Post-Harvest component

Section-1: Value addition

Section-2 : Onion storage structure

Objective

The objective is to reduce postharvest losses of selected agriculture produce through appropriate technological interventions such as appropriate storage structures and increase farmers' financial returns through value addition route which includes primary and secondary processing

Specific Objectives:

K. Technology Intervention to reduce post-harvest losses of onions

L. Technology Intervention for value addition of agricultural produce via processing

M. Commissioning of the storage project

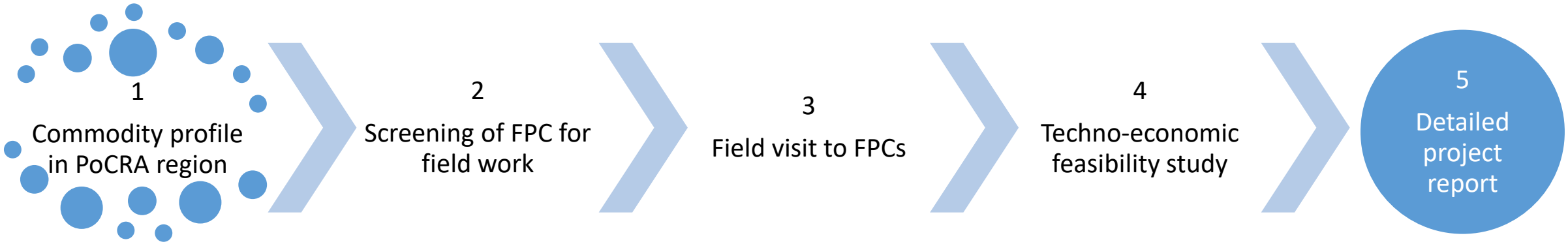
Section-1 : Value Addition

Phase III Deliverables: Value addition

- A detailed project report in regard to value addition of agriculture produce via new processes & products.

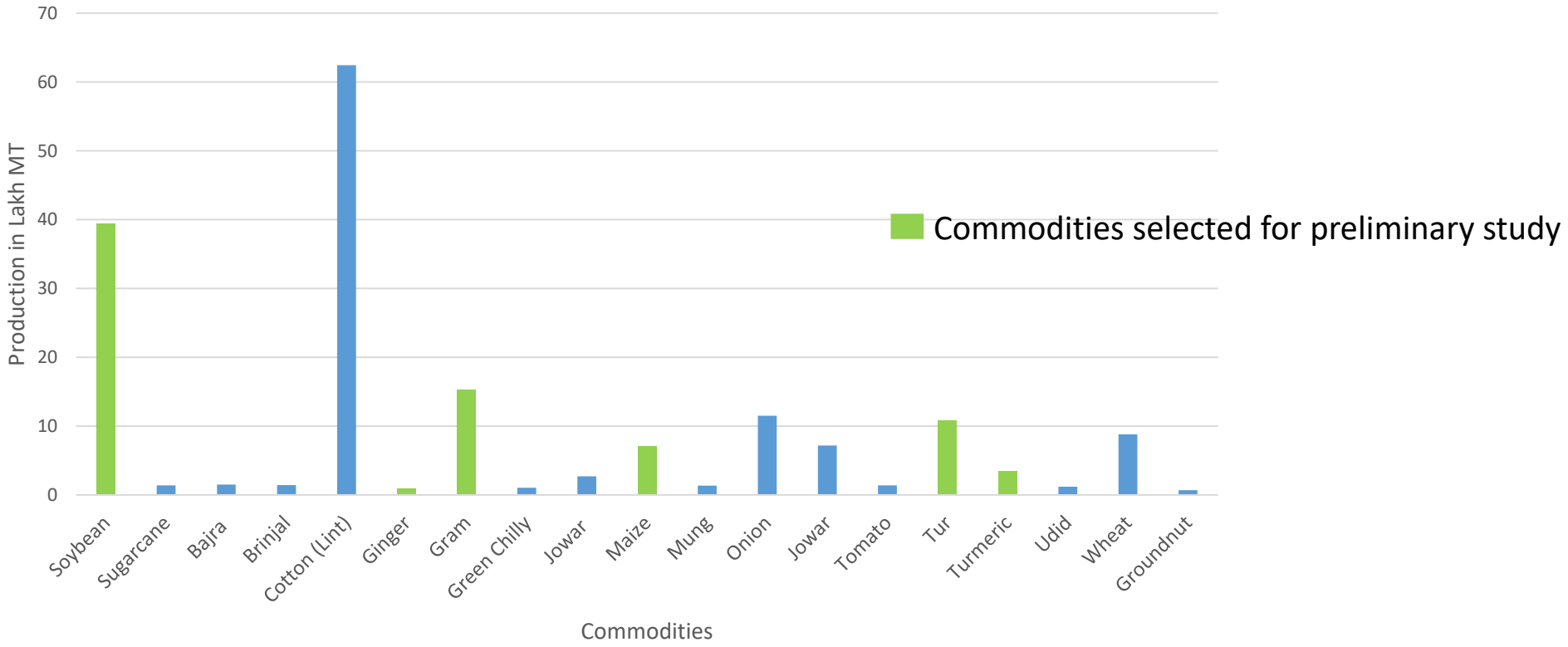
- Note on mapping of commodities for the assessment of the production, marketing, financial and personal attributes that should be considered for a new venture

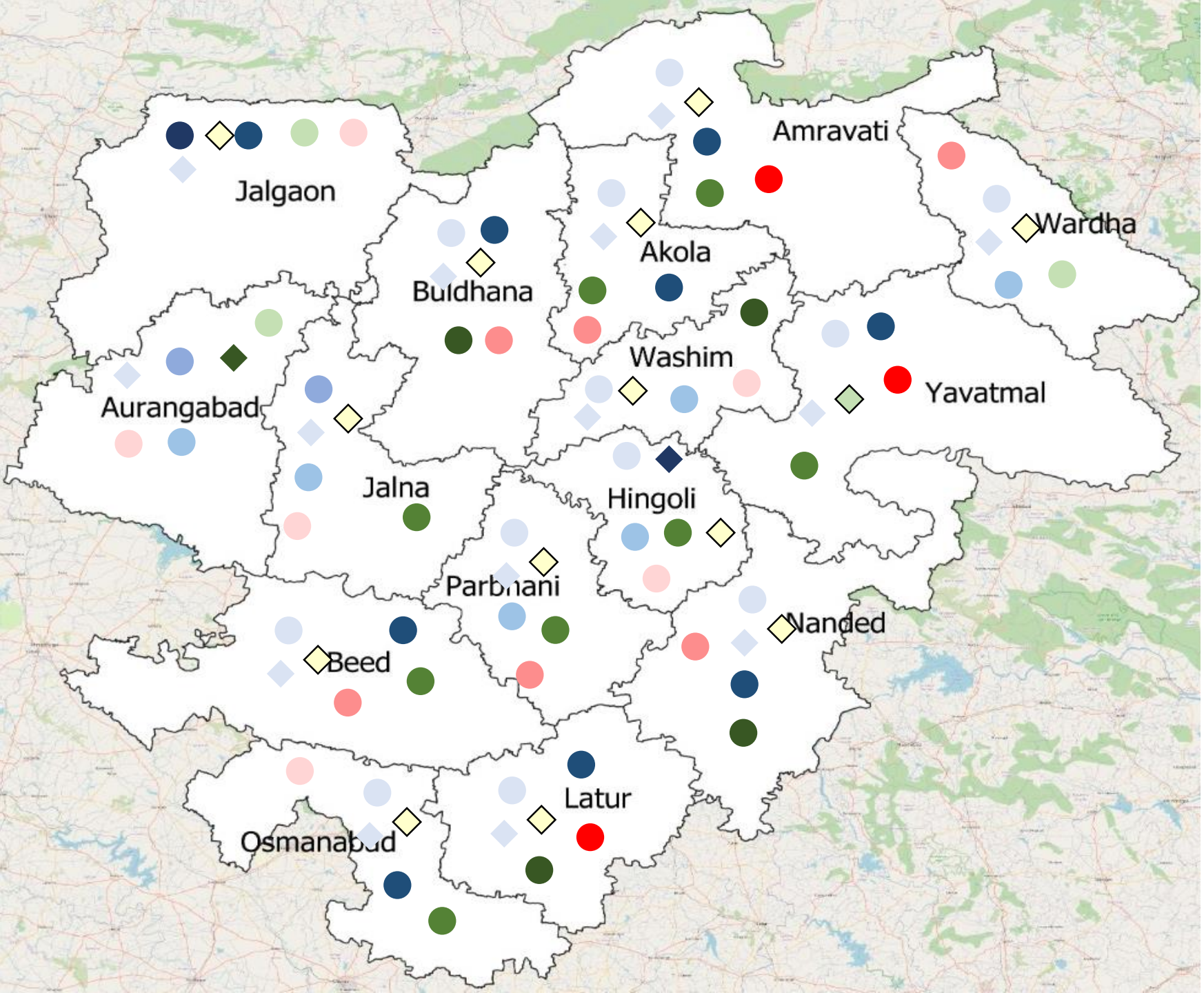
Methodology



1. Crops in PoCRA region

- PoCRA region produces variety of grains, oilseeds, spices, vegetables and fruits
- 60+ commodities with average total production of 1 Lakh MT
- Top 20 commodities with average production in PoCRA region is below

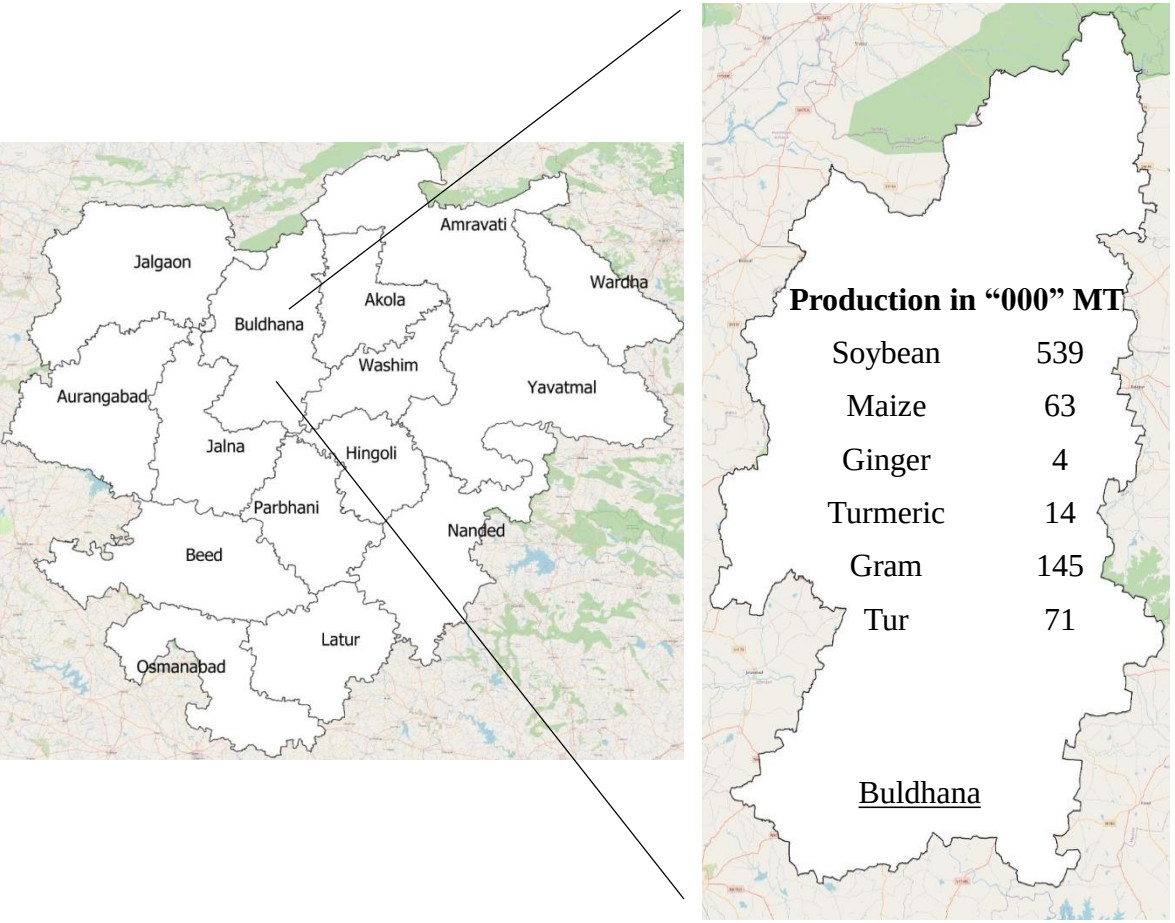




1.1 District-wise quantum of select commodities

	Production in Lakh MT		
Crops	**Cat-1**	**Cat-2**	**Cat-3**
Soybean	>348	174-348	<174
Maize	>188	94-188	<94
Turmeric	>128	64-128	<64
Gram	>86	43-86	<43
Tur	>108	54-108	<54
Ginger	>44	22-44	<22

1.2 Potential of value added products in Buldhana based on production

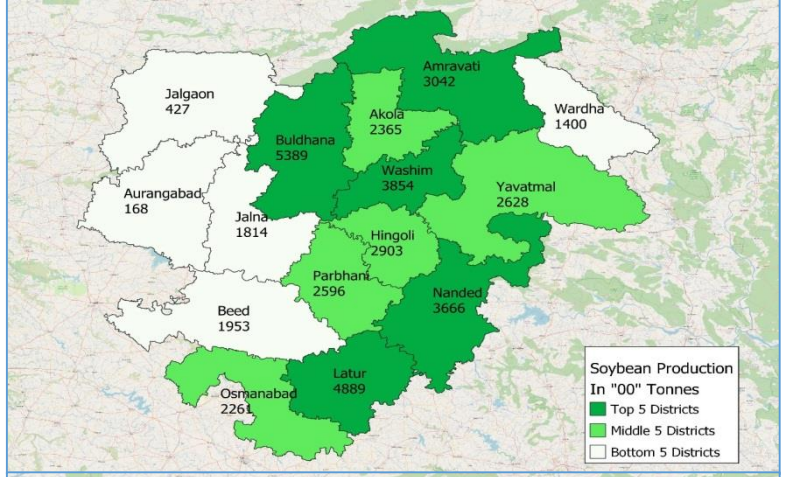


Commodity	Potential value added products	Remarks (wrt to quantum of input/raw material)
Soybean	Soy oil	Viability -Solvent extraction -30000 MT/annum and Mechanical Extraction > 4000 MT/annum
	Soy oil cake	By product of soy oil processing.
	Soybean protein	General viability >500 MT/annum
	Protein isolate	General viability >500 MT/annum
	Soybean atta	Feasible even at small scale (~10 MT/annum)
	Soy milk	Small to medium scale enterprise (>20MT/annum), perishable
	Soy tofu	Small to medium scale enterprise (>20MT/annum), perishable
	Poultry feed	General viability > 10000 MT
	Soya snacks (namkeen, sticks, chunks)	General viability >100 MT/annum
Maize	Corn flour	General viability > 400 MT/annum
	Corn flakes	Cereal and namkeen. General viability > 400 MT/annum
	Corn starch	General viability >1000 MT/annum ,Residue could go as poultry feed
	Glucose	Economics of scale is critical
	Protein rich poultry feed	General viability > 3000000 MT/annum
	Pop corn	Based on variety, General variability to be estimated
	Corn snacks	Chips and extruded snacks markets are upcoming. General variability to be estimated
	Silage	General variability to be estimated
Ginger	Dried ginger powder (Sunth)	Feasible even at small scale
	Ginger oil	Feasible even at small scale
	Pickle	Unsure of market
Turmeric	Turmeric powder	Depends on the curcumin content, Feasible even at small scale
	Curcumin extraction	Residue is starch, Feasible even at small scale
	Essential oil extraction	Feasible even at small scale
Gram	Dal mill	Feasible even at small scale
	Dal mixture/snacks	Feasible even at small scale
	Protein (Depending on quality)	General variability to be estimated
	Besan	Feasible even at small scale
Tur	Dal mil	Better value for unpolished dal

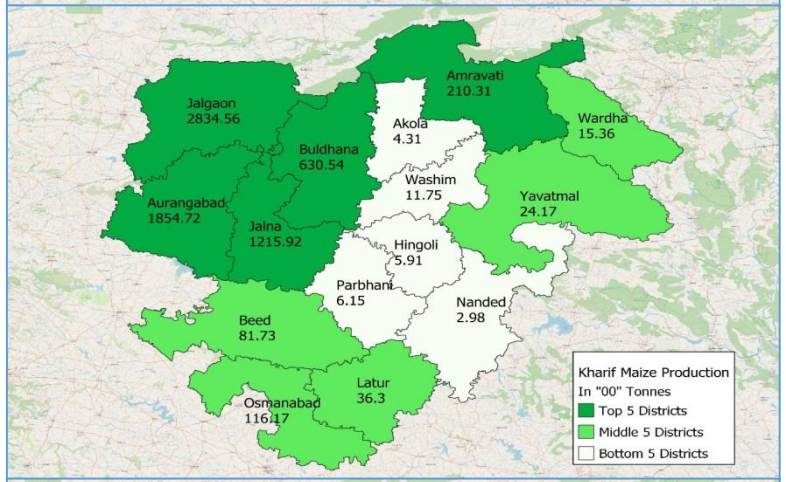
2. Screening of FPC for field work

Objective : To select FPCs for primary data collection

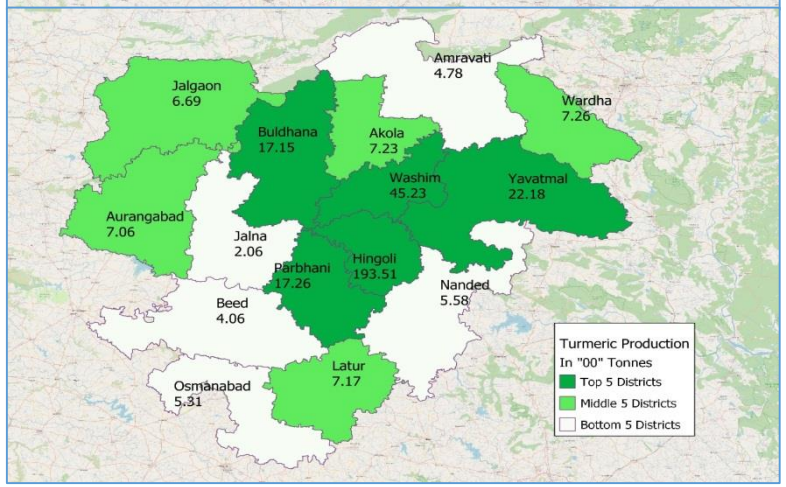
- Criteria for selecting districts
  - Top 3 districts in production of Soybean, Maize and Turmeric
- Criteria for selecting FPC:
  - Age of FPC : FPCs operating for more than one years
  - Principal crops : considering feasibility of value addition
  - Number of stakeholders : below 10 were screened out
  - Ratings given by PMU
- A list of 1451 FPCs was received from PMU from which 77 FPCs were selected for field work



Soybean

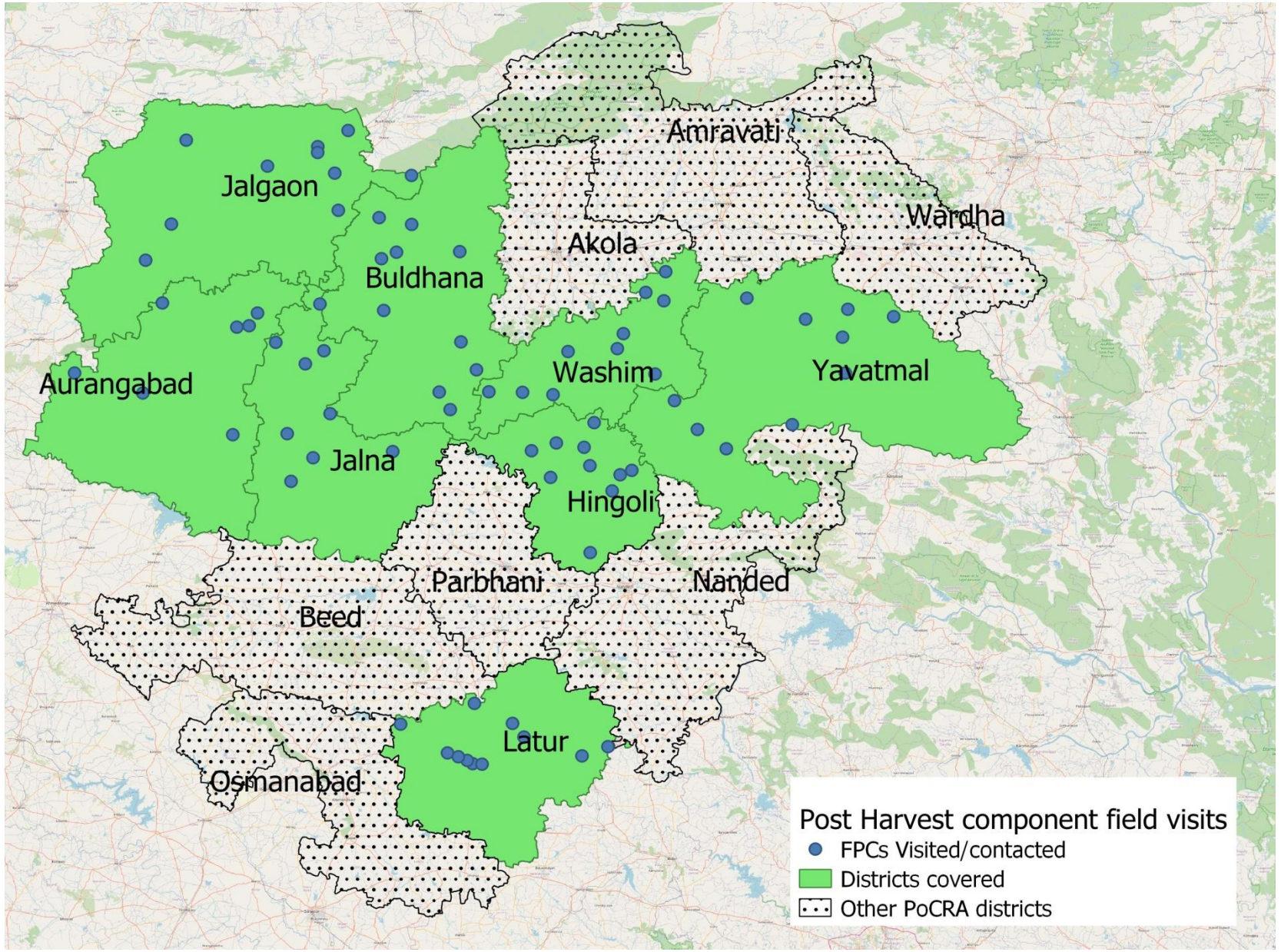


Maize



Turmeric

2.1 Location of selected FPCs



3. Field visits to FPC:

•Objective :

Primary data collection for the following information and to understand the status of ongoing activities of FPCs

i) Number of commodities

ii) Quantum

iii) Existing practices

iv) Willingness for value addition

(a)

(b)

(c)

(d)

Photos:

a) Steam distillation unit at Nardus FPC, Washim
b) Grading machine at Krushi Mauli FPC, Washim
c) Cleaning grading unit at Jai Siddheshwar FPC, A'bad
d) Seed processing and Warehouse at Sonpaul, Buldana

3.1 Field visits observations

- Cleaning, grading and packaging was the most popular processing activity in case of soybean and maize
- Many FPCs were NAFED agents (1% commission)
- Generally, trading of grain provided a profit of around 2%
- In case of soybean, seed processing was popular and generated a profit around 15%
- However, seed processing of soybean had a rejection rate around 30-40% while were then traded as grain
- FPCs dealing in Turmeric and Ginger were mainly involved in trading. Therefore practices related to processing were not observed during field visit
- In few cases, drying of horticulture produce and essential oil extraction was observed

<u>Challenges:</u>

- The accuracy of primary data was based on respondent's heuristics
- The respondents expected that we would provide them with immediate solutions or grant approvals
- Contact details were often inaccurate, especially in Washim district
- Hurdles such as ST strike and omicron reduced field mobility

4. Techno- economic feasibility study

Objective :
To check technical feasibility and financial viability considering cost-benefit analysis and break-even analysis, market viability of select products derived from Soybean, maize and turmeric

5. Components of DPR

- Market demand and Potential of each product
- Process flow diagram
- Plant Layout
- Financial analysis
- Sensitivity analysis
- Conjoint analysis
- Monte-carlo simulation (Uncertainty analysis)
- SWOT analysis
- Details of forward and backward linkages
- Food safety standards

Proposed value added products for PoCRA region

1. Poultry feed

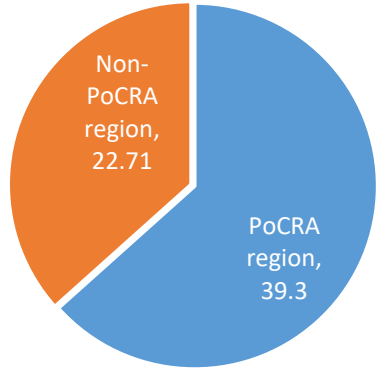
2. Soy Milk and Tofu

3. Turmeric powder and
4. Curcumin powder

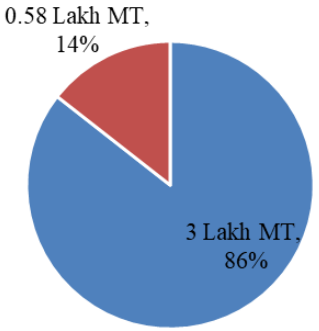
The choice of value added products are based on:

- Quantum of production of main raw material
  - Soybean (39 lakh MT), Maize (7 lakh MT) and Turmeric (3.4 Lakh MT) are in the Top 10 produced commodities in PoCRA region
- Scope of value addition
  - Depends on viability and investment in processing
- Established markets and demand
  - Current demand for poultry feed is 25 million MT and will grow at 18% in near term[1]
  - Global consumption of soy milk is increasing at 20%[2]
  - Turmeric powder is important spice in Indian cuisines and curcumin has high demand in pharmaceuticals.

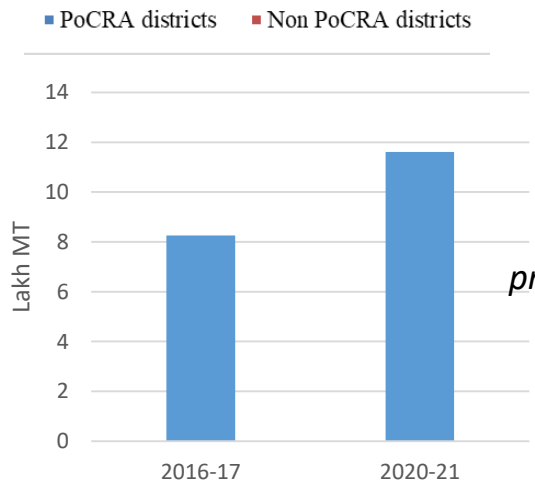
1- 19th Livestock Census by Department of Animal Husbandry
2- https://www.fortunebusinessinsights.com/soy-milk-market-102475



Soybean Production (Lakh MT in Maharashtra



Turmeric Production (Lakh MT) in Maharashtra

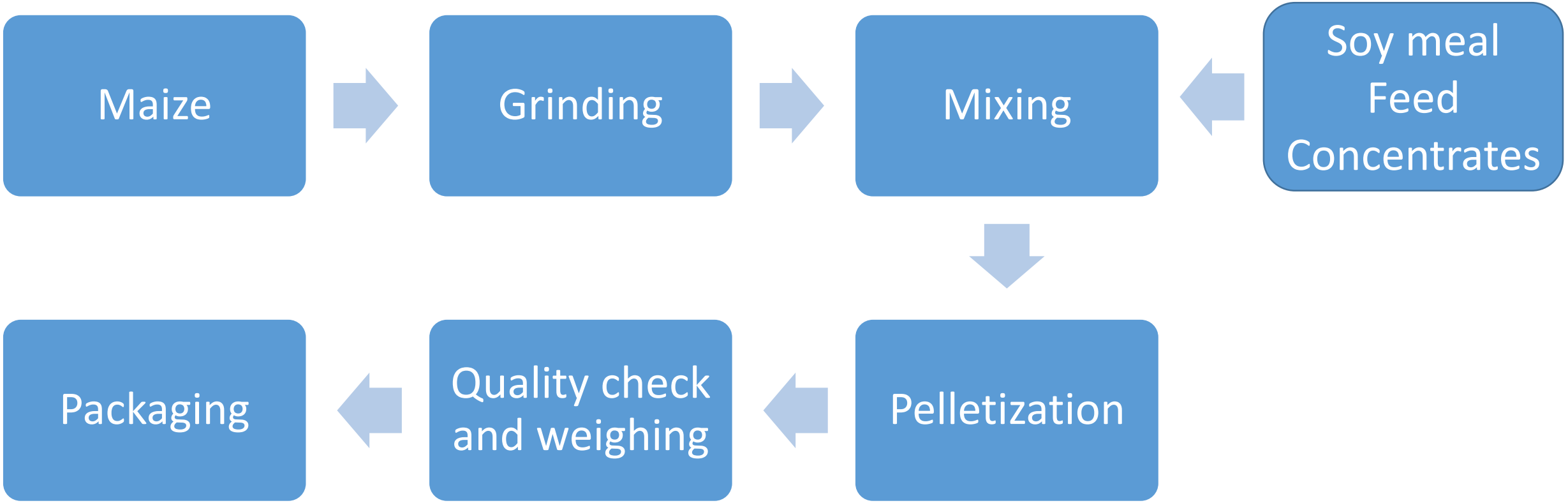


Growth in Maize production in PoCRA region

1. Poultry feed unit

- Main raw materials are maize and soybean
  - Maize production in PoCRA region is about 7 lakh tons
  - Soybean production in PoCRA region is about 39 Lakh tons
- The current demand for poultry feed in India is ~25 million tons
- The demand is expected to grow by 18 percent in near term
- Composition of the feed:
  - maize, soymeal, molasses and other minerals
  - Two compositions were explored : maize-soymeal : (65%-23% & 55%-33%)
- Production process involves :
  - Grinding, mixing, conditioning, pelletization, cooling and packaging
- The proposed project will offer flexibility to produce
  - Prestarter feed
  - Crumbs (started feed)
  - Pellet Feed (Finisher feed)

1.1 Process flow diagram of poultry feed pellet production



1.2 Financial analysis of Poultry feed unit (1 TPH)

Assumptions

Time parameters	Value	Financing parameters	Value
Analysis year	2022	Equity and loan	25% and 75%
Project life	15	Depreciation method	Straight line
Construction period (months)	12	Depreciation period	10 years
Start up period (Months)	1	Income tax	35%
Operating parameters		Discount rate (%)	10
Annual operating time (days)	300	Construction plan	Value
Start up cost (% DFC)	5	1st year (% DFC)	75
Salvage Value (%DFC)	5	2nd year (% DFC)	25

DFC- Direct fixed cost.
(Direct cost + Indirect cost + contingency)

Summary of Raw material cost (Composition-1)

Bulk Material	Unit Cost (INR)	Annual Amount	Annual Cost (INR)		%
Fines	18.00	74,412	kg	1,339,416	1.01
Maize	18.00	2,715,444	kg	48,877,992	36.99
mixture	50.00	576,000	kg	28,800,000	21.79
soy meal	50.00	1,060,301	kg	53,015,040	40.12
Water	120.00	995	MT	119,367	0.09
TOTAL				132,151,815	100.00

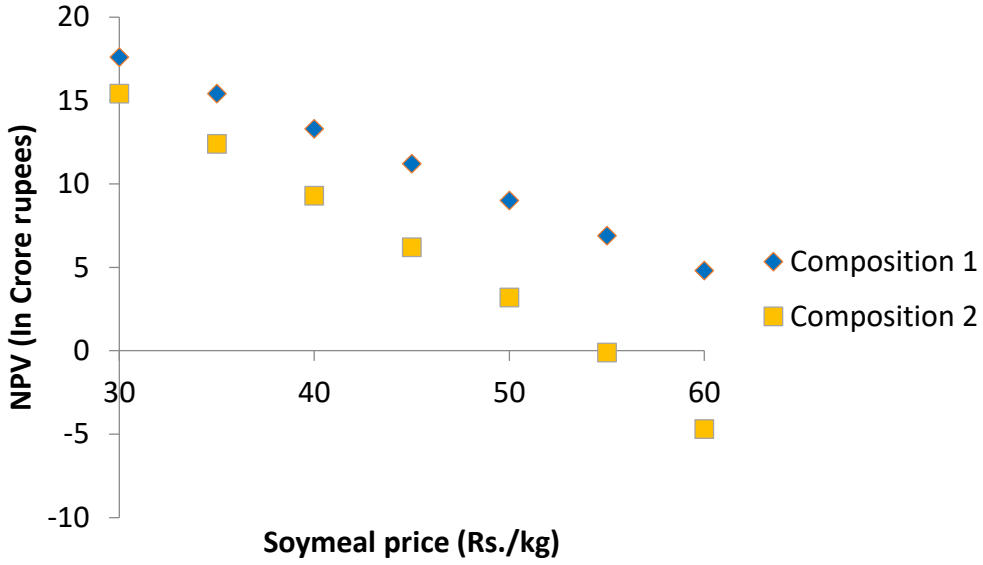
Feed compositions

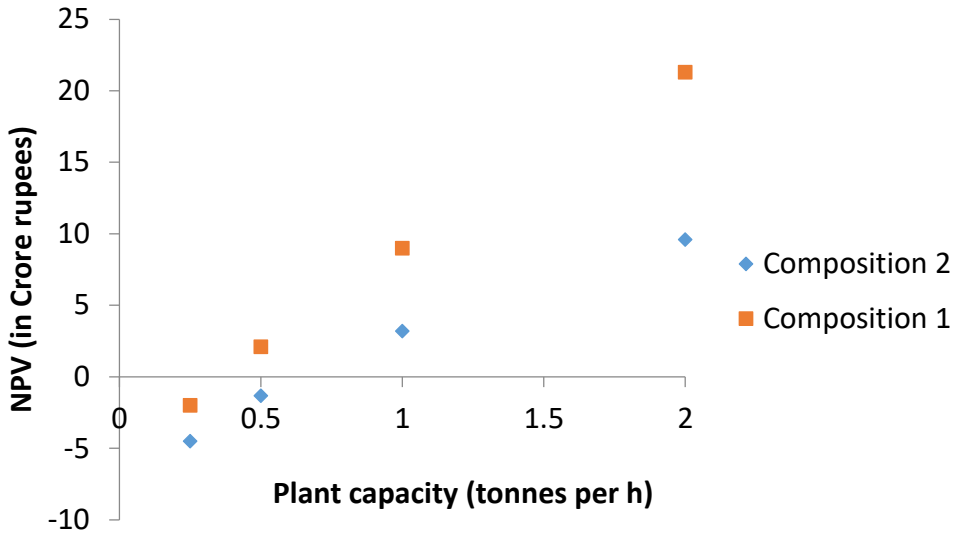
S.No	Ingredients	Composition-1 (%)	Composition -2 (%)
1	Maize	65	55
2	Soya meal	23	33
3	Dicalcium phophate	1	1
4	Meat bone meal	2	2
5	Mustard DOC	2.35	2.35
6	Soybean Oil	1	1
7	Mineral and Vit. mixture	0.2	0.2
8	Methionin + Tryptophane	0.3	0.3
9	Lysine	0.15	0.15
10	Rice bran deoiled	3	3
11	Molasses	1	1
12	limestone	1	1

Summary of project economics

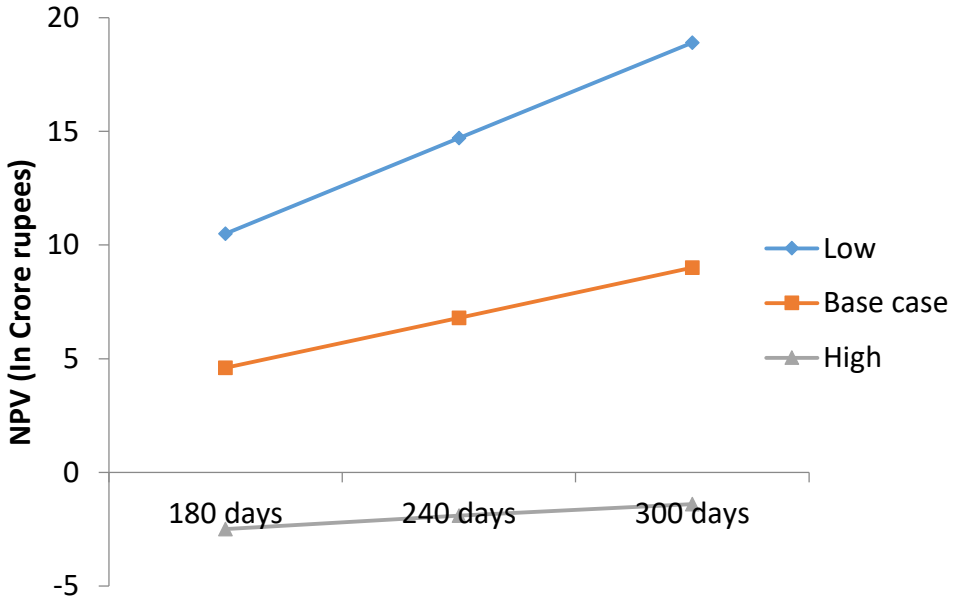
	Composition 1	Composition 2
Total Capital Investment (INR)	28,911,000	30,388,000
Annual operating cost (INR)	145,104,000	160,491,000
Net Unit Production cost (INR/kg)	29.67	32.66
Product Selling price		
Pellets (INR/kg)	35	35
Net Profit		
Pellets (INR/year)	16,940,000	7,460,000
IRR % (after taxes)	140.1	41.9
Payback period (years)	1.7	4.1
BCR	3.14	1.05

Sensitivity analysis





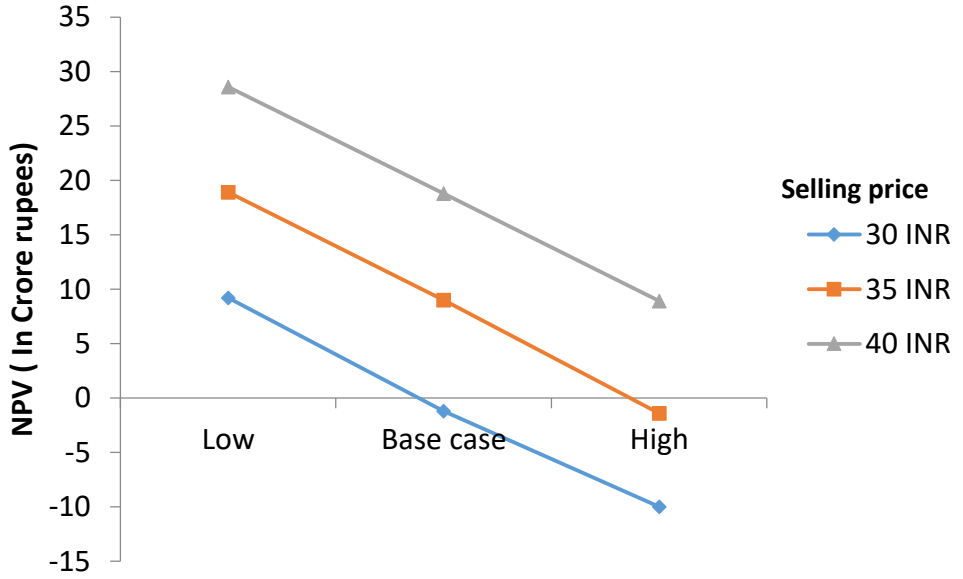
Conjoint analysis



Low price: Maize- Rs. 15/kg, Soymeal - Rs. 40/kg and Feed mixture - Rs.40/kg

Base case Scenario: Maize- Rs. 18/kg, Soymeal - Rs. 50/kg and Feed mixture - Rs.50/kg

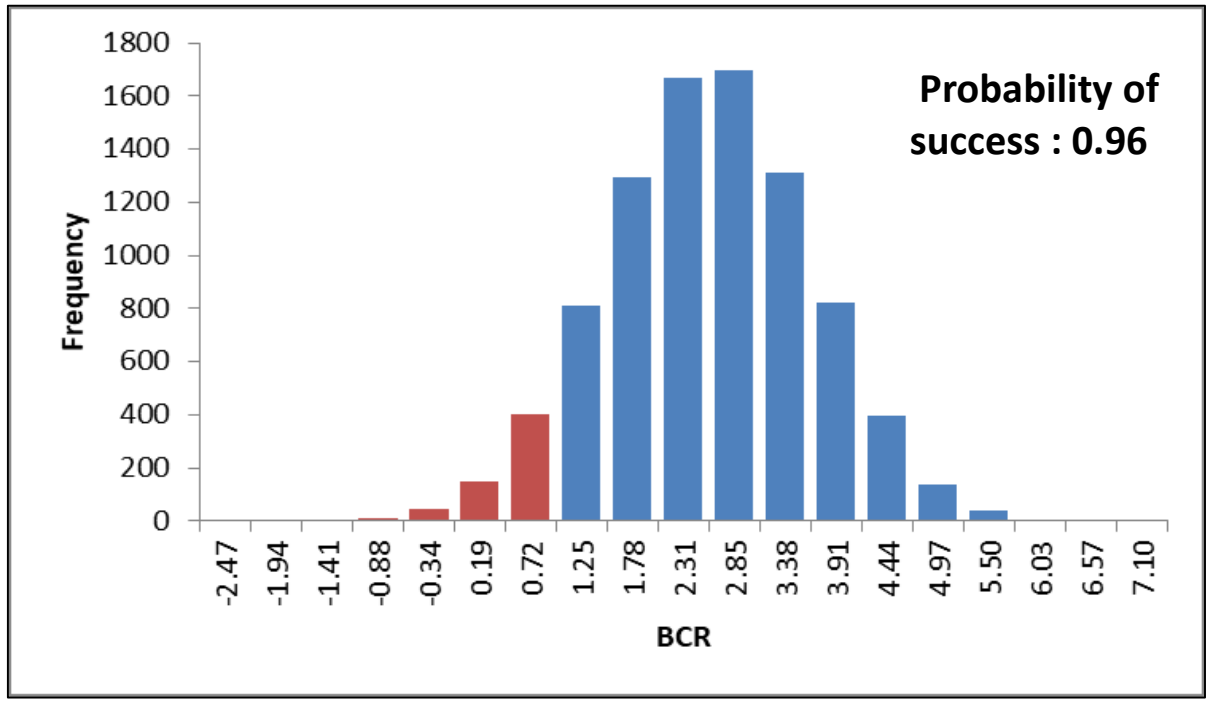
High price: Maize- Rs. 21/kg, Soymeal - Rs. 60/kg and Feed mixture - Rs.60/kg



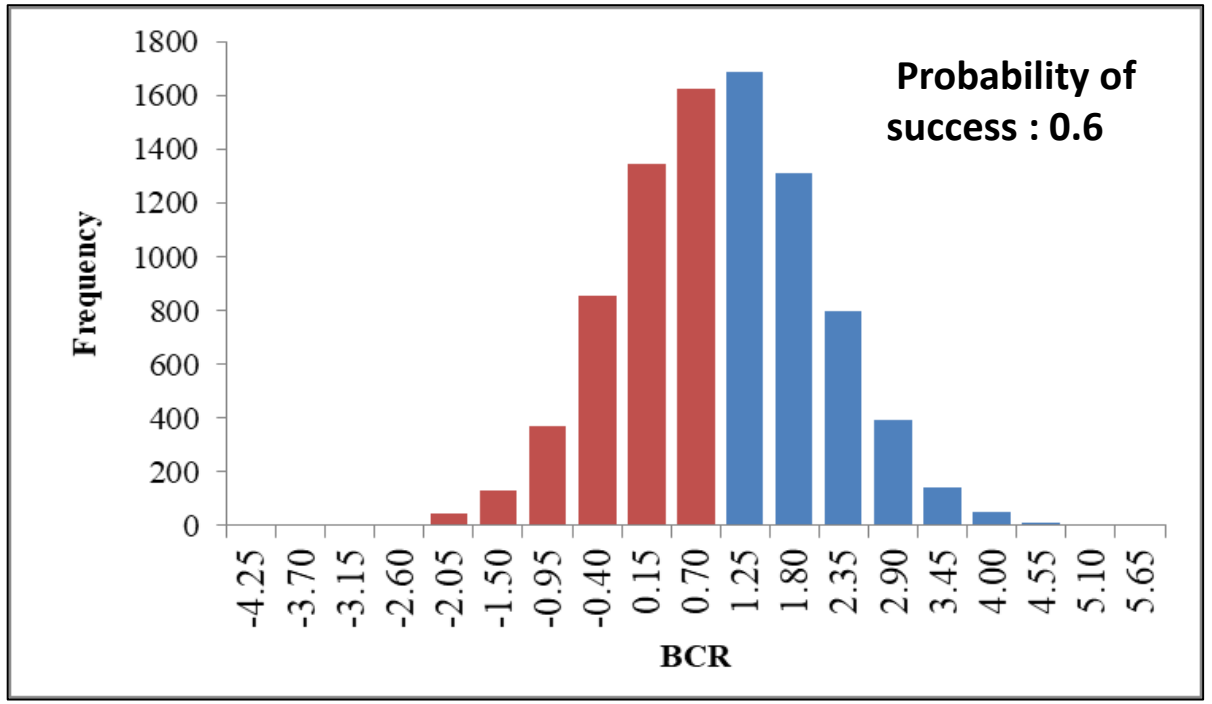
Monte Carlo Simulation for poultry feed unit

	Min	Max	Mode	Average
Input				
Maize price	18	22	18	20
Soymeal price	40	60	50	50
Mixture price	45	55	45	50
Fines	18	21	18	19.5
Output				
Pellet price	30	40	40	35

Composition 1



Composition 2

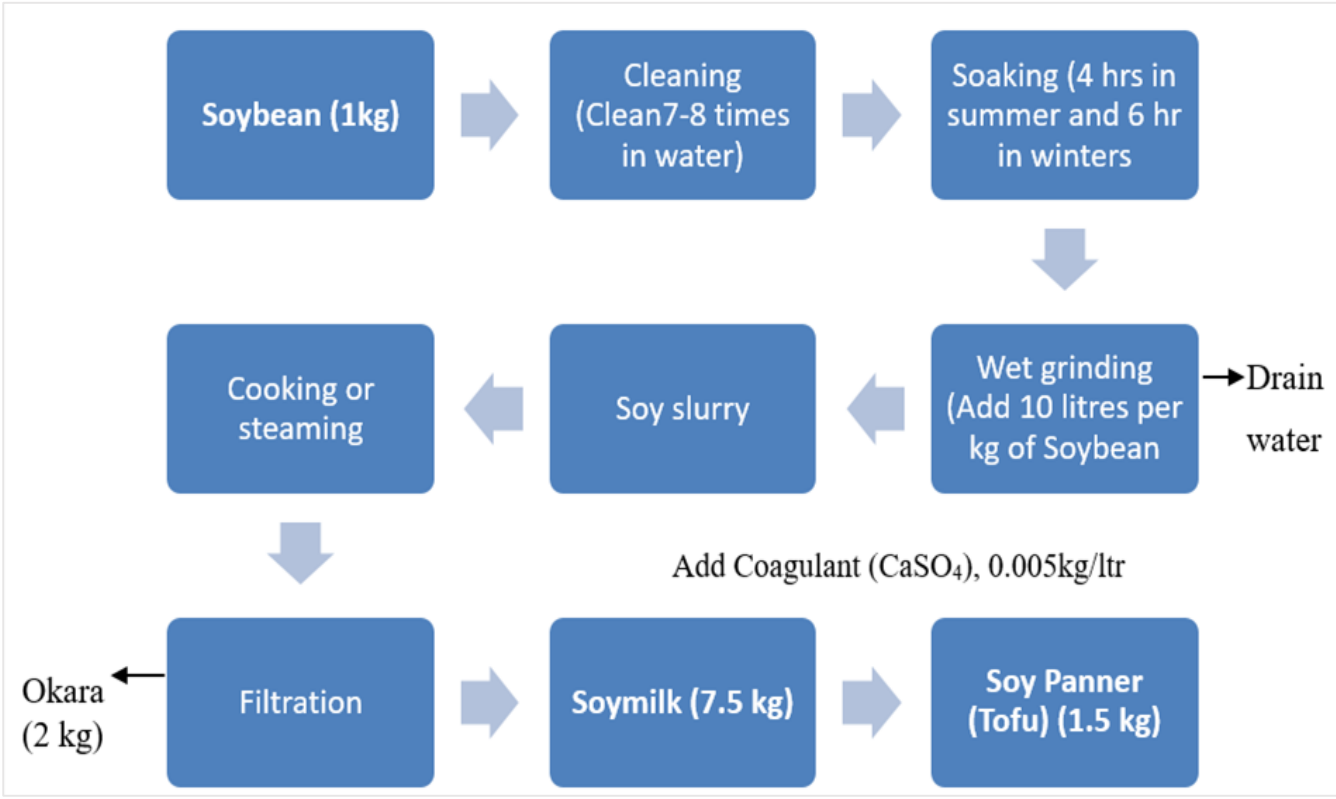


1.3 Summary of financial analysis of poultry feed unit

- IRR is significant (140%- Comp.1 and 40%- Comp.2)
- For BCR>1, MSP should be >Rs30/kg
- Probability of success is 96% in composition-1

2. Soy milk and Tofu

- Globally, the consumption of soy milk is increasing at a rate of 20.8%
- Prepared by soaking and crushing soybeans in water to produce a creamy, milk-like beverage.
- Soy milk is economical, protein rich, lactose-free and highly digestible
- Consumed as such or after sweetening and diluting, alternatively, it can be made into yogurt (curd) or tofu (paneer)



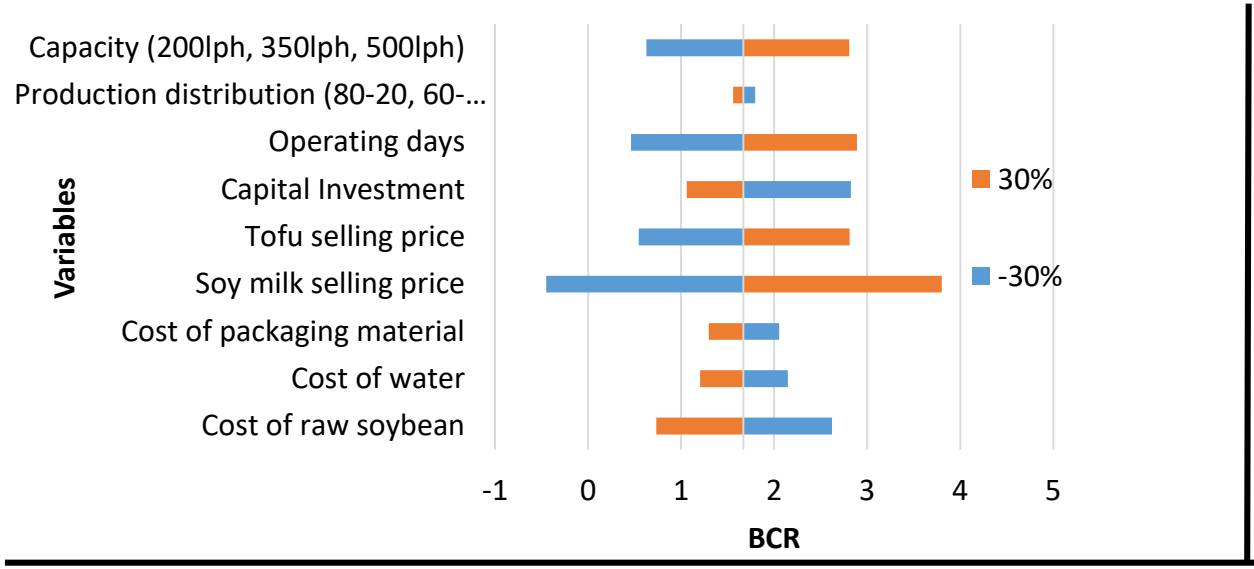
2.1 Financial Analysis

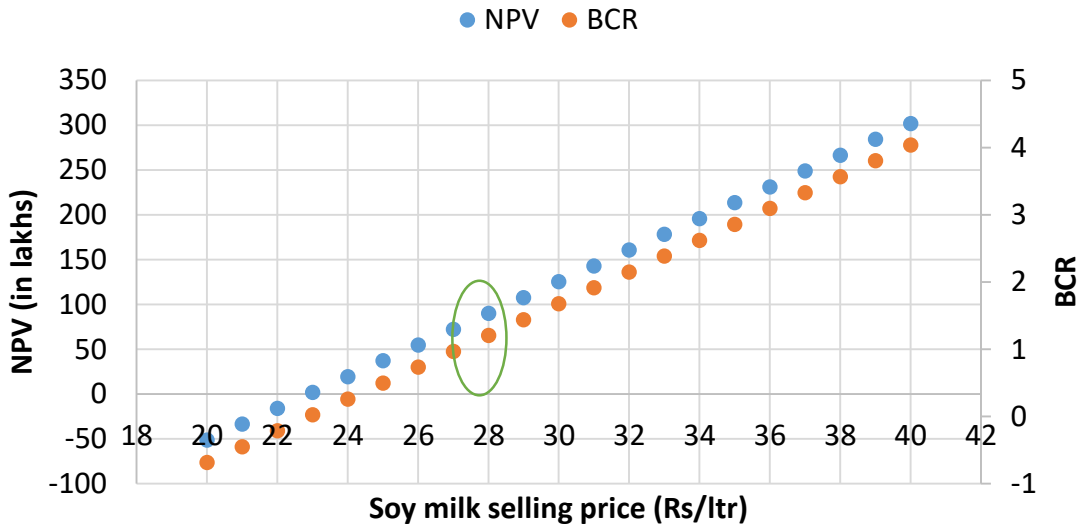
A. Machine Capacity	In litre/hour	350
Operating days		200
B. Total Capital Investment		7,472,858

C. Annual Expenses				**Details**	**Rupees**
C.1	*Interest on Loan@ 10%pa*			Considering 40% of capital cost is loaned by FPC	298,914
C.2	*Manpower Cost 3 Workers @ 10000/- per month*			400000/- marketing expenditure per annum	760,000
C.3	C.3.1	Raw soybean		60 Rs/kg	4480,000
	C.3.2	Coagulant ($CaSo_4$)		25 Rs/kg	70,000
	C.3.3	Packaging material			
		C.3.3.1	Milk packing material	Tetra pack (200 ml) - 5 Rs/unit	1,678,320
		C.3.3.2	Tofu packing material	250 gram pieces - 2.5 Rs/unit	111,888
C.4	*Power Consumption*				
	C.4.1	Unit consumed per annum			107,461
	C.4.2	Cost of Electricity @ Rs. 10/kWh		Industrial power supply-10Rs/kWhr	1,074,610
C.5	*Cost of Water*			RO water - 0.4 /litre	2,240,000
C.6	*Maintenance*				20,000
C.7	*Fuel-LPG*			900 Rs/cylinder	44,053
C.8	*Contingency*			5% of total fixed cost	373,643
C.9	*Depreciation*				
	C.9.1	Depreciation on Furniture		at 10%	5,000
	C.9.2	Depreciation on Machines		at 10%	74,911
	C.9.3	Depreciation on Civil work		at 10%	300,000
C.10	Total Annual Expenses (C1:C9)				11,531,340

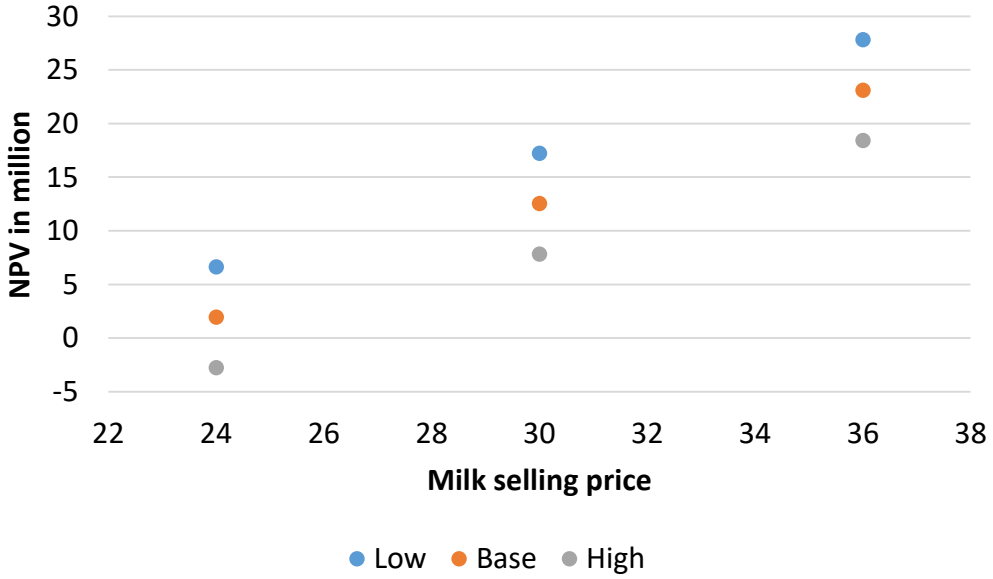
D. Total production per annum		**Distribution of production**	**Rupees**
D.1	*Soy milk (Plain)*	60% of total production	336,000
D.2	*Soy Tofu*	40% of total production	44,800
E. Cost of production			
E.1	*Soy milk (Plain)*	**Rs/ltr**	20.59
E.2	*Soy Tofu*	**Rs/kg**	102.96
F. Annual Income (Full capacity)			
F.1	*Soy Milk (Plain)*	Soy milk selling price -30 Rs/ltr	10,080,000
F.2	*Soy Tofu*	Soy Tofu selling price -120 Rs/ltr	5,376,000
F.3	*Total income*		15,456,000
G. Economic Indices		Plant life : 10 years. Capacity Utilization : Year 1- 50% , Year 2 – 65%, Year 3 – 80%, Year 4 onwards 100%	
G.1	*Net present value (NPV)*	In Rs.	12,526,666
G.2	*Internal rate of return (IRR)*	%	35.98
G.3	*Benefit to cost ratio (BCR)*		1.676
G.4	*Discounted payback period*	In years	3.136

Sensitivity analysis



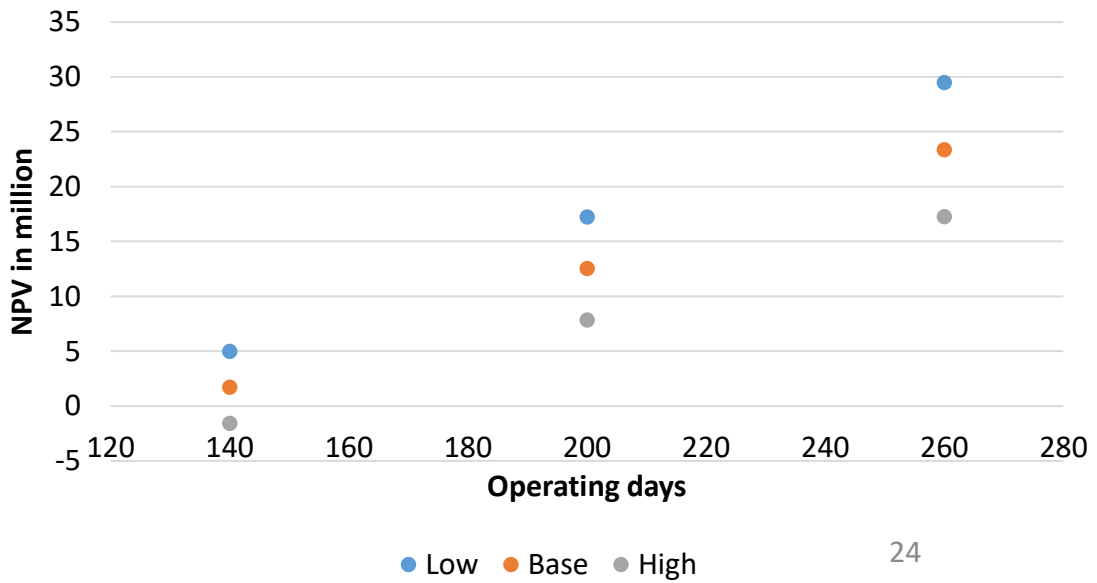


Conjoint analysis



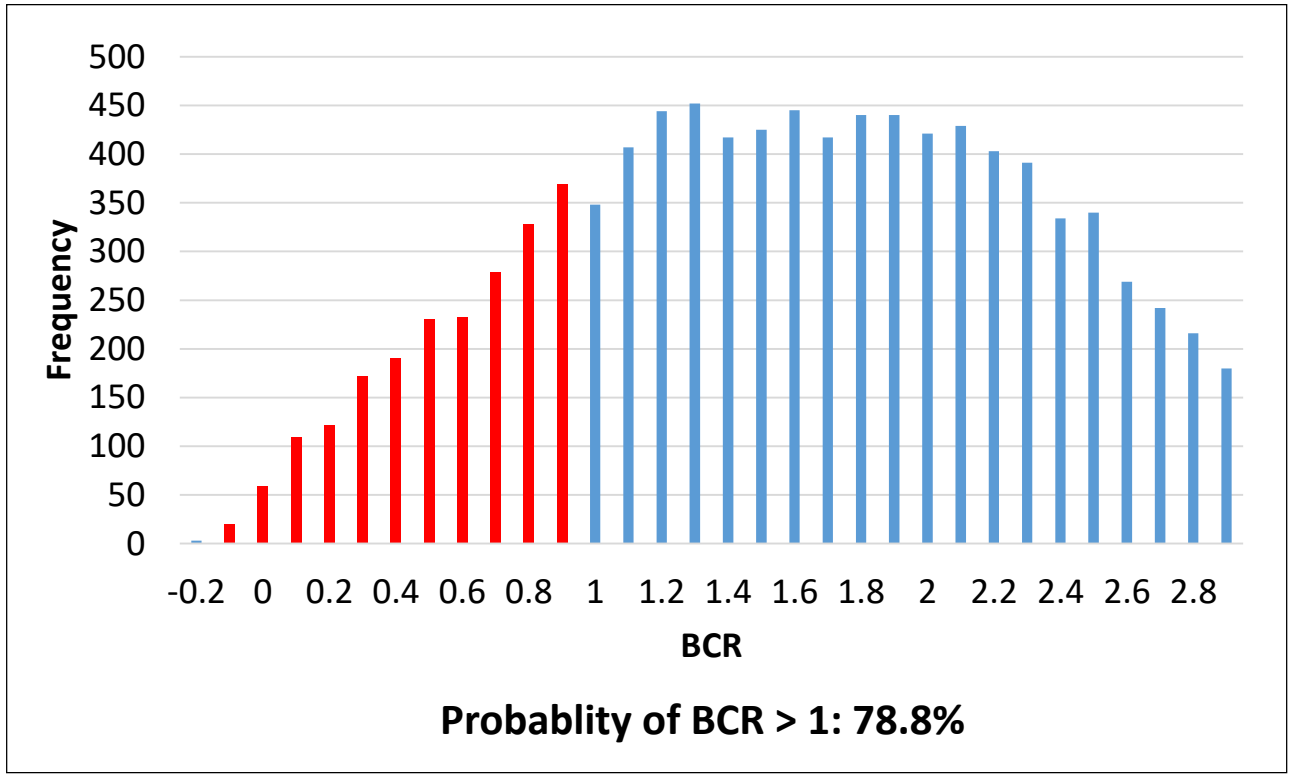
Raw soybean price

Low – Rs. 48/kg
Baseline – Rs. 60/kg
High - Rs. 72/kg



Monte-Carlo Simulation for Soy milk/Tofu

Parameter	Minimum value (INR)	Maximum value (INR)
Soybean cost (Raw material)	50	70
Soymilk selling price	25	35
Soy tofu selling price	100	140



2.3 Summary of financial analysis of Soy milk/Tofu unit

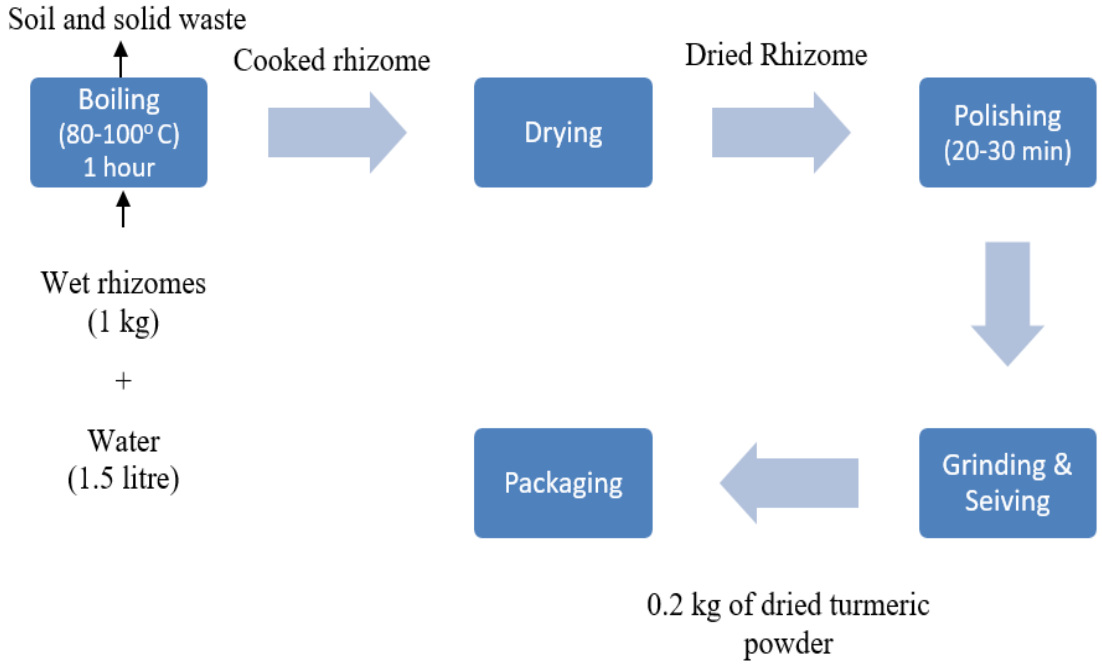
- IRR (36%) and BCR (1.6) suggest project viability at base case scenario
- Soy milk selling price was the most sensitive parameter affecting the plant economics
- A minimum selling price of Rs. 27.15/ltr (Base case – Rs. 30/ltr) was required from BCR>1
- Considering all possible uncertainties of price fluctuations, the probability of success (BCR>1) was 78.8%

3. Turmeric powder

- The production turmeric in PoCRA region has increased significantly in last 5 years from 1.23 lakh metric tons in 2016-17 to 2.71 lakh metric tons in 2020-21

- Important ingredient in Indian cuisines and has evergreen market

- Availability of fresh (wet) rhizome is limited to 3-4 months



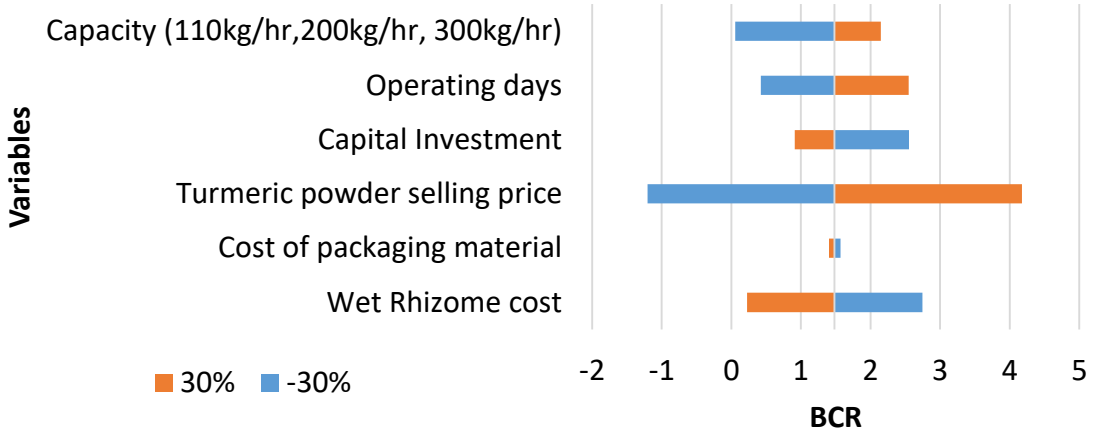
3. 1 Turmeric powder : financial analysis

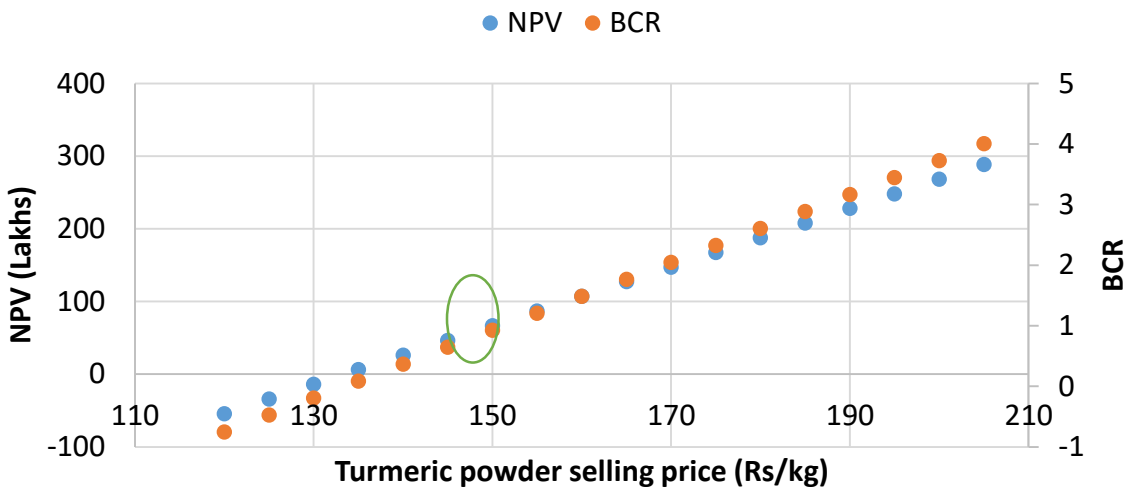
A. Plant capacity per annum (MT)	384
Operating days and shift (8 hrs)	120 and 2
B. Total Capital Investment	7,199,204

C. Annual Expenses			**Details**	**Rupees**
C.1	*Interest on Loan@ 10%pa*		Considering x% of capital cost is loaned by FPC	287,968
C.2	Salaries			247,000
	C.2.1	Manpower cost	3 per shift- Rs.8000/month, 1 manager-Rs.15000/month	207,000
	C.2.2	Marketing cost	40000 per annum	40,000
C.3	*Raw Material cost*			
	C.3.1	Raw Turmeric cost		5,760,000
	C.3.2	Packaging material	1/- per kg of produce	384,000
C.4	*Power Consumption*			
	C.4.1	Unit consumed per annum		100,363
	C.4.2	Cost of Electricity	Rs. 10/kWhr	1,003,635
C.5	*Cost of water*		1 kg rhizome = 1.5 litre water, Plain water at Rs. 0.12/litre	69,120
C.6	*Maintenance*			30,000
C.7	*Contingency*		5% of total fixed cost	359,960
C.8	*Depreciation*			
	C.8.1	Depreciation on Furniture	at 10%	5,000
	C.8.2	Depreciation on Machines	at 10%	422,044
	C.8.3	Depreciation on Civil work	at 10%	125,000
C.9	*Total Annual Expenses (C.1 : C.8)*			8,693,727

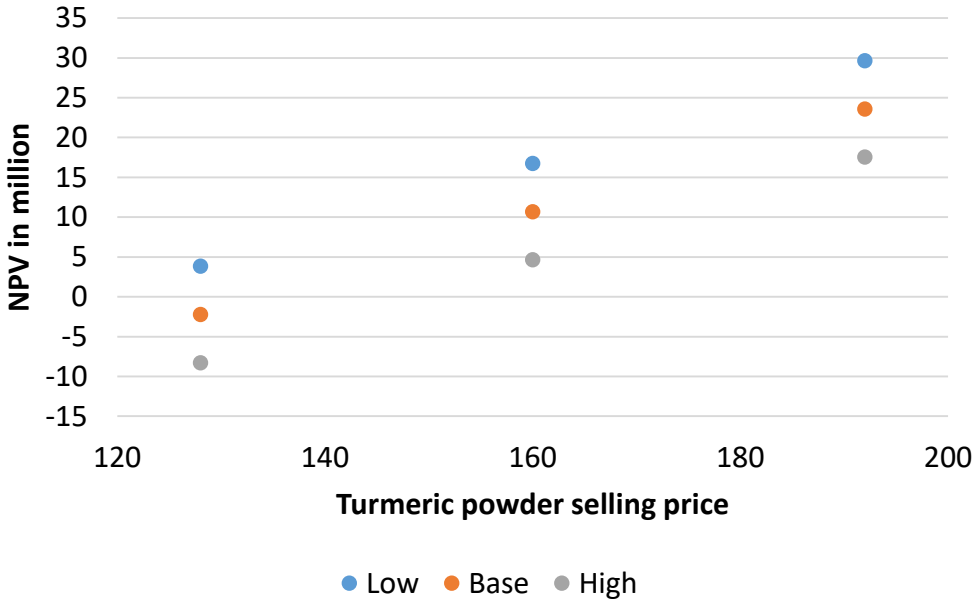
D. Total production per annum		20% recovery from wet rhizomes	76,800
E. Cost of Production		Rs/kg	113.19
F. Annual Income (Full capacity)		Turmeric powder selling price - Rs. 160/kg	12,288,000
G. Economic Indicators		Plant life : 10 years. Capacity Utilization : Year 1- 50% , Year 2 – 65%, Year 3 – 80%, Year 4 onwards 100%	
G.1	*Net present value (NPV)*	In Rs.	₹ 1,07,00,670
G.2	*Internal rate of return (IRR)*	%	33
G.3	*Benefit to cost ratio (BCR)*		1.49
G.4	*Discounted payback period*	In years	3.37

Sensitivity analysis



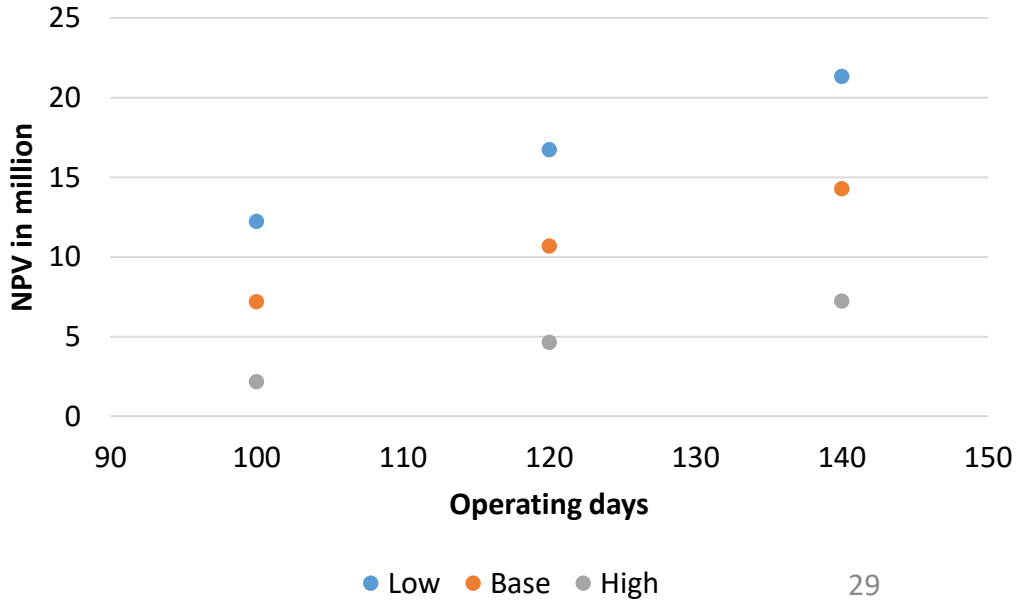


Conjoint analysis



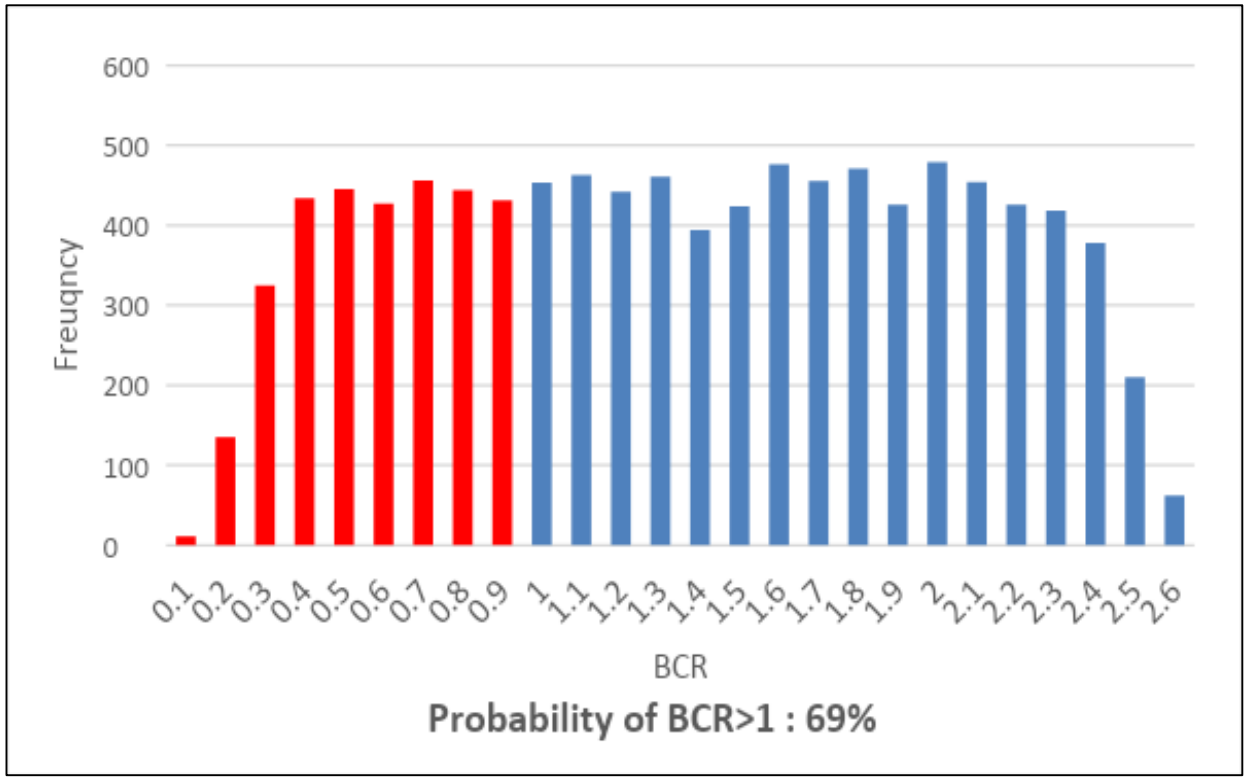
Fresh Rhizome price

Low – Rs. 12/kg
Baseline – Rs. 15/kg
High - Rs. 18/kg



Monte Carlo Simulation for turmeric powder

Parameter	Min	Max
Fresh Rhizome (Raw material)	12	18
Turmeric powder selling price	140	180



Histogram showing Monte Carlo simulation w.r.t to BCR for turmeric powder plant

3.3 Summary of financial analysis of Turmeric powder unit

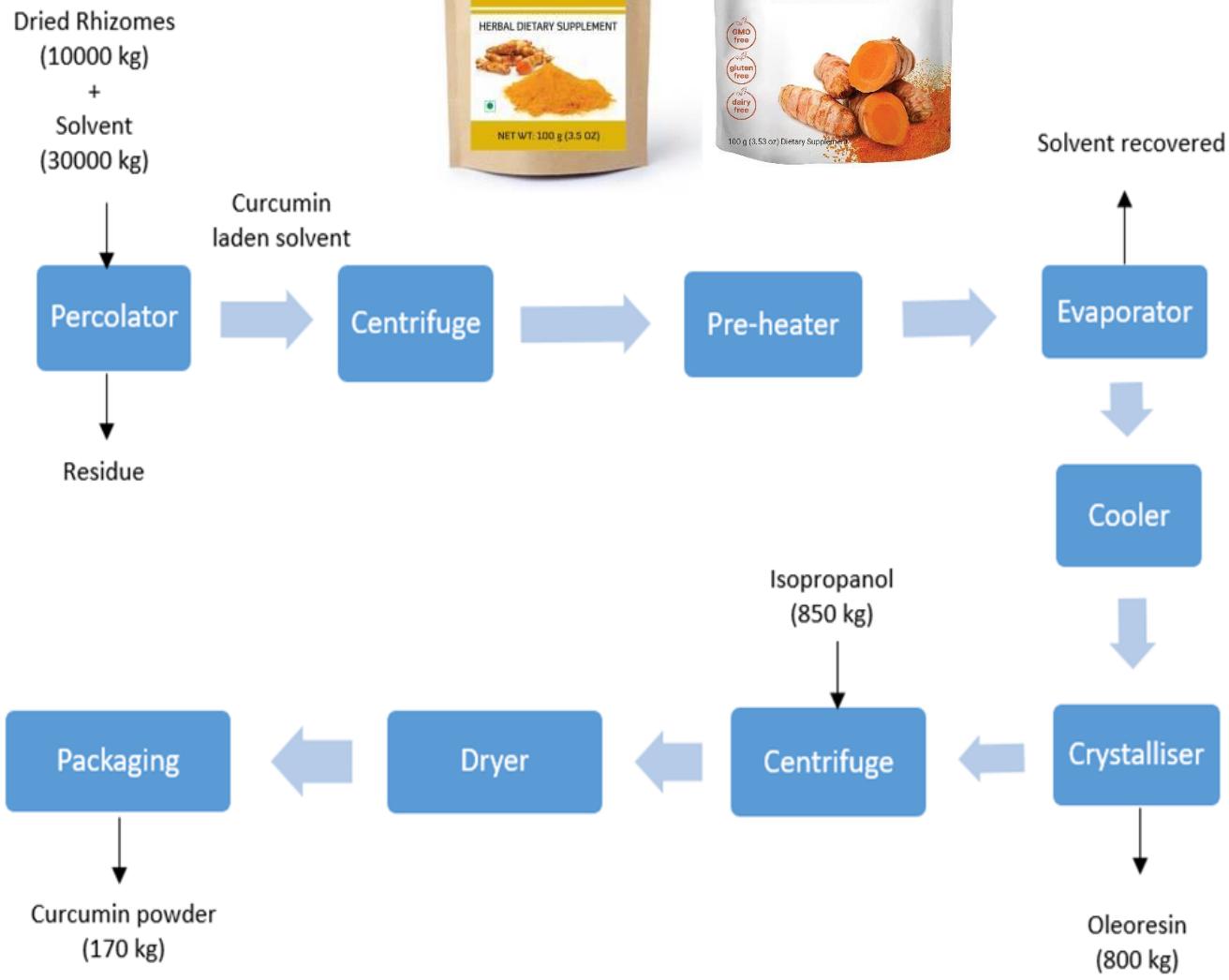
- IRR (33%) and BCR (1.49) suggest project viability at base case scenario
- Turmeric selling price was the most sensitive parameter affecting the plant economics
- A minimum selling price of Rs. 151/kg (Base case – Rs. 160/kg) was required from BCR>1
- Considering all possible uncertainties of price fluctuations, the probability of success (BCR>1) was 69%

4. Curcumin powder

- The worldwide curcumin showcase measure is anticipated to reach USD 99.3 million by 2024 and USD 151.9 million by 2027, growing at a CAGR of 12.7%. *
- Curcumin has anti-inflammatory, anti-oxidative, anti-fungal, and anti-bacterial properties
- Curcumin content depend on variety of turmeric

Species of turmeric in PoCRA region	Approx. curcumin content*
Pratibha	3.5-7.7 %
Selam	2.2-5.9 %
Rajapuri	2.8-4.4 %
Krishna	1.6-3.5 %

*(Grand View Research, Inc., 2021)

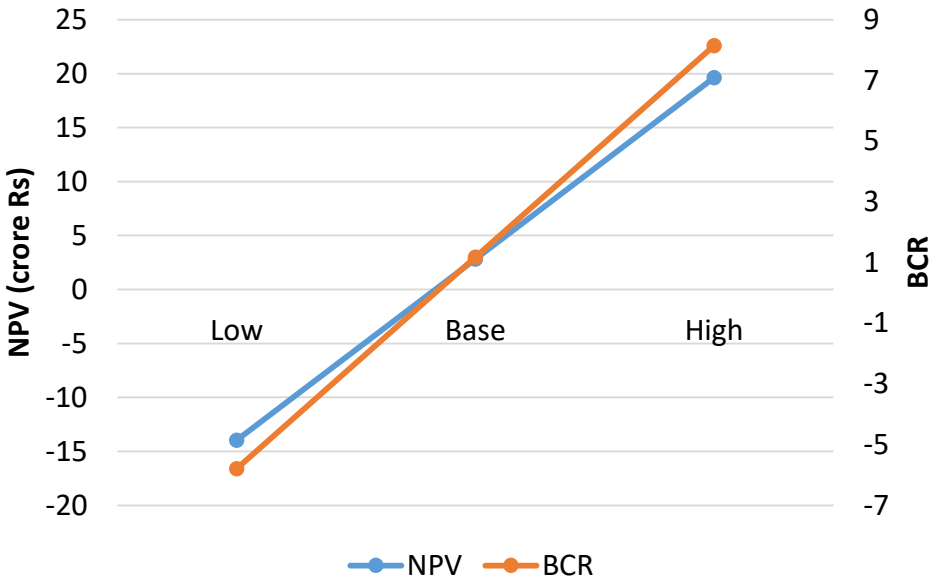


4.1 Curcumin powder : financial analysis

A. Plant capacity per day (MT)		10
A.1	*Number of operating days*	300
B. Total Capital Investment		2,41,05,600

C. Annual Expenses			**Details**	**Rupees**
C.1	*Interest on Loan@ 10%pa*		*40% of capital cost is loaned*	9,64,224
C.2	*Manpower Cost 3 Workers @ 10000/- per month and 1 supervisor @ 30000/- per month*		200000/- marketing expenditure per annum	9,20,000
C.3	C.3.1	Raw Turmeric cost	*Rs. 75/kg*	22,50,00,000
	C.3.2	Solvent (Ethanol)	*2% losses per batch*	3,60,00,000
	C.3.3	Isopropanol	*2% losses per batch*	46,80,000
	C.3.4	Packaging material	*20/- per kg of produce*	58,20,000
C.4	*Power Consumption*			
	C.4.1	Unit consumed per annum		1,000,372
	C.4.2	Cost of Electricity @ Rs. 10/KW		1,00,03,729
C.5	*Cost of water*		*1 kg rhizome = 10 litre water*	12,00,000
C.6	*Maintenance*			20,000
C.7	*Contingency*		*5% of total fixed cost*	12,05,280
C.8	*Depreciation*			
	C.8.1	Depreciation on Furniture	*at 10%*	5,000
	C.8.2	Depreciation on Machines	*at 10%*	5,66,500
	C.8.3	Depreciation on Civil work	*at 10%*	1,00,000
C.9	*Total Expenses (C.3 + C.12)*			19,15,81,004

D. Total production per annum			
D.1	*Curcumin Powder*	*in kg*	51,000
D.2	*Turmeric oleoresin*	*in kg*	240,000
F. Annual Income (Full capacity)		*Selling price of curcumin : Rs. 5000/kg* *Selling price of oleoresin : Rs. 200/kg*	30,30,00,000
G. Economic Indices		Plant life : 10 years. Capacity Utilization : Year 1- 50% , Year 2 – 65%, Year 3 – 80%, Year 4 onwards 100%	
G.1	*Net present value (NPV)*	IN Rs.	6,55,92,949
G.2	*Internal rate of return (IRR)*	%	48.77%
G.3	*Benefit to cost ratio (BCR)*		2.72
G.4	*Discounted payback period*	In years	2.58



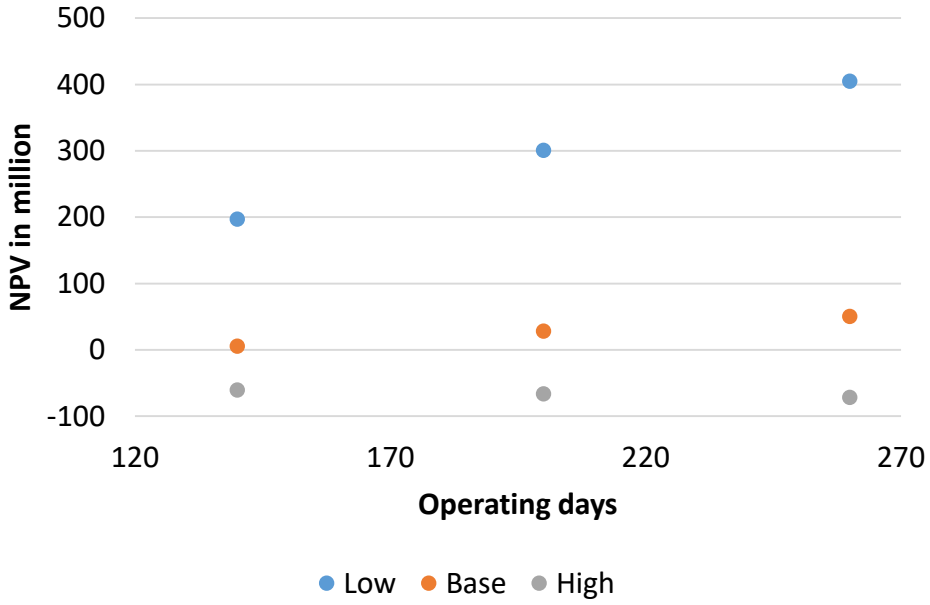
Sensitivity analysis

Low price: Dried turmeric rhizomes cost- Rs. 70/kg, Curcumin powder selling price- Rs. 4000/kg and Oleoresin selling price - Rs.150/kg

Base case Scenario: Dried turmeric rhizomes cost- Rs. 75/kg, Curcumin powder selling price- Rs. 5000/kg and Oleoresin selling price - Rs.200/kg

High price: Dried turmeric rhizomes cost- Rs. 80/kg, Curcumin powder selling price- Rs. 6000/kg and Oleoresin selling price - Rs.250/kg

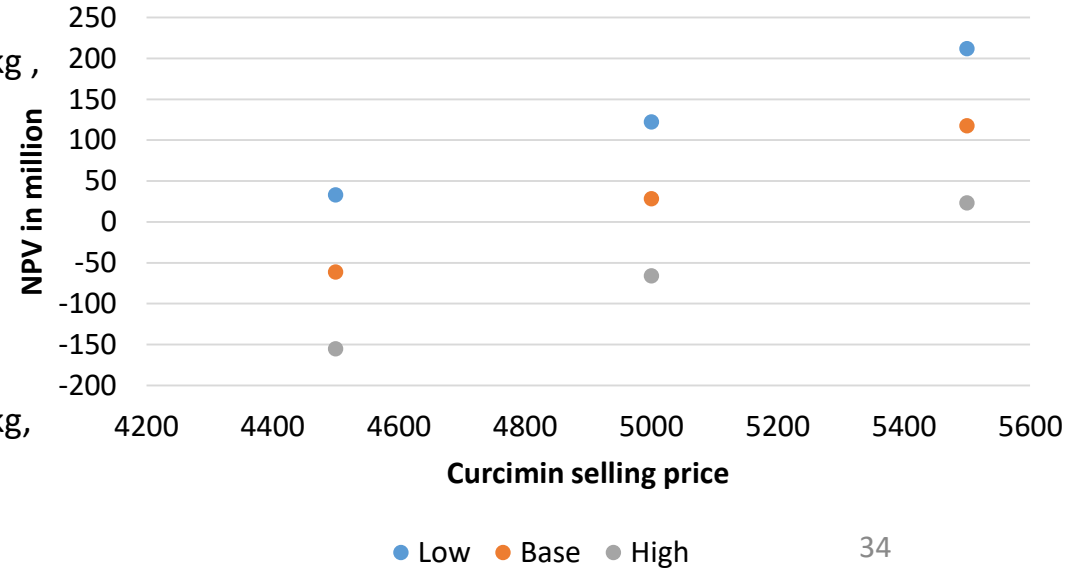
Conjoint analysis



Low – Dry rhizome : Rs. 67.5/kg , Ethanol: Rs. 54/kg , Isopropanol: Rs. 117/kg

Baseline – Dry rhizome : Rs. 75/kg , Ethanol: Rs. 60/kg, Isopropanol: Rs. 130/kg

High - Dry rhizome : Rs. 82.5/kg, Ethanol: Rs. 66/kg , Isopropanol: Rs. 143/kg

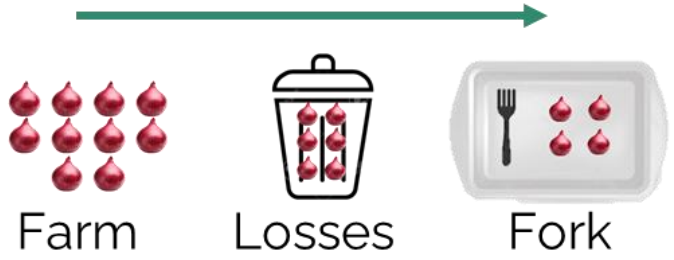


Summary of Economic viability of potential value added products

Parameter for comparison	Poultry feed unit	Soy milk and Tofu unit	Turmeric Powder	Curcumin Powder
Raw materials	maize, soymeal, molasses	Soybean	Wet Turmeric rhizomes	Dried turmeric rhizomes/ turmeric powder
Plant Capacity	1 TPH	350 lit/hr	2Q/hr	10 TPD
Direct capital investment (in lakhs Rs.)	135.96	74.72	71.99	241.05
Total Operational Cost (in lakhs Rs.)	1451.04	115.31	86.93	1915.81
NPV (in lakhs Rs.)	900.00	125.26	107.00	655.92
IRR (%)	140.1	35.98	33	48.77
BCR	3.14	1.67	1.49	2.72
PBP (years)	1.7	3.13	3.37	2.58
Probability of success (BCR>1)	96%	78.8%	69%	31.2%

Section-2
Onion Storage Structure

Problem



Losses in 'Storage phase' of Value Chain

20-50 % | ~15-25 Billion ₹ PA

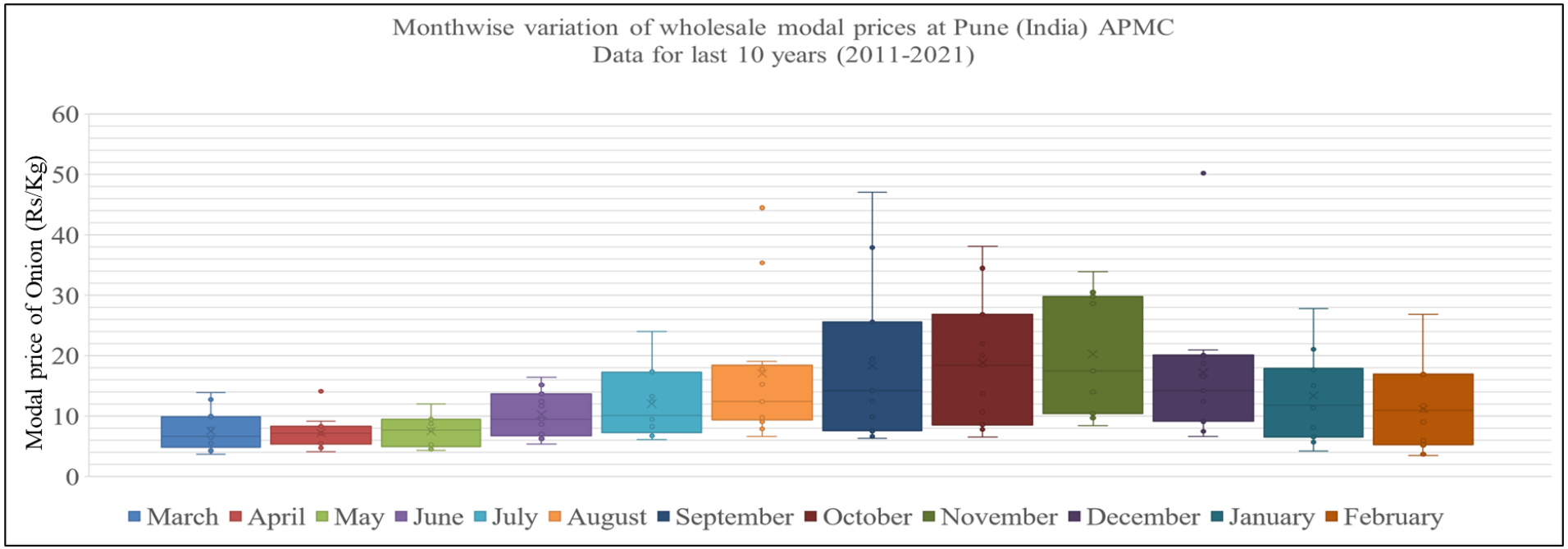
Poor and insufficient storage infrastructure

Farmers face huge losses during 'Peak supply period'

Consumers suffer from high retail prices during 'Peak Demand Period'

High perishability of Onion

B:C ratio (for Onion crop) is continuously shrinking



1. Kalyani Gorrepati, A. M. (June 2018). Post-harvest losses in different varieties of onion. *Indian Journal of horticulture*, 314-318.
2. Zhao, G., Liu, S., Chen, H., Lopez, C., Hernandez, J., Guyon, C., Iannacone, R., Calabrese, N., Panetto, H., Kacprzyk, J., Alemany, M., 2019. Value-Chain Wide Food Waste Management: A Systematic Literature Review. Lecture Notes in Business Information Processing 348, 41–54. https://doi.org/10.1007/978-3-030-18819-1_4

Phase III Deliverables- Storage Structure intervention

- A detailed project report for a selected Farmer Producer Company in regard to Storage technologies (onion storage possibilities to improve financial gain of farmers).

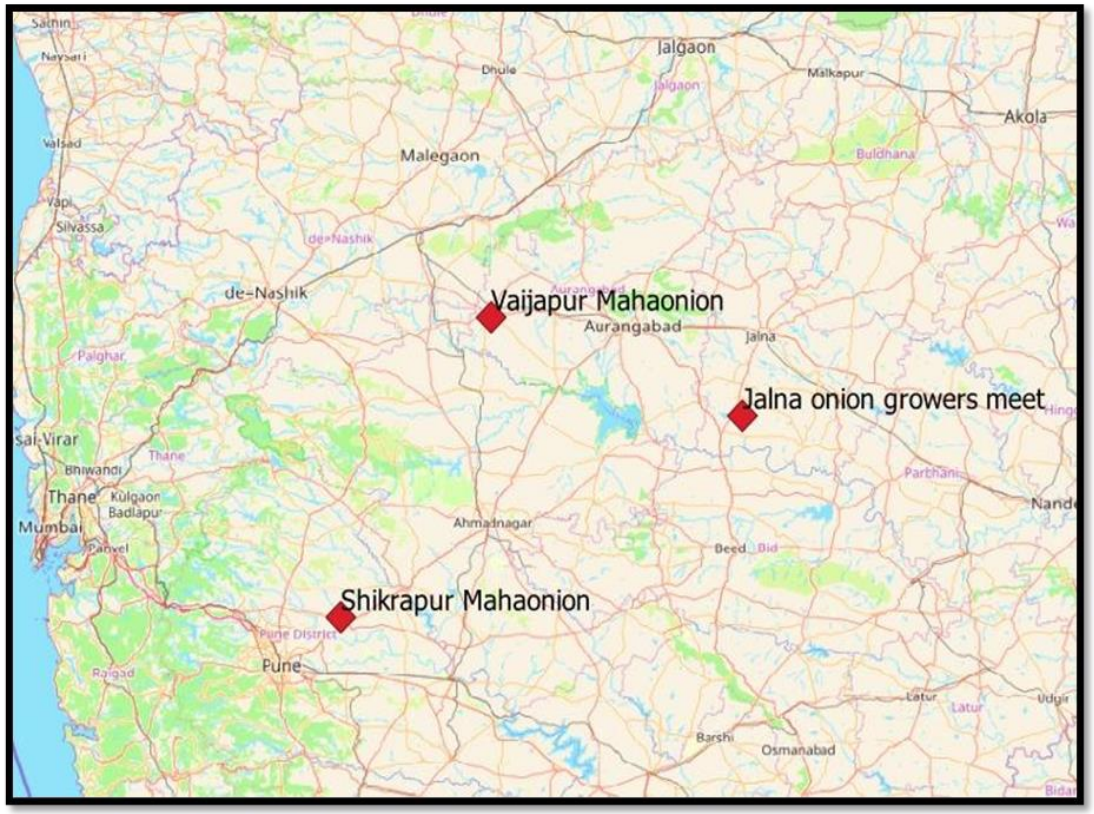
- Uncertainty analysis report for storage interventions.

A. Detailed Feasibility Analysis

Field visits

Specific objectives :

- Survey of existing storage structures and storage practices (PoCRA region)
- Identifying challenges that can be addressed through appropriate technological interventions (confined to onion storage)




Hariyali and other FPCs, Ambad


Naathji FPC, Vaijapur


Agronirmiti FPC, Shikrapur


NAFED sponspred storage facility, Wadner

Comparison of potential solutions based on field visits

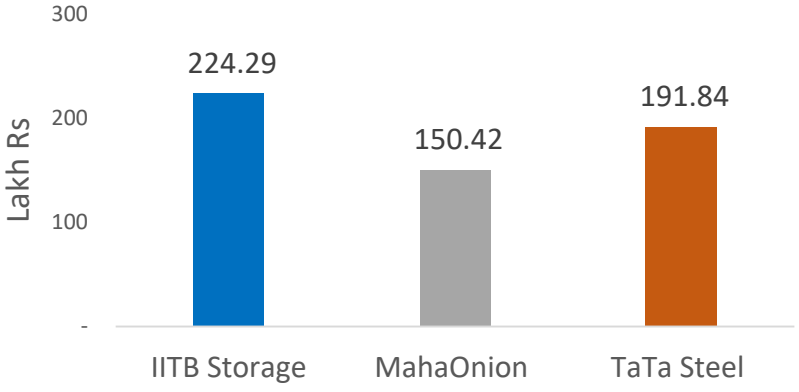
Features	MahaOnion Storage Structure	Tata Steel Onion storage structure	IITB Storage structure
			
Floor space needed	Large	Medium	Small
Forced Ventilation	No	Yes	Yes
Controlled air flow	No	No	Yes
Temp. control	No	Partial	Yes
Humidity control	No	No	Yes
Loading/Unloading	Manual	Manual	Semi-Automatic
Anti bug UV lights	No	No	Yes
Storage Losses*	35-60%	25-40%	10-15%
Principle	Open Ventilated Traditional storage	Evaporative Cooling with Blower fans	Complete control of Inside air parameters

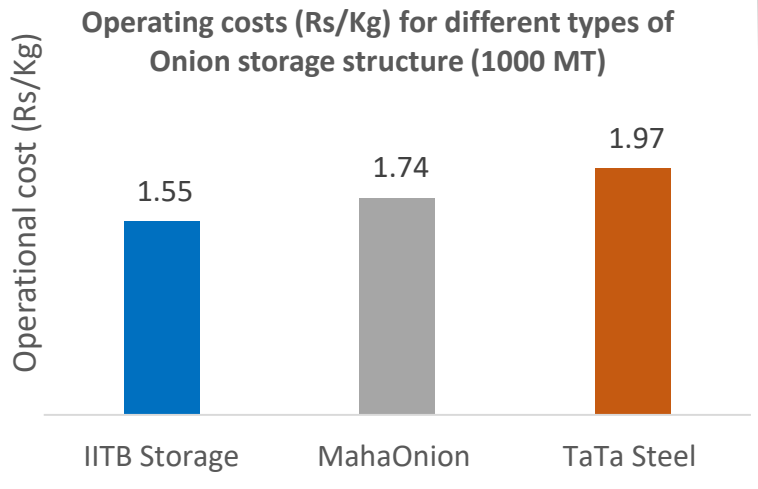
* Storage losses values mentioned are gathered from various sources, It includes field reports, published papers, Data from experiments at IITB, ICAR-DoGR and data collected from the survey at installed locations of storage structures.

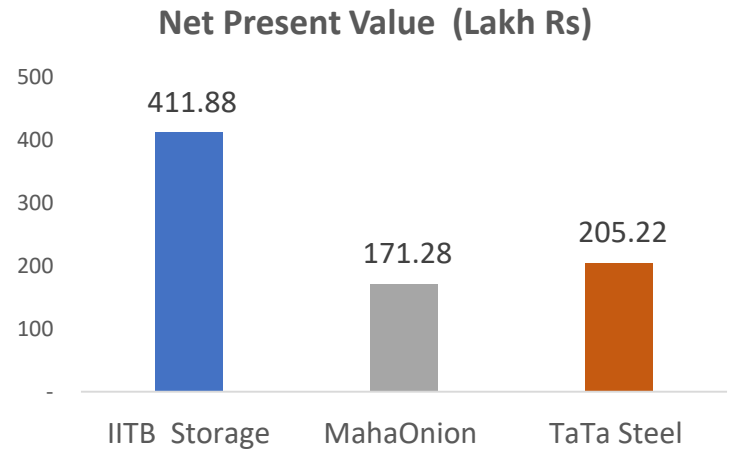
Assumptions for Techno-Economic Feasibility analysis

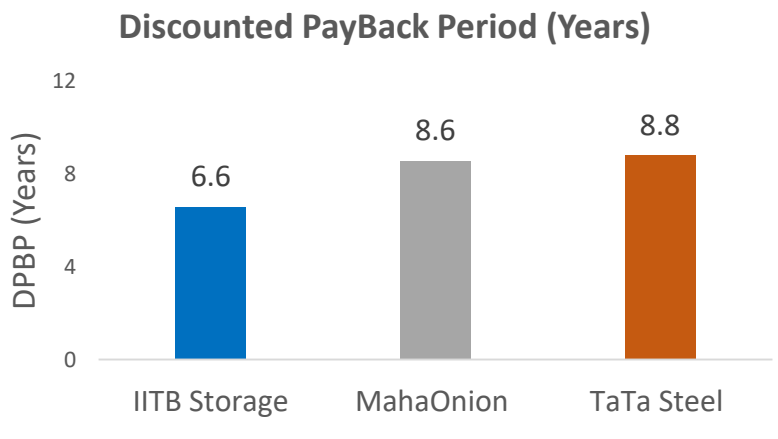
Variable	IITB Storage	MahaOnion Storage	TATA Steel NestIn	Unit
Onion Procurement cost	**8**	**8**	**8**	Rs
Onion Selling price	**20**	**20**	**20**	Rs
Storage structure Life	15	15	15	years
Storage duration	6	6	6	month
Losses during duration of storage	20	35	30	%
Discount Rate	10	10	10	%
Salvage Value of Storage Structure	15	15	15	% of initial Cost
Difference in Prices	12	12	12	Rs/Kg
Inflation rate	4	4	4	%
Loan Interest rate	10	10	10	%
% Subsidy	0	0	0	%
% Loan of capital investment (excluding subsidy)	75	75	75	%

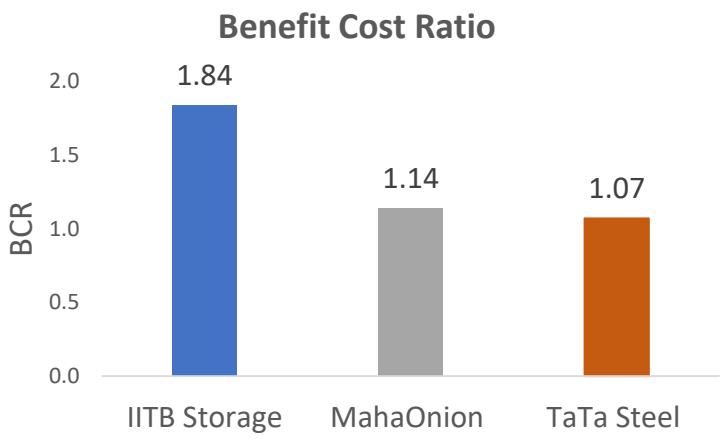
Comparison of Onion storage structures (1000 MT)

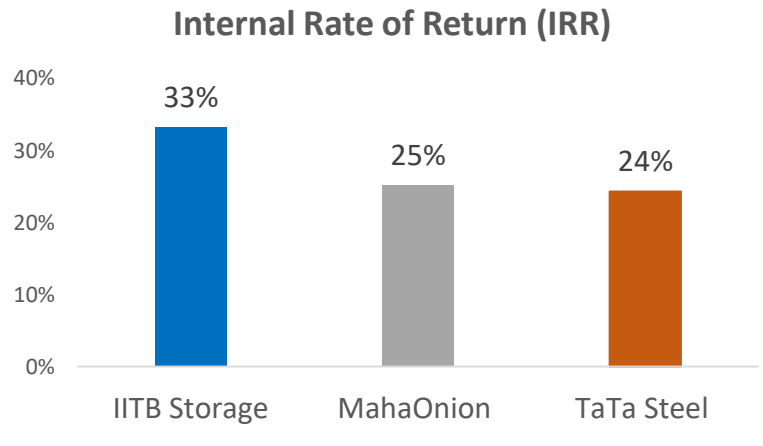




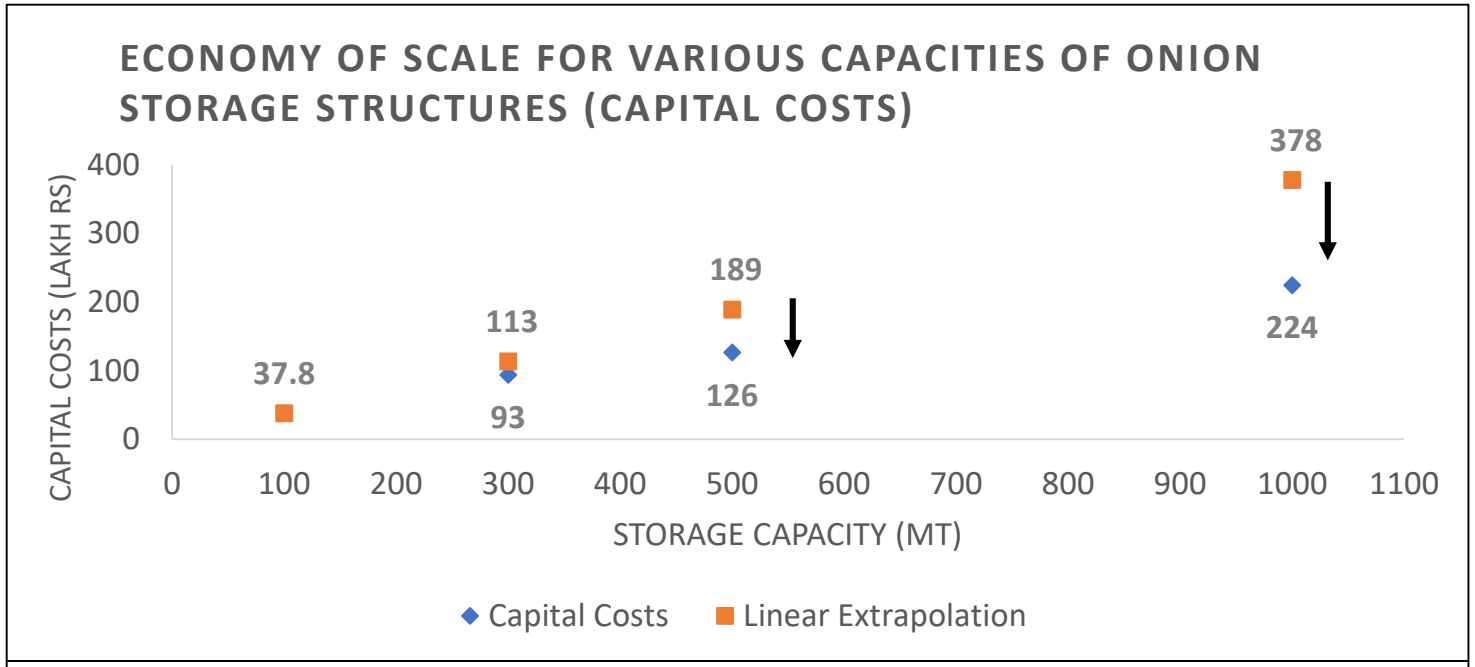


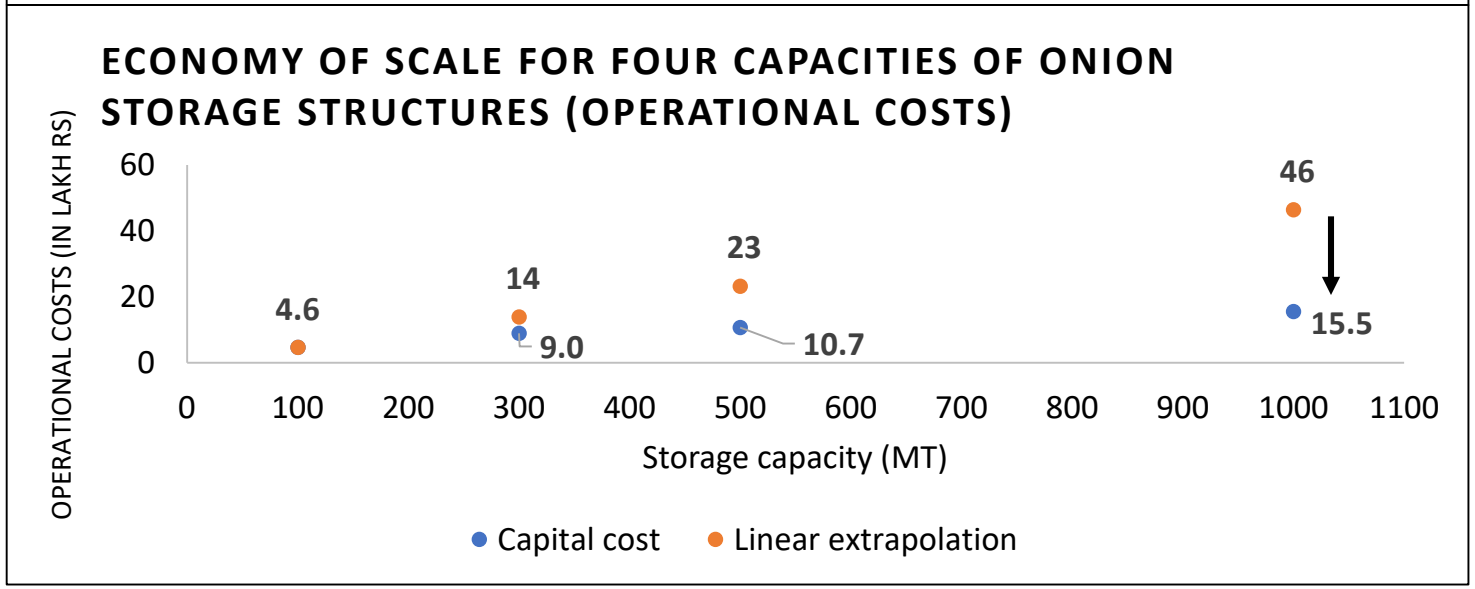






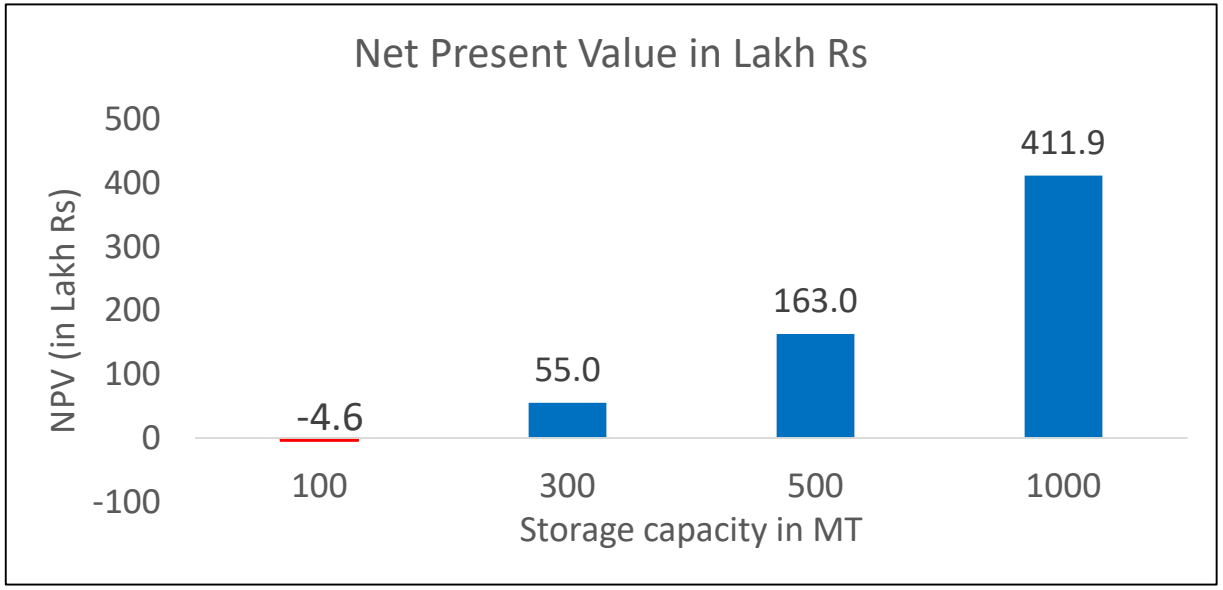
Effect of scale of operation (IITB storage structure)

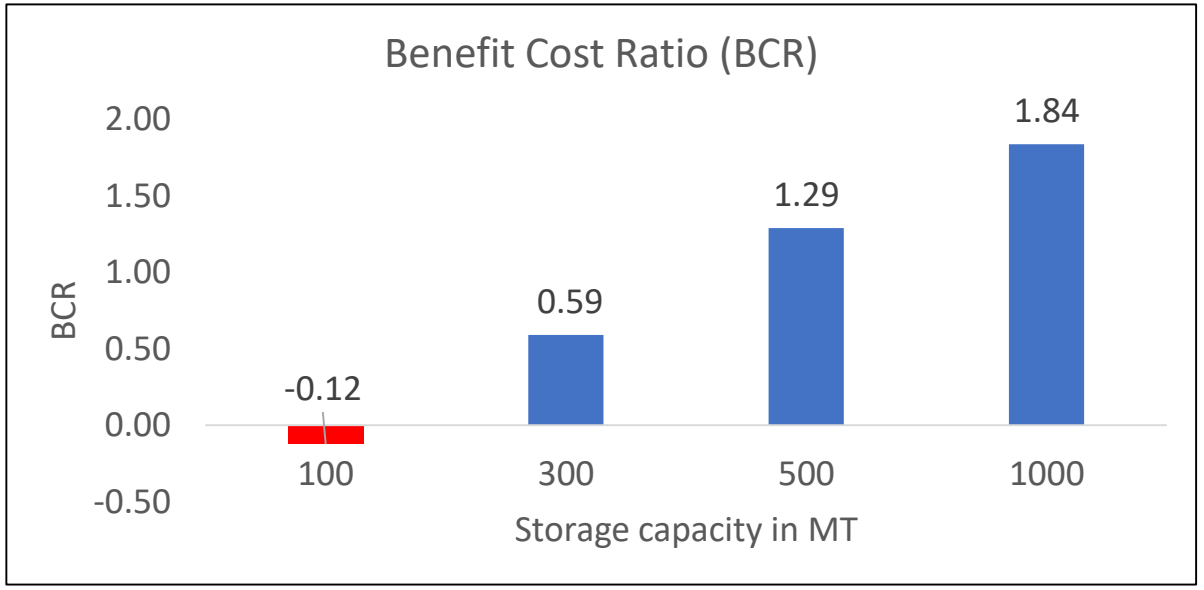


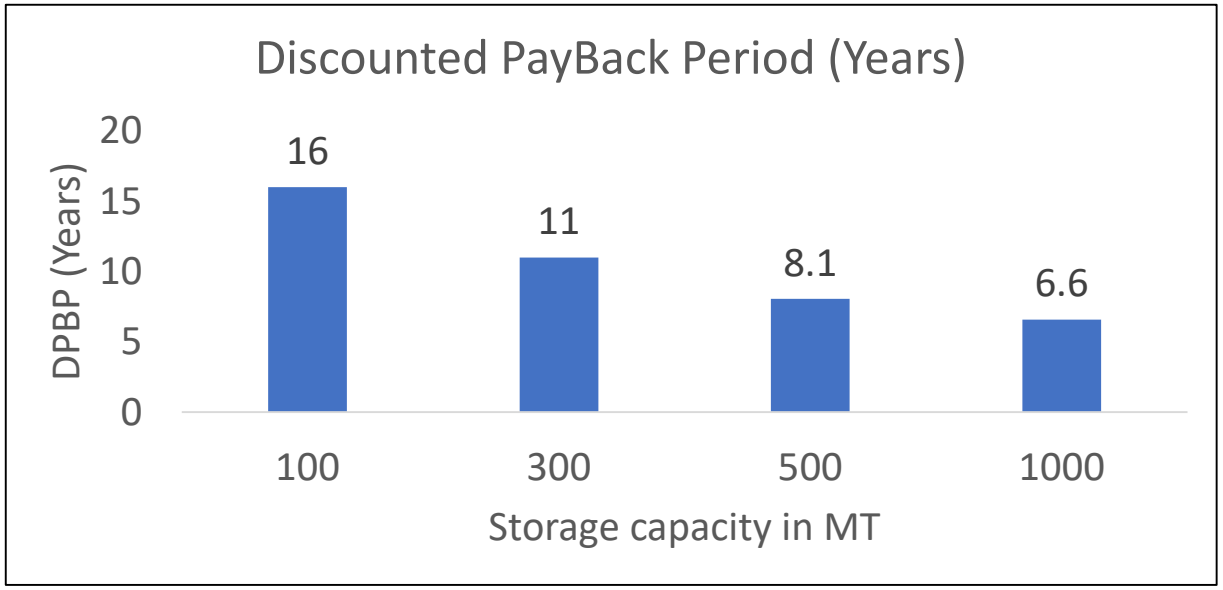


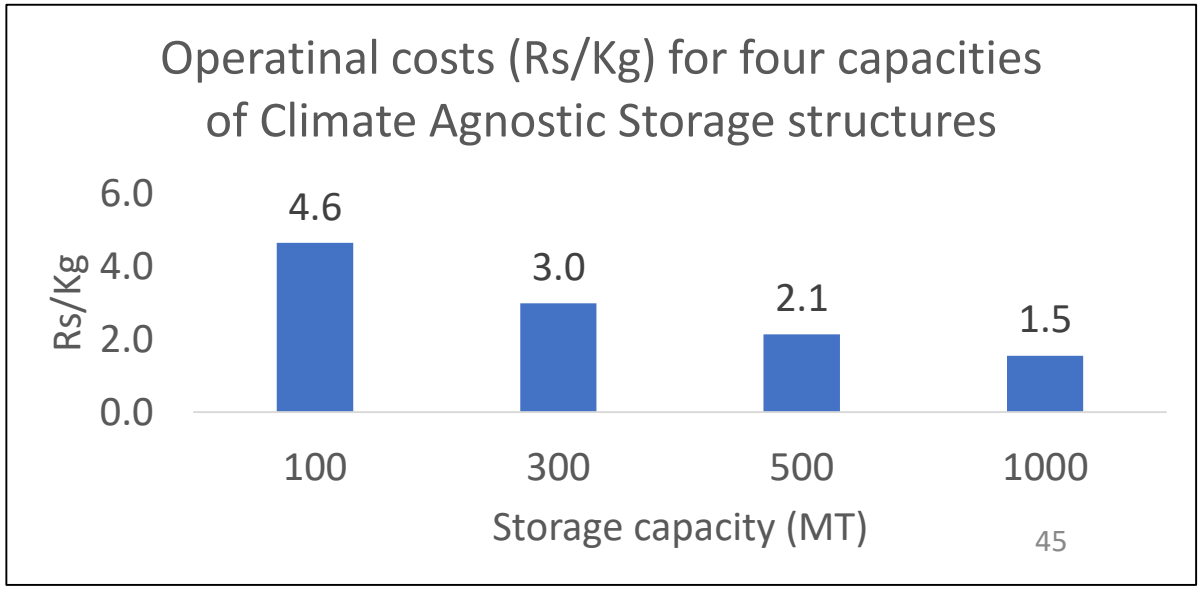
- As different components of CA storage structure comes in standard sets, increment in capacities benefit by bringing down the capital costs.
- Storage structure of 300 MT capacity seems appropriate considering the financial scope of the project.

Comparison of different capacities of IITB Storage structures for different economic indicators (Without any Subsidy)

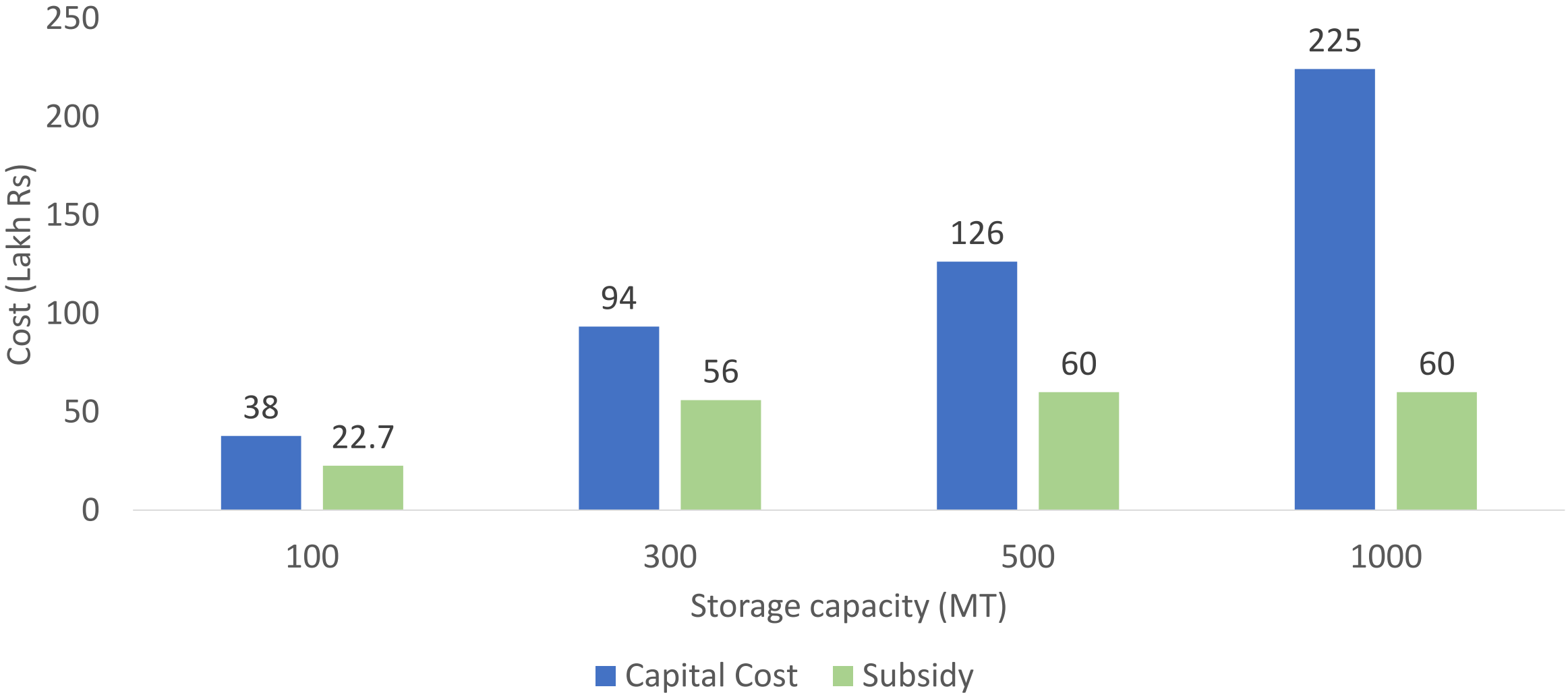








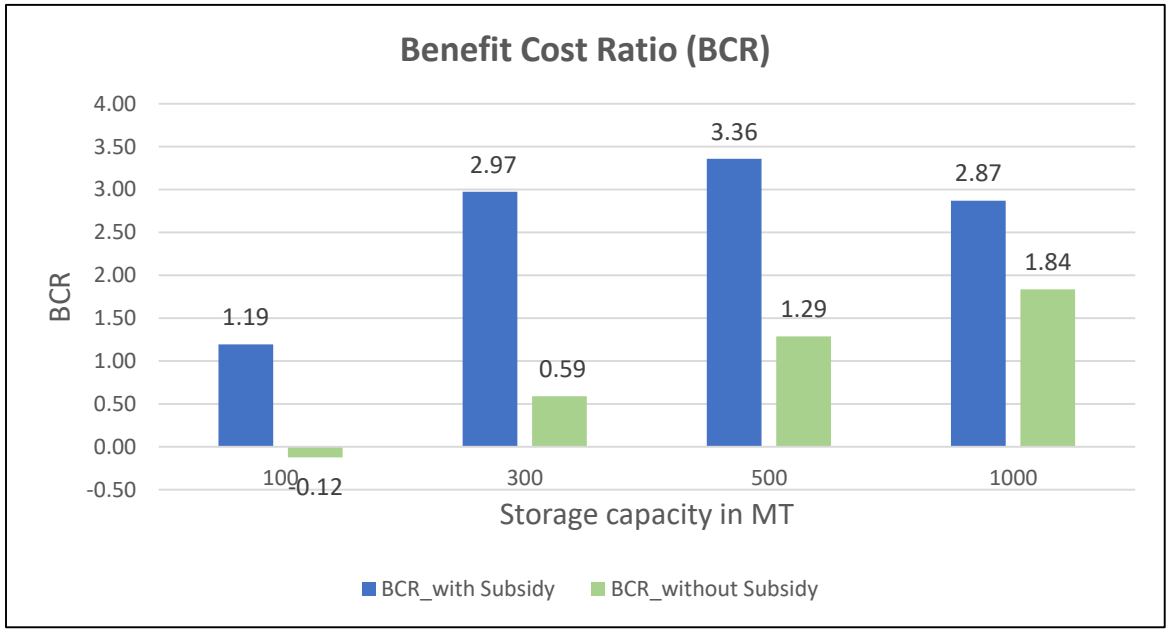
Capital costs and respective subsidy amounts available for four capacities

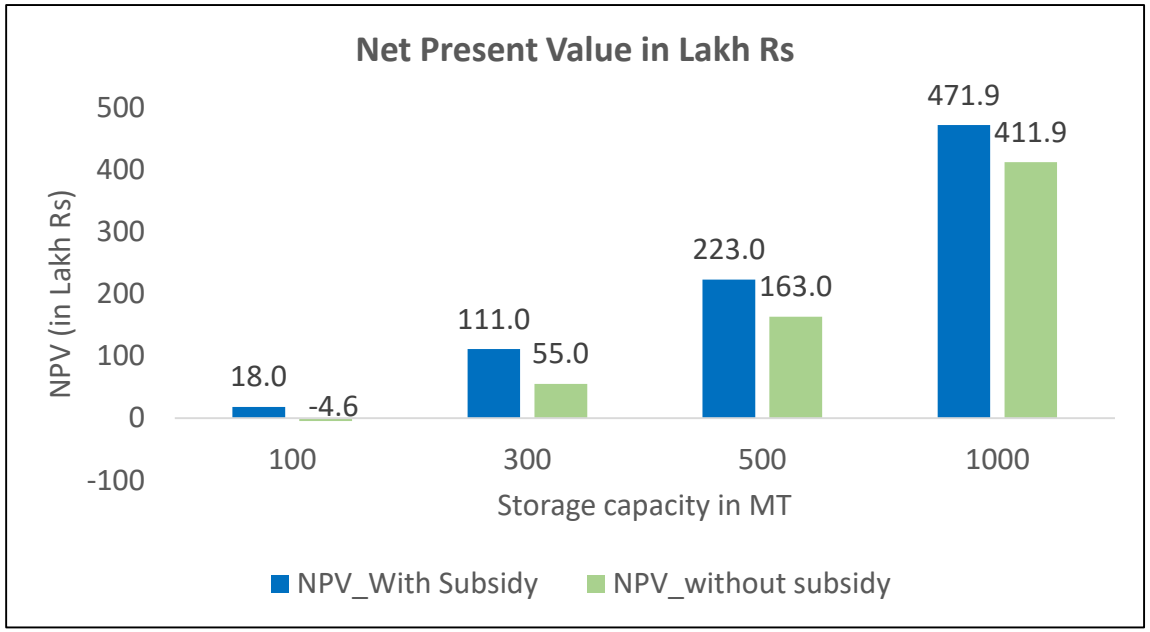


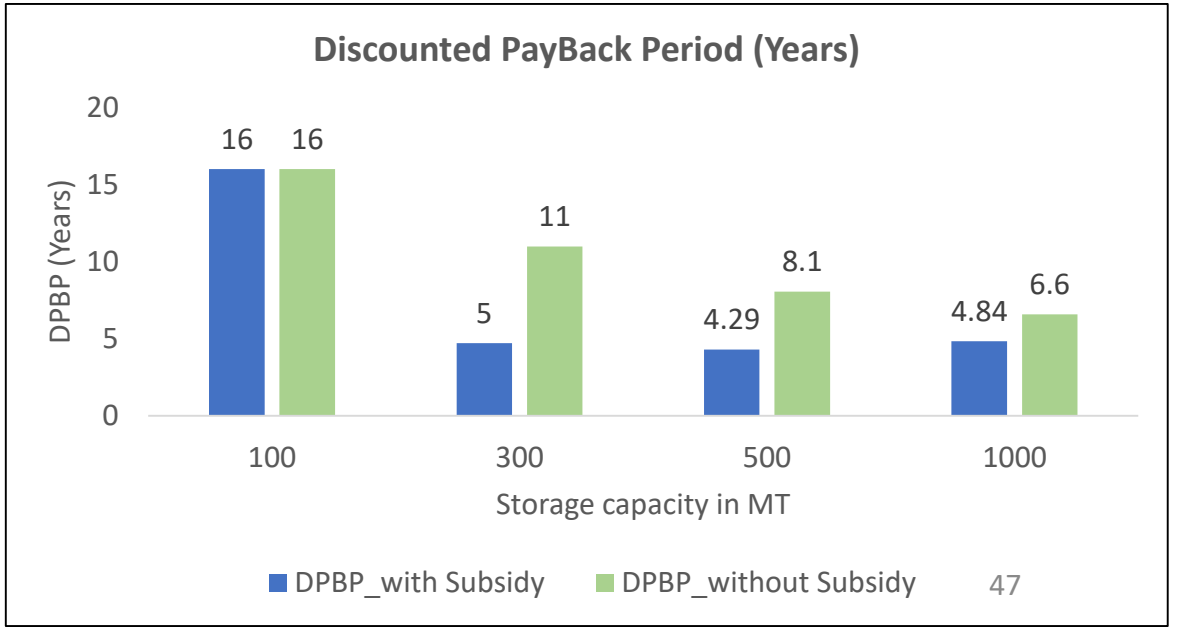
Comparison of different capacities (With and Without Subsidy)

PoCRA Policy,

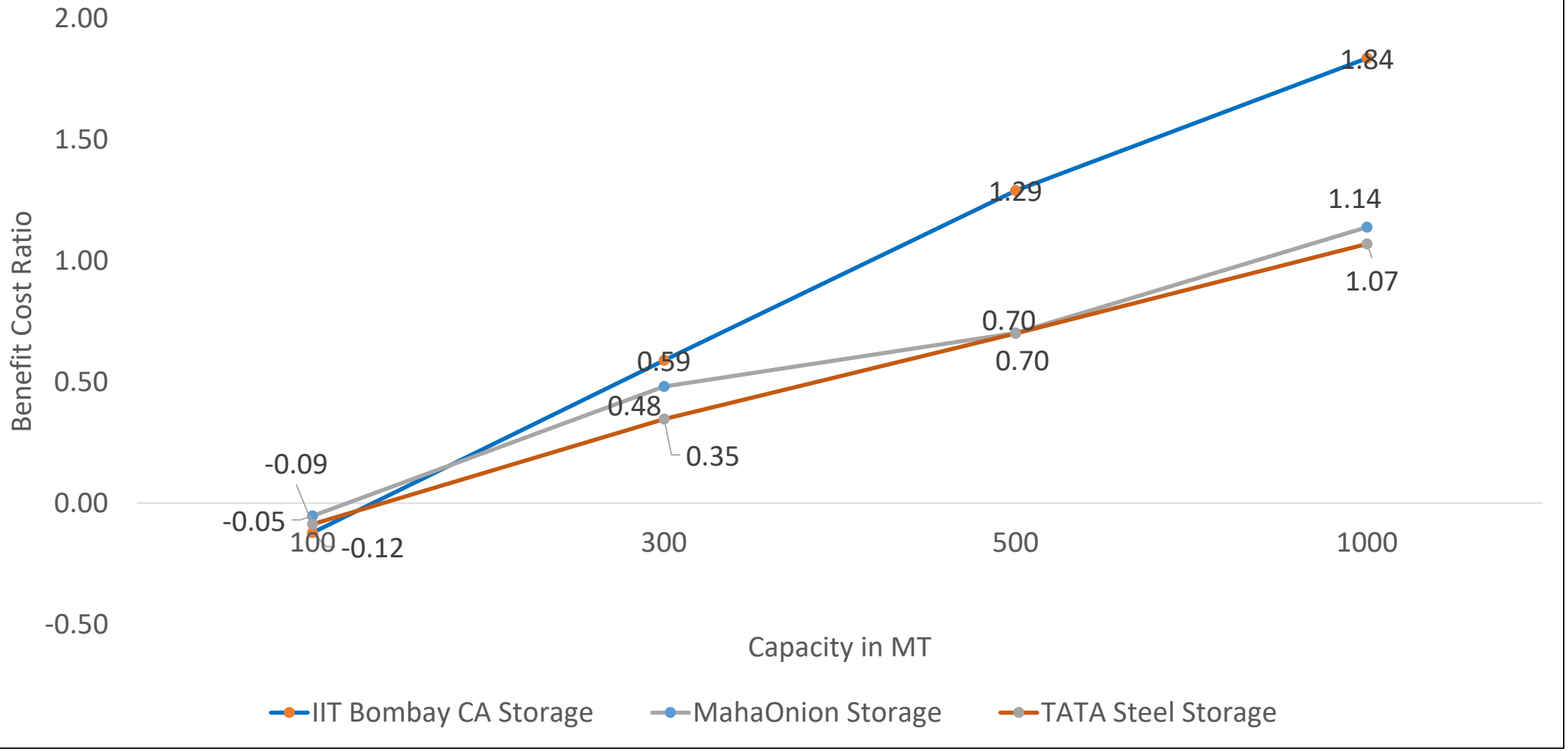
- 60% subsidy up to 1 Crore project cost
- Rs 60 lakh after 1 Crore project cost

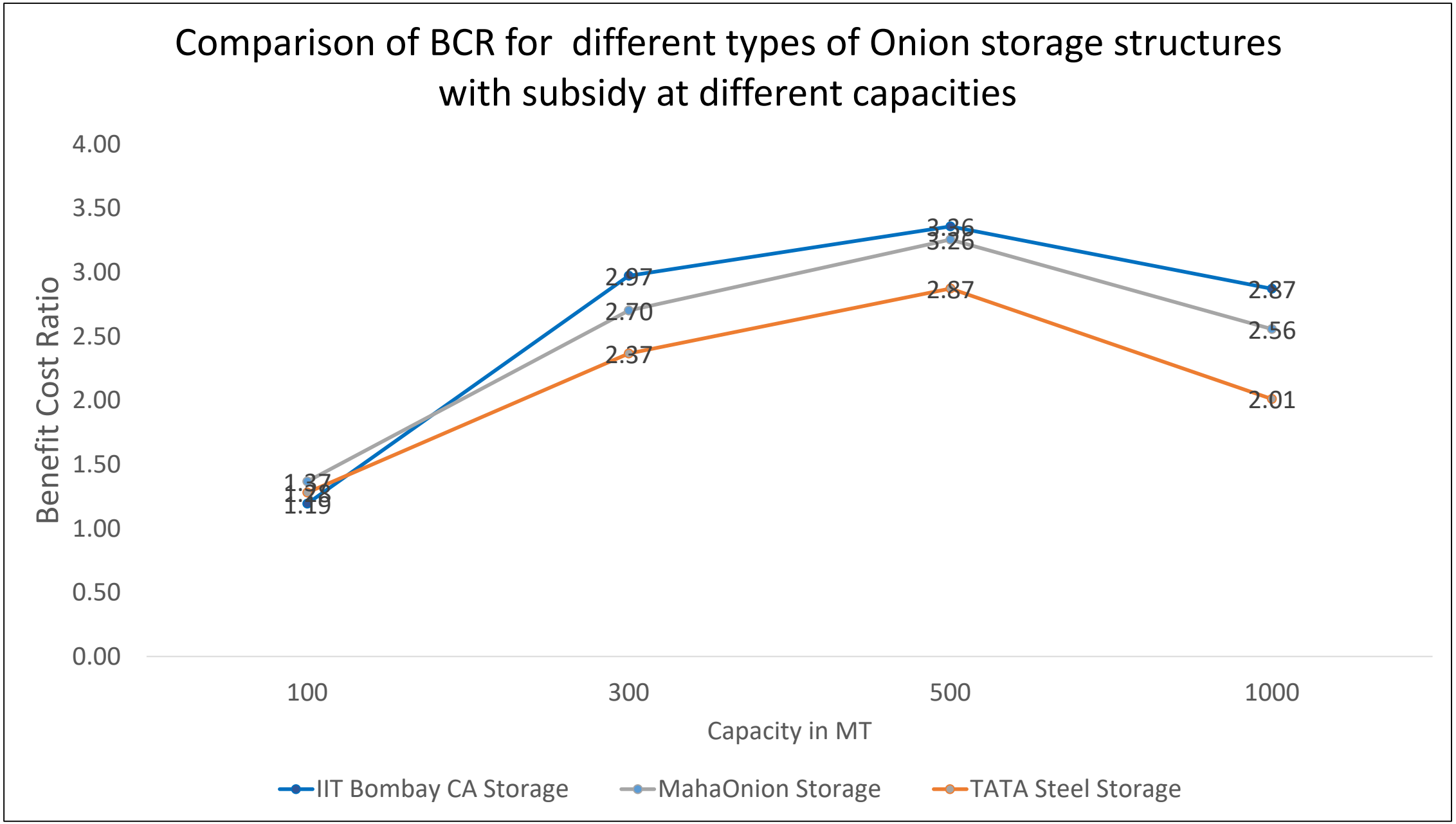






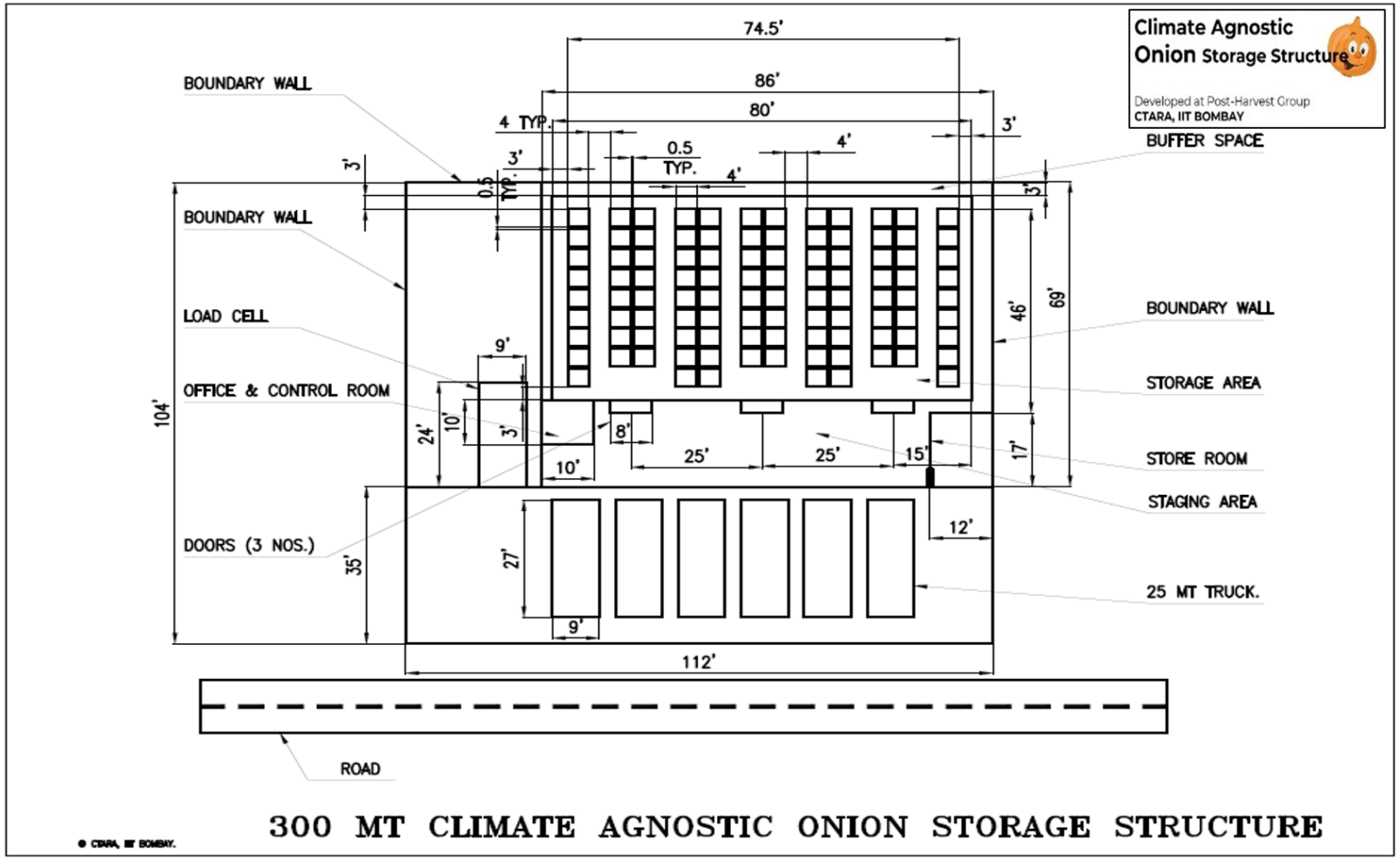
Comparison of BCR for different types of Onion storage structures at different capacities without subsidy (worst case scenario)




Comparison of BCR for different types of Onion storage structures with subsidy at different capacities
Benefit Cost Ratio
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2.97
2.70
2.37
2.87
2.56
2.01
100
300
500
1000
Capacity in MT
IIT Bombay CA Storage
MahaOnion Storage
TATA Steel Storage

B. Detailed Project Report of 300 MT Storage structure and Uncertainty Analysis

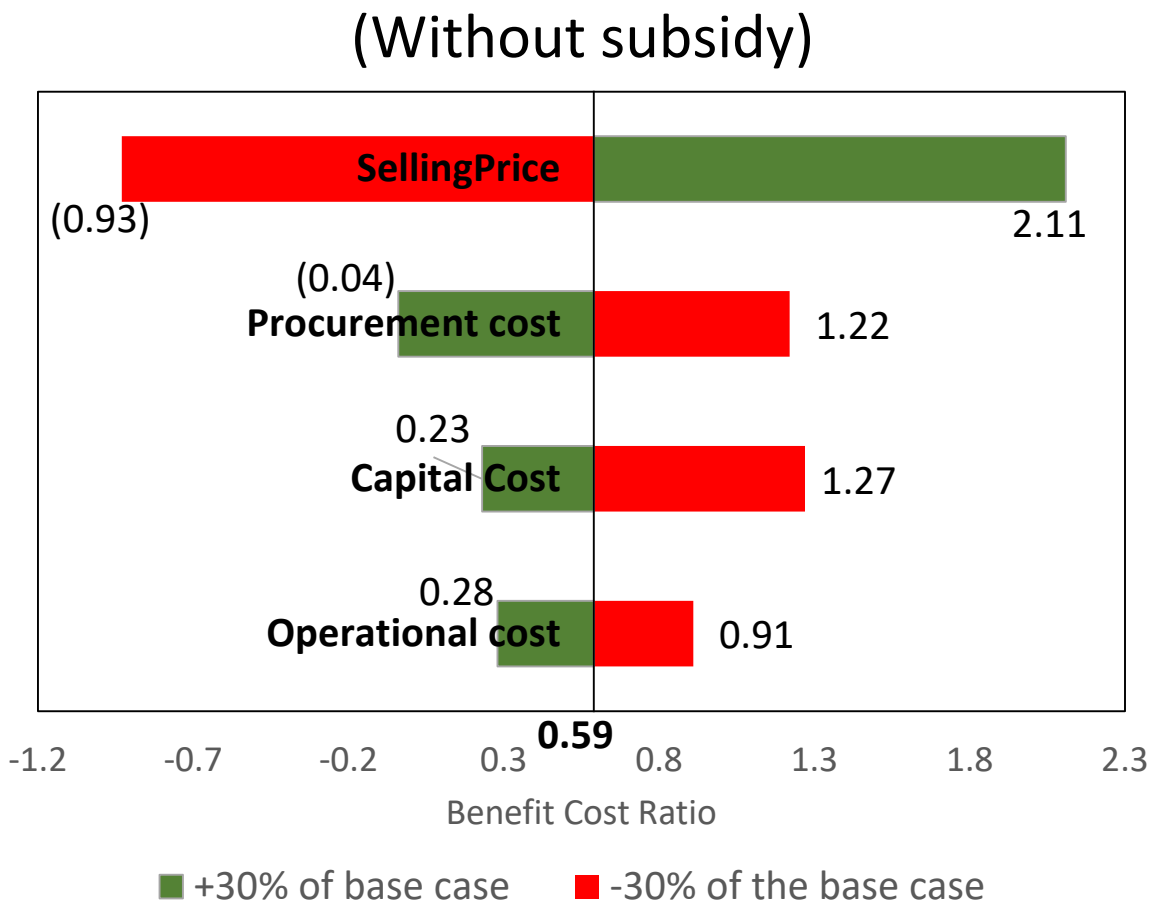
Layout of 300 MT IITB Storage structure

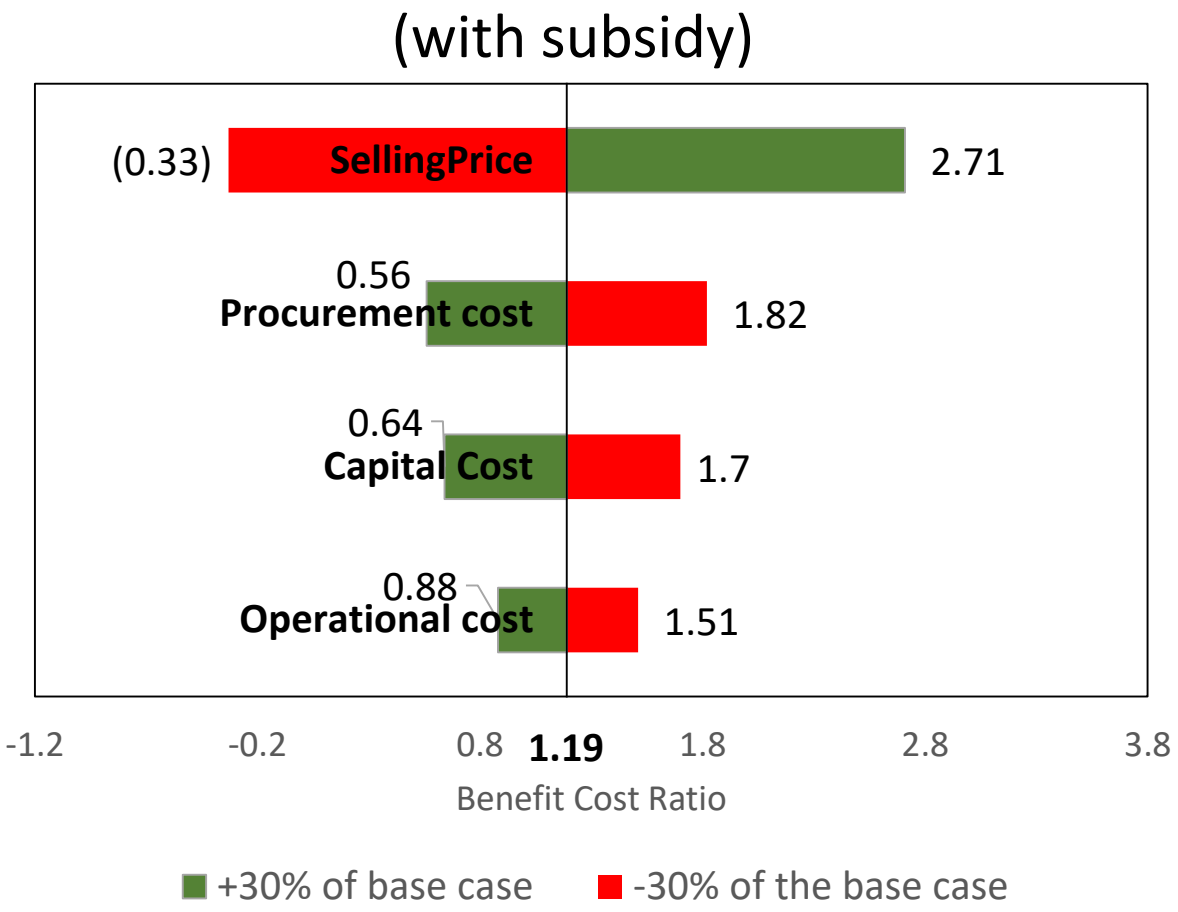


Particulars	Specifications (ft)	Area (Sq ft)	Area (Sqm)
Storage Area	80' X 46' X 17'	3,680	342
Flooring Area	86' X 69' X 2'	5,934	551
Surrounding Area (Overall)	**112' X 104'**	**11,648**	**1,082**

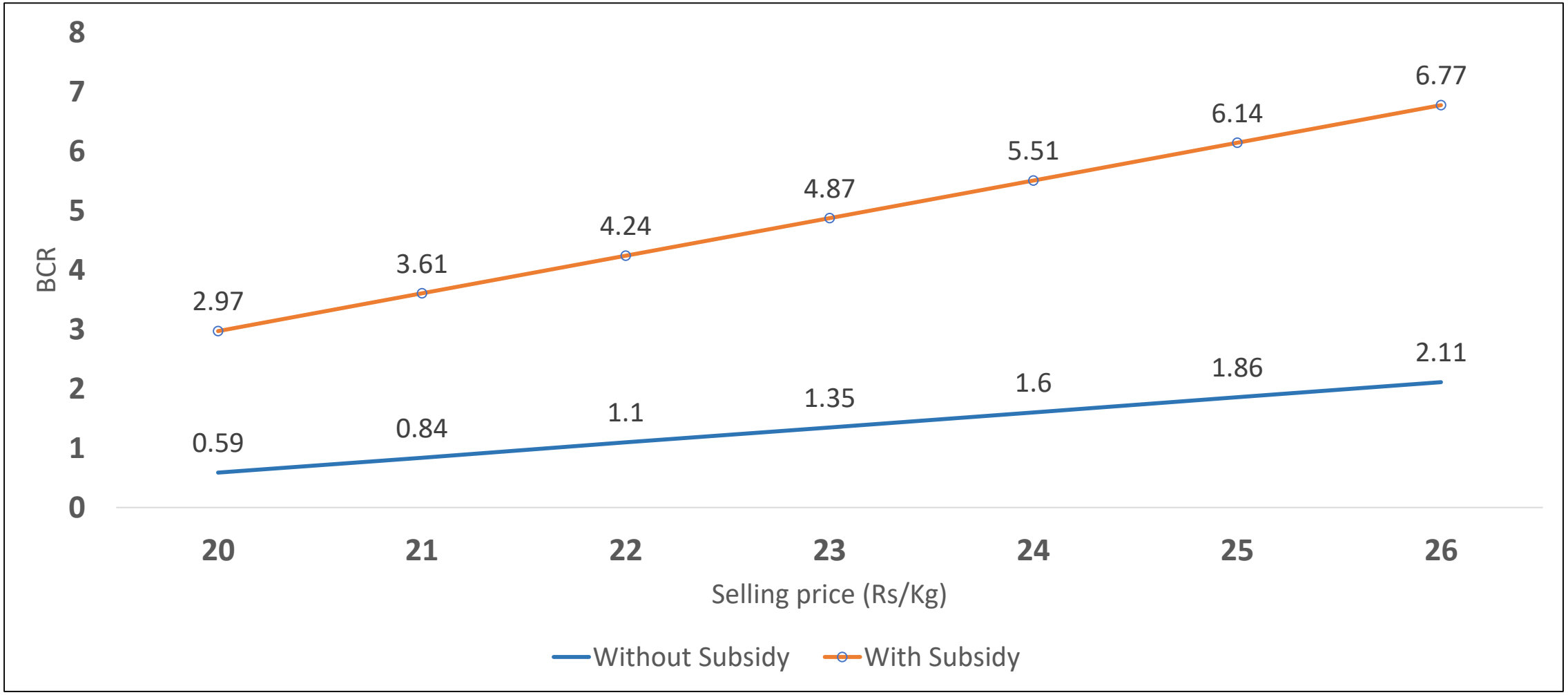
3D visualization of 300 MT IITB Storage structure

Sensitivity Analysis of 300 MT Climate Agnostic Storage structure

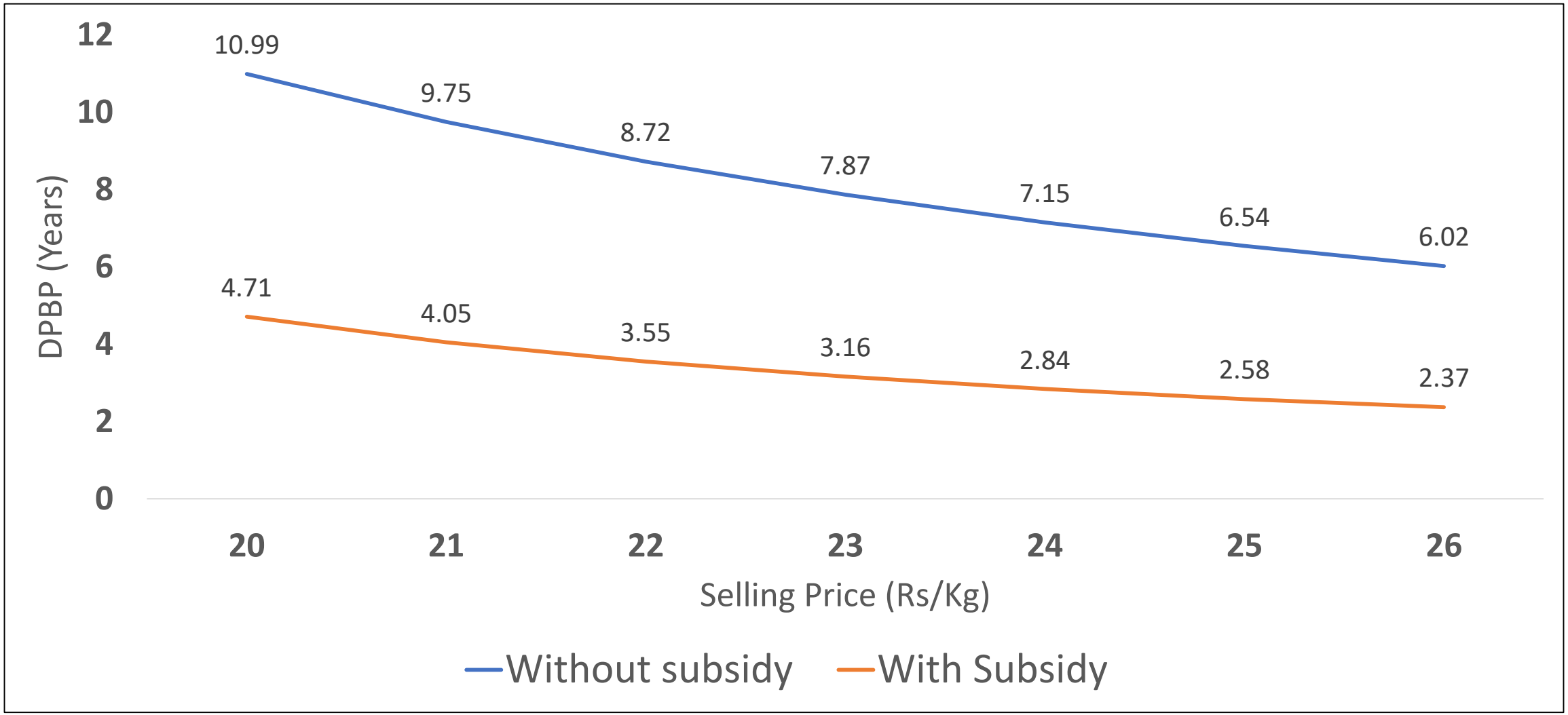




What if the selling price changes?...(1)



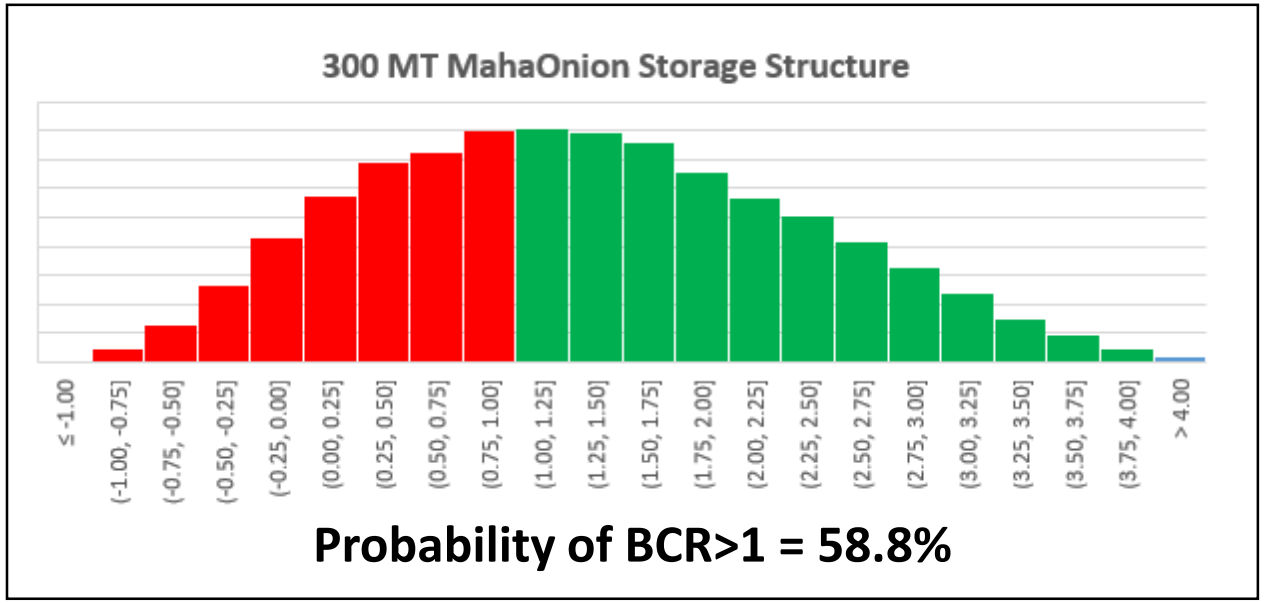
What if the selling price changes? …(2)



*Procurement cost Rs.8/Kg

Uncertainty Analysis - Monte Carlo Simulation (Without Subsidy Scenario)

Probability of BCR>1 = 49.2%



Probability of BCR>1 = 58.8%

Probability of BCR>1 = 70%

Current work towards Phase IV

Deliverable (M) : Commissioning of the Climate Agnostic (CA) storage structure will be taken up by the FPC with the assistance of IITB with the financial support of an external funding agency including the agribusiness component of the PoCRA project.

Particulars	Status
1. Materials listing and procurement plan	Ongoing
2. Site selection plan	Ongoing
3. Preparation of training module	Ongoing
4. Development of Land	Plan is prepared
5. Building & Civil Works	Plan is prepared
6. Machinery requirement	Prepared
7. Vendor list and placement of order	Ongoing
8. Details on Trial runs & Commissioning	Ongoing
9. Plans for electricity, and Water	Ongoing

Way forward

- To check the response, several meeting of the FPC was conducted (10th-25th February) where the intervention and associated costs were proposed.
- Many FPCs and farmers have shown interest to be a part of intervention. Second meeting with interested FPCs is proposed in last week of April (on field)
- Design is finalized. Started the process of identifying the vendor for the installation and commissioning work.
- After approval of DPR from PMU, the implementation schedule will be finalized. In agreement with interested FPCs.

THANK YOU

Onion storage structure (K) : Deliverables

Development of a detailed project report for one existing Farmers Producer Company (FPC) in regard to technological intervention in large scale (500-1000 tonnes) onion storage structure

A.Detailed Mapping of Onion

Quantum, Processing and Storage. Review of Current storage practices

B &C. Screening & detailed study of FPCs

Portfolio, Quantum, Productivity, capability, Willingness to adopt technology etc.

D.Financial Modeling

Projected income & Expenditure, Cost-benefit & Break Even Analysis

E. Implementation Planning

SWOT analysis, Risk mitigation strategies, Implementation planning