Project Design Document: Greening of Rural value chains for Banana

Project Background

In India, bananas hold the second position in terms of fruit crop importance, only surpassed by mangoes. This popularity can be attributed to their year-round availability, affordability, diverse varieties, taste, and numerous nutritional and medicinal benefits.

Among the states of India, Maharashtra stands as the second-largest producer of bananas, with an average productivity of 55-60 MT per hectare. However, a significant issue arises after the harvesting of banana bunches, as the surplus banana stem, generating approximately 60-65 MT per hectare, is currently discarded by farmers. The common practice involves throwing the stems on boundaries and burning them after drying, resulting in wastage and pollution.

Farmers face disposal problems with the stem and incur expenditure, without getting any income. The stem fibres can be used to make textile products. Other uses of the stem include making liquid organic fertilizer,which is a good source of nitrogen, phosphorus, potassium and micronutrients.

Astamba Farmers Producer Company Limited is an FPO in Taloda, Nandurbar, which was formed in 2020. The FPO has 495 shareholders, most of whom are tribal, from nearby villages. It is currently engaged in activities like vermicomposting. The FPO already has tools such as the cutter, fibre making machine and turner, but the plant is non functional since it lacks an electricity connection. The FPO has also been planning to set up an integrated plant for processing banana stems into such as paper, bags, folding files.

Project Description

This project aims at increasing the scale of operations of the processing unit, support for market linkages, diversification of its products and decarbonisation of the energy vector. The project envisages the accomplishment of these objectives through the purchase of the following equipment:

1. **10 kW solar photovoltaic panels systems and battery storage equipment** - Cumulative total savings on energy consumption amount to 13,500 units annually, which accounts for 11 tonnes of CO_2 emissions mitigated annually, assuming 6 hours of daily generation for 250 days in a year. The initial investment is repaid by savings in electricity bills for the operation of the plant at an average variable electricity cost of INR 11/kWh.
2. **Electric hauler for micro-logistical services** with a payload capacity of 500kg – cumulative total savings on using an electric vehicle as compared to diesel-powered vehicle is INR 50,000 annually, along with 480 kg of CO_2 emissions mitigated.
3. **Extension of scope of operations with additional equipment** for further value addition to fetch better prices, including equipment for liquid organic fertilizer, packaging unit for packaging and branding.

4. **Supporting the FPO in certification of their products** which would further improve the marketability of the product.

Summary of Investments

Total project cost is expected to be close to INR 30 lakhs that includes design, engineering, procurement, installation, first year operations and support in packaging and branding. The table below summarizes the project components and the investment requirements.

Table 1: Capital Costs for the project

S. No	Technology	Unit	Capacity	Qty (Nos.)	Cost (Rs/unit)	Value (Rs.)	Cost sharing			Sharing (%)	Relevant schemes
							FPO equity**	Govt subsidy	Loan		
1	Electric Hauler (Mahindra Treo Zor)	kg	500		400,000	400,000	40,000	74,000	286,000	10:18.5:71.5	FAME II
2	Project Cost*				2,436,500	2,436,500	243,650	852,775	1,340,075	10:35:55	PMFME, point iii and iv
	Solar photovoltaic panel system with battery	kW	10	1	6,00,000						
	Stem Cutter			1	1,40,000						
	Fibre Extraction Machine	kg/hr	4	5	3,75,000						
	Turner			1	1,50,000						
	Charkha	kg/day	4	8	56,000						
	Weighing Machine	kg/hr		1	20,000						

	Branding and Packaging unit				1,50,000	1,50,000					
4	Land cost				2,50,000	2,50,000	0	0	2,50,000		
	Total					**3,086,500**	**283,650**	**926,775**	**1,876,075**	**9:30:61**	

Source: MP Ensystems Research

*Project cost includes all costs (plant and machinery, solar photovoltaic panel costs, et al), excluding land cost

**Based on discussions held on ground and their financial conditions, equity share ranges from 5% to 15%, hence has been assumed at 10%

Barriers addressed in the project implementation:

The FPO has been aspiring to work for improving the income levels of farmers in the region through procurement of their produce locally at remunerative prices and distribute the profits generated through the operations of the plant as dividend at a later stage. It aims to achieve these targets through a low-carbon pathway, which would further improve its sustainability in the long run and doesn't add to the widespread land and air pollution in Akkalkuwa through its operations. The key barriers addressed through the proposed project implementation are listed below.

Table 2: Barriers addressed through the project

Barriers	**How the proposed project will address barriers through net-zero carbon solutions**
Frequent power outages, reliance on diesel generator sets as backup, high operation expenses	Installation of a rooftop solar panels which eliminates carbon emissions while ensuring continued power availability at minimal costs
High cost of fuel for transport and logistics	Use of electric hauler for local transportation to bring-in produce from the individual farms to the central processing facility
Limited scope of operations	Addition of unit and further processing to produce more value-added products, which have greater visibility and fetch better prices
Market Access	The packaging machine helps shape the brand identity of the products which improves market access.

Source: MP Ensystems Research

Financial Analysis

A simple cash-flow analysis is below, with the conservative assumption that the equipment has a lifespan of 10 years.

Project Cost

The major components of a small-scale banana steam processing unit are land, building and civil works. A project cost of **INR 30.87 Lakhs** has been estimated. The details of project cost are given in **Table 3.**

Table 3: Total Project Cost

Project Cost					
S. No.	**Particulars**	**Unit**	**Qty.**	**Rate (Rs.)**	**Amount (Rs. Lakh)**
1	Land	acre	0.5	500000	2.5
2	Land Development				3.782
3	Civil Work				3.782
4	Plant and Machinery				18.91
5	Miscellaneous fixed assets				0.9455
6	Preliminary and Preoperative expenses				0.9455
	Total				30.865

Source: MP Ensystems Research

Operational Expenses

The operational expenditure incurred under different heads is as specified in Table 4. The operational expenditure is expected to grow at an annual rate of 5%.

Table 4: Operational expenditure

Manpower Requirement				
S. no.	**Personnel**	**Number**	**Salary (Per Month)**	**Total (Rs. Lakh/year)**
1	Plant manager	1	13000	1.56
2	Worker	14	10000	16.8
	Total	15	23000	18.36
Other Costs				
S. No.	**Cost Head**	**Annual Cost(INR)**		
1	Administrative Costs	50000		
2	Utility Costs	50000		
3	Marketing and advertising	50000		

Source: MP Ensystems Research

Means of Finance

Financing to food processing falls under priority sector lending. The loans to units meeting the criteria of MSME are classified under the MSME sector. Such units can be financed by Scheduled Commercial Banks, Regional Rural Banks and Cooperative Banks. Important terms and conditions of financing such units are discussed in this section.

Table 5: Means of Financing

Means of Finance		
Total Financing required	INR lakhs	30.865
Equity	%	9%
Grant	%	30%
Debt	%	61%
Interest Rate (Per Annum)	%	12.00%
Moratorium	Years	1
Annual Installment	Years	9
Equity Component	INR lakhs	2.77785
Grant Component	INR lakhs	9.2595
Debt Component	INR lakhs	18.82765

Source: MP Ensystems Research

The financial indicators analysed by discounting cash flow @10% discount rate are given in **Annexure II** and the summary is presented in **Table 6**.

Table: 6 Estimated Financial Indicators

Financial Indicators	**Estimated**	**Requirement**
Net Present Worth	32.78	Should be +ve
IRR	34%	> 10%
BCR	1.34	Should be >1.0
DSCR	2.9	Should be >1.5

Source: MP Ensystems Research

The repayment period has been drawn by considering net surplus available for repayment. The bank loan with interest is repayable within 9 years with a moratorium of one year. The debt service coverage ratio based on assumed techno economic parameters is found satisfactory.

The following specific attributes of ESG can further be achieved through the implementation of this project:

- There are a number of environmental opportunities including mitigation of carbon emissions and reduction of resource depletion. There are direct climate benefits to the project. The installation of roof-top solar results in the mitigation of 11 tonnes of CO_2 emissions every year, while the usage of EVs leads to the prevention of 480 kg of CO_2 annually.
- The Astamba FPO is led by dynamic women directors who are majority in the director body and are committed to empowering tribal women by generating sustainable livelihood opportunities. This project aims to create a positive social impact by generating local employment and increasing income opportunities for marginalized communities. By promoting environmentally and socially responsible practices, the FPO seeks to strengthen existing community relations while fostering a sense of collective prosperity.

Annexure I: Catalogue of processed products

Types of processed Products	Proportion in sales	Selling Price (Rs/kg)	Packaging Cost (INR/kg)
Fibre	40%	135	1
Liquid Organic Fertilizer	40%	50	1
Yarn	10%	280	1
Wastage of raw material during processing	%	10%	
Rate of raw material	INR/kg	1	
Weighted average cost of packing	INR/kg	1.1	

Annexure II: Calculation of financial indicators

Particulars	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**	
Capital Cost	30.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Recurring Cost	10.0	12.1	16.4	18.6	20.8	23.0	23.1	23.2	23.3	23.5	
Total Cost	40.8	12.1	16.4	18.6	20.8	23.0	23.1	23.2	23.3	23.5	225
Benefits	14.5	18.1	25.4	29.0	32.6	36.3	36.3	36.3	36.3	36.3	301
Net Benefits	-26.3	6.0	8.9	10.4	11.8	13.2	13.1	13.0	12.9	12.8	7.6
Discounting Factor	10%										
Net Present Worth	32.78										
IRR	34%										
BCR	1.336 59418 2										