

COMMERCIAL CULTIVATION ON SARPAGANDHA



1.0 INTRODUCTION

The Rauvolfia root or Serpentine root (Sarpagandha) is an important crude drug used in modern medicine. Its leaves are simple, 7.5 -10cm long and 3.5 -5 cm broad. The root is prominent, tuberous, usually branched, 0.5 to 2.6 cm diameter and upto 40 to 60 cm deep into soil. The root bark, which constitutes 40-60% of the whole root, is rich in alkaloids known for its efficacy in reducing high blood pressure and as a sedative or tranquilizing agent. The fresh root emits a characteristic acrid aroma, is very bitter in taste and the roots possess high alkaloid concentration. Reserpine is the compound/active principle used for hypertension as a life saving drug in allopathic system of medicine.

1.1 Habitat: It is an erect under shrub (woody herb) and found in scrub jungles and forest clearings growing to a height of 60-90 cm. The shrub grows wild in NE region up to an altitude of 500 m.

This project profile is for commercial cultivation of Sarpagandha with a total plantation area of 1 ha.

2.0 PACKAGE OF PRACTICES

(i) Soil & Climate: The plant grows in a wide variety of soils ranging from sandy alluvial loam to red lateritic loam with large percentage of humus and acidic in reaction. The ideal pH for this crop is from 4.6-6.5. It prefers hot humid climate, humus rich sandy loam soil and a climate

with a temperature range of 10 - 30°C seems to be well suited for this plant.

(ii) Propagation: Rauvolfia can be propagated by seed and also by vegetative means like root cutting, root stumps and stem cutting. Seed propagation is the best method for commercial plantation. A healthy mother stock should be raised before hand for collection of seeds.

Seed germination is highly variable. Germination of heavy seeds during April-June after soaking them in water for 24 hours is about 20-40 % while freshly collected heavy seeds germination is highest (upto 60 %). April-May is found to be suitable for sowing seeds in nursery. The nursery is prepared by raised beds mixing with one-third of well matured FYM and leaf mould and two-third amount medium silt-loam soil under partial shade.

Seeds are sown in April, 2-3 cms apart in rows in shallow furrows. The furrows are then covered with a fine mixture of soil and FYM and the bed should be kept moist by light watering. Germination starts after 15-20 days and continues upto 40-50 days. The nursery should be kept moist throughout the germination period. Seedlings are ready by mid June- July for transplantation.

About 6 kg seed sown during April-May in a 500-sq m bed will be sufficient for one-hectare area.

(iii) Planting: The nursery grown seedlings of 40-50 days old which have 4-6 leaves (10- 2 cm tall, naked rooted or

in poly bags), are transplanted at spacing of 30 x 30 cm. Seedlings are carefully dugout and the taproot is cut. They are then dipped in a 0.1 % solution of fungicide before planting, to protect them against soil borne fungus causing damping off disease. Sarpagandha takes a long duration (18 months onwards) as it is a slow growing crop particularly in the initial stage. About 80,000-1,00,000 number of seedlings are required/ha as a sole crop. Plants get established well within 25-30 days after planting.

(iv) Manure & Fertilizers: FYM @ 20-25 MT/ha should be applied during land preparation. After planting N,P & K at the rate 10:60:30 kg/ha is applied as basal dose. Later two equal doses of N each of 10 kg/ ha in moist soil may be applied at 50 days and 170 days after planting.

(v) Irrigation: Rauvolfia is cultivated as a rainfed crop. However, if available 4 irrigations in summer and 2 in winter at one month interval may be applied for higher yield.

(vi) Weeding & Interculture: Weeding, cleaning, hoeing twice during rains and after rains.

Flowering and fruiting starts from 6 months onward after transplanting which is irrelevant, unless there is need to collect sufficient seeds for sale or for mass multiplication. If the plant is allowed to flower and bear fruits, these markedly depress both shoot and root growth, because a significant amount of photosynthates is utilized for the

production of flowers and fruits by the plants. Therefore, defloration is recommended for better root growth and yield. For seed collection an area may be earmarked.

(vii) Harvesting & Processing: The marketable roots are generally collected 2-3 years after plantation preferably after 30 months of planting. When transplanting is done during June-July, harvesting period coincides with shedding of leaves during early autumn. At this stage, the root contains maximum concentration of total alkaloids. During harvest, the roots may be found to go up to 40 cm deep in the soil. During root harvesting, the thin roots are also collected. Care should be taken to keep the root bark intact as the bark constitutes 40-56 % of the whole root and has a higher alkaloid content. In general, during winter months plants remain dormant and is considered ideal for harvesting.

Application of a light irrigation if possible will make digging easier. After digging, the roots are cleaned, washed and cut into 15 cm pieces for drying and storage. The dry root possesses upto 10-12 % moisture and are stored in polythene lined gunny bags in a cool dry place to protect them from mould.

(viii) Yield: Though Rauvolfia can be propagated by various methods, maximum yield of root is obtained when the propagation is done by seeds that vary from 0.1 to 0.4 kg per plant. The average yield of Rauvolfia dry root is approximately 2000-2500 kg/ha under average management when harvested at 30 months.

3.0 COST OF THE PROJECT

The estimated project cost is given below.

Particulars	(Rs. in lacs)
	Amount (Rs)
Land & Site Development	-
Building & Civil Works	3.17
Misc. Assets	0.85
Setting up of Nursery	0.16
Land Preparation	0.05
Transplanting of Seedlings	0.15
Preliminary & Pre-operative Expenses	0.39
Working Capital	2.82
TOTAL	7.58

4.1 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.

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

Particulars	Area (Sqft)	Rate (Rs)	Amount (Rs)
Labour quarter cum Store room (Brick wall, CGI roof, Concrete floor)	720	400	288000
Add: Electrification, etc @ 10%			28800
		TOTAL	316800
		Say (Rs. in lacs)	3.17

4.3 Misc. Assets: Details of miscellaneous 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

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

Target area for cultivation (in ha)		1		
Quantity of seeds required for sowing in 1 ha (kg)		6		
Total quantity of seeds required (kg)		6		
Area required for raising seedlings in sqm (500 sqm/ ha)		500		
Particulars	Unit	Qty	Rate (Rs)	Amount (Rs)
Purchase of seeds	kg	6	2000	12000
Engagement of labour for nursery land preparation	Mandays/ ha	25	200	250
Engagement of labour for planting of seeds	Mandays/ ha	75	200	750
Cost of FYM	kg/ ha	25000	0.20	250
		Sub-total		13250
Add: Maintenance for seedlings for 3 months, etc. @ 20%				2650
		TOTAL		15900
		Say (Rs. in lacs)		0.16

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

Particulars	Mandays/ ha	Rate (Rs)	Area under crop (ha)	Amount (Rs)
Engagement of labour for land preparation	25	200	1	5000
		Say (Rs. in lacs)		0.05

4.6 Transplanting of Seedlings: Details of expenses for transplanting of seedlings is given below.

Particulars	Mandays/ ha	Rate (Rs)	Area under crop (ha)	Amount (Rs)
Engagement of labour for transplanting of seedlings	75	200	1	15000
		Say (Rs. in lacs)		0.15

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

(Rs. in lacs)

Particulars	Amount (Rs)
Travelling expenses	0.20
Interest during implementation	0.09
Miscellaneous expenses	0.10
TOTAL	0.39

4.8 Working capital: Details of working capital are given below.

(Rs. in lacs)

	Amount (Rs)		
	Yr 1	Yr 2	Yr 3
Total operating expenses	1.44	1.38	1.74
Operating expenses capitalised for Yr 1 & Yr 2	2.82		

4.9 MEANS OF FINANCE

The means of finance for the project is estimated as below.

(Rs. in lacs)

Particulars	Percent	Amount (Rs)
<u>EQUITY</u>		
A. Equity from Promoters	40%	3.03
B. Subsidy from Central/State Govt.	-	
<u>DEBT</u>		
Term Loan from Banks/FIs	60%	4.55
TOTAL	100%	7.58

5.0 PROFITABILITY STATEMENT

(Rs. in lacs)

Particulars	Yr 1	Yr 2	Yr 3
<u>A. INCOME</u>			
Yield of dry roots per annum (in kg)	0	0	22000
Price of dry roots (Rs. per kg)	80	80	80
Income from sale of oil (Rs lakh)	0.00	0.00	17.60
<u>B. OPERATING EXPENSES</u>			
Manures & Fertilizers	0.07	0.00	0.00
Weed Control & Intercultural Operations	0.15	0.15	0.15
Harvesting	0.00	0.00	0.08
Post Harvest Operations	0.00	0.00	0.08
Power	0.09	0.09	0.09
Salary	1.08	1.09	1.10
Repair & Maintenance	0.04	0.05	0.06
Miscellaneous Expenses	0.00	0.00	0.18
Total Operating Expenses	1.44	1.38	1.74
Less: operating expenses capitalised	1.44	1.38	0.00
Operating profit	0.00	0.00	15.86

C. FINANCIAL EXPENSES			
Depreciation	0.16	0.16	0.16
Interest on Term Loan	0.36	0.36	0.33
Expenses on nursery written off	0.05	0.05	0.05
Expenses on land preparation written off	0.02	0.02	0.02
Expenses on transplanting of seedlings written off	0.05	0.05	0.05
Net Profit	-0.64	-0.64	15.25
Net cash accruals	-0.36	-0.36	15.53
Principle repayment	0.00	0.00	4.55

6.1 Estimation of Production: Yield of dry roots is estimated as below.

Particulars	Unit	Quantity	
Yield of dry roots/hectare	kg	22000	
Area under crop	ha	1	
Total yield of dry roots	kg	22000	
	Yr 1	Yr 2	Yr 3
Schedule of harvest (Gestation period of 30 months)	0	0	1
Yield of dry roots per annum (in kg)	0	0	22000

6.2 Manures & Fertilizers: Expenses on manures & fertilizers in the 1st year 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)
Basal dose of Nitrogen (Year1)	10	Urea	46%	22	5.50	120	1	120
Basal dose of Phosphorus (Year 1)	60	SSP	16%	375	4.00	1500	1	1500
Basal dose of Potassium (Year1)	30	MOP	60%	50	12.00	600	1	600
2nd dose of Nitrogen at 50 days (Year 1)	10	Urea	0.46	22	5.5	120	1	120
3rd dose of Nitrogen at 170 days (Year 1)	10	Urea	0.46	22	5.5	120	1	120
Application of Manures during land preparation in Year 1 (25000 kg/ha @ Rs 0.20/kg)								5000
Expenses on manures & fertilizers during Year 1 (Rs)								7459

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

		Rate (Rs)	Area under crop (ha)	Cost/ annum (Rs)
Engagement of labour for weed control & intercultural operations	75	200	1	15000
	Yr 1	Yr 2	Yr 3	
Number of weed control & intercultural operations per annum	1	1	1	
Expenses on weed control & intercultural operations per annum (Rs)	15000	15000	15000	

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	1	8000
	Yr 1	Yr 2	Yr 3	
Schedule of harvest (Gestation period of 30 months)	0	0	1	
Expenses on harvest per annum (Rs)	0	0	8000	

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

Particulars	Mandays/ha	Rate (Rs)	Area under crop (ha)	Cost/ operation (Rs)
Engagement of labour for post harvest operations	40	200	1	8000
	Yr 1	Yr 2	Yr 3	
Schedule of post harvest operations	0	0	1	
Expenses on post harvest operations per annum (Rs)	0	0	8000	

6.6 Power: Expenses on power is estimated below.

Particulars	Quantity	Power (Kw)	Total (Kw)	Hrs/day	kwh/day
3 HP Pumpset	1	2.24	2.24	1	2.24
General Lighting	4	0.1	0.36	8	2.88
Power requirement per day (kwh)					5.12
Days/ annum		360			
Rate/ unit (Rs)		5			
Expenses on power per annum (Rs)		9212			

6.7 Salary: Expenses on salary is given below.

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

6.8 Repair & Maintenance: Expenses on repair & maintenance in the 1st year is estimated as given below. It is assumed that expenses on repair & maintenance will increase @ 20% every subsequent year.

(Rs. in lacs)

Particulars	Cost (Rs)	Rate	Amount (Rs)
Building & Civil Works	3.17	1%	0.03
Misc. Assets	0.85	1%	0.01
Total			0.04

6.9 Miscellaneous Expenses: Miscellaneous expenses have been assumed at 1% of sales.**6.10 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	3.17	3.34%	0.11
Misc. Assets	0.85	6.23%	0.05
Total			0.16

6.11 Interest on Term Loan & Principal Repayment: Interest rate has been assumed at 8% per annum. Duration of Loan repayment has been considered for a period of 3 years including moratorium period of 33 months with equal monthly instalments. The details of calculation are given below.

(Rs. in lacs)

Month	Year Ending March 31	1	2	3
Month 1	Opening balance	4.55	4.55	4.55
	Repayment	0.00	0.00	0.00
	Interest (8%)	0.03	0.03	0.03
	Closing balance	4.55	4.55	4.55
Month 2	Opening balance	4.55	4.55	4.55
	Repayment	0.00	0.00	0.00
	Interest	0.03	0.03	0.03
	Closing balance	4.55	4.55	4.55
Month 3	Opening balance	4.55	4.55	4.55
	Repayment	0.00	0.00	0.00
	Interest	0.03	0.03	0.03
	Closing balance	4.55	4.55	4.55
Month 4	Opening balance	4.55	4.55	4.55
	Repayment	0.00	0.00	0.00
	Interest	0.03	0.03	0.03
	Closing balance	4.55	4.55	4.55
Month 5	Opening balance	4.55	4.55	4.55
	Repayment	0.00	0.00	0.00
	Interest	0.03	0.03	0.03
	Closing balance	4.55	4.55	4.55
Month 6	Opening balance	4.55	4.55	4.55
	Repayment	0.00	0.00	0.00
	Interest	0.03	0.03	0.03
	Closing balance	4.55	4.55	4.55
Month 7	Opening balance	4.55	4.55	4.55
	Repayment	0.00	0.00	0.00
	Interest	0.03	0.03	0.03
	Closing balance	4.55	4.55	4.55
Month 8	Opening balance	4.55	4.55	4.55
	Repayment	0.00	0.00	0.00
	Interest	0.03	0.03	0.03
	Closing balance	4.55	4.55	4.55
Month 9	Opening balance	4.55	4.55	4.55
	Repayment	0.00	0.00	0.00
	Interest	0.03	0.03	0.03
	Closing balance	4.55	4.55	4.55
Month 10	Opening balance	4.55	4.55	4.55
	Repayment	0.00	0.00	1.52
	Interest	0.03	0.03	0.03
	Closing balance	4.55	4.55	3.03
Month 11	Opening balance	4.55	4.55	3.03
	Repayment	0.00	0.00	1.52
	Interest	0.03	0.03	0.02
	Closing balance	4.55	4.55	1.52
Month 12	Opening balance	4.55	4.55	1.52
	Repayment	0.00	0.00	1.52
	Interest	0.03	0.03	0.01
	Closing balance	4.55	4.55	0.00

	Principal Repayment	0.00	0.00	4.55
	Interest	0.36	0.36	0.33
	Repayment	0.00	0.00	0.00
	Interest	0.03	0.03	0.03
	Closing balance	4.55	4.55	4.55
Month 7	Opening balance	4.55	4.55	4.55
	Repayment	0.00	0.00	0.00
	Interest	0.03	0.03	0.03
	Closing balance	4.55	4.55	4.55
Month 8	Opening balance	4.55	4.55	4.55
	Repayment	0.00	0.00	0.00
	Interest	0.03	0.03	0.03
	Closing balance	4.55	4.55	4.55
Month 9	Opening balance	4.55	4.55	4.55
	Repayment	0.00	0.00	0.00
	Interest	0.03	0.03	0.03
	Closing balance	4.55	4.55	4.55
Month 10	Opening balance	4.55	4.55	4.55
	Repayment	0.00	0.00	1.52
	Interest	0.03	0.03	0.03
	Closing balance	4.55	4.55	3.03
Month 11	Opening balance	4.55	4.55	3.03
	Repayment	0.00	0.00	1.52
	Interest	0.03	0.03	0.02
	Closing balance	4.55	4.55	1.52
Month 12	Opening balance	4.55	4.55	1.52
	Repayment	0.00	0.00	1.52
	Interest	0.03	0.03	0.01
	Closing balance	4.55	4.55	0.00
	Principal Repayment	0.00	0.00	4.55
	Interest	0.36	0.36	0.33

6.12 DEBT SERVICE COVERAGE RATIO (DSCR)

(Rs. in lacs)

Year	1	2	3	TOTAL
Profit After Tax (Net Profit)	-0.64	-0.64	15.25	
Depreciation	0.16	0.16	0.16	
Interest	0.36	0.36	0.33	
Total	-0.12	-0.12	15.74	15.50
Interest	0.36	0.36	0.33	
Loan repayment	0.00	0.00	4.55	
Total	0.36	0.36	4.88	5.61
DSCR	-0.33	-0.33	3.22	

Average DSCR = 2.76

7.0 BREAK EVEN POINT (BEP)

(Rs. In lacs)

Year	1	2	3	Total
A. Net sales (Rs. lakh)	0.00	0.00	17.60	17.60
B. Variable cost				
Manures & Fertilizers	0.07	0.00	0.00	0.07
Weed Control & Intercultural Operations	0.15	0.15	0.15	0.45
Harvesting	0.00	0.00	0.08	0.08
Post Harvest Operations	0.00	0.00	0.08	0.08
Power	0.09	0.09	0.09	0.28
Miscellaneous Expenses	0.00	0.00	0.18	0.18
Total variable cost				1.14
C. Contribution (A-B)				16.46
D. Fixed & Semi-fixed Costs				
Salary	1.08	1.09	1.10	3.27
Repair & Maintenance	0.04	0.05	0.06	0.15
Interest on Term Loan	0.36	0.36	0.33	1.06
Depreciation	0.16	0.16	0.16	0.48
Total fixed cost				4.96
E. BREAK EVEN POINT				30%

TECHNICAL CONSULTANT

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