# Project Design Document: Greening of rural value chains for rice processing plant

## Project background

Kanhan Agro Vision Farmers Producer Company Limited is a farmer-producer organisation (FPO) comprising 312 members. The FPO was established in 2018 and has a rice processing unit of capacity of 4 TPH at Kanhan Pimpri, Nagpur. The paddy is sourced from the farmers in the region. The paddy is collected from both members and non-members of farmers. The raw paddy undergoes processing and creates final polished rice of different gradings. The polished rice is subsequently sold to the contracted companies and traders. The FPO does the job work for farmers.

However, the processing unit faces challenges of high operation cost and a major component is electricity cost. This issue results in low profitability of the plant.

# **Project description**

This project aims at the solarisation of rice processing unit by installing solar PV at FPO situated at Nagpur. Electricity is the primary energy input to the plant which has a connected load of 167 kW. The daily operation of the processing unit is 5 hours. The electricity bill we collected from FPO and cumulative annual consumption of electricity is around 23500 units. The specification of solar PV system is proposed as follows,

15 kW solar photovoltaic panel system: cumulative total savings on energy consumption amount to 23700 units annually, which accounts for 19 tonnes of CO2 emissions mitigated annually, assuming an average capacity utilization factor (CUF) of 4.5. The initial investment is compensated for by savings in electricity bills for the operation of the plant at an average variable electricity cost of INR 10/kWh. To make the plant energy efficient the 5% cost is considered per kW.

#### Summary of investments

Total project cost is expected to be close to INR 7.5 lakhs that includes design, engineering, procurement, installation. Per kW cost of solar PV is considered 50,000 Rs/kW with EE major INR 5000 per kW for a 15-kW system is considered.

S N o	Technology	Un it	Capacit y	Qty (Nos .)	Cost (Rs/unit )	Value (Rs.)	Cost sha	aring		Sharing (%)	Relevan t scheme s
							FPO equity **	Govt subsid	Loan		

Table 1: Capital Costs for the project

1	Project Cost*				750,000	750,000	150,0 00	0	600,00 0	20::0::8	
	Solar photovoltaic panel system with battery	kW	15	1	750,000	750,000	150,0 00	0	600,00		
	Energy efficient measures			1	75,000	75,000	15,00 0		60,000		
	Total					825,000	165,0 00	0	660,00 0		

<sup>\*</sup>Project cost includes all costs (plant and machinery, solar photovoltaic panel costs, et al), excluding land cost

# 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 distribution of the profits 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 through its operations. The key barrier addressed through the proposed project implementation is listed below.

Table 2: Barriers addressed through the project

	How the proposed project will address barriers through net-zero carbon solutions
diesel generator sets as backup, high	Installation of a rooftop solar panels which eliminates carbon emissions while ensuring continued power availability at minimal costs

Source: MP Ensystems Research

#### Financial analysis

A simple cash-flow analysis is below, with the conservative assumption that the equipment has a lifespan of 20 years.

### Project cost

Project cost includes solar panel equipment cost and installation cost, other components of project cost are taken as zero as the plant is already installed and operational.

Table 3: Total Project Cost

Project Cost									
S. No.	Particulars	Unit	Qty.	Rate (Rs.)	Amount (Rs. Lakh)				
1	Solar photovoltaic	kW	15	750,000	7.5				
2	Energy efficiency measures			75,000	0.75				
	Total				8.25				

Source: MP Ensystems Research

<sup>\*\*</sup>Based on discussions held on the ground and their financial conditions, equity share ranges from 5% to 30%, hence has been assumed at 20%

#### Means of finance

Regarding the implementation of solar rooftop installations for industrial consumers, no subsidies are accessible for this initiative. Consequently, the funding for the project will be undertaken by the FPO. The financial arrangement for this venture entails a 20% equity investment from the FPO and the remaining 80% through a loan arrangement. Additional specifics concerning the financing breakdown can be referenced in Table 5.

Table 5: Means of Financing

Means of Finance								
Total Financing required	INR lakhs	8.25						
Equity	%	20%						
Grant	%	0%						
Debt	%	80%						
Interest Rate (Per Annum)	%	12.00%						
Moratorium	Years	1						
Annual Instalment	Years	5						
Equity Component	INR lakhs	1,65,000						
<b>Grant Component</b>	INR lakhs	0						
Debt Component	INR lakhs	6,60,000						

Source: MP Ensystems Research

The financial indicators analysed by discounting cash flow at 10% are given in **Annexure I** and the summary is presented in **Table 6**.

Table: 6 Estimated Financial Indicators

Financial Indicators	Estimated	Requirement
Net Present Worth	18.36	Should be positive
IRR	83%	> 10%
BCR	4.2	Should be >1.0

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 5 years with a moratorium of one year.

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, reduction of resource depletion. There are direct climate benefits to the project. The installation of roof-top solar results in the mitigation of 19 tonnes of CO<sub>2</sub> emissions every year.

# Annexure I: Calculation of financial indicators

				Det	ailed calculatio	n and cash	flow				
	Elect	cricity cost sav	ving		Tax Saving						
Year s	Electricit y generatio n per annum	Electricit y tariff	Savings on Electrici ty	Gros s asset value	Accelerate d depreciati on	Tax saving due to AD	Total savin g	O&M charge s	Annual loan repaym ent	Net cash flow	Cummulati ve saving
	(KWh)	(INR/KW h)	(INR Lakhs)	(INR Lakh s)	(INR Lakhs)	(INR lakhs)	(INR lakhs )	(INR lakhs)	(INR lakhs)	(INR lakhs)	(INR lakhs)
	Α	В	C=A*B	D	E=D*40%	F=E*30 %	G=C+ F	Н	1	J=G- H-I	К
0	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-1.65	-1.65
1	24637.50	10.00	2.46	8.25	3.30	0.99	3.45	0.08	-1.83	1.54	-0.11
2	24514.31	10.30	2.52	4.95	1.98	0.59	3.12	0.09	-1.83	1.20	1.09
3	24391.74	10.61	2.59	2.97	1.19	0.36	2.94	0.10	-1.83	1.01	2.10
4	24269.78	10.93	2.65	1.78	0.71	0.21	2.87	0.11	-1.83	0.93	3.03
5	24148.43	11.26	2.72	1.07	0.43	0.13	2.85	0.12	-1.83	0.89	3.92
6	24027.69	11.59	2.79	0.64	0.26	0.08	2.86	0.13	0.00	2.73	6.65
7	23907.55	11.94	2.85	0.38	0.15	0.05	2.90	0.15	0.00	2.75	9.41
8	23788.01	12.30	2.93	0.23	0.09	0.03	2.95	0.16	0.00	2.79	12.20
9	23669.07	12.67	3.00	0.14	0.06	0.02	3.01	0.18	0.00	2.84	15.04
10	23550.73	13.05	3.07	0.08	0.03	0.01	3.08	0.19	0.00	2.89	17.92
11	23432.98	13.44	3.15	0.05	0.02	0.01	3.16	0.21	0.00	2.94	20.87
12	23315.81	13.84	3.23	0.03	0.01	0.00	3.23	0.24	0.00	3.00	23.86
13	23199.23	14.26	3.31	0.02	0.01	0.00	3.31	0.26	0.00	3.05	26.91
14	23083.24	14.69	3.39	0.01	0.00	0.00	3.39	0.28	0.00	3.11	30.02
15	22967.82	15.13	3.47	0.01	0.00	0.00	3.47	0.31	0.00	3.16	33.18
16	22852.98	15.58	3.56	0.00	0.00	0.00	3.56	0.34	0.00	3.22	36.40
17	22738.72	16.05	3.65	0.00	0.00	0.00	3.65	0.38	0.00	3.27	39.67
18	22625.02	16.53	3.74	0.00	0.00	0.00	3.74	0.42	0.00	3.32	42.99
19	22511.90	17.02	3.83	0.00	0.00	0.00	3.83	0.46	0.00	3.37	46.36
20	22399.34	17.54	3.93	0.00	0.00	0.00	3.93	0.50	0.00	3.42	49.79
	Total		62.84		8.25	2.47	65.3 2	4.73	-9.15	49.79	419.62

Cummulative savings (INR lakhs)	419.62
Net present worth (INR lakhs)	₹ 18.36

Internal Rate of Return	
(IRR)	83%
ВСМ	4.2

