to benefit directly 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. This cluster development will reduces the share of imported seed potato by replacing high-quality locally produced seed potato at a low price and saving the import cost. Further, increase the volume of onion production which helps reducing the imports of onions. The ultimate effort of the ASMP is motivating farmers for using good agriculture practices (GAP) in their cultivation activities by introducing new technologies. The Jaffna Potato and Onion Cluster will bring a change into the process of cultivation, processing and sale of these crops, primarily so that the quality is sufficient to replace some of the imported produce, thus helping farmers to have a better market that is both sustainable and rewarding.
Justification and Alternatives considered **(Different ways to meet the project need and achieve the project purpose)**	Kopay, Uduvil, and Tellipalai have a well-established farmer organisation already and the production of Potato and Onion. The main sources of water for agriculture irrigation are from shallow dug wells and some deep boreholes. Average depth of a dug well is about 3 to 5 metres with year-round available water. Main crops grown are potato, tobacco and red onion in addition to commercial-grown fruit crops such as banana, grapes and mango. Jaffna District is considered one of the major red onion producing areas of the island. By studying agriculture scenario, suggests that this cluster area contributes to around 50% of it. It also indicates that this cluster area is also the main potato and banana growing area of the district. Accordingly,

[1] ASMP Project Appraisal Document.

more than 75% of the total potato cultivation area in the district is located in this cluster area, and it is also instrumental in selecting the three proposed DS divisions for these projects. Selecting a different area will cause many other issues including environmental destructions such as clearing jungle. Further, the soil quality of these selected areas is very suitable than other areas in Jaffna district. Therefore, selecting these areas are considerably favourable in terms of environmental safeguards.

The "technology alternative" would mean different technology applications to meet the project needs at the selected cluster. New On-farm technology package introduces will **reduces invasion of pesticides, weedicides and insecticides**. New and improved quality-enhancing technologies and Productivity Enhancing Technologies such as drone technology, **water-conserving**, and low-pressure drip, **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 outcomes.

The "no-action" alternative would mean that no Potato/Onion Cluster Development is undertaken by the ASMP and hence no financial, technical, and market support for the existing Potato/Onion Cultivators in Kopay, Uduvil, and Tellipalai. Therefore, conventional farm practices such as floor irrigation which wastes huge volume of water, low productivity, low quality, high use of chemicals, poor land use management, less tolerance to pests and diseases and low income will continue to dominate the economy of the farmers, and the agriculture sector will not develop in Jaffna.

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
	8	Agrarian Development Act of No 46 of 2000 and 2011 (Section 32)	√			All project activities should be officially consented and take ownership of the project activities.

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]

PROJECT DESCRIPTION

Proposed start date	January 2022
Proposed completion date	December 2023
Estimated total cost	LKR 226 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**	Development of Potato/Onion cluster includes modern agriculture technological package such as preparation of lands, drainage management, irrigation management, seeds, planting, use of fertilizers, maintenance, harvesting, post-harvesting and marketing. In addition, improvements of rural road network, collection system, establishment of institutional set-up, training of farmers, etc will also include to the entire package which Potato/Onion cluster will receive. All agriculture technology package and infrastructure improvements proposed are given below:

attached as required)

Table 3: Recommendations for improved technology package for potatoes

Main technology	Practice (s)	Comments
Varieties	• Red LaSoda – red potato – US • Sassay – white potato – France	• These two varieties have been proven successful in Jaffna as seed tubers
Land preparation	• Deep ploughing using mould board plough Application of compost • Deep ploughing again using mould board plough (perpendicular to first ploughing) • Disking or harrowing (two perpendicular passes) • Micro levelling to facilitate drainage works • Raised beds 0.9 m wide and 0.5 m high with special bed making tractor pulled accessory	• Improved land preparation practices. Mechanised bed making using implement pulled by tractor. This innovation will significantly reduce labour requirements and will speed up land preparation tasks considerably. Increased bed height will improve internal drainage and aeration in the root zone. This environment will prevent soil borne diseases that are very important in potato cultivation
Flood prevention and drainage field techniques	• Site micro levelling using laser levelling 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 of time preventing waterlogging
Low pressure drip tape irrigation systems	• White UV (ultraviolet) resistant drip tape • Computer controlled heads for water application scheduling supported by fertility sensors, soil moisture sensors and evapotranspiration measuring devices • Design based on local agri-climatic conditions and soil physical properties • Precision fertigation with liquid organic compounds based on soil analysis • Precision application of liquid pesticides in the vicinity of the root zone as required i.e. control of soil borne diseases • Anti-clogging flushing components • One drip tape lateral in the middle of planting rows	• Drip tape is a low-cost drip irrigation system very well suited for the production of vegetables. Is very easy to install and remove from crop cycle to crop cycle
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
High-density planting of chillies	• Raised beds 0.9 m wide including buffer zone (0.3 m) • Two planting rows in a bed • Plant spacing within a planting row 0.30 m • Potato population density is 74,592 plants per ha	• Modern horticulture is based on high-density planting. High population densities are the building block for productivity and greatly improve land utilisation efficiency, a serious problem in developing countries that has a large effect on the food security of a country
Precision fertilisation	• Fertigation with organic liquid fertilisers supplemented with fertilisation and/or fertigation with chemical fertilisers	• Formulation of fertiliser regimes based on complete soil tests and foliar analyses
Pesticide free, eco-friendly insect control	• Sticky insect traps placed systematically inside the crop, along the planting beds, at a spacing of 10 m	• Pesticide free, non-toxic insect control that also allows for the determination of insect population dynamics used in IPM practices to schedule spraying operations
Integrated pest management (IPM)	• Pest population and pest damage assessment surveys to evaluate pest and disease intensity/quantity factors for damage prevention and to determine pest population threshold status for rational application of pesticides	• IPM practices are combined with modern spray techniques, when necessary, i.e. ultra-low volume spray using drones • Pesticide application through irrigation system
Precision harvesting	• Harvesting following market quality specifications with respect to size	• Precision harvesting is a key practice to create and preserve quality and extend shelf life
Postharvest technology	• Field heat removal • Cold chain management • Transport to market	• These practices are utilised to preserve optimum quality and shelf life throughout value chain
Quality monitoring and evaluation system	• Quality score Tally of defects Value chain feedback loop	• The quality monitoring and evaluation system provides data for quality management and creates a feedback mechanism to correct quality problems to ensure and maintain high potato quality throughout the value chain

Table 4: Improved technology package for green onions

Main technology	Practice (s)	Comments
Varieties	MIBO/1	True seeds locally produced by the ASMP
Open field nursery husbandry	Seedlings are produced for transplant in an open field nursery using true seeds produced in Matale by the ASMP	Imported seeds are also available, but local seeds give better results
Low pressure drip tape irrigation systems	• White UV resistant drip tape • Computer controlled heads for water application scheduling supported by fertility sensors, soil moisture sensors and evapotranspiration measuring devices • Design based on local agri-climatic conditions and soil physical properties • Precision fertigation with liquid organic compounds based on soil analysis • Precision application of liquid pesticides in the vicinity of the root zone as required i.e. control of soil borne diseases • Anti-clogging flushing components • Two drip tape laterals in the planting row	Drip tape is a low-cost drip irrigation system very well suited for the production of vegetables. Is very easy to install and remove from crop cycle to crop cycle
Land preparation	• Deep ploughing using mouldboard plough • Application of compost Deep ploughing again using mouldboard plough	Improved land preparation practices. Mechanised bed making using implement pulled by tractor. This innovation will significantly reduce labour requirements

		(perpendicular to first ploughing) • Disking or harrowing (two perpendicular passes) • Micro levelling to facilitate drainage works • Raised beds 0.9 m wide and 0.5 m high with special bed making tractor pulled accessory	and will speed up land preparation tasks considerably. Increased bed height will improve internal drainage and aeration in the root zone. This environment will prevent soil borne diseases that are very important in onion cultivation
	Flood prevention and drainage field techniques	Site micro levelling using laser levelling 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 of time preventing waterlogging
	High-density planting	• Raised beds 0.9 m wide including buffer zone (0.3 m) • Plant spacing is 10 cm within a row, 7 rows per bed • Population density is approximately 784,000 plants per ha	Farmers already use ultra-high-density planting for onions
	Precision fertilisation	Fertigation with organic liquid fertilisers supplemented with fertilisation and/or fertigation with chemical fertilisers	Formulation of fertiliser regimes based on complete soil tests and foliar analyses
	Pesticide free, eco-friendly insect control	Sticky insect traps placed systematically inside the crop, along the planting beds, at a spacing of 10 m	Pesticide free, non-toxic insect control that also allows for the determination of insect population dynamics used in IPM practices to schedule spraying operations
	Integrated pest management (IPM)	Pest population and pest damage assessment surveys to evaluate pest and disease intensity/quantity factors for damage prevention and to determine pest population threshold status for rational	• IPM practices are combined with modern spray techniques when necessary, i.e. ultra-low volume spray using drones

	application of pesticides Most common diseases of onions are damping off, purple blotch. Stemphylium leaf blight, colletotrichum blight/ anthracnose/twister disease, fusarium basal rot/basal rot, white rot (sclerotial rot), pink root rot, black mould. Postharvest diseases include bulb rots, botrytis rots, black mould and bacterial soft rot	• Pesticide application through irrigation system
Precision harvesting	Harvesting following market quality specifications for size (diameter)	Consumers prefer smaller onions
Storage	Onions are stored in cold rooms at 25˚C and 75% relative humidity	Onions can be stored for more than 3 months under the recommended temperature and relative humidity regimes
Quality monitoring and evaluation system	Quality score Tally of defects Value chain feedback loop	The quality monitoring and evaluation system provides data for quality management and creates a feedback mechanism to correct quality problems to ensure and maintain high onion quality throughout the value chain

Following rural farm access roads are proposed to improve in terms of facilitating smooth access to the cluster farmlands:

Table 5: Access roads identified for repair in Jaffna, potato cluster

No	Location	Unit	Length
1	Urelu Siva road	km	0.69
2	Road in Ravatgiri GN division	km	1.14
3	Kadipulam road	km	0.78
4	Myilankandu road – road 2	km	0.24
5	Myilankandu road – road 1	km	0.10
6	Nilavarni road – 2	km	0.70
	Total length of roads identified	**km**	**3.65**

Note: Farm access roads identified for repair are marked in orange.

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 drip-irrigation system	174ha	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 Paving interlocks	6 road sections Total length 3.65km	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

Project Director
ASMP
Ministry of Agriculture
No. 123/2 Pannipitiya Road,
Battaramulla
Tel: +94 112 877 550
Fax: +94 112 877 546
Email: projectdirectorasmp2@hotmail.com
Web: https://www.asmp.lk/

Deputy Project Director – Northern Province
No. 340, Point Pedro Road,
Anaipanthy,
Jaffna.

Environmental and Social Safeguards Specialist
ASMP

	Ministry of Agriculture No. 123/2 Pannipitiya Road, Battaramulla Tel: +94 112 877 550 Fax: +94 112 877 546 Email: sanjayadms@hotmail.com Web: https://www.asmp.lk/ **Nature of Consultations and Inputs Received** Consultations with Environmental and Social Safeguard Specialist/ PMU However, an institutional mechanism for the Potato/Onion Cluster Development has been proposed. Institutional roles in this cluster (Cluster Development Plan (CDP) № 11 - Jaffna – Potato/Onion) 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 potato/onion 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. • All the Potato farmers are members of farmer organisations or successors.

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.

Figure 2: Topographic Map of Project Area in Jaffna

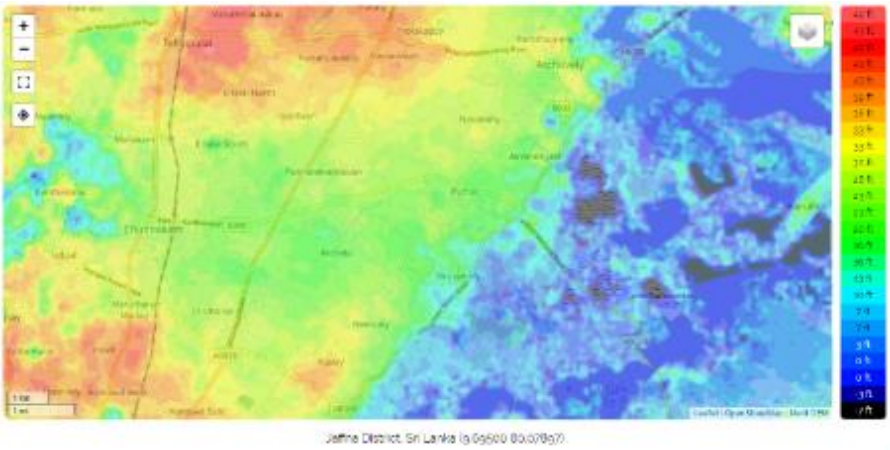


Table 7: Terrain Types of the Cluster Area

Location	Land area		Terrain types
	ha	% of DS	
Valikamam North	4,668	100	Undulating and Flat
Valikamam South	3,625	100	Undulating and Flat
Valikamam East	6,909	69	Undulating and Flat
	22.80	31	Undulating and Flat

Source: Punyawardena, 2003

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 7 months remain as dry months. The monthly average sunshine hours per day in this dry period is more than 7 hrs. It is the best condition for crop production to achieve its optimal yield if irrigation is not a limiting factor. As year-round groundwater availability is assured in Jaffna District, intensive agriculture is highly potential. Likewise, as the micro irrigation is a main component of technological package for the crop grown under the proposed project, it will be more advantageous in agricultural advancement in the area.

Table 8:onthly agro-ecological characteristic variation Jaffna average from 1970–1999

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	
Max. temperature 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
Min. 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: Punyawardana, 2003

The average maximum temperature is about 32.1˚C and the average minimum temperature is about 23.2˚C. As the minimum temperature goes down around 22˚C in January and February, this area is also recommended for potato cultivation.

Soil
(Type and quality)

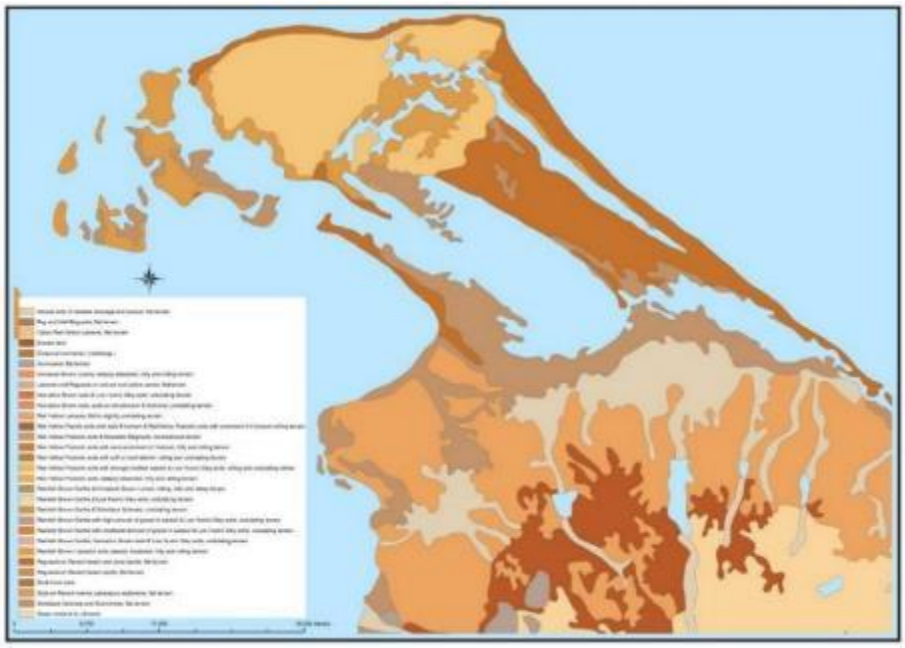
The soil is sandy along the coast but sandy clay or clayey sand in the interior with high infiltration rates. The peninsula's overburden mantle is covered with three different types of soils classified according to agricultural suitability. They are:

(i) Calcic Red Yellow Latosols;
(ii) Solodized Solonetz and Solonchaks; and
(iii) Regosols on recent beach sands

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 below.

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.

Table 9: Agroecological Characteristics of the Cluster Area

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

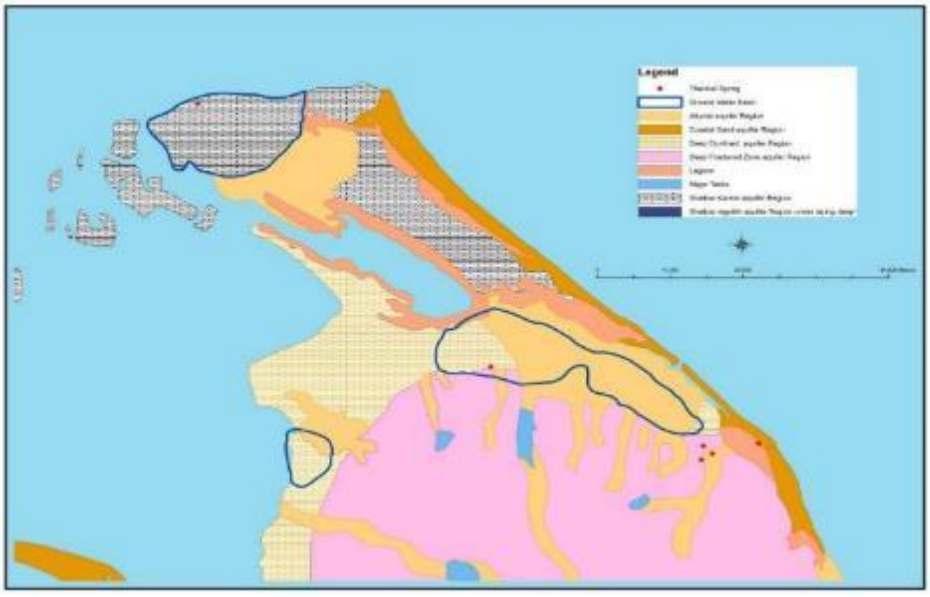
Currently, they are using ordinary dug wells in the farmlands for irrigating the plants. Many farmers have inserted tube wells inside the dug wells to the continuous water supply. However, they are aware of the danger of a change in water quality and quantity in the future. All these wells are domestic 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 aquifers 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 it's 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 fresh waterbodies 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, and 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 potato/onion rotation cluster have been selected from three DS divisions in Jaffna District consisting of several GN divisions. Hence, this section will discuss the demographic characteristics of the DS divisions instead of GN divisions. The project has selected 140 farmers form these three GN divisions for this potato season and planned to increase the number up to 500 farmers in 2022 season by incorporating more GN divisions in future. Hence, it is justifiable to look at the demographic characteristic at DS level rather than GN level. Valikamam North DS division has 45 GN divisions, comprising 14,522 families and estimated population of about 45,244.[2] The entire population from this DS division was displaced during the conflict initially with the extension of the		

[2] Resource profile, Divisional Secretariat 2021.

strategic Palaly airport, Myliddy Fisheries harbour and Kankesanthurai harbour and later in 1995 with the Jaffna displacement. After the capture of Jaffna District by Sri Lankan forces people were resettled in phases. Twenty-four GN divisions have been fully resettled while some GN divisions have been partially resettled. The resettlement process is still going on and there are still a few more GN divisions to be resettled.

Valikamam South DS division has 30 GN divisions consisting of 17,477 families with total population of 52,776. Valikamam East DS division has 31 GN divisions consisting of 24,001 families and 76,944 population. All the selected farmers in this cluster have agreed to release 0.2 ha of land for cultivating these crops in rotation and have either their own dug well or shared dug well or tube well as their source of water for cultivation. Moreover, the majority of them are cultivating these selected crops in traditional methods. Majority of selected farmers own their lands with title deeds; others have leased lands, while 10–15% of the farmers are practising cultivations on both types of lands. As stated above, currently 146 farmers have been selected for this season from more than 25 GN divisions in these three DS divisions and it is expected to increase these to 500 farmers by next season from many more GN divisions. The number of families and the gender breakdown in the selected DS divisions is shown below in Table 5. Further, there are 10,665 female-headed families out of 45,335 families which represents 23.52% of the total number of families in the three DS divisions. In addition, there is a large percentage of youths (23–25%) in the 20–34 age group in these DS divisions, potentially providing a good opportunity to become involved in potato/onion cultivation.

Households	**Number**
Male head	45,335
Female head	10,665
% female head	23.52
Total	174,964
Agricultural population	
Male	16,126
Female	6,002
Total	22,128

In discussions with farmers, they highlighted the local migration of youths who were looking for different types of employment opportunities with soft skills rather than engage in agriculture. Further, they claimed that the existing agricultural activities do not ensure a consistent and stable monthly income.

Table 10: Household and agricultural population in the selected DS divisions in potato/onion cluster in Jaffna District

Households	**Number**
Male head	45,335
Female head	10,665
% female head	23.52
Total	174,964
Agricultural population	
Male	16,126
Female	6,002
Total	22,128

Source: *Statistical Handbook 2021 three DS divisions*.

The project creates many opportunities for unemployed people to have daily basis employment while others may get the opportunity to work as skilled farm labourers. Further, there will be employment opportunities at the

	postharvesting processing centres. Hence, development of potato/onion cultivation will provide a good prospect for the youth to have a stable income; and it can prevent local employment migrations both male and female youths should be encouraged by conducting training and awareness to actively engage in the cultivation of these crops. In addition, exploring new/ innovative areas within potato/onion sector would create more employment opportunities or income-generating options for youth and women in the area. There are no published household income and expenditure details specific to the farmers in these DS divisions or farmers engaged in cultivating potato or onion cultivation. However, income data is published in different forms in different DS division. In Valikamam North 8,597 families have a monthly income of less than LKR 10,000. There are 10,317 families in Valikamam South and 16,359 families in Valikamam East earning less than LKR 10,000 per month. In general, the household income and expenditure statistics in Jaffna District 2006/07, published by the Department of Census and Statistics in 2016, shows that the mean household monthly income in 2016 of 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 potato/onion cluster in Valikamam area, dependency rate in these three divisions range 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; they do not keep proper accounting or income and expenditure statements for anyone to assess their income over expenditure. In the Census and Statistical Department published data shows 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.
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).

DESCRIPTION OF PROPOSED AGRICULTURAL ACTIVITIES

6.1 CULTIVATION

The existing condition of the crop	According to *PotatoPro*,[3] the potato was introduced to Sri Lanka in the 1850s by Europeans who settled in elevated areas of the country. Nuwara Eliya District is one of the two major production areas of the country[4][5], located in the up-country wet zone (more than 2,500 mm of rainfall), above an altitude of 1,000 m, with temperatures ranging from 10°C to 15°C and with a relative humidity of 80%. Production in this district takes place in the 'Yala season' (February–July) and in the 'Maha season' (August–December). Badulla district is the second major production area of the country located in the up-country intermediate climatic zone at an altitude of 1,000–1,500 m. Cultivation is carried out in paddy fields and high lands. Production takes place both in the 'Yala' and 'Maha' seasons. In this area, annual rainfall is 1,500–2,250 mm with a relative humidity of 70%. The temperature range is 15–22°C. In 2017, the national production of potatoes in Sri Lanka was as follows[1]: • Quantity produced: 73,358 tonnes • Area harvested: 4,457 ha • Average yield: 16.5 tonnes per ha With a country population of 21.92 million (World Bank, 2020) and using the 2017 production figures and the 2013 per capita consumption, the total consumption of potatoes in Sri Lanka can be estimated at 183,251 tonnes. These estimates indicate that the local potato industry supplies approximately only 40% of the consumption of the country, meaning 60% of the consumption has to be imported (109,894 tonnes). To become potato self-sufficient, the country needs to cultivate close to 6,660 additional ha. In other words, the potato harvested area needs to more than double to satisfy the requirement of the country. Put in a different way, the industry needs to grow 250% to be able to supply the country. These numbers make potato an excellent import substitution crop for Sri Lanka using high technology. The distribution of production in the two major districts is characterised by a major production peak in October/ November and a medium size peak in March/April. Production is very low from November through February and from May/June through August and September. The very low production levels from November through February in Badulla and Nuwara Eliya offer a great opportunity for Jaffna production, but the window is very narrow. Agroclimatic conditions, especially temperature difference of day and night, are somewhat favourable for potato production in that time period, although rainfall is rather low from January to September. In those months, irrigation is required.
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	Potato and red onion plot sizes vary from 0.1 to 0.4 ha. Potato cultivations take place in Maha season (December–January), followed by red onion cultivations during Yala season.

[3] https://www.potatopro.com/sri-lanka/potato-statistics

[4] Up-country farmers have a very high preference for potato growing due to its high profitability.

[5] Two other districts, Puttalam and Jaffna, cultivate potatoes to a lesser extent

	The selected land is ploughed with a disc plough attached to a 4-wheel tractor and after about 2 weeks, a tine tiller or rotovator is used to break up the clods into fine particles. Specific beds of 0.6 x 0.37 m beds are arranged for easy irrigation and crop management. Between rows (beds spacings) are 30 to 45 cm and pre-sprouted seed potatoes are planted in 30 cm spacing. Main sources of irrigation are agro-wells or tube wells. Compost or cattle manure is applied two weeks before the first ploughing at a rate of one lorry load per 0.2 ha and it will be mixed up with soil when harrowing. Basal fertiliser mixture of potato will be applied at the rate of 250 kg per ha. About 100 kg of urea per ha will be applied as the first top dressing, 2 weeks after planting. Second top dressing will be taken place 3 weeks after planting at a rate of 150 kg urea and 125 kg muriate of potash per ha. Planting materials are purchased from a company that had been set up mainly to supply seed potato. Haylies Company is the importer and use the Sassy and Red La Soda varieties. Moistness of the soil is assured in the first four days and will be irrigated once every seven days thereafter up until 10 days before harvesting. Fields are kept weed free until 3–4 weeks before harvest by earthening up and hand picking out weeds thereafter if needed. Thrips, cut worms and aphids are reported as major pests, and early blight and soft rot as diseases. Selecting vigorous planting materials and use of recommended pesticides are the control methods. Furthermore, selecting disease-free planting materials, assuring field sanitation and applying fungicides for blight are the methods used to control diseases.
Water requirement	The soil moisture content must be maintained at a relatively high level. For best yields, a 100 to 110-day crop requires from 200 to 220 mm of water. In general, water deficits in the middle to late part of the growing period tend to reduce yield more than those in the early part. Because the potato has a shallow root system, yield response to frequent irrigation is considerable, and very high yields are obtained with mechanized sprinkler systems that replenish evapotranspiration losses every one or two days. The water requirement for the crop is estimated as 2,000 liters per day per ½ acre extent. Currently, farmers use open drains to irrigate potato cultivation and it is a high-water wasting system while spreading the diseases via it. Under this subproject, low pressure drip irrigation is provided for the farmers and it will reduce water wasting and will help to maintain a healthy crop.
Use of fertiliser and pesticides and weedicides	Overuse of chemical fertilizers and agrochemicals is a common phenomenon in potato cultivation in Sri Lanka. But ISP plots will be applied only required type of fertilizers and needed quantity after a sample soil testing. Likewise Good Agricultural Practice concept will be promoted for every lot of farms which reduce unnecessary pesticide applications too. The soil analysts will give recommendations for both chemical fertilizers usages and adding organic manure to the crop. And it will indirectly reduce the use of chemical fertilizers. Initial weed control prior to cultivation is only done manually. After the establishment of the crop in the field, using agronomic methods such as controlling watering, following cultivation cycle, and timely application of the recommended fertilizers are practiced. It is recommended to minimize the usages of the agrochemical such as pesticides and fungicides. Farmers' technical know-how to identify the economic thresholds

	level in pests' control will be enhanced as a part of this subproject through the experts in DOA. When the pests attack to overrun the economic threshold level, an integrated system with less chemical application will be allowed to control the pests. Farmers to use chemical fertilizer for potato production. Urea is used as the nitrogen source, Rock Phosphate and Triple Super Phosphate are used as the phosphate source and Mutreate of Potash is the Potassium source. To control pests and diseases, there are several crop management methods apart from pesticide application. They establish the crop at the proper time, proper land preparation, destroy crop residuals, manually destroy the eggs and larva, and weed control. Further, DOA has recommended crop rotation to minimize the pests and disease attacks to potato cultivation. According to their recommendations, only one crop of potato per year will be cultivated in proposed seed-producing lands and crop rotation will be practiced by cultivating vegetable crops during the rest of the period in the year. Farmers will be advised to avoid cultivating crops belonging to the Solanaceae family for crop rotation To control pests and diseases, there are several crop management methods apart from pesticide application. They are; • Selection of high-quality initial seeds from a reliable source • Use of treatment for planting material before planting • The correct time of planting • Use of recommended fertilizers at the correct rate and correct time of application • The high amount of nitrogen fertilizer (urea) may increase the susceptibility to pests. Therefore, excessive use of nitrogen fertilizer must be avoided • Foliar liquid fertilizer can be used when potato plants show deficiency systems. The fertigation units will be provided to each farmer to connect with sprinkler irrigation and add liquid fertilizer to the crop • Use of sprinkler irrigation methods *Phytophthora infestans* is an oomycete or water mold, a microorganism that causes the serious potato disease known as potato blight. This is a common disease among the crop in the area. Applying the recommended fungicide is the solution to mitigate the issue. Integrated pest management (IPM) is encouraged to control the pest and diseases in crop management as per the pest management plan (PMP) prepared for ASMP. If it is essential to apply agrochemicals, only recommended applying registered chemicals under the Department of Agriculture and PMP as well.
Harvesting	Harvesting is done 2 months after planting. Harvested potatoes are sold at the Chunnakam/Thirunalveli (or other nearby market) by transporting in small trucks. The cost of transportation is said to be around LKR 200 per 50 kg sack. 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 tubers planted per unit area will be nearly double the recommended and it is expected that the yield will increase by more than 75%. Likewise, it should also be noted that the drip irrigation system, which can provide water to the plant, is particularly suitable for soils that minimise leaching fertilisers and agrochemicals to the groundwater. Every grower is advised to take care of crop sanitation in the field at all times. Their effort in weed control will be minimised as the surface of the bed is covered with a specially manufactured polythene.

	From the above details it can be seen that the products produced under this project are designed not to cause any harmful effects on the environment, humans or animals. Toxins up to harvesting and market preparation. Accordingly, there is a possibility of obtaining a special price for the produce grown under this project by earning a name as *Jaffna Potato*. All products grown under the project will be directed to pre-identified specific markets.
Postharvest storage and transportation	**Potato** Potato harvesting should be done in a dry weather. When the crop reaches 80–90 days and the upper part (haulm and leaves) of the plant turns yellow, then can cut by sickle or slashed by machine, so helping to stop of any disease down the stem and allowing the tubers to remain in the ground for 10–15 days before needing to be harvested. Harvesting can be done by tractor-operated digger or manually. After harvesting, the tubers need to be cured in a shady area to avoid any greening. All damaged/ diseased tubers need to be removed during sorting operations at the PUC collecting and processing centres. Handling and packaging are on-farm activities where harvested potatoes are heaped temporarily in the field. The good tubers are packed in jute bags, net bags or poly woven bags with a capacity of 50 kg, 25 kg and 10 kg for transportation. The smaller bag sizes are better as there is generally less bruising of the tubers. The PUC collecting centre could use wooden boxes/plastic crates for transport of the sorted potato crop to where the graded potato would be packed in bags of different sizes for storage and marketing. Grading plays a major role in marketing. Potato marketing involves a number of actors that operates between the producers and consumers. This results in the low farm gate price compared to the high consumer prices, due to spread of margins at each transaction in the supply chain. This necessitates the producers to make cohesive groups/PUCs to create an enabling environment for their own marketing of produce supported by postharvest and cold chain infrastructure for potato. Potatoes are mostly produced during the Maha season, but are consumed year-round. Therefore, storage of potatoes under optimum conditions will be a very important part of supply chain in order to avoid a glut on the market. Problems associated with potato storage are sweetness, sprouting and decay resulting in a lowering of the culinary qualities of the stored potato as well as making them unfit for preparation of French fries. Some growers occasionally store mature potatoes in the ground several weeks before harvest. Pits are occasionally used for short-term, small-scale storage of potatoes in some areas. **Red onion** The majority of farmers use manual harvesting methods for red onion. Red onions for fresh market are manually undercut, trimmed, cured and collected in field containers then loaded on to tractors and transported in bulk to pack houses or processing facilities. • **Curing -** One of the simplest and most effective ways to reduce water loss and decay during postharvest storage of red onion is curing after harvest. In bulb crops, curing refers to the process of drying of the neck tissues and of the outer leaves to form dry scales. Some water loss takes place during curing. Removing

	decayed bulbs before curing and storage ensures a greater percentage of usable product after storage. When onions are cured in the field they are undercut, then hand pulled. Sometimes the roots and tops are trimmed and the bulbs are then allowed to dry in field racks or bins for 2–7 days or longer (depending on ambient conditions). Onions develop the best scale colour if cured at temperatures of 25–32°C. • **Storage -** Onions are occasionally room-cooled before shipment to market. Onions destined for storage are cooled during the early phase of the storage period with cool air forced through storage piles or bins. Cooling may be done with cold ambient air or with air cooled by mechanical refrigeration. Onion can be hydro cooled. Onion, are often stored after curing and before preparation for market (cleaning, grading, sizing and packing). The onions may be stored for 3–10 months in mechanically refrigerated or ventilated storages. • **Cleaning -** Dry brush or forced air blowing, removing dust particles, dried leaves, scales and excess moisture. • **Sorting -** Eliminate defective products and plant debris. • **Sizing -** Size mechanically or by hand. Mechanical sizers are generally diverging rollers or weight sizers. • **Grading -** Separate into quality grades. • **Packing -** Pack into consumer units (bags, trays) and then pack into master containers; or bulk pack into shipping containers (bags, boxes, and bins). • **Loading into transit vehicles -** Bulk transport to processing plants. For fresh market, most products are packed in shipping containers: palletised for boxes mostly destined for export; manually stacked if in bags. Accordingly, the existing small market in this area will be replaced by wider market links to 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 grown under this project are designed and maintained to minimise any harmful effects on the environment, human and animal toxins. Therefore, this cluster will play a significant role in changing and upgrading the livelihood of the cluster area.
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 specially the low-pressure drip irrigation system which aimed to supply irrigation to the root zone

	without percolate to the ground water. 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 potato/onion cluster is given in table 11.

Table 11: ISP of ASMP - Proposed IPM Technologies for Crop Potato and Onion in Jaffna (CDP 11)

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 of all alternative host plants of pest and diseases	Future risk of pest damages are minimised
Land preparation stage	Doing 1st ploughing with disk or mould board ploughs	• Soil aeration improved • Different stages of pest cycles are destroyed. • Harmful bacteria and microorganisms are destroyed and minimize due to aeration is improved. • Also, Harmful pathogens are destroyed also due to exposing soils to sunlight.	Improved land preparation practices. Mechanised bed making using implement pulled by tractor. This innovation will significantly reduce labour requirements and will speed up land preparation tasks considerably. Increased bed height will improve internal drainage and aeration in the root zone. This environment will prevent soil borne diseases that are very important in potato cultivation
	Adding Compost and mixing with soil	Increase beneficial macro and microorganism in the soil and decrease pathogenic micro-organism. Development of soil structure	
	Doing 2nd deep ploughing with disk or mould board ploughs perpendicular to 1st ploughing	Mixing organic matter with the soil. Soil aeration improved. Harmful pathogens are destroyed	
	Disking or harrowing (two perpendicular passes)		
	Flood prevention and Drainage improvements. Raised beds are 0.5m in height and 0.9 m wide.	Less risk of disease spread	
	Beds will be arranged in such a way to reception of maximum sunlight	Sunlight will not be a limitation to the plant to produce maximum yield	
Planting stage	• Red LaSoda - Red potato – US • Sassay - white potato - France	These two varieties have been proven successful in Jaffna as seed tubers	Variety adopted for Jaffna is assured
	Tubers of same size will be planted in same bed	Easy to manage agronomic practices. Uniform plantation is assured	A healthy plantation is assured.
	Placement of silver and black plastic mulch over the beds. Planting points will be made by punching the polythene in recommended distances.	Established technology to control weeds and reduce evapotranspiration which lowers irrigation water needs. In addition, reflecting sunlight will improve the solar radiation reception to the chili plants. No chemical weed control.	Less labor needs. Reduce irrigation volume. Optimized photosynthesis

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	
	No water stress is allowed	Vigorous growth and Even plantation is assured	
	Only correct dose of nutritionally balanced fertilizers will be applied	No unwanted canopy development and vigorous growth is assured	
Juvenile, Flowering and Maturity stages	Daily attention on all seedlings 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
	Field sanitation is assured by managing garbage in the field		
	Suspicious plants are marked and will be monitored for pest and diseases. Treatment will be followed if only identified as economically harmful pest or a disease.		
	Diseases attacked plants are uprooted and immediately destroyed		
	Automated Micro irrigation by using drip tapes	• Volume of water need for the effective root zone is assured. • Percolation of irrigated water toward the ground water is minimized. • helped for a vigorous plant growth	Easy to handle, cost reduced. Less harm to the environment
	• Fertigation with organic or chemical fertilizers. • Formulation of fertiliser regimes based on complete soil tests and foliar analyses. • It will be continued flowering and maturity stages too	• Correct dose of nutrient to the plant is assured. • It minimized adding of excess fertilizes to the environment. • Vigorous plant growth is assured. • Less risk of pest and disease infestation	Easy to handle.
	Required dose of fertilizer will be supplied though fertigation, by soil and leaf analysis.	Balanced plant nutrient requirement for the plant is assured. Plant vigour will be increased. Optimum fruit setting will be occurred	A healthy plantation is assured. Maximum yield will be assured

	Automated Micro irrigation by using drip tapes	• Volume of water need for the effective root zone is assured. • Percolation of irrigated water toward the ground water is minimized. • helped for a vigorous plant growth	Easy to handle, cost reduced. Less harm to the environment
	Sticky insect traps placed systematically inside the crop, along the planting beds, at a spacing of 10 m	Pesticide free, non-toxic insect control that also allows for the determination of insect population dynamics used in IPM practices to schedule spraying operations	Healthy crop is assured
	Pest population and pest damage assessment surveys to evaluate pest and disease intensity/quantity factors for damage prevention and to determine pest population threshold status for rational application of pesticides	• IPM practices are combined with modern spray techniques when necessary i.e. ultra-low volume spray using drones if needed. • Pesticide application through irrigation system if needed	Healthy crop is assured
Harvesting stage	harvesting following market quality specifications on size (girth and length) and colour (maturity stage)	Precision harvesting is a key practice to create and preserve quality and extend shelf life with minimum risk of diseases infestation	Expected quality production is assured
Transport stage	Harvest will be transported to the markets by using creates. Care will be taken to minimum damages to the produce.	Losses in transportation will be minimum. Diseases infestation will be minimum	Expected quantity of produce is assured. Reasonable price is assured.

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.

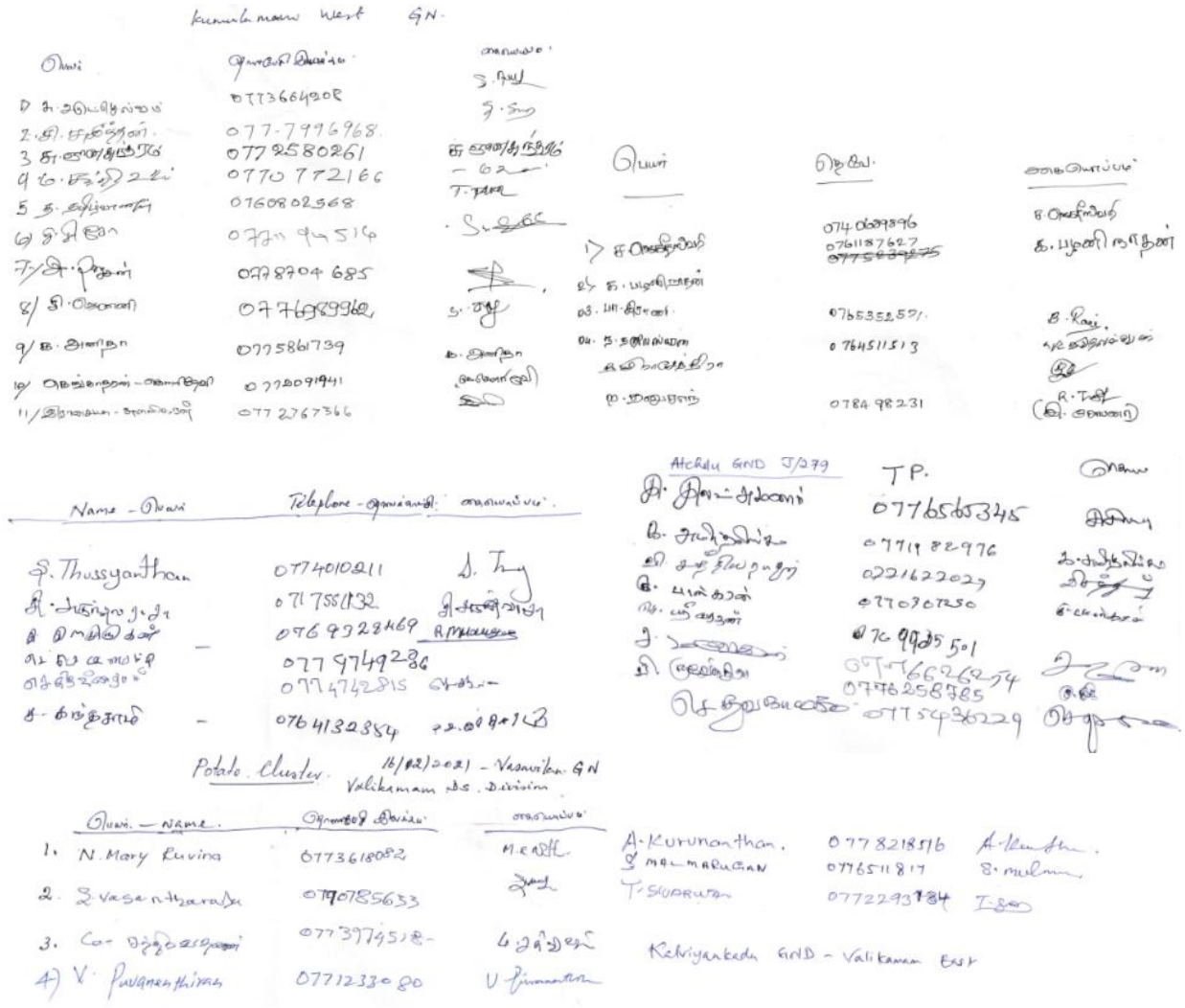


Figure 5: Attendance Sheets of Public Consultations

Table 12: Outcomes of the Public Consultations

#	Farmer's Representation	Summary of Public Consultations
1	Vasavilan GN divisions J/244 Valikamam North DS Division	Farmers mentioned that they are ready to alienate even more than ½ an acre and that they are having ownership or lease rights for the lands they are cultivating. Further they said that they can easily obtain legally valid lease document from the landowners. Water source is dug well and if it rains adequately in the rainy season of September-January water will be available throughout the next cultivation season. Most of the farmers have sunk tube well inside the wells to draw water from the deep ground water level. Otherwise, the farmers will face water shortage during try season. Hence, there is a danger of saltwater intrusion and possibility of changing the water quality. However, they mentioned with the

		introduction of drip irrigation in the project this issue could be resolved in future. Participants were asked to sit down and draw the community map of their GN divisions indicating all available infrastructure and the social, environmental, and cultural resources and to point out the issues they are facing regarding these resources. One community map was drawn, and they indicated the schools, major and minor roads, places of worships and the defence front line. They pointed out that their valuable fertile lands are still occupied by the army and the resettlement process in the released areas is also very slow due to lack of funds. Porcupine and wild boar from the uncleared areas intrude and causing damage to vegetables and jams cultivated in the cleared areas especially in the lands adjoining the DFL. They also mentioned that the government import policy regarding the subsidiary food crops cultivated by them during the time of harvest is causing huge losses and discouraging them. They insisted that the tax policy towards the subsidiary food crops should be stable and support the farmers and encourage them to cultivate more and get good prices for their produce. After the meeting the team visited the land close by to see the land preparation for cultivating potato. Met the field coordinators appointed for the clusters in the field as well.
2	Punnalaikadduwan South J/207 and Evinai J/209 in Valikamam South DS division	The farmers are ready to alienate minimum of ½ an acre of land and all the selected farmers have their own dug wells as their water source for cultivation. They were given a brief explanation of the project and found that they have understood the project objective of the ASMP well and ready to support the project. They are keen to adopt modern technology in potato-onion rotational cultivation to maximize their annual income. After the discussion the farmers from J/207 and J/209 started drawing their community map indicating their social, cultural, and environmental resources and indicated the problems they faced in their cultivation. They pointed out all their social and cultural infrastructures such as schools, cooperative, GN office, temples, post office, and common hall, in the map. The road network is also shown in the map. Men and women participated equally in the discussion. Their major problem was non availability of chemical fertilizer and insecticides. Another problem pointed out by the farmers was the uncertainty of government import policy or taxing policy. The farmers in the North feel that they are given step motherly treatment by the government and introduces policies that affect the market prices during the harvest time. Both the GN divisions were together few years back and divided into two recently.
3	Atchelu GN division J/279 in Valikamam East	They were keen in cultivating potato and onion in rotation. They are very much familiar in cultivating these crops in the traditional method and very keen in adopting the new methods of land preparation and planting introduced by the project. They were very much concern about the fertility of their soil and use lot of organic fertilizer during the land preparation. Land ownership is not a problem in the division. They have either deeds or legal ownership for the land. Since it is a red clay soil it will be soggy when watered and hard when dry. N water stagnation in the land. These crops are planted by farmers in the area in a traditional way and they have been struggling to earn adequate income for the family. If a high income is guaranteed by the modern farming

		technologies and practices the farmers are ready to adopt those technologies and farming practices without hesitation. There are dug wells with tube wells inside the dug wells ensures the water requirement throughout the year. There are several ponds in the areas collecting water during the rainy season and recharge the ground water. The potato cultivators said that they send their produce to the commission agents in Colombo for marketing their produce. They pointed out the wrong taxation policy of the government which affect the prices of their produce in the past. They were asking us for an appropriate policy measure focusing on producers considering the seasonal variation of products in different regions. The farmers were in a hurry, and they were not able to draw the community map. After the discussion the team visited to see a land prepared for potato planting. He has alienated more than 1/2 an acre for the cultivation. He is having Cavendish banana plot as well. The plants were healthy and having long bunches of fruits supported by logs. The farmer said this variety of banana gets a stable price in the local market compared to Ambul or Kathali and Poovalai. It was raining and the team was not able to walk through the field.
4	Kalviyankadu GN division J/259 in Valikamam East DS division	They were interested in mapping theirs GN division. Two of the participants are educated youth and very keen in farming. The FO Presidents wife also showed interest in drawing the community map after the discussion. The team discussed the project objectives and the process to achieve those objectives. Later the reason for the present visit was explained and requested the participants to tell us the social, environmental, cultural, and any other obstacles that may arise in the process of implementing the proposed methods of cultivation and technologies. The source of water for irrigating the crops is mainly dug wells with tube wells inside and they never encountered a problem of water scarcity. However, they believe that the drip irrigation system introduced in the project will use less water and be a solution for the thread. They envisage that the quality of the ground water may change in future and be a thread for cultivation. One selected farmer has received the planting material and he was not satisfied about the quality of the seed potato supplied to him. He showed the discarded potato seeds which were not good for planting. Due to the heavy rain the farmers in this area were not able to get their beds ready for planting. Land preparation process is delaying the planting in the area. The team visited the fields allocated for the planting. The selected farmers have either deeds or legal right to cultivate the lands. In the community participants indicated few social and cultural locations including the Kopay police station. To some extent they have shown the areas where the potato farmers concentrated and the major road network in the map. In this discussion also they pointed out the discriminated import policy of the government towards Northern farmers. Despite these issues the farmers interested in cultivating all types of crops for the local market as well as the market outside markets.

- **Existing issues**

Although at present farmers are getting comparatively low prices, they have a good potential to obtain higher prices for their produce if they could win again the “brand” of *Jaffna Potatoes* in the local markets

as a high quality product. Technological problems and gaps in present potato cultivation practices of farmers that affect crop productivity and quality in Jaffna District are as follows:

1 Lack of adoption of new agronomic practices.
2 Risk of pest and diseases damages.
3 Low productivity of lands, labour and other inputs.
4 Excessive flood irrigation creates many problems such as waterlogged conditions, poor crop performances, high disease incidence and waste of water.
5 High risk of soil erosion due to prolonged flood irrigation.
6 Poor crop management practices and poor sanitation.
7 Difficulties in finding labour.
8 Most youth in the labour force have left the district or gone abroad for employment.
9 Reluctance of even the youth in the district to engage in agriculture.
10 Contamination of groundwater due to irregular application of chemical fertilisers and pesticides.
11 High cost of transport.
12 Low quality of product and grading is not practiced.
13 Lack of reasonable prices for the products.

Figure 6: Public Consultations with Potato/Onion Cluster Farmers

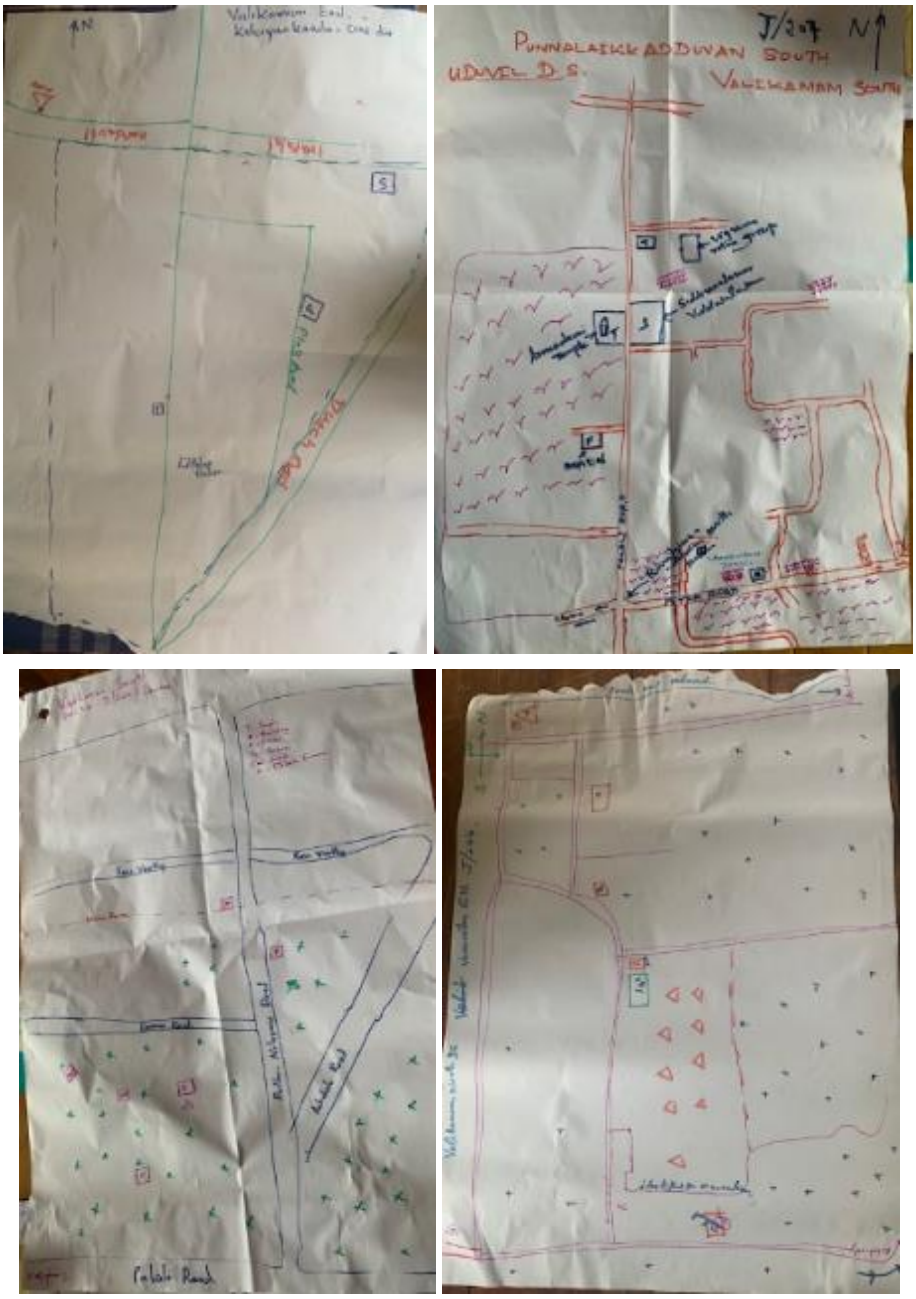


Figure 7: Community Mapping Outcomes

Figure 8: Existing Land Preparation for Potato/Onion Cultivations

Figure 9: Existing Water Sources

ENVIRONMENTAL EFFECTS AND MITIGATION MEASURES

Table 13: 8a. Screening for Potential Environmental Impacts

№	Screening question	Yes	No	Significance: (low, moderate, high)	Remarks
1	Will construction and operation of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in water bodies, etc.?)	√		Low-moderate	• Due to propose agricultural activities there will be changes to landform which includes preparation cultivation beds, laying of drip irrigation systems, etc. However, these lands are originally cultivating lands which will be using for potato/onion cultivation • There will be moderate level changes to the topography due to proposed infrastructure developments such as rural road improvements, and construction of collection centre
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?	√		Low - Moderate	• Proposed infrastructure developments will have low concerns due to harmful substances such as cement. Rural roads improvements, construction of collection centre, etc will use cement in considerable volume • Agricultural practices proposed may use weedicides, pesticides, fertilisers which may cause harm on health. However, the use of such will be discouraged and IPM will be promoted.
3	Will the Project produce solid wastes during construction or operation?	√		Low - Moderate	• Construction waste will be generated such as excavated materials and unsuitable soil which should be reused as much as possible and final disposal should be done at an approved location without creating environmental issue • During land preparation, weeds controlling and harvesting time, there will be solid waste generated due to agricultural activities and organic waste can be used for compost yard
4	Will the Project release pollutants or any hazardous, toxic, or noxious substances to air?	√		Moderate - High	• There is a possibility leaching Pesticides, and weedicides to the adjoining drains and waterbodies. Possibility to have significant impacts to other flora and fauna. • 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 is expected during construction

№	Screening question	Yes	No	Significance: (low, moderate, high)	Remarks
5	Will the Project cause noise and vibration or release of light, heat energy, or electromagnetic radiation?	√		Low	• Considerable volume of noise will be generated due to proposed infrastructure developments such as excavations, movements of vehicles and machineries, etc • However, proposed cultivation practices will have very minor level of noise, vibration, light, etc
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?	√		Low	• All chemicals used to include pesticides and weedicides during cultivation may contaminate land or water. 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	Flooding locations were not identified during the visit and the project will not cause localised flooding. However, due to poor engineering practices such as haphazard us disposal of waste may create localise flooding
8	Will there be any risks and vulnerabilities to public safety due to physical hazards during the construction or operation of the Project?	√		Low	• Both proposed agricultural and infrastructure improvements will create vulnerabilities to the general public due to use of pesticides, weedicides, excavation activities, movements of vehicles and machineries, etc
9	Are there any transport routes on or around the location which are susceptible to congestion or which cause environmental problems, which could be affected by the project?	√		Low	• Improvements to the existing rural roads will create temporary disturbances to the users including traffic congestions and access disruptions
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		√		• Important or sensitive areas were not found

№	Screening question	Yes	No	Significance: (low, moderate, high)	Remarks
	bodies, the coastal zone, mountains, forests that could be affected by the project?				
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 such important habitats observed which will have an impact
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 farmlands will be used. 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 foreseen
16	Are there any areas or features of historic or cultural importance on or around the location which could be affected by the project?		√		No features of historic importance have been identified within the study area
17	Are there existing land uses on or around the location e.g., home gardens, other private property, industry, commerce, recreation, public open space, community facilities, agriculture, forestry, tourism, mining, or quarrying which could be affected by the project?		√		The selected lands are existing agricultural lands and construction of collection centre land will be a government land
18	Are there any areas on or around the location which are densely populated or built up, which could be affected by the project?		√		• No built-up areas. These areas predominantly agricultural areas
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		√		• No such sensitive areas will be affected
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,		√		• Existing agricultural practices will be improved by the sub project activities and no negative impacts are anticipated

№	Screening question	Yes	No	Significance: (low, moderate, high)	Remarks
	fisheries, tourism, minerals, which could be affected by the project?				
21	Are there any areas on or around the location which are already subject to pollution or environmental damage e.g., where existing legal environmental standards are exceeded, which could be affected by the project?		√		• There are no areas around the location where legal environmental standards have been exceeded or has been environmentally polluted

8B. Environmental Management Plan

Table 14: 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	Use of harvesting crates Mechanical scarring and bruising quality defects Sorting and packaging	• 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

№	Potential environmental impacts and risk level	Key project activities causing the impact	Mitigation measures proposed and action to be implemented by the contractor
	to low quality of product and high amount of waste	Storing the harvested product before delivery to the packing facility	• Use of Discarded poor quality ones 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
3	Activities related to installation of drip irrigation systems	Installation of drip irrigation 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 onsite, 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 (P*arthenium hysterophorus)*	Vegetation clearing Planting of Potato/Onion	• Provide DoA certified chilli seed variety only to farmers for nurseries • 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 Soil erosion	• 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 • Introduction of proper drainage system including catch-pits and silt-traps to avoid silt and other particles been carried by the drainage water out of the site
7	Impaired water quality	Cultivation of Potato/Onion	• 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 organic materials in the field Waste from weed control activities Polythene from Poly mulches Plastics from Drip irrigation left-overs	• Burnt to maintain the farmlands' hygienic condition • Use postharvest waste for compost production • Implement waste minimisation as proposed in pilot activity for reducing waste generation, and providing income generation and empowerment • Plastic and Polythene should be collected, segregated and disposed via approved agents at approved locations preferably thorugh LAs
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	Spreading COVID 19 virus	All activities	• The Farmers must ensure that all workers are well trained on COVID 19 safety precautions published by health ministry • Make required precautionary measures at the site level to take care of Covid-19 infected person

№	Potential environmental impacts and risk level	Key project activities causing the impact	Mitigation measures proposed and action to be implemented by the contractor
11	Health hazard	Use of agrochemicals (fertilisers, pesticides, weedicides etc.) Snake Bite Exposure to Chemicals	• Carry out proper hazardous identification and risk assessment of all proposed activities • Training and awareness on safe chemical handling • Use drone technology to spray chemicals • Availability of First-aid kits • Training on first-aid and carry out mocks • Implement proper health and safety protocols by elimination, substitution, engineering controls, administrative control and provide Personal Protective Equipment (PPE). Provide necessary PPE (*basics should include gloves, googles, masks and protective clothing*) • A safety inspection checklist should be prepared taking into consideration what the workers are supposed to be wearing and monitored • Pest and disease control according to the international standard including IPM frame work of the world bank and pest management action plan prepared by ASMP • Formulation of fertiliser regimes based on complete soil tests and foliar analysis • Pest population and pest damage surveys to assess pest threshold status for application of pesticides

Table 15: EMP for Improvements of Rural Farm Access Roads 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	• Discussions should be conducted with the project-affected persons. • Residents in the area have to be briefed on the project, purpose, design, and outcomes via a documented community consultation session ***-This should be done immediately once the contractor is mobilized.*** • The contractor should take note of all impacts, especially access issues and safety hazards that will be of concern to the residents, and take necessary measures as stipulated in the EMP to mitigate them. • The contractor will maintain a log of any grievances/complaints and actions are taken to resolve them. • A copy of the EMP should be available at all times at the project supervision office on site.
2	Exposing and damaging of physical cultural resources	▪ Site preparatory work	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
			• 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 nightguard 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 to find the report, within a specified 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 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.
3	Over extraction of natural resources	▪ Material Sourcing	• The contractor is required to ensure that sand, aggregates, and other quarry material are 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. • Sourcing of any material from protected areas and/or designated natural areas, including tank beds, is strictly prohibited. • If the contractor uses non-commercial burrow/quarry sites, the sites should be remediated accordingly once material sourcing has been completed. • The contractor should submit in writing all the relevant numbers and relevant details of all pre-requisite licenses etc. and report their status accordingly.

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
4	Impact on habitats of fauna and flora	▪ Vehicle and machinery movements ▪ Site preparation including the tree removal (if any)	1. The contractor shall make every effort to avoid the removal and/or destruction of trees, including those of religious, cultural, and aesthetic significance. 2. If such action is unavoidable, the Engineer shall be informed in advance to verify and report on the technical justification for the trees that will be required to be removed. • The following steps are to be followed if trees are identified for removal during the renovation. • Identify and document the number of trees that will be affected with girth size and species type. • Trees shall be removed from the construction sites before the 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 about the felling of trees and the removal of vegetation. • Removed trees of economic value must be handed over to the State Timber Corporation.
5	Air Pollution including dust generation 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	• In the **construction method statement**, the contractor should designate areas for maintaining material stockpiles, waste stockpiles, 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. • Stockpiles should be suitably covered to minimize washing off. • The site should be wetted at least 2/3 times a day during dry weather to keep dust levels low. • 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. • 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, residents. • There should be no burning of wastes on-site.
6	Noise Pollution & vibration that can affect nearby structures	▪ Operation of construction equipment and machinery.	• 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

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
		▪ Material storage and transport.	(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. • 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 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.	• Speed limits and operating times for the construction vehicles should be imposed. • Travel routes for construction vehicles should be designed to avoid areas of congestion. • All roads and access sites must be restored to their original state as soon as possible • If project works occur after dark, a lighting system should be maintained such that vehicles and pedestrians can see the construction area. • Public should be informed properly on the inconvenience made during construction. • During construction, proper safety measures and barricade systems should be introduced for traffic management.
8	Blocking of surface drainage paths leading to localised flooding and ponding of water	▪ Site Preparation including the provision of access roads, material/waste piles	• 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 residents. The contractor shall identify areas for stockpiling material and waste. • The stockpiles should be suitably covered to minimize wash-offs to nearby waterways/ drains. • If impacts to surface drainage cannot be avoided leading to ponding of rainwater 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 ▪ Waste generated for labour camps ▪ Construction debris	• 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.

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

№	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			Emergency Procedures • An emergency aid service must be in place at the worksite. • 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** • Construction camps should have adequate sanitation facilities for construction workers to control the transmission of infectious diseases. • Avoid housing workers in camps and provide socio-economic benefits locally by employing local people. If there is no alternative to employing workers from elsewhere, locate accommodation camps away from communities on land acquired from willing sellers. Provide labor camps with adequate sanitation, waste disposal, and health facilities according to labor laws. Clear work campsites after use and reinstate vegetation. Conduct programs to raise worker awareness of HIV/AIDS. **Information management** • Develop and establish contractor's procedure for receiving, documenting, and addressing complaints from the affected public and nearby communities. • Provide advance notice to local communities by way of information boards or leaflets 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 ▪ Noise, vibration, dust, and waste piling	• Prior consultation and consent should be taken from relevant authorities and should conduct work with minimum disturbance to the public. • Provision of access during designated times of the day or where possible provide temporary access paths for users/ staff within the premises.
	Post-construction phase		
12	Clearing/Closure of Construction Site/Labour Camps		• Contractor to prepare site restoration plans for approval by the engineer. The plan is to be implemented by the contractor before demobilization. This includes burrowing sites and storage yards as well. • On completion of the works, all temporary structures will be cleared away, all rubbish cleared, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the contractor's expenses, to the entire satisfaction of the engineer.

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

Table 16: Environmental management plan for Construction of collection centre and Compost Yard

SN	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
1	Public complaints and lack of community support for the project implementation	• Information Disclosure among Stakeholders • Community Outreach activities including training	• Discussions should be conducted with the beneficiary farmers including women, and youth • The beneficiary farmers selection based on the criteria which were developed at stakeholders meeting and identifying of beneficiary farmers were undertaken transparently • Residents in the area will be briefed on the project, purpose and design, and outcomes with a comprehensive discussion • Communication and training activities focusing on women, youth, and farmers who are poor in communication • The contractor should take note of all impacts, especially temporary issues and safety hazards that will be of concern to the cropping pattern of the farmers. All possible impacts will be mitigated as stipulated in the EMP to mitigate them • The contractor will maintain a log of any grievances/complaints and actions taken to resolve them • A copy of the EMP should be available at all times at the project supervision office on site
2	Removal of trees	• Clearing of lands	3. The farmer shall make every effort to avoid removal and/or destruction of trees, including those of religious, cultural and aesthetic significance. 4. If such action is unavoidable, the Engineer shall be informed in advance to verify and report on the technical justification for the trees that will be required to be removed. • The following steps are to be followed if trees are identified for removal during the renovation

SN	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			• Identify and document the number of trees that will be affected with girth size & species type • Trees shall be removed from the construction sites before commencement of construction with prior permission from the concerned department (LA) • Compensatory plantation by way of Re-plantation of at least twice the number of trees cut should be carried out in the project area • The contractor shall adhere to the guidelines and recommendations made by the CEA, if any with regard to felling of trees and removal of vegetation • Removed trees of economic value must be handed over to the State Timber Corporation
3	Spreading COVID 19 virus	• All activities	• take all necessary precautions to maintain the health and safety of all Staffs including labourers • The contractor must ensure that all workers, including managers, are well trained on COVID 19 safety precautions published by the health ministry. • appoint a health and safety officer at site, who will have the authority to issue directives for the purpose of maintaining the health and safety of all personnel authorized to enter and or work on the site and to take protective measures to prevent accidents • ensure suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics • Follow all necessary guidance stipulated under Interim Guidance on COVID-19 Version 1-April 2020 (see Annex 6)
4	Water Quality	• Spill out of fuels and lubricants from machinery	• Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets • Prioritize re-use of excess spoils and materials in the construction works. • Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies; • Place storage areas for fuels and lubricants away from any drainage leading to water bodies; • Dispose of any wastes generated by construction activities in designated sites. • Irrigation works must be planned to be carried out during times of lowest flow

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	Spreading of Invasive Alien Species (P*arthenium hysterophorus*)	• 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
6	Noise Pollution & Vibration that can affect nearby structures	• Operation of equipment and machinery. • Material storage and transport • Use of hammer type pile driving will generate high noise and vibration.	• Working time for noise/vibration generation activities should be restricted and carried out only from 6.00 am to 6.00 pm. • All equipment and machinery should be operated of noise not to exceed 75 dB (during construction) as practical as possible. Regularly maintenance of all construction vehicles and machinery to meet noise control regulations stipulated by the CEA in 1996 (Gazette Extra Ordinary, No 924/12). If the construction activities happen during the night-time, it is necessary to maintain the noise level at below 50 db. • Use of mechanically driven saw blades for tree felling will make the noise levels restricted to only a short period of time. • Construction equipment and machinery should be maintained in good condition. The contractor shall submit the list of high noise/vibration generating machinery & equipment to the PE for approval
7	Air Pollution including dust generation that can affect nearby vegetation and households	• Site Preparation activities setting up of material storage yards, and removal of vegetation • Transport of construction material and storage on site	• In the construction method statement, the contractor should clearly designate areas for maintaining material stockpiles, waste stockpiles, labor camps, and vehicle maintenance yards. These dust-emitting sources should be located away from human activity and natural drainage paths as much as possible. • All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations. • Stockpiled soil and sand shall be slightly wetted before loading, particularly in windy conditions. • The site should be wetted at least 2/3 times a day during dry weather to keep dust levels low.

SN	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			• 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.
8	Solid Waste Disposal	• Site clearing • Construction waste • Waste from labour resting areas	• The contractor shall make a list of all types of waste resulting from the construction activity, and obtain direction from the LA on possible disposal sites for each waste type. • Any hazardous type of waste shall be dealt with special care and instructions from the LA. • The contractor shall document all types and quantities of waste generated and removed from the site and the disposal locations. • The contractor shall remove waste from the site each day and dispose of the waste in the LA-approved site/s.
9	Public/occupational safety hazard	• Site clearing, storage of equipment, material etc. • Increased traffic of heavy vehicles for material transportation • Noise and vibration of construction machinery	**Training** 1. The contractor must ensure that all workers, including managers, are trained on occupational health and public safety risks and mitigation measures for the site, prior to commencement of construction. **Personal Protective Equipment** 2. All workers will be provided with necessary PPEs (basic should include a safety helmet, protective footwear, and high visibility jackets). 3. In addition, the contractor shall maintain in stock at the site office, gloves, ear muffs, goggles, dust masks, safety harness, and any other equipment considered necessary. 4. A safety inspection checklist should be prepared to take into consideration what the workers are supposed to be wearing and monitoring. **Site Delineation and Warning Signs** 5. The entire construction site should be delineated using devices such as cones, lights, tubular markers, orange and white stripes, and barricades to inform oncoming vehicular traffic and pedestrians in the area about work zones.

SN	Potential Environmental Impacts and Risk Level	Key project activities causing the impact	Mitigation Measures proposed and action to be implemented by the Contractor
			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, locate accommodation camps away from communities on land acquired from willing sellers. Provide labour camps with adequate sanitation, waste disposal, and health

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

COST OF MITIGATION

Table 17: Environmental mitigation measures and estimated cost

No.	Environmental mitigation measure	Cost (LKR)	Remarks
1	Information boards, leaflets	100,000	Awareness leaflets for organic cultivation practices and IPM
2	On-site first aid facilities	50,000	
3	Safety equipment's including COVID-19	150,000	Personal protection equipment should be provided for road and canal renovation activities
4	Dust suppression	75,000	Need to be done during road and canal renovation activities
5	Waste removal from site	75,000	Waste from vegetation clearing, site preparation, labour camps
6	Training of farmers and village level stakeholders on IPM and new technological applications	200,000	Should be scheduled to a few sessions
	Total	**650,000**	

CONCLUSION AND SCREENING DECISION

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

Table 18: Summary of environmental effects

Key project activities	Potential environmental effects	Significance of environmental effect with mitigation in place
During Agricultural activities		
• Land preparation • Fencing (if applicable) • Micro levelling • Drainage Labour • Raised Beds • Planting	• Solid waste generation • Erosion due to rain	NS
• Introduction of basic flood prevention and drainage field techniques • Quick water evacuation ditches • Surface drainage techniques (removal of wet spots)	• Less water consumption, less soil erosion	SP
• Use of fertilisers and chemicals • Application of fertilisers • Application of weedicides • Application of pesticides • Other Spray	• Land, and water contamination	NS
• Manual weed control	• Solid waste generation	NS
• New and improved quality enhancing technologies • Introduction of water conserving and drip irrigation systems • Polythene mulch	• No such harm, less use of water and Less contamination of agro-chemicals on Land, air and water	SP
Infrastructure Activities (Improvements of Rural Roads and Construction of Collection Centre**)**		
• Vegetation clearing	• Clearing of vegetation will collect significant amount of waste which will lead to several environmental issues such as blockage of drainage, siltation of downstream, damage to habitats, spreading of invasive species etc	NS
• Material transportation and storage	• Emission of dust, generation of noise, disturbance to natural drainage, traffic congestion, public inconvenience	NS

Key project activities	Potential environmental effects	Significance of environmental effect with mitigation in place
• 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	• Wash away from cultivation lands may cause adjoining drains and lands get pollution including siltation	NS

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 ASMP 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.

SCREENING DECISION RECOMMENDATION

In general, the proposed initiatives will have a significant positive impact on rural agriculture communities by enhancing their economic conditions and prosperity while it has an influence on national economy at the national level.

Majority of the potential adverse effects can be classified as general agricultural activities and construction related impacts and which can be mitigated on site with proper engineering interventions as all activities proposed are minor scale of infrastructures limited to very small span of area. These potential constructional impacts are temporary in nature. Implementation of the EMPs proposed are sufficient to mitigate the identified impacts. These proposed EMPs for each distinctive activities should be accompanied with civil contracts which enforces contractors to adhere. In addition, following recommendations are proposed based on the activities:

Agriculture activities: Proper implementation of Integrated Pest Management practices proposed above should be highly encouraged and use of chemical fertilizers should be avoided. Water conservation practices such as proposed drip irrigation should be encouraged and farmers should be educated on the benefits of the same. Organic solid waste should be directed to the compost facility as much as possible. The majority of the potential adverse effects can be classified as general agricultural-related impacts and can be mitigated on-site with Good Agricultural Practices.

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 19: Screening Recommendations for each activity

Key recommendations	Actions / Approvals to be attended	Time period to attend each action	Responsibility / Remarks
Construction of Deep Wells	Obtain WRB Recommendations with yield test reports	Before mobilise contractors to construct wells	ISP PPMU Engineer-PMU
Removal of Trees	Consent should be obtained from the PMU and LA should be consulted	During land clearing	ISP PPMU Environmental and Social Safeguards Specialist-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

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

1) Provincial Agriculture Department, Northern Province
2) ESRI – Wageningen, Survey Department of Sri Lanka, 1989
3) Project Appraisal Document, Agriculture Sector Modernization Project
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8) Jaffna-Kilinochchi Water Supply and Sanitation Project, 2015
9) Check the Air Quality in Punnalaikadduvan, Sri Lanka - BreezoMeter
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ANNEXURE 2: BENEFICIARY LIST

No	Name of the Farmer	Gender	NIC	DSD	GN Division	Contact No	Land Extent (lach)	Land Extent (acre)	Type of water source	Land coordinates		Water coordinates	
										East	North	East	Nort
1	Valli Nagenthirarajah	M	702013070V	Valikamam East	Achchelu	779910559	16.00	1.00	Well	397602	1077627	397583	1077594
2	Sinnaththurai Uthayakumar	M	772193440V	Valikamam East	Achchelu	779720605	8.00	0.50	Well	398149	1077180	398171	1077194
3	Kunaraththinam Piratheepan	M	812711334V	Valikamam East	Achchelu	776630471	8.00	0.50	Well	397737	1076963	397711	1076969
4	Balasuntharam Sasitharan	M	852784091V	Valikamam East	Achchelu	778333184	32.00	2.00	Well	398380	1077057	398434	1077025
5	Sinnaththurai Uthayashankar	M	782934732V	Valikamam East	Achchelu	769650905	10.00	0.63	Well	398817	1077801	398344	1077784
6	Kanthaiya Vairavanathan	M	693591538V	Valikamam East	Achchelu	779392566	27.00	1.69	Well	397616	1077055	397621	1077030
7	Thurairasa Nimalan	M	843562337V	Valikamam East	Achchelu	772933958	20.00	1.25	Well	398572	1076995	398551	1076974
8	Manoharan Niroshan	M	893280782V	Valikamam East	Achchelu	771721514	12.00	0.75	Well	397635	1075964	397629	1075953
9	Sinnappodi Thevathasan	M	622253194V	Valikamam East	Achchelu		8.00	0.50	Tubewell	398629	1077361	398619	1077339
10	Sellakkili Sureshkumar	M	782103128V	Valikamam East	Achchelu	778131635	8.00	0.50	Well	397343	1076325	397376	1076322
11	Selathurai Sivarathan	M	642074150V	Valikamam East	Achchelu	769965501	8.00	0.50	Well	397625	1070874	397635	1076830
12	Thevathasan Jasikaran	M	862581636V	Valikamam East	Achchelu	761029637	24.00	1.50	Well	398968	1077972	398974	1078021
13	Sinnaththurai Rasenthiram	M	673063870V	Valikamam East	Achchelu	771740168	12.00	0.75	Well	398132	1077070	398116	1077074
14	Kanakasabai Amirthalingam	M	601780682V	Valikamam East	Achchelu	771982976	20.00	1.25	Well	397751	1076991	397711	1076970
15	Rasathurai Pushpakaran	M	823171250V	Valikamam East	Achchelu	775074772	15.00	0.94	Well	398281	1076374	398296	1076369
16	Murugan Theiventhiram	M	552603222V	Valikamam East	Achchelu	773565924	8.00	0.50	Tubewell	398676	1077582	398702	1077591
17	Peratharan Kirijanan	M	962132944V	Valikamam East	Achchelu	771936784	16.00	1.00	Tubewell	398126	1077262	398120	1077251
18	Ponnambalam Radha	M	602211363V	Valikamam East	Achchelu	775803721	8.00	0.50	Well	397807	1076578	397832	1076582
19	Nadarajah Karunakaran	M	840442470V	Valikamam East	Achchelu	770869670	12.00	0.75	Well	397836	1076751	397823	1076776

20	Ramanathan Nanthakumar	M	842931215V	Valikamam East	Achchelu	779282524	8.00	0.50	Well	398583	1077596	398613	1077588
21	Selvaraththinam Navaraj	M	850440417V	Valikamam East	Achchelu	776183242	32.00	2.00	Well	397691	1076997	397709	1076973
22	Sinnappa Thirunavukkarasu	M	570211011V	Valikamam East	Achchelu	771262207	20.00	1.25	Well	398585	1077275	398616	1077223
23	Balan Rasathurai	M	501420859V	Valikamam East	Achchelu	769992404	16.00	1.00	Well	398839	1077233	398825	1077194
24	Suntharam Vilvarajah	M	581062664V	Valikamam East	Achchelu	772153983	16.00	1.00	Well	397724	1076488	397706	1076531
25	Raththinasingam Sevaraththinam	M	660741640V	Valikamam East	Achchelu	768045971	12.00	0.75	Well	398497	1076963	398448	1076966
26	Ramu Thevarajah	M	632774117V	Valikamam East	Achchelu	773591459	20.00	1.25	Well	398084	1077001	398116	1077074
27	Vaiththilingam Sivanantharajah	M	852545810V	Valikamam East	Achchelu	771538394	20.00	1.25	Well	398769	1076493	398823	1076541
28	Rasaraththinam Eladsumanar	M	482362486V	Valikamam East	Achchelu	776565345	8.00	0.5	Well	397697	1076735	397695	1076764
29	Krishnapillai Srivijayasiththiraravi Jegatheeswary	F	671092058V	Valikamam East	Achchelu	776912307	8.00	0.5	Well	397600	1076366	397628	1076370
30	Poopalarajah Puvaneshvararajah	M	530664147V	Valikamam East	Achchelu	776162306	8.00	0.5	Well	398991	1077929	398861	1077905
31	Ponnuththurai Thavanesan	M	583164669V	Valikamam East	Achchelu	777047207	8.00	0.5	Well	398945	1076816	398957	1076790
32	Sabaratnam Achchuthan	M	800622409V	Valikamam East	Achchelu	777046170	8.00	0.5	Well	398956	1076679	398899	1076684
33	Maniokaran Nirojan	M	893280782V	Valikamam East	Achchelu	771721514	8.00	0.5	Well	397620	1075954	397615	1075952
34	Sathasivam Manokaran	M	562453962V	Valikamam East	Achchelu	776626254	8.00	0.5	Well	398935	1076858	398955	1076866
35	Vishwalingam Saththiyanathan(Phone no)	M	653381395V	Valikamam East	Achchelu	771627079	8.00	0.5	Well	398750	1077321	398712	1077284
36	Ramalingam Sowntharajan	M	551643670V	Valikamam East	Achchelu	776155988	8.00	0.5	Well	399067	1076569	399032	1076590
37	Ladsumanan Jedmaranjan	M	693495059V	Valikamam East	Achchelu	778704089	8.00	0.5	Well	398387	1077772	398384	1077813
38	Balan Rasarathinam	M	560900570V	Valikamam East	Achchelu	779205862	8.00	0.5	Well	399834	1076743	399800	1076731
39	Kunasingam Rani	F	19596350097	Valikamam East	Achchelu	770307254	8.00	0.5	Well	398874	1077566	398888	1077601

40	Visayarathinam Venukopan	M	833164821V	Valikamam East	Achelu	773031037	8.00	0.5	Well	398845	1077729	398882	1077744
41	Murugesu Vimalanathan	M	820752465V	Valikamam East	Sirupiddy west		8.00	0.5	Well	399437	1076874	399411	1076712
42	Pillaiyan Ruvendra	M	642001728V	Valikamam East	Sirupiddy west	776258785	8.00	0.5	Well	399588	1077189	399556	1077207
43	Sivalai Raththineswaran	M	682572671V	Valikamam East	Siruppiddy West	772813759	10.00	0.63	Tubewell	399460	1070841	399415	1070843
44	Kaththi Tharumarajah	M	563612347V	Valikamam East	Siruppiddy West	770322277	10.00	0.63	Well	400137	1076011	400116	1076076
45	Sellan Thevan	M	197004801948	Valikamam East	Siruppiddy West	770620115	20.00	1.25	Well	399739	1076853	399734	1076857
46	Markkandu Manorajah	M	682013826V	Valikamam East	Siruppiddy West	760364711	10.00	0.63	Well	399376	1076942	399407	1076915
47	Sinnaththambi Sellan	M	561700834V	Valikamam East	Siruppiddy West	770413484	10.00	0.63	Well	399583	1077134	399601	1077127
48	Ponnaiya Maheswaran	M	680460710V	Valikamam East	Siruppiddy West	771244748	15.00	0.94	Tubewell	399580	1076855	399555	1076874
49	Sinnaththambi Sribaskaran	M	632622260V	Valikamam East	Siruppiddy West	779049683	8.00	0.50	Well	400005	1076713	400020	1076738
50	Selvam Selvarajah	M	772644388V	Valikamam East	Siruppiddy West	775589135	9.00	0.56	Tubewell	399455	1076808	399415	1076843
51	Shanmuganathan Satheeswaran	M	810271876V	Valikamam East	Siruppiddy West	777211914	8.00	0.50	Tubewell	399899	1076615	399911	1076614
52	Selvarajah Selvaruban	M		Valikamam East	Siruppiddy West	777061305	8.00	0.50	Tubewell	399747	1075930	399759	1075925
53	Selvathisanayakam Thavanayakam	M	572691233	Valikamam East	Sirupiddy East	775436229	8.00	0.50	Well	400093	1076573	400062	1076575
54	Rasenthiran Pirasath	M	901013390	Valikamam East	Navakiri	770076223	8.00	0.50	Well	400280	1079097	400333	1079072
55	Suppar Kalananthan	M	622602431V	Valikamam East	Navakiri	766762907	16.00	1.00	Well	399882	1078394	399836	1078428
56	Sellappah Sivalingam	M	591532804V	Valikamam East	Navakiri	771094546	8.00	0.50	Well	400102	1079063	400102	1079063
57	Kanthasamy Rasakulasingam	M	491364521V	Valikamam East	Navakiri	778210199	15.00	0.94	Well	399760	1078306	399760	1078306
58	Velupillai Kugarasa	M	530034615V	Valikamam East	Navakiri	770728471	10.00	0.63	Well	401219	1079304	401018	1079266
59	Manikkan Tharmalingam	M	632832699V	Valikamam East	Navakiri	773954074	8.00	0.50	Well	400307	1079078	400333	1079072

60	Sellathurai Uthayasuriyan	M	813523353V	Valikamam East	Navakiri	776235404	15.00	0.94	Well	400281	1079097	400333	1079072
61	Sinnathurai Satheeshkanthan	M	812382888V	Valikamam East	Navakiri	771770707	20.00	1.25	Well	401810	1079305	401822	1079340
62	Shanmuganathan Mahenthiran	M	850664366V	Valikamam East	Navakiri	779411696	8.00	0.50	Tubewell	399756	1079033	399756	1079033
63	Jeyaparan Yashmina	F	876642204V	Valikamam East	Navakiri	740451518	20.00	1.25	Tubewell	400332			
64	Shanmuganathan Sabanathan	M	713054429V	Valikamam East	Navakiri	762161327	26.00	1.63	Well	399710	1079099	399686	1079107
65	Azhagarathinam Subramaniyam	M	531605012V	Valikamam East	Navakiri	764751346	10.00	0.63	Well	400230	1078489	400230	1078476
66	Vaithilingam Kanthasamy	M	194820910055	Valikamam East	Navakiri	760690702	12.00	0.75	Well	400412	1079064	400410	1079036
67	Kanapathipillai Sathiyanathan	M	197528904728	Valikamam East	Navakiri	775367774	20.00	1.25	Well	399703	1079013	399703	1079013
68	Aananthi Sounthararajan	F	738452615V	Valikamam East	Navakiri	779116049	10.00	0.63	Well	400106	1079408	400106	1079349
69	Sinnathamby Suntharalingam	M	482913121V	Valikamam East	Navakiri	773374563	8.00	0.50	Well	401414	1079051	401414	1079051
70	Sinnaiah Azhagarathinam	M	540993696V	Valikamam East	Navakiri	764822439	14.00	0.88	Well	401423	1079145	401448	1079186
71	Kumuthini Kopalathaas	F	198074701929	Valikamam East	Navakiri	773634360	15.00	0.94	Well	400325	1078473	400317	1078470
72	Ilayathamby Sulochanathevi	F	795505535V	Valikamam East	Navakiri	767104442	10.00	0.63	Tubewell	400618	1078993	400633	1078969
73	Thiruchelvam Vipulananthan	M	650772466V	Valikamam East	Navakiri	769081904	16.50	1.03	Well	399997	1078616	400007	1078624
74	Thiyagarasa Balakrishnan	M	732272550V	Valikamam East	Navakiri	773268132	32.00	2.00	Tubewell	400119	1079171	400119	1079171
75	Vinasithamby Thiruchenthuran	M	770323479V	Valikamam East	Navakiri	776313644	10.00	0.63	Well	401466	1079078	401451	1079086
76	Seevarathinam Vijayakumar	M	812643134V	Valikamam East	Navakiri	779293709	16.00	1.00	Well	398765	1078098	398743	1078076
77	Thiyagarasa Yogeswaran	M	196628802399	Valikamam East	Navakiri	767124235	20.00	1.25	Well	399581	1078973	399567	1078975
78	Kathiravelu Kuganesan	M	612380589V	Valikamam East	Navakiri		50.00	3.13	Well	399894	1079368	399931	1079420
79	Arumairasa Vaseegaran	M	781164682V	Valikamam East	Navakiri	760144935	8.00	0.50	Well	400467	1079849	400477	1079874
80	Velupillai Sriskantharasa	M	53326335V	Valikamam East	Navakiri	774357429	16.00	1.00	Well	401118	1079347	401080	1079323

81	Mahalingam Arushkumar	M	803544476V	Valikamam East	Navakiri	761486466	10.00	0.63	Well	401121	1079357	401080	1079323
82	Nadarasa Kirubakaran	M	781894419V	Valikamam East	Navakiri	776728443	30.00	1.88	Tubewell	399857	1078177	399857	1078177
83	Ponnambalam Jeganathan	M	630023114V	Valikamam East	Navakiri	766576362	12.00	0.75	Well	400407	1079311	400412	1079298
84	Ariyakutty Thadchanamoorthy	M	591263110V	Valikamam East	Navakiri	763673486	15.00	0.94	Well	400458	1079291	400425	1079311
85	Iyakutty Yogeswaran	M	691660257V	Valikamam East	Navakiri	774407107	8.00	0.50	Well	401685	1079270	401650	1079288
86	Sivalingam Azhageswaran	M	742064093V	Valikamam East	Navakiri	776510844	10.50	0.66	Well	400489	1079342	400496	1079333
87	Kunarathinam Gowshikan	M	930794376V	Valikamam East	Navakiri	768723514	30.00	1.88	Well	400709	1079192	400724	1079198
88	Jegatheeswaran Kokila	F	908274725V	Valikamam East	Navakiri	768786574	8.00	0.50	Well	400318	1079646	400354	1079635
89	Apputhurai Rakunathan	M	196529402466	Valikamam East	Navakiri	774933564	10.00	0.63	Well	401623	1079390	401631	1079392
90	Uthayanathan Yogeswary	F	676183850V	Valikamam East	Navakiri	767024598	7.00	0.44	Well	400515	1079103	400542	1079120
91	Rasathurai Shankar	M	197829903429	Valikamam East	Navakiri	776569570	8.00	0.50	Tubewell	399813	1079045	399825	1079047
92	Thavakumar Krishanthy	F	199252001057	Valikamam East	Navakiri	771042739	8.00	0.50	Well	401626	1079410	401618	1079392
93	Rasathurai Balasingam	M	542243015V	Valikamam East	Navakiri	773934518	12.00	0.75	Well	400404	1079279	400412	1079298
94	Thiyagarasa Gnaneswaran	M	196817403979	Valikamam East	Navakiri	764459746	20.00	1.25	Well	400085	1078979	400114	1079015
95	Apputhurai Arunthavarasa	M	710362882V	Valikamam East	Navakiri	774530790	22.00	1.38	Well	400047	1079137	400052	1079125
96	Sivabalasingam Rajeswary	F	738212240V	Valikamam East	Navakiri	762219015	24.00	1.50	Well	400186	1078799	400203	1078806
97	Jeyarathinam Kantharuban	M	822022936V	Valikamam East	Navakiri	776633937	8.00	0.50	Well	399953	1078589	399957	1078550
98	Moothambi Raththinasingam	M	51280467V	Valikamam East	Navakiri	773558631	10.00	0.63	Well	400617	1079339	400641	1079370
99	Vijayaraththinam Eswarythevi	F	596373020V	Valikamam East	Navakiri	776199897	7.00	0.44	Well	399523	1079125	399523	1079125
100	Tharmarasa Baleswary	F	568114191V	Valikamam East	Navakiri	762249260	10.00	0.63	Well	400807	1078406	400794	1078387
101	Kantharuban Nirosha	F	8476723802V	Valikamam East	Navakiri	776258093	10.00	0.63	Well	399884	1078525	399879	1078517

102	Selvarasa Thiruparasan	M	197513704305	Valikamam East	Navakiri	776197291	12.00	0.75	Well	399639	1078537	399631	1078490
103	Tharmarathinam Ramesh	M	801981720V	Valikamam East	Navakiri	771534814	10.00	0.63	Well	400660	1079875	400646	1079881
104	Sinnappu Thanabalasingam	M	551631303V	Valikamam East	Navakiri	741618137	12.00	0.75	Well	401462	1079114	401451	1079086
105	Sellathurai Tharmaraththinam	M	571123398V	Valikamam East	Navakiri	778760644	10.00	0.63	Well	401534	1079012	401451	1079086
106	Vallipuram Balasubramaniyam	M	600203714V	Valikamam East	Navakiri	772699155	14.00	0.88	Well	400643	1079844	400646	1079881
107	Sellappa Kiritharan	M	19771870348	Valikamam East	Navakiri	770260161	10.00	0.63	Well	401395	1078734	401361	1078729
108	Suppaiyah Vaikunthan	M	821883270V	Valikamam East	Navakiri	777741795	8.00	0.50	Well	401724	1078934	401687	1078975
109	Ranganathan Rakulan	M	821244153V	Valikamam East	Navakiri	776089784	10.00	0.63	Well	399981	1078782	399972	1078779
110	Sellathurai Sivachelvayoganathan	M	633501041V	Valikamam East	Navakiri	776002402	13.00	0.81	Tubewell	401407	1079201	401407	1079201
111	Rajenthira Rajeswaran	M	793571283V	Valikamam East	Navakiri	776313680	0.50	0.03	Well	400283	1079064	400333	1079072
112	Velupillai Tharmasri	M	611423535V	Valikamam East	Navakiri	777990009	30.00	1.88	Well	400228	1079373	400228	1079373
113	Paramalingam Mathiniyar	M	804353788V	Valikamam East	Navakiri	777155840	20.00	1.25	Well	399645	1078896	399635	1078913
114	Thiyagarasa Nadarasa	M	511700697V	Valikamam East	Navakiri	776184043	10.00	0.63	Well	400261	1079375	400253	1079352
115	Rasaratnam Kandeepan	M	783535220V	Valikamam East	Navakiri	773472644	20.00	1.25	Well	400252	1078776	400252	1078776
116	Thambirasa Uthayanan	M	730152000V	Valikamam East	Navakiri	779615705	20.00	1.25	Well	400847	1078817	400851	1078815
117	Moothambi Raththinasingam	M	51280467V	Valikamam East	Navakiri	773558631	10.00	0.63	Well	400422	1079180	400425	1079192
118	Thambaiya Nirmalanantham	M	561303959V	Valikamam East	Navakiri	771631294	0.50	0.03	Well	401087	1079806	401095	1079787
119	Thillainadarasa Thurairathnam	M	452562431V	Valikamam East	Navakiri	777498307	30.00	1.88	Well	400692	1078898	400677	1078866
120	Annamalai Logeswaran	M	762575027V	Valikamam East	Navakiri	775264674	28.00	1.75	Well	399802	1078763	399801	1078771
121	Nadarasa Viththiya	F	905913166V	Valikamam East	Navakiri	760599150	18.00	1.13	Well	400261	1079375	400283	1079352
122	Uthayakumar Karththika	F	858333644V	Valikamam East	Navakiri	774680532	12.00	0.75	Well	399710	1078703	399700	1078989
123	Thiyagarasa Mahenthiranathan	M	197711903919	Valikamam East	Navakiri	767024598	6.00	0.38	Well	400568	1079094	400546	1079125

124	Azhagarathinam Sivakumar	M	620233650V	Valikamam East	Navakiri	770551806	40.00	2.50	Well	399991	1078201	399984	1078205
125	Murugesu Kamalathevi	F	527082897V	Valikamam East	Navakiri	776059864	16.00	1.00	Well	400864	1078827	400864	1078827
126	Kanagasabapathy Sayanthan	M	733253215V	Valikamam East	Navakiri	770774250	9.00	0.56	Well	401423	1079057	401449	1079090
127	Poothan Markandan	M	582451966V	Valikamam East	Navakiri	776459187	10.00	0.63	Well	401013	1079692	401022	1079683
128	Sivaneswaran Mahaludchumy	F	716271978V	Valikamam East	Navakiri	764482305	16.00	1.00	Well	400270	1079076	400333	1079072
129	Thavarasa Saseelathevy	F	697203516V	Valikamam East	Navakiri	778268543	10.00	0.63	Well	400054	1079394	400094	1079394
130	Kanapathy Selvarasan	M	194815310051	Valikamam East	Navakiri	776385358	8.00	0.50	Well	401362	1078983	401377	1078989
131	Kanthan Thevarasa	M	732000496V	Valikamam East	Navakiri	775809076	12.00	0.75	Well	400692	1079628	400699	1079638
132	Kidinan Vanarasa	M	643082047V	Valikamam East	Navakiri	772195381	10.00	0.63	Well	401612	1079933	401652	1079942
133	Sinnappu Thuraisingam	M	473455218V	Valikamam East	Navakiri	779266162	10.00	0.63	Well	401445	1079088	401449	1079090
134	Rasasamy Kalyanasuntharam	M	195513902562	Valikamam East	Navakiri	772195261	7.50	0.47	Well	400564	1079027	400528	1079016
135	Tharmarathinam Rajkumar	M	850763127V	Valikamam East	Navakiri	779769246	10.00	0.63	Well	400691	1079796	400691	1079796
136	Seevarathinam Parameshwary	F	-	Valikamam East	Navakiri	778448338	16.00	1.00	Well	400430	1079086	400546	1079125
137	Velupillai Sivasubramaniyam	M	481384060V	Valikamam East	Navakiri	776059864	24.00	1.50	Well	400439	1079179	400425	1079192
138	Puvanenthiranathan Maheswary	F	467322575V	Valikamam East	Navakiri	776569711	14.00	0.88	Well	400876	1078903	400895	1078911
139	Selvarasa Thiruparanjan	M	840804771V	Valikamam East	Navakiri	772332555	12.00	0.75	Well	399701	1078722	399700	1078705
140	Thambu Senthilnathan	M	722944437V	Valikamam East	Navakiri	779228821	8.00	0.5	Well	399722	1078854	399707	1078857
141	Sellathurai Sivaselvayoganathan	M	633501041V	Valikamam East	Navakiri	776002402	8.00	0.5	Well	401394	1079179	401401	1079199
142	Tharmasri Sajen	M	890640052V	Valikamam East	Navakiri	774222101	8.00	0.5	Well	399192	1077739	399224	1077772
143	Rasaiyah Sivakumar	M	197820403714	Valikamam East	Navakiri	779116049	8.00	0.5	Well	399951	1078763	399974	1078769
144	Vellaiyan Amirthalingam	M	550871840V	Valikamam East	Avarangal West	776716474	8.00	0.5	Well	401596	1080196	401571	1080191

145	Ramanathan Satheeskumar	M	830264310V	Valikamam East	Avarangal West		8.00	0.5	Well	401837	1079105	401839	1079086
146	Rsaiyah Amirthalingam	M	563513020V	Valikamam East	Avarangal West	771274730	8.00	0.5	Well	400209	1079538	400252	1079537
147	Thangavelu Ajandan	M	820095081 V	Valikamam East	Avarangal West	776176915	8.00	0.5	Well	401812	1079606	401830	1079626
148	Arumugam Annathurai	M	791675162V	Valikamam East	Avarangal West	764206826	8.00	0.5	Well	400580	1080783	400539	1080722
149	Rayappu Anton Mariyathas	M	530080030V	Valikamam East	Avarangal West	778072006	8.00	0.5	Well	400490	1080725	400509	1080713
150	Krishnapillai Uthayakumar	M	682881879V	Valikamam East	Achchuvely west	760362767	8.00	0.5	Well	400584	1080736	400539	1080722
151	Kamaladevi Ganalingam	M	195377502874	Valikamam East	Achchuvely West	763967675	8.00	0.5	Well	401350	1078982	401350	1078982
152	Sivalingam Uthayakumar	M	197820503540	Valikamam East	Achchuvely West	771548270	8.00	0.5	Well	400834	1081514	400834	1081514
153	Arasarthnam Emil Dayas	M	753504508 V	Valikamam East	Achchuvely West	773624650	8.00	0.5	Well	401132	1081219	401132	1081219
154	Ganapiragasham Diluxshan Nevilkumar	M	780760389 V	Valikamam East	Achchuvely West	766785513	8.00	0.5	Well	400894	1081475	400894	1081475
155	Kanapathipillie Selvarasa	M	196830710060	Valikamam East	Achchuvely West	774040740	8.00	0.5	Well	401246	1081036	401225	1081047
156	Kanapathi Selvarathnam	M	195024003044	Valikamam East	Achchuvely West	776154485	8.00	0.5	Well	401570	1081485	401562	1081492
157	Kanapathi Sinnarasha	M	532194261 V	Valikamam East	Achchuvely West	773115083	8.00	0.5	Well	401403	1080744	401403	1080744
158	Veluppillie Perinpadevan	M	530203662 V	Valikamam East	Achchuvely West	760021629	8.00	0.5	Well	402282	1080283	402304	1080336
159	Palan Sinnathampi	M	550411814 V	Valikamam East	Achchuvely West	774698911	8.00	0.5	Well	401820	1080074	401797	1080094
160	Kunalan Piratheepan	M	826971550 V	Valikamam East	Achchuvely West	764803245	8.00	0.5	Well	402172	1080270	402172	1080270
161	Nagamuththu Vimalrajh	M	840611302 V	Valikamam East	Achchuvely West	779892510	8.00	0.5	Well	401439	1080649	401439	1080649
162	Innasimuththu Killienroj	M	702922488 V	Valikamam East	Achchuvely West	774799415	8.00	0.5	Tubewell	401570	1080935	401559	1080944

163	Thurirasa Anantharasa	M	701442334 V	Valikamam East	Achchuvely West	776454483	8.00	0.5	Tubewell	402146	1080453	402146	1080461
164	Thanieya Puvaneswaran	F	683223271 V	Valikamam East	Achchuvely West	771182582	8.00	0.5	Well	400527	1079323	400491	1079331
165	Sellan Thurisingam	M	532903106 V	Valikamam East	Achchuvely West	776918950	8.00	0.5	Tubewell	401751	1080321	401751	1080321
166	Sepasthithasan Anton Feransis	M	753053662 V	Valikamam East	Achchuvely West	776012995	8.00	0.5	Well	400678	1081278	400678	1081278
167	Rajeswaran Immanuvel Vethanajagam	M	753333878 V	Valikamam East	Achchuvely West	778001283	8.00	0.5	Well	401381	1081163	401384	1081162
168	Antony Mariyathas Danicies Jenarthan	M	831891009 V	Valikamam East	Achchuvely West	776057177	8.00	0.5	Well	400393	1080998	400393	1080998
169	Rathnam Vignesvararasa	M	433270099 V	Valikamam East	Achchuvely West	771641535	8.00	0.5	Well	401689	1080145	401689	1080145
170	Amrthanathan Edvin Joch	M	561723346 V	Valikamam East	Achchuvely West	771374995	8.00	0.5	Well	401694	1081321	401673	1081332
171	Kanapathi Tampirasa	M	195802203397	Valikamam East	Achchuvely West	771857982	30.00	1.88	Well	401580	1078958	401570	1078923
172	Sarvanatham sriteepan	M	791733715 V	Valikamam East	Achchuvely West	772830998	25.00	1.56	Well	401726	1078731	401768	1078721
173	Kanthiya Satheskumar	M	771640974 V	Valikamam East	Achchuvely West	777419560	40.00	2.50	Well	402177	1078623	402130	1078562
174	Manigam Thiruselvan	M	640973854V	Valikamam East	Achchuvely West	769812772	12.00	0.75	Well	401320	1078757	402270	1078779
175	Karuthar Ponniya	M	410451824 V	Valikamam East	Achchuvely West	773824971	8.00	0.50	Well	402346	1079162	402372	1079133
176	Sevarathinam Sathiyathasn	M	721940543 V	Valikamam East	Achchuvely West	771641850	32.00	2.00	Tubewell	401743	1079531	401749	1079531
177	Manigan Rasu	M	611773935V	Valikamam East	Achchuvely West	775825262	15.00	0.94	Well	402069	1079047	402102	1079051
178	Ielayavan Sathasivam	M	523007216 V	Valikamam East	Achchuvely West	763113317	15.00	0.94	Well	402101	1079150	402077	1079138
179	Kanthan Sellakandu	M	502593196V	Valikamam East	Achchuvely West	775300283	10.00	0.63	Well	401489	1078912	401481	1078912
180	Nielan Markandu	M	195232310061	Valikamam East	Achchuvely West	779065659	20.00	1.25	Well	401349	1078760	401346	1078735

181	Thuraiyan Thavamugunthan	M	792714595 V	Valikamam East	Achchuvely West	778429554	10.00	0.63	Well	401641	1078797	401651	1078803
182	Thampiya Subramaniyam	M	194808703297	Valikamam East	Achchuvely West	767673187	10.00	0.63	Well	402307	1079017	402329	1079027
183	Visvalingam Sivanantham	M	550962098 X	Valikamam East	Achchuvely West	767260556	10.00	0.63	Well	402172	1078597	402190	1078562
184	Majurugan Paramasingaram	M	443022732 V	Valikamam East	Achchuvely West	212058110	14.00	0.88	Well	402210	1078944	402201	1078994
185	Sayanthan Tarsana	M	916540850 V	Valikamam East	Achchuvely West	770601101	15.00	0.94	Well	401929	1079370	401931	1078288
186	Selliya Ramasanthiran	M	513204396 V	Valikamam East	Achchuvely West	778488391	12.00	0.75	Well	401732	1079473	401826	1079499
187	Nagamuthu nallanathan	M	551542203 V	Valikamam East	Achchuvely West	774799415	8.00	0.50	Well	400407	1079425	400354	1079454
188	Jeyapalan Kowsala	M	776700754 V	Valikamam East	Achchuvely West	772444417	11.00	0.69	Well	402276	1078600	402286	1078619
189	Thgavelu Kiritharan	M	800702062 V	Valikamam East	Achchuvely West	778543710	15.00	0.94	Well	401568	1078910	401570	1078923
190	Kalingarasa Balaventhan	M	761391950 V	Valikamam East	Achchuvely West	776169902	15.00	0.94	Well	402034	1078897	402036	1078916
191	Muthulingam Vignesvaralingam	M	782043099 V	Valikamam East	Achchuvely West	770174204	15.00	0.94	Well	402023	1078894	402045	1078923
192	Poologarasa Kajan	M	833664883 V	Valikamam East	Achchuvely West	772224376	8.00	0.50	Well	401674	1079263	401659	1079284
193	Kanagasabi Mohanathas	M	781372404 V	Valikamam East	Achchuvely West	779309707	20.00	1.25	Well	402224	1078369	402228	1078374
194	Sinnathurai Balanathan	M	690443376 V	Valikamam East	Achchuvely West	773717208	20.00	1.25	Well	401959	1048847	401909	1078798
195	Sivarajathuri Vignesvaran	M	563280794 V	Valikamam East	Achchuvely West	777164823	16.00	1.00	Well	401842	1078929	401797	1078916
196	Amirthalingam Mathuranthagan	M	841862058 V	Valikamam East	Achchuvely West	776505129	20.00	1.25	Well	402070	1079274	401999	1079292
197	Kiddinan Rasarathinum	M	491822155 V	Valikamam East	Achchuvely West		17.00	1.06	Well	401792	1080040	401777	10800041
198	Sivasothi Sivatharsan	M	841862058 V	Valikamam East	Achchuvely West	773604206	10.00	0.63	Tubewell	401778	1079004	401778	1079012

199	Manikan Rasanayagam	M	661012994 V	Valikamam East	Achchuvely West	772083756	20.00	1.25	Well	399958	1079140	399992	1079160
200	Kathiresu Pologarasa	M	642973738 V	Valikamam East	Achchuvely West	772224376	8.00	0.50	Well	401634	1079180	401608	1079194
201	Kanthasami Vasikaran	M	851694919 V	Valikamam East	Achchuvely West	778037565	12.00	0.75	Well	402205	1078440	402220	1078470
202	Ganam Uma	M	715084554 V	Valikamam East	Achchuvely West	773557105	16.00	1.00	Well	401951	1079173	401951	1079173
203	Taventhirum Santhiravathana	M	757584093 V	Valikamam East	Achchuvely West	770713048	12.00	0.75	Well	401919	1079898	401914	1079876
204	Kanapathi Katkandu	M	194503910057	Valikamam East	Achchuvely West	770713048	15.00	0.94	Well	401924	1079846	401914	1079876
205	Sellan Nadarasa	M	532454735 V	Valikamam East	Achchuvely West	766989361	20.00	1.25	Tubewell	401592	1079107	401545	1079096
206	Kathiravelu Ketheswaran	M	693441064 V	Valikamam East	Achchuvely West	763619148	20.00	1.25	Well	402275	1078566	402275	1078566
207	Murugan Tangavelu	M	441342292V	Valikamam East	Achchuvely West	778124259	10.00	0.63	Well	402142	1078608	402132	1078558
208	Palan Magilvaganam	M	463062692 V	Valikamam East	Achchuvely West	777210674	35.00	2.19	Well	401564	1078907	401570	1078231
209	Kanapathipillie Sellathurai	M	551111270 V	Valikamam East	Achchuvely West	761420042	12.00	0.75	Well	402124	1078581	402132	1078558
210	Kanapathipillai Srikantharasa	M	503321610V	Valikamam East	Idaikadu	779116111	18.00	1.13					
211	Vellupillai Murukupillai	M	452041901V	Valikamam East	Idaikaadu	776872589	8.00	0.5	Well	401633	1082319	401655	1082336
212	Veerieasvaran Thanuseegan	M	953191059V	Valikamam East	Valalai	774515851	8.00	0.5	Well	401763	1083058	401775	1083049
213	S.Rajanikanth	M	832254452V	Valikamam East	Achchuvely North	771905776	8.00	0.5					
214	Kunasingam Ragikaran	M	730624573V	Valikamam East	Achchuvely North	777283967	8.00	0.5	Well	401292	1080575	401286	1080557
215	Subramaniyam Piratheepan	M	7606603716V	Valikamam East	Achchuvely North	779910154	8.00	0.5	Well	401050	1080253	401020	1080222
216	Imayakanth Sukanya	F	1.97765E+11	Valikamam East	Achchuvely North	766899438	8.00	0.5	Well	402063	1080690	402082	1080676
217	Selvanayagam Vijayakumar	M	793521847V	Valikamam East	Paththameni	774380787	8.00	0.5	Well	401946	1082368	401967	1082388

218	Erampu Atputham	M	671730984V	Valikamam East	Paththameni	774841538	8.00	0.5	Well	401968	1082049	401931	1082068
219	Ladsukanthan Vasantharaj	M	821143390V	Valikamam East	Paththameni	779116010	8.00	0.5	Well	401853	1081626	401882	1081615
220	Rajamoorthy Paramaanatham	M	781474134V	Valikamam East	Paththameni	769701673	8.00	0.5	Well	401572	1081533	401561	1081489
221	Parameswaren Thananjeyan	M	932694620V	Valikamam East	Paththameni	779137505	8.00	0.5	Well	401776	1081850	401774	1081872
222	Sivaganam Sivapalan	M	792353150V	Valikamam East	Paththameni	779048945	8.00	0.5	Well	402390	1082152	402428	1082153
223	Paalkandu Indiralingam	M	6912706100V	Valikamam East	Pathameni	768095103	28.00	1.75					
224	Kanthasamy Jegatheesan	M	198115303050	Valikamam East	Pathameni	778234515	21.00	1.31	Tubewell	402374	1082395	402371	1082395
225	Kanakalingam Imayanathan	M	800065046V	Valikamam East	Pathameni	770280593	8.00	0.50	Tubewell	402427	1082291	402369	1082239
226	Sinnathurai Srisurenthiran	M	641012238V	Valikamam East	Pathameni	212058358	10.00	0.63	Well	402921	1082072	402915	1082120
227	Sachithanantham Sajeepan	M	872051651V	Valikamam East	Pathameni	775013124	35.00	2.19	Tubewell	401050	1082584	401036	1082577
228	Velupillai Navarathinam	M	551020878V	Valikamam East	Pathameni	774574057	18.00	1.13	Well	401818	1082330	401818	1082330
229	Vickneshvaran Aananthakumary	F	685770806V	Valikamam East	Pathameni	771236044	28.00	1.75	Well	401726	1082121	401734	1082144
230	Yoganathan Sakunthalathevi	F	195454110012	Valikamam East	Pathameni	774322333	20.00	1.25	Well	401785	1081573	401771	1081602
231	Balan Varatharasa	M	521063629V	Valikamam East	Pathameni	777408896	8.00	0.50	Well	402919	1082135	402915	1082120
232	Masilamani Sritharan	M	197129704648	Valikamam East	Pathameni	764656093	9.00	0.56	Well	402578	1082244	402591	1082178
233	Sellapu Murukaiya	M	571742402V	Valikamam East	Pathameni	771754440	18.00	1.13	Tubewell	402273	1082394	402273	1082394
234	Karunakaran Selvamathivathany	F	867272321V	Valikamam East	Pathameni	777872064	8.50	0.53	Well	402393	1082211	402393	1082211
235	Sivapatham Nanthakumar	M	31046836	Valikamam East	Pathameni	777740691	13.00	0.81	Well	402543	1082268	402525	1082286
236	Kaaralasingam Kugeshwaran	M	196414603957	Valikamam East	Pathameni	771758855	16.00	1.00	Well	402236	1082136	402236	1082136
237	Kaneshamoorthy Kirubakaran	M	750461190V	Valikamam East	Pathameni	778750394	10.00	0.63	Well	401843	1082273	401843	1082273

238	Murukupillai Sivarasan	M	651152313V	Valikamam East	Pathameni	779336332	8.00	0.50	Well	401854	1081472	401845	1081471
239	Gnanasekaram Kunaseelan	M	670722066V	Valikamam East	Pathameni	766730820	10.00	0.63	Well	402285	1081396	402319	1081622
240	Kanthasamy Thavamoorthy	M	601313448V	Valikamam East	Pathameni	774147699	20.00	1.25	Tubewell	401904	1081551	401904	1081551
241	Kamalathevi Seevaraththinam	F	597233442V	Valikamam East	Pathameni	768869368	20.00	1.25	Tubewell	401867	1081509	401867	1081509
242	Sivakumaran Tharshika	F	866252190V	Valikamam East	Pathameni	779773086	10.00	0.63	Well	401653	108162	401653	108642
243	Muthukumar Parameshwaran	M	611873190V	Valikamam East	Pathameni	764645529	20.00	1.25	Well	401792	1081857	401780	1081873
244	Raththinam Tharsan	M	922302910V	Valikamam East	Pathameni	774164793	10.00	0.63	Well	401641	1081989	401641	1081981
245	Thampipillai Chanthirakumar	M	562673563V	Valikamam East	Pathameni	774443217	10.00	0.63	Well	401984	1081630	401984	1081630
246	P Harikaran	M	198932303360	Valikamam East	Pathameni	773650158	18.00	1.13	Well	401668	1081580	401668	1081569
247	Navarathinam Thanushan	M	932053004V	Valikamam East	Pathameni	774574057	18.00	1.13	Well	401920	1081683	401920	1081683
248	Rasappu Selvarathinam	M	472994670V	Valikamam East	Pathameni	774542605	8.00	0.50	Well	400949	1081253	400949	1081253
249	Rasathurai Kunasothinayagam	M	194933310015	Valikamam East	Pathameni	757400578	20.00	1.25	Well	403315	1081434	403315	1081434
250	Kanakarathinam Thevarasa	M	581003552V	Valikamam East	Pathameni	769657286	8.00	0.50	Tubewell	401812	1082328	401812	1082328
251	Sinnathurai Thiruchelvam	M	682973838V	Valikamam East	Pathameni	771592098	8.00	0.50	Well	401612	1082192	401613	1082213
252	Kumaranantham Kirubananthan	M	771251528V	Valikamam East	Pathameni	774684027	8.00	0.50	Tubewell	402036	1082178	402036	1082178
253	Nanthakumar Vinushan	M	200313600019	Valikamam East	Pathameni	779121491	8.00	0.50	Well	402080	1081905	402027	1081881
254	Kathirkamanathan Nitharshan	M	952453351V	Valikamam East	Pathameni	769062474	10.00	0.63	Well	401835	1081983	401793	1082003
255	Ponnaiyah Jaseenthiran	M	802341180V	Valikamam East	Pathameni	777906268	8.00	0.50	Well	401779	1081986	401793	1082003
256	Rasanayagam Thanushiyan	M	980892638V	Valikamam East	Pathameni	774738541	20.00	1.25	Well	401939	1081957	401906	1081956
257	Sivagnanam Prabakaran	M	761091611V	Valikamam East	Pathameni	775237129	8.00	0.50	Tubewell	402144	1081954	402144	1081954
258	S Rasanayagam	M	561772010V	Valikamam East	Pathameni	774738541	7.00	0.44	Well	401952	1081900	401952	1081900

259	Rasaiya Rajamohan	M	197833504160	Valikamam East	Pathameni	772865601	16.00	1.00	Well	402911	1082140	402923	1082125
260	Sivagnanam Kajakaran	M	901480729V	Valikamam East	Kaliyanai	777549617	8.00	0.50	Well	402030	1081891	402028	1081886
261	Sivarasa Sivakumar	M	761644181V	Valikamam East	Achchuvely	779593397	9.00	0.56	Tubewell	401270	1082947	401214	1082947
262	Sivakumar Thanurash	M	200012100390	Valikamam East	Achchuvely	773530263	10.00	0.63	Tubewell	401208	1082975	401214	1082947
263	Veerakathipillai Sivasubramaiyam	M	572594491V	Valikamam East	Achchuvely	772782812	10.00	0.63	Well	401167	1082623	401125	1082596
264	Ponnampalan Thanapalasingam	M	521335106V	Valikamam East	Achchuvely	776034513	10.00	0.63	well	401934	1083778	401949	1083787
265	Pathmanathan Arunanthi	M	810281669V	Valikamam East	Achchuvely	773426040	10.00	0.63	Tubewell	401353	1082912	401381	1082935
266	Kumarasamy Prabakaran	M	198034503420	Valikamam East	Achchuvely	773111478	10.00	0.63	Tubewell	401698	1083205	401711	1083213
267	Thambirasa Kaneshamoorthy	M	4511922817V	Valikamam East	Neervely South	774146213	8.00	0.50	Well	397208	1075256	397163	1075274
268	Raveenthiran Vaakeesan	M	198530504305	Valikamam East	Neervely South	777448617	20.00	1.00	Well	398083	1074336	398123	1074301
269	Balasubramaniyam Shanthiramohan	M	773510768V	Valikamam East	Neervely South	774550773	70.00	0.50	Well	397977	1075600	397961	1075660
270	Manikavashakar Tharmarasha	M	582760462V	Valikamam East	Neervely South	773341004	0.00	0.00	Well	399190	1076847	399170	1076854
271	Shenathirasha Pulenthiran	M	652461026V	Valikamam East	Neervely South	779234535	20.00	1.25	Well	397682	1075842	397932	1075839
272	Pulenthiran Parankunran	M	922421366V	Valikamam East	Neervely South	779597233	25.00	1.56	Well	398329	1074389	398321	1074395
273	Muththaiyah Pathmanathan	M	542514060V	Valikamam East	Neervely South	779986410	20.00	1.25	Well	397315	1076712	397343	1076670
274	Vijayashankar Thanabalasingam	M	199313503098	Valikamam East	Neervely South	765651951	42.00	2.63	Well	397254	1074873	397247	1074876
275	Rsasenthiram Vaitheeswaren	M	572323005V	Valikamam East	Neervely South	773664365	8.00	0.5	Well	397135	1075090	397115	1075093
276	Paramanathan Sujakan	M	942120281V	Valikamam East	Neervely North		8.00	0.5	Well	398967	1075771	398972	1075767
277	Suntharalingam Kabilan	M	933260488V	Valikamam East	Neervely West	777965565	8.00	0.5	Well	397054	1075110	397029	1075102

278	Rathinam Suthakaran	M	810141840V	Valikamam East	Neervely West	771630988	8.00	0.5	Well	397227	1075497	397226	1075529
279	Sinnaiyah Manokaran	M	791771510V	Valikamam East	Neervely West	774186860	8.00	0.5	Well	397274	1075439	397230	1075455
280	Shankarapillai Shanthirasoodi	M	670271523V	Valikamam East	Neervely West	772562813	25.00	1.56	Well	398228	1075634	398224	1075625
281	Kirusha Thayaseelan	F	875634453V	Valikamam East	Neervely West	775961049	22.00	1.38	Well	397244	1075374	397242	1075367
282	Kanakarathnam Kamalenthira	M	751910584V	Valikamam East	Neervely West	775851437	20.00	1.25	Well	397015	1075364	397006	1075301
283	Subramaniyam Rashaiyah	M	501561009V	Valikamam East	Neervely West	773835420	30.00	1.88	Well	398059	1075586	398042	1075587
284	Vijayakumaran Kavithas	M	942342390V	Valikamam East	Neervely West	778133039	11.00	0.69	Well	397284	1075622	397272	1075641
285	Kathirkamanathan Thamiliny	F	855193060V	Valikamam East	Urumpirai North	775388469	20.00	1.25	Well	394726	1074971	394741	1075008
286	Thampu Appuththurai	M	562610317V	Valikamam East	Urumpirai North	770183869	25.00	1.56	Well	394250	1075342	394296	1075342
287	Arumugam Vaseekaran	M	641412120V	Valikamam East	Urelu	771632561	16.00	1.00	Well	395347	1077114	395364	1077125
288	Kirishnan Selvarooban	M	812632450V	Valikamam East	Urelu	774013959	8.00	0.50	Well	395053	1077108	394975	1077100
289	Guganeshwaran Karunakaran	M	861533220V	Valikamam East	Urelu	777577262	10.00	0.63	Well	396631	1076020	396611	1076010
290	Amirthalingam Kannathasan	M	653011512V	Valikamam East	Urelu	770856536	16.00	1.00	Well	396702	1076117	396683	1076154
291	Vigneshwaran Gowsikan	M	870200404V	Valikamam East	Urelu	772203110	16.00	1.00	Well	396702	1076587	396735	1076578
292	Nagamuththu Rashaiya	M	462223099V	Valikamam East	Urelu	775827701	8.00	0.50	Well	396462	1077202	396459	1077175
293	Pasupathi Rashenthiram	M	520023428V	Valikamam East	Urelu	776735994	8.00	0.50	Well	396886	1076615	396863	1076634
294	Sinnaththmphy Santhirakumar	M	582521352V	Valikamam East	Urelu	776735994	8.00	0.50	Well	396656	1076764	396641	1076748
295	Ponnaiyan Tharmarasa	M	490820248V	Valikamam East	Urelu	770569974	8.00	0.50					
296	Sivasubramaniyam Suthakaran	M	732250328V	Valikamam East	Urelu	770050890	8.00	0.50	Well	395148	1076527	395138	1076529
297	Santheeswaran Thanushan	M	862213154V	Valikamam East	Urelu		8.00	0.50	Well	396660	1076621	396664	1076629

298	Sivasubramaniyam Satheeskumar	M	780233958V	Valikamam East	Urelu	776172430	8.00	0.50	Well	395874	1075765	395901	1075711
299	Amirthalingam Arunraj	M	880403222V	Valikamam East	Urelu		8.00	0.50	Well	396564	1076159	396549	1076175
300	Sownthirathevan Piratheepan	M	833612905V	Valikamam East	Urelu		8.00	0.50	Well	394327	1076645	394360	1076649
301	Tharmalingam Pirasanna	M	832692298V	Valikamam East	Urelu	771230099	8.00	0.50	Well	396555	1076604	396533	1076600
302	Sivalingam Nimal	M	812394789V	Valikamam East	Urelu	776172892	8.00	0.50	Well	395402	1076006	395416	1076002
303	Selvanayagam Suthaharan	M	853214698V	Valikamam East	Urelu	777421397	8.00	0.50	Well	396346	1076363	396291	1076293
304	Thurairasha Vigneshwaran	M	543243507V	Valikamam East	Urelu	778435154	8.00	0.50	Well	396507	1076507	396504	1076524
305	Puvaneshwaran Gowsalyan	M	873604557V	Valikamam East	Urelu	770257893	8.00	0.50	Well	396623	1076073	396639	1076061
306	Kannathasan Renugan	M	943631727V	Valikamam East	Urelu	770856536	8.00	0.50	Well	396680	1076137	396683	1076157
307	Malini Amirthayogan	F	656950552V	Valikamam East	Urelu	769269207	8.00	0.50	Well	396285	1076342	396291	1076293
308	Arasalingam Arunthavatheesan	M	602795179V	Valikamam East	Urelu		8.00	0.50	Well	396578	1076275	396577	1076289
309	Sinnaththurai Srikantharasha	M	197519100606	Valikamam East	Urelu		8.00	0.50	Well	395919	1076305	395915	1076310
310	Illayathamby Jatheeswaran	M	652602142V	Valikamam East	Urelu	764481896	8.00	0.50	Well	396601	1077286	396617	1077276
311	Eithayakumar Premini	F	838073409V	Valikamam East	Urelu	779239488	8.00	0.50	Well	396397	1076579	396411	1076569
312	Subramaniyam Muhunthan	M	740871099V	Valikamam East	Kopay North	776204719	30.00	1.88	Well	399612	1076100	399596	1076068
313	Selvarasa Thayalan	M	198202800717	Valikamam East	Kopay North	775407770	24.00	1.50	Well	396819	1074405	396831	1074437
314	Thirunavukkarasu Perinpanathan	M	603221443V	Valikamam East	Kopay North	776653089	12.00	0.75	Well	397627	1074152	397637	1074145
315	Tharmalingam Sivotharan	M	197901202950	Valikamam East	Kopay North	762163854	15.00	0.94	Well	397579	1074182	397580	1074148
316	Sellathurai Paramalingam	M	490644253V	Valikamam East	Kopay North	775008162	12.00	0.75	Well	396695	1074134	396712	1074094
317	Raththinam Thavaselvan	M	197912904240	Valikamam East	Kopay North	773548314	10.00	0.63	Well	398144	1073815	398187	1073790

318	Tharmalingam Yogeshwaran	M	771812732V	Valikamam East	Kopay North	776452466	8.00	0.50	Well	397603	1074175	397580	1074148
319	Veerabahu Rasalingam	M	512373453V	Valikamam East	Kopay North	776731746	10.00	0.63	Well	398144	1073815	398187	1073790
320	Sellathurai Kesavarasan	M	842362334V	Valikamam East	Kopay North	776346753	16.00	1.00	Well	395834	1073422	395795	1073441
321	VeluppilaI Kanthasamy	M	500633301V	Valikamam East	Kopay North	774086253	12.00	0.75	Well	397237	1074681	397269	1074720
322	Annalingam Jeyakumar	M	712834668V	Valikamam East	Kopay North	773056620	10.00	0.63	Well	396861	1074667	396859	1074700
323	Nalliah Thayaparan	M	742360563V	Valikamam East	Kopay North	774053118	12.00	0.75	Well	397031	1074326	397033	1074349
324	S Kayatheepan	M	890742360V	Valikamam East	Kopay North	779580051	16.00	1.00	Well	398237	1072832	398243	1072835
325	Illayathamby Pathmanathan	M	572401251V	Valikamam East	Kopay North		8.00	0.5	Well	398442	1076147	398420	1076132
326	Subramaniyam Kanthasamy	M	540624038V	Valikamam East	Kopay North	765477145	8.00	0.5	Well	397061	1074646	397034	1074622
327	Kumarasamy Thayaparan	M	710482373V	Valikamam East	Kopay North	779580213	8.00	0.5	Well	398049	1075141	398056	1075149
328	Sasikaran Thadshini	F	827751073V	Valikamam East	Kopay North	772778215	8.00	0.5	Well	397122	1076311	397183	1076374
329	Sinnathamby Selvam	M	551173720V	Valikamam East	Urumbirai South	777167898	8.00	0.5	Well	395363	1073377	395388	1073395
330	Arumainayagam Suthan	M	883023390V	Valikamam East	Urumbirai West	779056955	8.00	0.5	Well	394128	1074129	394152	1074119
331	Selvaretnam Shanmugarathinam	M	663640160V	Valikamam East	Urumbirai East	770641234	12.00	0.75	Well	396105	1074783	396087	1074813
332	Thurairasasingam Ramesh	M	801842860V	Valikamam East	Kopay South	770921654	25.00	1.56	Well	395140	1071540	395172	1071540
333	Rasarathinam Yogarathinarasa	M	623262855V	Valikamam East	Kopay South	776701203	8.00	0.50	Well	395837	1072357	395840	1072387
334	Sivaloganathan Theivarani	F	676900837V	Valikamam East	Kopay South	775177555	8.00	0.50	Well	394922	1071630	394940	1071581
335	Aruchunan Kokilathasan	M	782153218V	Valikamam East	Kopay South	778365832	25.00	1.56	Well	395038	1071667	395039	1071658

336	Senthamilselvan Pushparani	F	197282303800	Valikamam East	Kopay South	778365832	25.00	1.56	Well	395336	1071506	395306	1071571
337	Murukesu Kanagalingam	M	410111640V	Valikamam East	Kopay South	774728003	10.00	0.63	Well	395749	1072585	395752	1072594
338	Tharmalingam Sivakumaran	M	197601304554	Valikamam East	Kopay South	776848187	22.00	1.38	Well	394989	1071604	394983	1071586
339	Gunasekaram Piranavan	M	830404414V	Valikamam East	Kopay South	773284906	20.00	1.25	Well	396865	1071185	396856	1071191
340	Kanaku Thayalan	M	691263002V	Valikamam East	Kopay South	774134583	23.00	1.44	Well	395199	1073293	395146	1073305
341	Ramanathan Sivakumaran	M	773564728V	Valikamam East	Kopay South	771965794	8.00	0.50	Well	395128	1071899	395120	1071932
342	Vellupillai Varnathasan	M	713023663V	Valikamam East	Kopay South	779586696	8.00	0.50					
343	Sellathurai Malmaruhan	M	641501743V	Valikamam East	Kopay South		8.00	0.50	Well	395368	1071835	395357	1071813
344	Aruchunan Kurunathan	M	951541478V	Valikamam East	Kopay South		8.00	0.50	Well	395726	1072263	395711	1072276
345	Thiyagarasa Sivaruban	M	872263217V	Valikamam East	Kopay South	772293184	8.00	0.50	Well	394909	1071632	394939	1071581
346	Thillaiyampalam Bamathran	M	673440386V	Valikamam East	Kopay Center	770386871	8.00	0.50	Well	396298	1073075	396293	1073041
347	Rasasekaram Jeyamalar	F	787712916V	Valikamam East	Kopay Center	776981623	8.00	0.50	Well	395560	1072684	395586	1072709
348	Yogarasa Tharsigan	M	933290735V	Valikamam East	Kopay Center	772938386	8.00	0.50	Well	395673	1072714	395665	1072756
349	Kaneshalingam Irayutham	M	198200700100	Valikamam East	Kopay Center	779122660	8.00	0.50	Well	395792	1072919	395824	1072939
350	Kayuraj Kanagalingam	M	831711078V	Valikamam East	Kopay Center	77041757	8.00	0.50	Well	395807	1072963	395824	1072939
351	Jeyarasasekaram Sritharan	M	761003666V	Valikamam East	Kopay Center	772549001	12.00	0.75	Well	395779	1073271	395828	1073264
352	Kumaravel Navarathinakumar	M	711801502V	Valikamam East	Kopay Center	776949846	8.00	0.50	Well	395815	1073299	395827	1073266
353	Markanndu Kengatharan	M	580694390V	Valikamam East	Urumbirai South	776120273	8.00	0.50	Well	395182	1073348	395228	1073315

354	T Paran	M	711363017V	Valikamam south	Elarlai Centre	779819650	8.00	0.50	Well	394906	1079060	394879	1079063
355	Kumarasingam Premathas	M	721041255V	Valikamam south	Earlalai Centre	773541837	8.00	0.50	Well	395286	1079130	395275	1079154
356	Tharmalingam Vickneswaran	M	693374324V	Valikamam South	Earlalai West	775416950	8.00	0.50	Well	394886	1079119	394864	1079144
357	Sabapathy Paramanathan	M	722884019V	Valikamam South	Earlalai West	779422056	8.00	0.50	Well	394782	1079173	394739	1079185
358	Tharmalingam Gnaneswaran	M	612833010V	Valikamam South	Earlalai West	772846830	8.00	0.50	Well	394919	1079091	394927	1079068
359	Balasingam Pirasath	M	971383011V	Valikamam South	Earlalai West	773327385	8.00	0.50	Well	395035	1078714	395023	1078730
360	Thevarasa Sarvananthan	M	833665170V	Valikamam South	Earlalai West	771027479	8.00	0.50	Well	394759	1078508	394815	1078497
361	G Vinothan	M	952582224V	Valikamam south	Earlalai West	770321793	8.00	0.50	Well	394799	1079232	394798	1079236
362	T Tharmakulasingam	M	601040948V	Valikamam south	Earlalai West	773794583	6.00	0.38	Well	394795	1079246	394798	1079236
363	S Sivakumaran	M	730232900V	Valikamam south	Earlalai East	778439796	5.00	0.31	Well	394876	1079160	394870	1079146
364	S Murukappan	M	662191701V	Valikamam south	Earlalai East	775952689	12.00	0.75	Well	395290	1078009	395298	1078000
365	S Subatheeswaran	M	198107204595	Valikamam south	Earlalai East	777349252	8.00	0.50	Well	395884	1078018	395884	1078018
366	Thanabalasingam Tharaneetharan	M	791133025V	Valikamam South	Earlalai South	774125171	8.00	0.50	Well	394877	1078496	394887	1078467
367	Perampalam Varatharasan	M	653552599V	Valikamam South	Earlalai South	776758637	8.00	0.50	Well	395542	1077714	395516	1077740
368	Thanabalasingam Thangapalan	M	197807203505	Valikamam South	Earlalai South	775530030	8.00	0.50	Well	394830	1078545	394840	1078553
369	Perampalam Uthayakumaran	M	633362904V	Valikamam South	Earlalai South	770360184	8.00	0.50	Well	395113	1077936	395127	1077913
370	N Vellivel	M	420890226V	Valikamam south	Earlalai South	740796876	8.00	0.50	Well	395751	1078143	395729	1078181
371	T Balachandran	M	493234048V	Valikamam south	Earlalai South	770813264	8.00	0.50	Well	394870	1077962	394885	1077958

372	K Manivannan	M	710301255V	Valikamam south	Earlalai South	776141764	10.00	0.63	Well	395388	1078060	395385	1078055
373	R Subajini	F	828491016V	Valikamam south	Earlalai South	770530801	8.00	0.50	Well	395742	1078172	395729	1078189
374	S Ajanthini	F	198877400843	Valikamam south	Earlalai South	776283924	20.00	1.25	Well	394992	1077969	394990	1077982
375	S Sumathini	F	805753030V	Valikamam south	Earlalai South	763961694	8.00	0.50	Well	395727	1078184	395729	1078189
376	N Thesingarasa	M	522336213V	Valikamam south	Earlalai South	778973302	8.00	0.50	Well	395626	1077111	396626	1077111
377	Perampalam Rasarathinam	M	490233806V	Valikamam south	Earlalai South	774945376	8.00	0.50	Well	395415	1077543	395409	1077557
378	K Uthayasooriyan	M	7104346654	Valikamam south	Earlalai South	773768860	8.00	0.50	Well	394837	1077714	394824	1077670
379	T Vaheesan	M	198619802580	Valikamam south	Earlalai South	771029568	8.00	0.50	Well	395970	1078316	395960	1078286
380	K Nishanthan	M	931554336V	Valikamam south	Earlalai South	779212176	8.00	0.50	Well	394962	1077897	394966	1077919
381	M Nagarathinam	M	196329902815	Valikamam south	Earlalai South	768078822	8.00	0.50	Well	394958	1077982	394966	1077919
382	K Vimalasooriyan	M	763414582V	Valikamam south	Earlalai South	775768435	8.00	0.50	Well	394860	1077727	394824	1077670
383	R Raveenthirarasa	M	197130710036	Valikamam south	Earlalai South	771629725	20.00	1.25	Well	395488	1078124	395497	1078097
384	S Senthees	M	197730303803	Valikamam south	Earlalai South	773867543	12.00	0.75	Well	394591	1078512	394582	1078498
385	E Kajan	M	850314764V	Valikamam south	Kuppilan North	770781337	12.00	0.75	Well	395913	1077567	395905	1077567
386	S Perumal	M	631837867V	Valikamam south	Earlalai	764679460	8.00	0.50	Well	395066	1078145	395080	1078148
387	K Abarasuthan	M	197907003243	Valikamam south	Kanthi Mahal, Mayilankadu	768460210	16.00	1.00	Well	395309	1078226	395328	1078221
388	T Thiyagarasa	M	580454046	Valikamam south	Soorawatthai,	778696939	10.00	0.63	Well	394641	1078449	394657	1078443

					Chunnakam							
389	S Jegatheeswaran	M	198108604656	Valikamam south	Soorawatthai, Chunnakam	773944748	20.00	1.25	Well	394969	1077974	395002	1077988
390	V Kanthasamy	M	563614889V	Valikamam south	Siththiyam puliyadi, Thellippalai East	770034744	8.00	0.50	Well	394862	1078932	394867	1078950
391	N Thanesma	F	19241283786	Valikamam south	Siththiyam puliyadi, Thellippalai East	769899306	5.00	0.31	Well	394911	1078954	394900	1078932
392	S Kaneshan	M	473255251V	Valikamam south	Punnalaikaduvan South	775034935	8.00	0.5	Well	396819	1078571	396808	1078580
393	S Vickneswaran	M	751408720V	Valikamam south	Punnalaikaduvan South	776411571	8.00	0.5	Well	396914	1078618	396945	1078645
394	K Manjulathevi	F	747593698V	Valikamam south	Punnalaikaduvan South	770346835	8.00	0.5	Well	396817	1078577	396808	1078540
395	Kathiravelu Sathiyaruban	M	7818454683V	Valikamam south	Punnalaikaduvan South		8.00	0.5	Well	398580	1079240	398598	1079252
396	S Krishnakumar	M	711830197V	Valikamam south	Punnalaikaduvan South	774742815	8.00	0.5	Well	396860	1077687	396860	1077689
397	Selvarathinam Sasikumar	M	782792806V	Valikamam south	Punnalaikkadduvan South	777242580	8.00	0.5	Well	397269	1078506	397269	1078506
398	Saravanamuthu Kanthasamy	M	572732746V	Valikamam south	Punnalaikaduvan South	764132351	8.00	0.5	Well	397966	1077875	397966	1077897

399	S Selvarasa	M	653052467V	Valikamam south	Punnalaikkadduvan South	771163256	10.00	0.5	Well	397084	1078677	397084	1078689
400	T Inparani	F	575750923V	Valikamam south	Punnalaikkadduvan South	763501549	20.00	0.5	Well	397585	1078570	397364	1078546
401	S Kanthasamy	M	441335563V	Valikamam south	Punnalaikkadduvan South	765556537	8.00	0.5	Well	396544	1078390	396544	1078390
402	S Kamal	M	822861253V	Valikamam south	Punnalaikkadduvan South	770552709	8.00	0.5	Well	396765	1078279	396094	1078273
403	K Sabeshkaran	M	750083013V	Valikamam south	Punnalaikkadduvan South	761423905	15.00	0.5	Well	397014	1077588	391019	1077577
404	K Vathsan	M	850321477V	Valikamam south	Punnalaikkadduvan South	779906261	20.00	0.5	Well	397620	1078229	397620	1078229
405	S Krishnamoorthy	M	670152731V	Valikamam south	Punnalaikkadduvan South	779749286	15.00	0.5	Well	396887	1078654	396987	1078654
406	Sinnathurai Gnanasothy	M	652791905V	Valikamam South	Punnalaikaduvan South	777520332	8.00	0.5	Well	396791	1076931	396826	1076956
407	Sinathurai Arunthavarasa	M	195625110101	Valikamam South	Punnalaikkadduvan South	717551132	8.00	0.5	Well	397089	1077638	397117	1077656
408	Arasaratnam Kajatheepan	M	852243015V	Valikamam South	Punnalaikkadduvan South	771385266	8.00	0.5	Well	397073	1077517	397095	1077546
409	Sellathurai Ganeshamoorthy	M	648371847V	Valikamam South	Punnalaikaduvan South	771806161	8.00	0.5	Well	396723	1078645	396753	1078662
410	Selvaskantharasa Thushyanthan	M	808134073V	Valikamam South	Punnalaikaduvan South	774010211	8.00	0.5	Well	396842	1077423	396874	1077430

411	Ravichandran Puspajini	F	715171511V	Valikamam South	Eevinai	777168573	8.00	0.5	Well	397998	1079000	398031	1079008
412	Iyathurai Nithiyananthan	M	571060833V	Valikamam South	Eevinai		8.00	0.5	Well	398261	1078775	398276	1078758
413	Sivasampu Sivakumar	M	661211901V	Valikamam South	Eevinai	777729019	8.00	0.5	Well	399524	1078411	399546	1078374
414	Muthu Sriskantharasa	M	631812341V	Valikamam South	Eevinai	765489118	8.00	0.5	Well	397075	1077035	397058	1077029
415	Ragunathan Elamurugan	M	1.95932E+11	Valikamam South	Eevinai	769328649	8.00	0.5	Well	397473	1077480	397412	1077447
416	Thangarasa Suganthan	M	790655826V	Valikamam south	Eevinai	774598131	8.00	0.5	Well	398473	1078867	398471	1078849
417	S Tharmalingam	M	540994250V	Valikamam south	Kupilan South	776610686	8.00	0.5	Well	396231	1079159	396252	1079802
418	T Rajarajeswary	F	556422451V	Valikamam south	Kupilan South	766434590	8.00	0.5	Well	396039	1079107	396239	1079107
419	K Nadesu	M	570704419V	Valikamam south	Kuppilan South	771627023	10.00	0.5	Well	396164	1078267	396176	1078294
420	S Chandran	M	197017703276	Valikamam south	Kuppilan South	772853707	10.00	0.5	Well	396493	1080113	396493	1080113
421	Kamalathas Mithusha	F	199274702961	Valikamam south	Kuppilan South	770063341	8.00	0.5	Well	396389	1078528	396373	1078510
422	Velupilai Mahalingam	M	197004802340	Valikamam South	Kupilan south	776314557	8.00	0.5	Well	396015	1078413	396016	1078456
423	Santhirakanthan Mayurakanth	M	891263554V	Valikamam South	Kuppilan South	779672458	8.00	0.5	Well	396816	1079315	396781	1079321
424	S Navarathinarasa	M	601943620V	Valikamam south	Kupilan South	777143077	8.00	0.5	Well	396407	1078501	396375	1078510
425	S Vickshan	M	942133880V	Valikamam south	Kuppilan South	778756437	10.00	0.5	Well	396642	1079070	396642	1079090
426	P Thevarasa	M	503424100V	Valikamam south	Kupilan South	763825143	8.00	0.5	Well	396021	1078330	395974	1078290
427	S Ganeshanathan	M	743580559V	Valikamam south	Kupilan North	771822542	10.00	0.5	Well	396455	1078447	396442	1078449
428	Nagamani Sounthararasa	M	700022641V	Valikamam South	Kupilan North	771038030	8.00	0.5	Well	397144	1080098	397168	1080139

429	Anandan Ajanthan	M	988103332V	Valikamam South	Kupilan North		8.00	0.5	Well	396442	1078402	396445	1078445
430	Narasingam Ravichanthiran	M	196709502096	Valikamam South	Kupilan North	774631122	8.00	0.5	Well	397208	1080044	397256	1080075
431	T Pooranam	M	886252130V	Valikamam south	Earlalai East	779608965	8.00	0.5	Well	396033	1078492	366027	1078484
432	N Rameshwaran	M	793091184V	Valikamam south	Earlalai East	777040184	10.00	0.5	Well	396103	1079099	396111	1079114
433	S Mathiyalakan	M	850121613V	Valikamam south	Earlalai East	766554817	8.00	0.5	Well	396093	1079240	396155	1079260
434	T Senthilkumaran	M	7731717341V	Valikamam south	Earlalai East	776006238	10.00	0.5	Well	395952	1078943	395919	1078915
435	N Baskaralingam	M	702162084V	Valikamam south	Earlalai East	770639224	8.00	0.5	Well	396072	1078407	396083	1078707
436	M Kunarathinam	M	195214101237	Valikamam south	Earlalai East	-	8.00	0.5	Well	396062	1079203	396049	1079104
437	S Kaneshnathan	M	622231603V	Valikamam south	Earlalai East	776146462	8.00	0.5	Well	395960	1078460	395940	1078770
438	S Saraswathy	F	487982822V	Valikamam south	Earlalai East	777060296	8.00	0.5	Well	395891	1078950	395878	1078956
439	K Tharmakulasingam	M	196321800683	Valikamam south	Earlalai East	777060296	8.00	0.5	Well	395903	1078973	385882	1078961
440	K Sivakumaran	M	752082740V	Valikamam south	Earlalai East	770051257	8.00	0.5	Well	395720	1078580	395728	1078565
441	K Kathiramalainathar	M	632942214V	Valikamam south	Earlalai East	771333840	7.00	0.5	Well	395971	1078759	395940	1078770
442	T Selvarasa	M	582502064V	Valikamam south	Earlalai East	770468658	10.00	0.5	Well	396260	1079185	396260	1079200
443	K Kannathasan	M	821775124V	Valikamam south	Earlalai East	770455731	13.00	0.5	Well	395699	1078699	395720	1078639
444	S Nanthini	F	686162736V	Valikamam south	Earlalai East	779599987	13.00	0.5	Well	396689	1078696	395720	1078689
445	S Uthayakumaran	M	723460756V	Valikamam south	Earlalai East	774566675	20.00	0.5	Well	396033	1079190	396040	1079194
446	K Maheswaran	M	196834102384	Valikamam south	Earlalai East	771565294	20.00	0.5	Well	395947	1078777	395940	1078770

447	P Sutheshkumar	M	860794187V	Valikamam south	Earlalai East	772019820	20.00	0.5	Well	395720	1078888	395723	1078881
448	T Theiventhiram	M	653342470V	Valikamam south	Earlalai East	768766679	15.00	0.5	Well	396003	1078890	396024	1078695
449	G Manohari	F	745971709V	Valikamam south	Earlalai East	779608965	8.00	0.5	Well	396133	1079136	396157	1079260
450	M Thevakumar	M	752172722V	Valikamam south	Earlalai East	778573928	30.00	0.5	Well	396047	1078645	396047	1078636
451	T Nanthinithevi	F	785154070V	Valikamam south	Earlalai East	770506276	12.00	0.5	Well	395940	1078780	395940	1078765
452	T Amuthalingam	M	722273389V	Valikamam south	Earlalai East	776291439	20.00	0.5	Well	395959	1073964	395981	1078992
453	S Yogeswary	F	198278901312	Valikamam south	Earlalai East	769936690	20.00	0.5	Well	395777	1078939	395919	1078915
454	T Yogalingam	M	197034502710	Valikamam south	Earlalai East	778422474	10.00	0.5	Well	396989	1080350	396957	1080351
455	K Kannan	M	691742644V	Valikamam south	Earlalai East	775985257	9.00	0.5	Well	395885	1078578	395890	1078545
456	S Mangayatkarashi	F	615643270V	Valikamam south	Earlalai East	763999610	20.00	0.5	Well	395724	1078582	395428	1078565
457	N Malar	F	547053206V	Valikamam south	Earlalai East	770417639	10.00	0.5	Well	396031	1078663	396047	1078636
458	N Kanakarathinam	M	197706304890	Valikamam south	Earlalai East	771042904	35.00	0.5	Well	396135	1078398	396130	1078388
459	N Kalanantharasan	M	196423401855	Valikamam south	Earlalai East	774501205	40.00	0.5	Well	395789	1079620	395840	1078659
460	K Thaneshwaran	M	197603104080	Valikamam south	Earlalai East	212059415	32.00	0.5	Well	396127	1073307	396195	1078811
461	K Kulasingam	M	652305092V	Valikamam south	Earlalai East	775985257	7.00	0.5	Well	395727	1078590	395728	1078565
462	R Yogarasa	M	488182821V	Valikamam south	Earlalai South	762474455	9.00	0.5	Well	396024	1078910	396038	1078893
463	R Sivarasa	M	4700600565	Valikamam south	Earlalai Centre	778095504	15.00	0.5	Well	396016	1078785	395949	1078765
464	R Annalingam	M	622562197V	Valikamam south	Navatkinatadi, Kupilan	779672600	8.00	0.5	Well	396188	1079317	396188	1079317

465	Jeyasuthan Thevakumar	M	861171400V	Valikamam North	Vasavilan	770703649	8.00	0.5	Well	399131	1080826	399143	1080836
466	Maniyam Arunthavalingam	M	691334628V	Valikamam North	Vasavilan	765766343	8.00	0.5	Well	399914	1079762	399907	1079745
467	Jeyakaran Sivaranjani	F	876061830V	Valikamam North	Vasavilan	770694402	8.00	0.5	Well	399997	1080367	400017	1080347
468	Ganapirakasam Robbin	M	198527203874	Valikamam North	Vasavilan	779089374	8.00	0.5	Well	399260	1080778	399260	1080778
469	Ponnu Balakobal	M	740693972V	Valikamam North	Vasavilan	776473740	8.00	0.5	Well	400637	1080391	400608	1080293
470	Suresh Nishanthan	M	932372894V	Valikamam North	Vasavilan	778347300	8.00	0.5	Well	400026	1080485	400066	1080515
471	Sellamuthu Kunam	M	630444730V	Valikamam North	Vasavilan	778040817	8.00	0.5	Well	400010	1080270	399993	1080260
472	Valli Sivam	M	522754765V	Valikamam North	Vasavilan	771323925	8.00	0.5	Well	399987	1080373	400007	1080347
473	Mahalingam Jeyan	M	673593909V	Valikamam North	Vasavilan	778950168	8.00	0.5	Well	399403	1080639	399374	1080651
474	Muthuthambi Navaradnaraja	M	562282653V	Valikamam North	Vasavilan	761441515	8.00	0.5	Well	399140	1080984	399129	1080968
475	Manikam Sivarasa	M	701302613V	Valikamam North	Vasavilan	779906622	8.00	0.5	Well	400135	1080313	400145	1080243
476	Rasthinam Thevarasa	M	197205704462	Valikamam North	Vasavilan	771377113	8.00	0.5	Well	399106	1079850	399145	1079839
477	Rathinam Sivaganam	M	800515050V	Valikamam North	Vasavilan	770529265	8.00	0.5	Well	399442	107919	3994491	1079906
478	Ratheskaran Jenitha	F	915753523V	Valikamam North	Vasavilan		8.00	0.5	Well	399774	1080728	399758	1080713
479	Nanthakobi Sanitha	F	915663460V	Valikamam North	Vasavilan	763783805	8.00	0.5	Well	399925	1080727	399915	1080710
480	Kugaseelan Sivaloganai	F	856053210V	Valikamam North	Vasavilan	775364984	8.00	0.5	Well	399425	1080768	399391	1080773
481	Sellakandu Suresh	M	662562700V	Valikamam North	Vasavilan	-	8.00	0.5	Well	400068	1080339	400007	1080347
482	Rasu Tharmasekaram	M	740484311V	Valikamam North	Vasavilan	763224913	8.00	0.5	Well	400076	1080439	400084	1080430

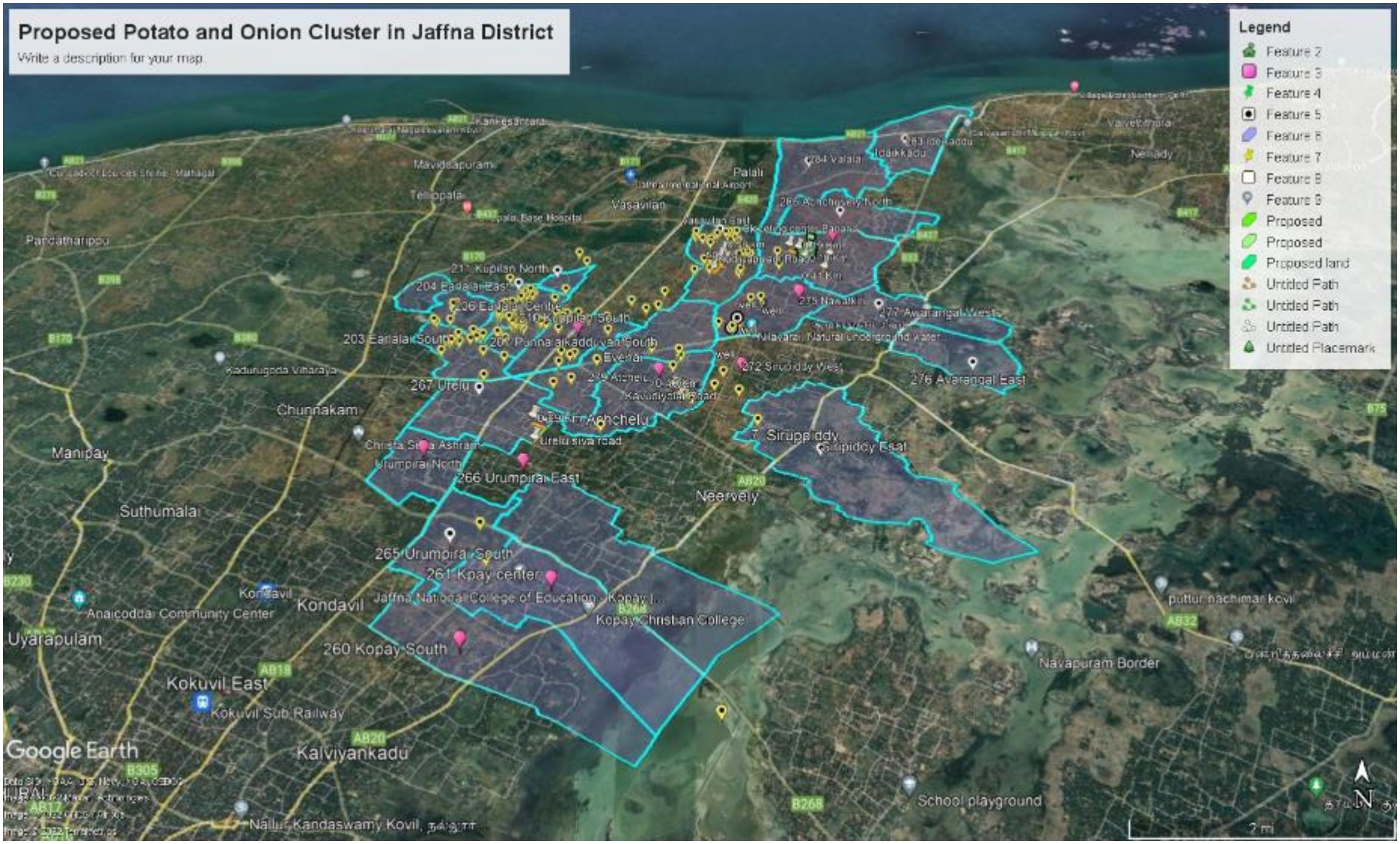
483	Sinnapu Tharumarasa	M	521393602V	Valikamam North	Vasavilan	-	8.00	0.5	Well	399375	1079887	399449	1079906
484	Ponnan Thabandran	M	7517139924V	Valikamam North	Vasavilan	769343851	8.00	0.5	Tubewell	399285	1080166	399285	1080166
485	Sivasambu Nadarasa	M	620234788V	Valikamam North	Vasavilan	767356855	8.00	0.5	Well	399913	1080720	399915	1080710
486	Sinnamanyam Satkunam	M	693502837V	Valikamam North	Vasavilan	765633230	8.00	0.5	Well	400082	1080371	400007	1080367
487	Nadarasa Nimal	M	770105102V	Valikamam North	Vasavilan	766895516	8.00	0.5	Well	399926	1080312	399926	1080312
488	Vijayarathinam Jeyaman	M	820882490V	Valikamam North	Vasavilan	779853512	8.00	0.5	Well	400648	1080017	400684	1079989
489	Nagan Sivakuru	M	471164267V	Valikamam North	Vasavilan	770564697	8.00	0.5	Well	399695	1080977	399695	1080977
490	Thampan Mahadevan	M	521522321V	Valikamam North	Vasavilan	777699720	8.00	0.5	Well	399260	1080778	399679	1080979
491	Nithiyantharasa Marryrubina	F	675061343V	Valikamam North	Vasavilan	773618082	8.00	0.5	Well	399275	1080804	399252	1080848
492	Markanddu Jeyalingam	M	780891025V	Valikamam North	Vasavilan	777110652	8.00	0.5	Well	399942	1079883	399966	1079887
493	Velayutham Puvanendram	M	581841892V	Valikamam North	Vasavilan	771233080	8.00	0.5	Well	399975	1080763	400009	1080755
494	Indrakumar Rasi	M	715614561V	Valikamam North	Vasavilan	779292115	8.00	0.5	Well	399388	1080165	399362	1080151
495	Ponnan Thayalachandran	M	701733959V	Valikamam North	Vasavilan	773477249	8.00	0.5	Well	399300	1080168	399309	1080158
496	Maniyam Santhiravathanan	M	197328304508	Valikamam North	Vasavilan	773974518	8.00	0.5	Well	399762	1080985	399735	1080973
497	Shihamani Vasantharasa	M	803294933V	Valikamam North	Vasavilan	770785633	8.00	0.5	Well	399899	1081001	399894	1080985
498	Jeyaroshan Nilakshana	F	946192406V	Valikamam North	Vasavilan	771065298	8.00	0.5	Well	399534	1080921	399519	1080947
499	Yokeswaren Sutharsan	M	923411038V	Valikamam North	Vasavilan	779292115	8.00	0.5	Well	399411	1080150	399362	1080151
500	Udayakumar Vithees	M	962862900V	Valikamam North	Vasavilan	773997606	8.00	0.5	Well	399870	1080813	399870	1080813

501	S.Murukananthasothy	M	691183190X	Valikamam East	Avarangal East	776356563	8.00	0.5					
502	P.Kanmani	F	195468610097	Valikamam East	Avarangal East	774038371	8.00	0.5					
503	K.Bakeerathan	M	700310590V	Valikamam East	Avarangal East	778313656	8.00	0.5					
504	S.Sivatharshan	M	891094167V	Valikamam East	Avarangal	773604206	8.00	0.5					
505	S.Piratheepan	M	791733715V	Valikamam East	Avarangal West	772830998	8.00	0.5					
506	S.Ilango	M	762990148V	Valikamam East	Achchuvely North	770192904	8.00	0.5					
507	M.Sritharan	M	753321616V	Valikamam East	Siruppiddi West	770869670	8.00	0.5					
508	S.Mathiveniyan	M	810734515V	Valikamam East	Siruppiddi East	776231033	8.00	0.5					
509	S.Harishankar	M	198405803031	Valikamam East	Siruppiddi East	779775650	8.00	0.5					
510	K.Ajanthan	M	802811403V	Valikamam South	Erlalai	776214468	8.00	0.5					
511	K.Vimalathasan	M	840965023V	Valikamam South	Evinai	779720601	8.00	0.5					
512	S.Selvakesavan	M	821984432V	Valikamam South	Evinai	779560276	8.00	0.5					

ANNEXURE 3: INSTITUTIONAL ROLES IN THE POTATO AND ONION CLUSTER

Agency/private sector	Officer responsible	Expected role in cluster development
Provincial Department of Agriculture (North)	Provincial director (agriculture)	Lead and provide guidance to relevant officers and FPO Coordinate all line agencies at district level
	Deputy director (agriculture)	Provide guidance to relevant officers and FPO Provide extension services and inputs. Solving farmer problems. Coordinate all line agencies at cluster level
	8 Agriculture Instructors	Maintain close link with farmers in the cluster area. Training of farmers Play the role of farmer facilitator
Divisional Secretariats (Valikamam North, East and South)	3 Divisional Secretaries	Make representation for review committees to assist DC (agriculture) Settlement of land issues and grant land permits, if necessary Make required services available to FPO from other agencies
	3 Land officers	Settlement of land disputes. Clearing boundary demarcations
	33 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, and 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 MAP




Proposed Potato Farmland, Ponnalaikadduvan
Write a description for your map.
Legend
Ponnalaikadduvan Farm Land
Proposed Potato Farmland, Ponnalaikadduvan
Ponnalaikadduvan Farm Land
A9
Ponnalaikadduvan Ayakadavar Pillaiyar
Ayakadavar sithivinayagar temple
Google Earth
300 ft
N


Proposed Potato Farmlands, Vasavalan
Write a description for your map.
Legend
Farmland, Vasavalan
Vasavalan Farm Land
Vasavalan Farm Land 2
Vasavalan Farm Land 1
Google Earth
200 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 20: 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: 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

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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