

# COMMERCIAL CULTIVATION & OIL DISTILLATION OF SUGANDHMANTRI



## 1.0 INTRODUCTION

Sugandhmantri is a rhizomatous aromatic perennial herb found in Assam, lower altitudes of Arunachal, Nagaland and Tripura etc. The dry rhizomes are known as 'Sugandhmantri'. Some properties of the herb are - stem short, slow growing, leaves radical with sheathing bases, long petioled, sagittate-cordate. The large rhizomes bearing withered leaf scales and numerous white rootlets are esteemed as an aromatic stimulant.

Its aromatic rhizomes contain an essential oil used for blending of many oriental perfumes. Steam distillation of rhizome yields yellow coloured essential oil about 1.0% on air-dry basis. The essential oil has a very good demand in perfumery and cosmetic industries. The spent material after extraction of essential oil is largely used in Dhup manufacturing.

More than 400 MT of dry rhizomes are collected and transported to outside the state mainly to Kannauj, Kanpur, Delhi, Kolkata, Mumbai etc from Barak Valley of Assam and other parts of the region every year.

It is being exploited as a minor forest product since long back without conservation and/or cultivation measures. If this is continued unabated very soon this unique and valuable species will be extinct from its place of origin.

This project profile is for commercial cultivation of Sugandhmantri and setting up of a distillation unit with total area under plant at 4 hectares.

## 2.0 PACKAGE OF PRACTICES

**(i) Soil:** Sandy and sandy loam to clay loam with organic litter is found suitable. Temporary water logging for 24-48 hours is beneficial for quick rhizome elongation. The plant prefers acidic soil of pH range 4.9 - 5.5.

**(ii) Climate:** Being a sub - tropical species it loves warm and humid climate with annual rainfall ranging from 2000-3000 mm.

**(iii) Stock Nursery:** A stock nursery is important for commercial cultivation. Generally 1/5th of the target area is brought under this nursery one year ahead of plantation. This is well nursed with adequate manuring and fertilization, mulching and other intercultural operations. By doing so, the cost of planting material can be reduced by about 40%.

**(iv) Propagation:** The individual seed material is the piece of rhizome with active buds of 2.5-3 cm size. Fresh rhizome pieces with active buds may be sprouted in sand beds before planting in the main field.

**(v) Land Preparation:** Land is prepared by deep ploughing or hoeing with addition of sufficient quantity of organic matter.

**(vi) Planting:** The appropriate method of planting is the ridge and furrow method. 15 cm deep furrows are opened at 30 cm apart. Rhizome pieces after sprouting are planted in the furrows at 45 cm apart and covered with soil

up to 5-7 cm. The rest is filled up by rice husk or other available mulch material. Rice husk is more beneficial as it takes a longer time to decompose and thus helps in rhizome elongation. When fresh cuttings are planted sprouting starts within 30 days of planting. 20-22 q of fresh rhizome/ha is required to get a plant population of 75000.

**(vii) Fertilizers:** 40:50:60 kg N, P205 and K20/ha per year may be applied. Entire quantity of P and K are applied along with organic matter as basal. N is applied in 3 equal splits starting from 40 days after planting.

**(viii) Interculture:** It is a weed-suppressing crop and one or two light hoeing in the first and second month of planting is enough to keep down the weed population. Removal of old and dry leaf and sheath is beneficial for rhizome elongation.

**(ix) Harvesting:** Sugandhmantri is harvested during winter, rain free period (November-April). During this period it is observed that the vegetative growth as well as moisture content of rhizome is minimum and the oil accumulation is maximum. The rhizomes attain a length of 20-30 cm or more in three years. Rhizome exceeding 15 cm long is chosen for harvesting.

Sugandhmantri becomes ready for rhizome harvest on 3rd year of planting. However, the crop can also be harvested in the second year. But three years rotation period has been observed to be more profitable from both yield and quality of the products.

Harvesting is done using hand Chiprang or garden hoe that may require digging out the rhizome from 5-10 cm deep. During harvest the side suckers may be left undisturbed for ratoon crops. Harvest may be taken every year by selection of well-grown rhizome starting from third year upto 10th year and then terminated or one time harvesting after 30-32 months may also be done. For

ratoon crop, manuring & fertilization should be done every year with pre monsoon shower.

**(x) Rhizome Processing:** After harvest, the leaves, stalks with leaf sheath and roots are removed and cleaned and then spread on the floor. Clean rhizomes are then cut into 2.5-3 cm pieces and dried by using deamed fire and smoke. When about 50% drying takes place, they are taken out and dried under the sun till a rattling sound on handling is obtained. The fresh and dry ratio of about 5.5 : 1 is safe for storing or distillation.

**(xi) Yield of Rhizome:** Fresh yield is about 10-12 times of planting material and thus average fresh yield after 3 years is about 240 q/ha. On drying it yields about 50 q dry rhizomes, which on steam distillation may yield 45 - 48 kg of essential oil at 1.0% recovery.

**(xii) Distillation:** After drying, distillation should be done within one month to get maximum recovery (1 % or more). With ageing, oil recovery goes down to 0.8 % (if distilled after 3 months of storing). Since the oil glands are situated inside the rhizome, which contains lot of starch, it has to be disintegrated or crushed to expose the oil glands in such a way that during the process, heat is not generated. Heat generation will destroy considerable quantity of oil. Distillation process takes about 10-12 hours to exhaust one batch.

At the end of distillation, oil is taken out from the receiver and is treated with anhydrous sodium sulphate salt @ 15-20 g/litre of oil. After making water free and filtering, the oil is stored in aluminium container. The spent material obtained after oil extraction is utilized as organic manure or as a raw material for Dhup or other incense sticks manufacturing. After disintegration or crushing, the material should be put into the distillation tank immediately to avoid loss of oil.

### 3.0 COST OF THE PROJECT

The estimated project cost is given below.

(Rs. in lacs)	
Particulars	Amount (Rs)
Land & Site Development	-
Building & Civil Works	4.49
Machinery & Equipment	3.84
Misc. Fixed Assets	0.85
Setting up of Nursery	2.39
Preparation of Seedlings	0.72
Land Preparation	0.20
Planting	0.60
Preliminary & Pre-operative Expenses	0.70
Working Capital	4.18
<b>TOTAL</b>	<b>17.97</b>

**3.1 Land & Site Development:** No cost has been considered for land & site development. It is assumed that the unit will be set up in existing farmland.

**3.2 Building & Civil Works:** Details of building & civil works are given below.

Particulars	Area (Sqft)	Rate (Rs)	Amount (Rs)
Distillation Shed (Open shed, CGI sheet roofings, kuttcha Floor)	400	300	120000
Labour quarter cum Store room (Brick wall, CGI sheet roof, concrete floor)	720	400	288000
Sub total			408000
Add: Electrification, etc @ 10%			40800
TOTAL			448800
Say (Rs. in lacs)			4.49

**3.3 Machinery & Equipment:** Details of machinery & equipment are given below.

Particulars	Qty	Rate (Rs)	Amount (Rs)
Distillation unit (Hydro-steam and lifting type, capacity 1.0 MT/batch, made of 304 grade stainless steel with all accessories and tax)	1	320000	320000
Add transportation, installation, etc @ 20%			64000
TOTAL			384000
Say (Rs. in lacs)			3.84

**3.4 Misc. Fixed Assets:** Details of miscellaneous fixed assets are given below.

Particulars	Qty	Rate (Rs)	Amount (Rs)
Water Supply System (STW boring, storage, 3 hp pump set, pipes & fittings)	1	75000	75000
Miscellaneous items	LS	LS	10000
TOTAL			85000
Say (Rs. in lacs)			0.85

**3.5 Setting up of a Nursery:** Details of expenses for setting up of a nursery is given below.

Target area for cultivation (in ha)				4
Area required for raising of mother stock in sqm (1/5 of target area)				8000
Number of seedlings required (75,000/ha)				60000
Particulars	Unit	Quantity	Rate (Rs)	Amount (Rs)
Purchase of seedlings	Nos	60000	3	180000
Engagement of labour for nursery land preparation	Mandays/ha	25	200	4000
Engagement of labour for planting of seedlings	Mandays/ha	75	200	12000
Cost of FYM	kg/ha	18000	0.20	2880
Sub-total				198880
Add: Maintenance for seedlings for 6 months, etc. @ 20%				39776
TOTAL				238656
Say (Rs. in lacs)				2.39

**3.6 Preparation of Seedlings:** Details of expenses for preparation of seedlings is given below.

No. of seedlings required per ha		75000		
Target area for cultivation (in ha)		4		
Total No. of seedlings required		300000		
Particulars	Unit	Quantity	Rate (Rs)	Amount (Rs)
Engagement of labour for cutting the rhizomes into 2 inch pieces	Manday/ 1000 Nos	1	200	60000
Add: Cost of drying, etc @ 20%				12000
TOTAL				72000
Say (Rs. in lacs)				0.72

**3.7 Land Preparation for Nursery:** Details of expenses for land preparation of nursery is given below.

Particulars	Mandays/ha	Rate (Rs)	Area under crop (ha)	Amount (Rs)
Engagement of labour for land preparation	25	200	4	20000
Say (Rs. in lacs)				0.20

**3.8 Planting:** Details of expenses for planting in nursery is given below.

Particulars	Mandays/ha	Rate (Rs)	Area under crop (ha)	Amount (Rs)
Engagement of labour for planting of seedlings	75	200	4	60000
Say (Rs. in lacs)				0.60

**3.9 Preliminary & Pre-operative Expenses:** Details of preliminary & pre-operative expenses are given below.

Particulars	Amount (Rs)
Travelling expenses	0.20
Interest during implementation	0.40
Miscellaneous expenses	0.10
<b>TOTAL</b>	<b>0.70</b>

**3.10 Working capital:** Details of working capital are given below.

Particulars	Yr 1	Yr 2	Yr 3
Total operating expenses	2.15	2.03	4.54
Operating expenses capitalised for Yr 1 & Yr 2	4.18		

**4.0 MEANS OF FINANCE:** The means of finance for the project is estimated below.

Particulars	Percent	Amount (Rs)
<b>EQUITY</b>		
A. Equity from Promoters	40%	7.19
B. Subsidy from Central/State Govt.	-	
<b>DEBT</b>		
Term Loan from Banks/FIs	60%	10.78
<b>TOTAL</b>	<b>100%</b>	<b>17.97</b>

**5.0 PROFITABILITY STATEMENT**

Particulars	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
<b>A. INCOME</b>							
Oil production per annum (in kg)	0	0	192	192	192	192	192
Oil price (Rs. per kg)	4500	4500	4500	4500	4500	4500	4500
Income from sale of oil (Rs lakh)	0.00	0.00	8.64	8.64	8.64	8.64	8.64
<b>B. OPERATING EXPENSES</b>							
Manures & Fertilizers	0.26	0.12	0.12	0.12	0.12	0.12	0.12
Weed Control & Intercultural Operations	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Harvesting	0.00	0.00	0.32	0.32	0.32	0.32	0.32
Post Harvest Operations	0.00	0.00	0.32	0.32	0.32	0.32	0.32
Distillation	0.00	0.00	1.77	1.77	1.77	1.77	1.77
Power	0.12	0.12	0.12	0.12	0.12	0.12	0.12

Salary	1.08	1.09	1.10	1.11	1.12	1.14	1.15
Repair & Maintenance	0.09	0.10	0.11	0.12	0.13	0.15	0.16
Miscellaneous Expenses	0.00	0.00	0.09	0.09	0.09	0.09	0.09
Total Operating Expenses	2.15	2.03	4.54	4.57	4.59	4.61	4.64
Less: Operating Expenses capitalised	2.15	2.03	0.00	0.00	0.00	0.00	0.00
Operating profit	0.00	0.00	4.10	4.07	4.05	4.03	4.00
<b>C. FINANCIAL EXPENSES</b>							
Depreciation	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Interest on Term Loan	0.86	0.86	0.84	0.68	0.49	0.30	0.10
Expenses on nursery written off	0.24	0.24	0.24	0.24	0.24	0.24	0.24
Expenses on preparation of seedlings written off	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Expenses on land preparation written off	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Expenses on planting of seedlings written off	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Net Profit	-1.40	-1.40	2.72	2.86	3.03	3.20	3.36
Net cash accruals	-0.53	-0.53	3.58	3.73	3.89	4.06	4.23
Principle repayment	0.00	0.00	1.20	2.40	2.40	2.40	2.40

### 6.1 Estimation of Production: Production of oil is estimated as below.

Particulars	Unit	Quantity					
Yield of fresh rhizomes/hectare/harvest	kg	24000					
Area under crop	ha	4					
Total yield of fresh rhizomes	kg	96000					
Recovery rate of dry rhizomes	%	20%					
Yield of dry rhizomes/harvest	kg	19200					
	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Number of harvests/year (Gestation period of 2 years; subsequent harvests at yearly intervals upto 10 years)	0	0	1	1	1	1	1
Yield of dry rhizomes/year (in kg)	0	0	19200	19200	19200	19200	19200
Percentage of oil recovery	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Total oil production per annum (in kg)	0	0	192	192	192	192	192

### 6.2 Manures & Fertilizers: Expenses on manures & fertilizers is estimated as below.

Particulars	Kg/ha	Source	Nutrient %	Kg/ ha (source)	Cost/ kg of Source (Rs)	Cost/ ha (Rs)	Area under crop (ha)	Amount (Rs)
Expenses on Nitrogen/ application	40	Urea	46%	87	5.50	478	4	1913
Expenses on Phosphorus/application	50	SSP	16%	313	4.00	1250	4	5000
Expenses on Potassium/ application	60	MOP	60%	100	12.00	1200	4	4800
	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	
Application of Manures during land preparation in Year 1 (18000 kg/ha @ Rs 0.20/ kg)	14400							
Application of Nitrogen/ annum	1	1	1	1	1	1	1	

Cost (Rs)	1913	1913	1913	1913	1913	1913	1913
Application of Phosphorus/annum	1	1	1	1	1	1	1
Cost (Rs)	5000	5000	5000	5000	5000	5000	5000
Application of Potassium/annum	1	1	1	1	1	1	1
Cost (Rs)	4800	4800	4800	4800	4800	4800	4800
Expenses on purchase of manures & fertilizers per annum (Rs)	26113	11713	11713	11713	11713	11713	11713

**6.3 Weed Control & Intercultural Operations:** Expenses on weed control & intercultural operations is estimated below.

Particulars	Mandays/ ha		Rate (Rs)	Area under crop (ha)		Cost/ annum (Rs)	
Engagement of labour for weed control & intercultural operations	75		200	4		60000	
	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Number of weed control & intercultural operations per year	1	1	1	1	1	1	1
Expenses on weed control & intercultural operations per annum	60000	60000	60000	60000	60000	60000	60000

**6.4 Harvesting:** Expenses on harvesting is estimated below.

Particulars	Mandays/ ha	Rate (Rs)	Area under crop (ha)		Cost/harvest (Rs)		
Engagement of labour for harvesting	40	200	4		32000		
	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Number of harvests/year (Gestation period of 2 years; subsequent harvests at yearly intervals upto 10 years)	0	0	1	1	1	1	1
Expenses on harvest per annum	0	0	32000	32000	32000	32000	32000

**6.5 Post Harvest Operations:** Expenses on post harvest operations is estimated as below.

Particulars	Mandays/ ha	Rate/manday (Rs)		Area under crop (ha)		Cost/operation (Rs)	
Engagement of labour for post harvest operations	40	200		4		32000	
	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Number of post harvest operations/year	0	0	1	1	1	1	1
Expenses on post harvest operations per annum	0	0	32000	32000	32000	32000	32000



**6.6 Distillation:** Expenses on distillation is estimated as below.

No. of hours per distillation	12						
Fuel (Dry herbage) consumption (kg/hr)	25						
Cost of dry herbage per kg (Rs)	5						
Expenses on fuel/distillation (Rs)	1500						
	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Yield of dry rhizomes/year (in kg)	0	0	19200	19200	19200	19200	19200
Quantity of dry rhizomes per distillation (kg)	250	250	250	250	250	250	250
No. of distillations per annum (Average)	0	0	77	77	77	77	77
Expenses on fuel (Rs)	0	0	115200	115200	115200	115200	115200
Add: engagement of labour (4 mandays/distillation & manday cost of Rs 200)	0	0	61440	61440	61440	61440	61440
Expenses on distillation per annum (Rs)	0	0	176640	176640	176640	176640	176640

**6.7 Power:** Expenses on power is estimated as below.

Particulars	Quantity	Power (Kw)	Total (Kw)	Hrs/day	kwh/day
3 HP Pumpset	1	2.24	2.24	1	2.24
General Lighting	6	0.10	0.56	8	4.48
Power requirement/ day (Kwh)					6.72
Days/annum			360		
Rate per unit (Rs)			5.00		
Expenses on power per annum			12092		

**6.8 Salary:** Expenses on salary in the 1<sup>st</sup> year is estimated as given below. It is assumed that expenses on salary will increase @ 1% every subsequent year.

Particulars of Employees	Numbers	Salary/Month (Rs)	Cost/annum (Rs)
Manager (Self)	0	0	0
Helpers	3	3000	108000
Total			108000

**6.9 Repair & Maintenance:** Expenses on repair & maintenance in the 1<sup>st</sup> year is estimated as given below. It is assumed that expenses on repair & maintenance will increase @ 10% every subsequent year.

(Rs. in lacs)

Particulars	Cost (Rs)	Rate	Amount (Rs)
Building & Civil Works	4.49	1%	0.04
Machinery & Equipment	3.84	1%	0.04
Misc. Fixed Assets	0.85	1%	0.01
Total			0.09

**6.10 Miscellaneous Expenses:** Miscellaneous expenses have been assumed at 1% of sales.**6.11 Depreciation:** Depreciation has been calculated by straight line method. The details of calculation are given below.

(Rs. in lacs)

Description	Cost (Rs)	Rate	Amount/annum (Rs)
Building & Civil Works	4.49	3.34%	0.15
Machinery & Equipment	3.84	7.07%	0.27
Misc. Fixed Assets	0.85	6.23%	0.05
Total			0.47

**6.12 Interest on Term Loan & Principal Repayment:** Interest rate has been assumed at 8%. Duration of Loan repayment has been considered for a period of 7 years including moratorium period of 30 months with equal monthly instalments. The details of calculation are given below.

(Rs. in lacs)

Month	Year	1	2	3	4	5	6	7
Month 1	Opening balance	10.78	10.78	10.78	9.58	7.19	4.79	2.40
	Repayment	0.00	0.00	0.00	0.20	0.20	0.20	0.20
	Interest (8%)	0.07	0.07	0.07	0.06	0.05	0.03	0.02
	Closing balance	10.78	10.78	10.78	9.38	6.99	4.59	2.20
Month 2	Opening balance	10.78	10.78	10.78	9.38	6.99	4.59	2.20
	Repayment	0.00	0.00	0.00	0.20	0.20	0.20	0.20
	Interest	0.07	0.07	0.07	0.06	0.05	0.03	0.01
	Closing balance	10.78	10.78	10.78	9.18	6.79	4.39	2.00
Month 3	Opening balance	10.78	10.78	10.78	9.18	6.79	4.39	2.00
	Repayment	0.00	0.00	0.00	0.20	0.20	0.20	0.20
	Interest	0.07	0.07	0.07	0.06	0.05	0.03	0.01
	Closing balance	10.78	10.78	10.78	8.99	6.59	4.19	1.80
Month 4	Opening balance	10.78	10.78	10.78	8.99	6.59	4.19	1.80
	Repayment	0.00	0.00	0.00	0.20	0.20	0.20	0.20
	Interest	0.07	0.07	0.07	0.06	0.04	0.03	0.01
	Closing balance	10.78	10.78	10.78	8.79	6.39	3.99	1.60
Month 5	Opening balance	10.78	10.78	10.78	8.79	6.39	3.99	1.60
	Repayment	0.00	0.00	0.00	0.20	0.20	0.20	0.20
	Interest	0.07	0.07	0.07	0.06	0.04	0.03	0.01
	Closing balance	10.78	10.78	10.78	8.59	6.19	3.79	1.40
Month 6	Opening balance	10.78	10.78	10.78	8.59	6.19	3.79	1.40
	Repayment	0.00	0.00	0.00	0.20	0.20	0.20	0.20
	Interest	0.07	0.07	0.07	0.06	0.04	0.03	0.01
	Closing balance	10.78	10.78	10.78	8.39	5.99	3.59	1.20
Month 7	Opening balance	10.78	10.78	10.78	8.39	5.99	3.59	1.20
	Repayment	0.00	0.00	0.20	0.20	0.20	0.20	0.20
	Interest	0.07	0.07	0.07	0.06	0.04	0.02	0.01
	Closing balance	10.78	10.78	10.58	8.19	5.79	3.39	1.00
Month 8	Opening balance	10.78	10.78	10.58	8.19	5.79	3.39	1.00
	Repayment	0.00	0.00	0.20	0.20	0.20	0.20	0.20
	Interest	0.07	0.07	0.07	0.05	0.04	0.02	0.01
	Closing balance	10.78	10.78	10.38	7.99	5.59	3.19	0.80
Month 9	Opening balance	10.78	10.78	10.38	7.99	5.59	3.19	0.80
	Repayment	0.00	0.00	0.20	0.20	0.20	0.20	0.20
	Interest	0.07	0.07	0.07	0.05	0.04	0.02	0.01
	Closing balance	10.78	10.78	10.18	7.79	5.39	3.00	0.60
Month 10	Opening balance	10.78	10.78	10.18	7.79	5.39	3.00	0.60
	Repayment	0.00	0.00	0.20	0.20	0.20	0.20	0.20
	Interest	0.07	0.07	0.07	0.05	0.04	0.02	0.00
	Closing balance	10.78	10.78	9.98	7.59	5.19	2.80	0.40
Month 11	Opening balance	10.78	10.78	9.98	7.59	5.19	2.80	0.40
	Repayment	0.00	0.00	0.20	0.20	0.20	0.20	0.20
	Interest	0.07	0.07	0.07	0.05	0.03	0.02	0.00
	Closing balance	10.78	10.78	9.78	7.39	4.99	2.60	0.20
Month 12	Opening balance	10.78	10.78	9.78	7.39	4.99	2.60	0.20
	Repayment	0.00	0.00	0.20	0.20	0.20	0.20	0.20
	Interest	0.07	0.07	0.07	0.05	0.03	0.02	0.00
	Closing balance	10.78	10.78	9.58	7.19	4.79	2.40	0.00



Principal Repayment	0.00	0.00	1.20	2.40	2.40	2.40	2.40
Interest	0.86	0.86	0.84	0.68	0.49	0.30	0.10

**6.13 DEBT SERVICE COVERAGE RATIO (DSCR)**

(Rs. in lacs)

Year	3	4	5	6	7	TOTAL
Profit After Tax (Net Profit)	2.72	2.86	3.03	3.20	3.36	
Depreciation	0.47	0.47	0.47	0.47	0.47	
Interest	0.84	0.68	0.49	0.30	0.10	
Total	4.04	4.01	3.99	3.97	3.94	19.95
Interest repayment	0.84	0.68	0.49	0.30	0.10	
Loan repayment	0.00	0.00	1.20	2.40	2.40	
Total	0.84	0.68	1.69	2.69	2.50	8.40
DSCR	4.79	5.91	2.37	1.47	1.58	

Average DSCR = 2.38

**7.0 BREAK EVEN POINT (BEP)**

(Rs. In lacs)

Year	3	4	5
A. Net sales (Rs. lakh)	8.64	8.64	8.64
B. Variable cost			
Manures & Fertilizers	0.12	0.12	0.12
Weed Control & Intercultural Operations	0.60	0.60	0.60
Harvesting	0.32	0.32	0.32
Post Harvest Operations	0.32	0.32	0.32
Distillation	1.77	1.77	1.77
Power	0.12	0.12	0.12
Miscellaneous Expenses	0.09	0.09	0.09
Total variable cost	3.33	3.33	3.33
C. Contribution (A-B)	5.31	5.31	5.31
D. Fixed & Semi-fixed Costs			
Salary	1.10	1.11	1.12
Repair & Maintenance	0.11	0.12	0.13
Interest on Term Loan	0.84	0.68	0.49
Depreciation	0.47	0.47	0.47
Total fixed cost	2.53	2.39	2.22
E. BREAK EVEN POINT	48%	45%	42%

**8.0 INTERNAL RATE OF RETURN (IRR)**

(Rs. in lacs)

Year	0	1	2	3	4	5	6	7	8	9	10
CASH OUTFLOW											
Capital Expenditure	11.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Working Capital	0.00	0.18	-0.01	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total (A)	11.57	0.18	-0.01	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CASH INFLOW											
Profit After Tax		-1.40	-1.40	2.72	2.86	3.03	3.20	3.36	3.44	3.41	3.38
Add: Depreciation		0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Add: Interest		0.86	0.86	0.84	0.68	0.49	0.30	0.10	0.00	0.00	0.00
Add: Salvage Value											
Total (B)	0.00	-0.06	-0.06	4.04	4.01	3.99	3.97	3.94	3.91	3.88	3.85
NET FLOW (B-A)	-11.57	-0.24	-0.05	3.83	4.01	3.99	3.96	3.94	3.91	3.88	3.85

IRR = 17%

TECHNICAL CONSULTANT

(a) NEDFi R & D Centre,  
Khetri, Kamrup,  
Assam-782403