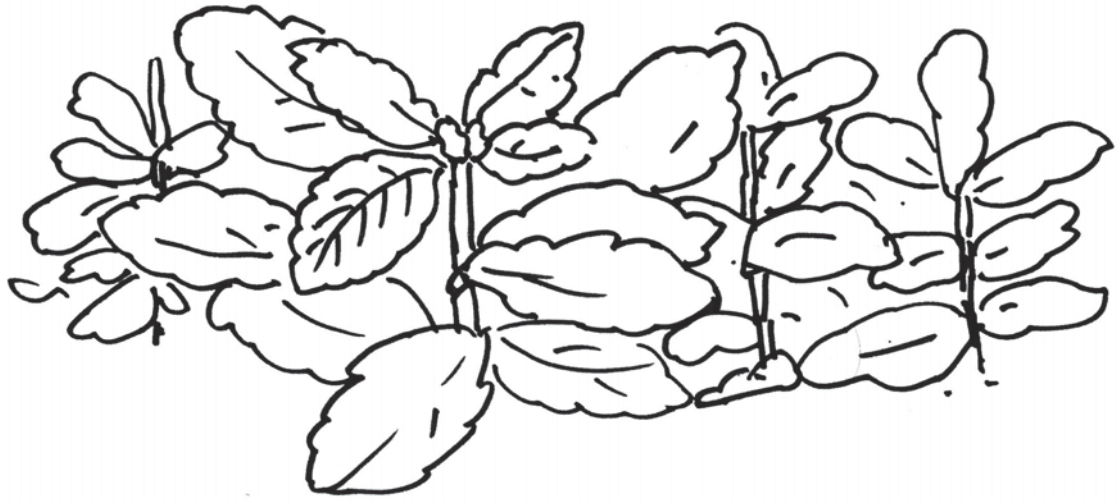
COMMERCIAL CULTIVATION OF STEVIA



1.0 INTRODUCTION

Stevia is a subtropical perennial plant that produces sweet steviol glycosides in the leaves which is also known as 'Cheeni Tulsi' or 'Mou Tulsi'. Plants grown at higher latitudes actually have a higher percentage of sweet glycosides. The plant can be utilized as a source for production of a natural sweetener (food), as a source of chlorophyll (non-food, Oral-hygiene product, medicine) as a source of phytosterols (Non-food, Medicine: raw stuff for the synthesis of oral contraceptives, cholesterol suppressing medicine, antitumour activity against prostrate tumours and activity against rheumatism), the sweetener can be converted into gibberellins by fermentation (Non-food-Agrochemicals), the vegetative residue can be used as animal feed and the stalks can be used as a source of cellulose (Non-food: Cellulose industry).

Its medicinal uses include regulating blood sugar, preventing hypertension, treatment of skin disorders and prevention of tooth decay. The compound obtained from stevia is considered to be the best alternate source for diabetes. The added value for this new crop can go up to a considerable extent.

This project profile is for commercial cultivation of Stevia with cultivation area of 3 hectares.

2.0 MARKET POTENTIAL

The market opportunity for Stevia is good. Statistics indicate that in some countries upto 30% of their sugar has been replaced by stevioside-like sweetness products.

3.0 PACKAGE OF PRACTICES

(i) Soil: Stevia prefers a well-drained fertile sandy loam or loam soil, high in organic matter with ample supply of water. It prefers acidic to neutral (pH 6-7) soil for better growth. It requires a consistent supply of moisture, but not waterlogged. Too much soil moisture can cause rot.

(ii) Climate: It is a semi-humid subtropical plant that shows higher leaf production under high light intensity and warm temperature. Day length is more critical than light intensity. Long spring and summer days favour leaf growth. Short days trigger blossoming. Stevia prefers partial shade during considerable summer sunshine.

(iii) Propagation: Stevia is usually propagated by stem cuttings, which root easily. The sweetness in leaves varies with different varieties. Therefore, for propagation cutting should be obtained from a source, which is high in stevioside and low in associated bitterness. Rooting can be enhanced by using commercial rooting hormones. Cutting should be 2-4 inches long, from leaf axils of

current year growth with atleast two leaf buds above ground. All the lower leaves are removed keeping 2or 3 small leaves. Treatment with paclobutrazol @ 100 ppm has been found to induce the root initiation in short time. Effective outcome of this treatment can be obtained when the cuttings are planted during the month of February-March. Propagation can be done in other period also with varying success.

(iv) Land Preparation: Land is either disced and /or harrowed twice to prepare a fairly smooth, firm-planting surface. Around 50 MT of FYM/ha has to be applied as a basal dressing during the last ploughing to incorporate the manure with the soil. With proper drainage and irrigation channels the field is divided into plots of convenient size.

Forming raised beds is the most economical way to grow Stevia. The raised bed should be of 15 cm in height and 60 cm in width. The distance between two rows should be 40 cm and that between each plant 23 cm. This would give a plant population of around 75,000 per hectare.

(v) Planting: March to mid May gives better results. Immediatly after planting, one irrigation is necessary. The concentration of stevioside in the leaves increases when the plants are grown under long day condition where vegetative period is longer and steviol glycoside yields will be higher.

(vi) Irrigation: It needs irrigation, as Stevia cannot stand drought. Sprinkler irrigation (micro sprinklers) is found to be advantageous since the herb is highly sensitive to water stress and requires frequent light irrigation. During summer, irrigation at 3-5 days interval gives best results.

(vii) Manures & Fertilizers: Under average condition application of FYM @ 50 t/ha and fertilizers N-60 kg, P205 30 kg and K20 45 kg/ha is recommended. N is applied in three splits once at basal and remaining two applications after first and second cutting. Stevia plants prefer low nitrogen, but high level of phosphorus and potassium. Slow release nitrogen sources are better due to requirement of low level of N and steady release of N from source. Sometimes stevia shows the symptoms of boron deficiency, which leads to leaf spot and that can be rectified by spraying Borax 6 %. Since the feeder roots tend to be quite near the surface, addition of compost for extra nutrients is beneficial.

(viii) Harvesting: Time of harvesting depends on land type, variety and growing season. The first harvest of the crop can be had in four months after planting and subsequent harvest once every 3 months. Generally it can be scheduled for mid to late September when plants are 50-70 cm in height. Short days induce flowering. Optimum yield (biomass) and stevioside quality and quantity is best obtained just before flowering. The easiest harvesting technique is to cut the branches off with pruning shears before stripping the leaves. The tips of the stems can be clipped off and added to harvest yield, as they contain as much stevioside as do the leaves. On an average three commercial harvests can be obtained per year.

It is better to cut the plants leaving about 10 cm stem portion from the ground. This will facilitate new flushes to emerge, which can be harvested as the next crop. For domestic use leaves may be used fresh for tea or may be combined with mint leaves.

(ix) Drying: Immediately after harvest the herb is dried. This can be accomplished on a screen or net. The freshly harvested plants can be hung upside down and dried in the shade. It can also be dried using simple drying racks inside transparent poly house or transparent glass roofing or by passing dry air just above room temperature.

Drying of the stem and soft green leaf material is completed immediately after harvesting utilizing a drying wagon or a kiln or done naturally in case of large-scale production. Depending on weather conditions and density of loading, it generally takes 24 to 48 hours to dry stevia at 400 to 500 C. The drying process does not require excessive heat; more important is good air circulation. On a moderately warm fall day, stevia can be quickly dried in the full sun in about 12 hours. (Longer drying time will lower the stevioside content of the final product). A home dehydrator can also be used, although sun drying is the preferred method.

After adequate drying, the leaves are stripped of the stems/ twigs and packed and stored in cool, dry place. For large-scale commercial production artificial drying and threshing of the dry herbs to separate leaves may be employed.

(x) Yield: About 15000kg/ha of green herb is obtained which on drying gives about 4166 kg/ha. After separating stems this yields about 3000 kg/ha in the first year. Yield goes on decreasing from 3 year of planting and hence terminated.

4.0 COST OF THE PROJECT

The estimated project cost is given below.

Particulars	Amount (Rs lacs)
Land & Site Development	-
Building & Civil Works	3.67
Misc. Assets	0.85
Cost of Seedlings	4.50
Land Preparation	0.15
Planting	0.45
Preliminary & Pre-operative Expenses	0.42
Working Capital	1.90
TOTAL	11.94

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 sheet roof, concrete floor)	720	400	288000
Drying Shed (Open shed with CGI sheet roof)	1000	50	50000
Add: Electrification, etc @ 10%			28800
		TOTAL	366800
		Say (Rs. in lacs)	3.67

4.3 Misc. Assets: Details of miscellaneous assets are given below.

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

4.4 Cost of Seedlings: Details of expenses for purchase of seedlings is given below.

Target area for cultivation (in ha)	3
No. of seedlings required per ha	75000
Total No. of seedlings required	225000
Price of a seedling (Rs)	2
Total cost (Rs)	450000
Say (Rs. in lacs)	4.50

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

Particulars	Mandays/ ha	Rate (Rs)	Area under crop (ha)	Amount (Rs)
Engagement of labour for land preparation	25	200	3	15000
			Say (Rs. in lacs)	0.15

4.6 Planting: Details of expenses for planting are given below.

Particulars	Mandays/ ha	Rate (Rs)	Area under crop (ha)	Amount (Rs)
Engagement of labour for planting of seedlings	75	200	3	45000
			Say (Rs. in lacs)	0.45

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

Particulars	Amount (Rs lacs)
Travelling expenses	0.20
Interest during implementation	0.12
Miscellaneous expenses	0.10
TOTAL	0.42

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

Working capital calculation for Yr 1	Period (Month)	Amount (Rs lacs)
Manures & Fertilizers	3	0.09
Weed control & Intercultural Operations	3	0.11
Harvesting	3	0.18
Post Harvest Operations	3	0.18
Power	3	0.02
Salary	3	0.27
Finished goods	1	0.30
Receivables	1	0.75
TOTAL		1.90
Working capital margin in Yr 1 (100%)	1.90	

5.0 MEANS OF FINANCE

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

Particulars	Percent	Amount (Rs lacs)
EQUITY		
A. Equity from Promoters	40%	4.78
B. Subsidy from Central/State Govt.	-	
DEBT		
Term Loan from Banks/FIs	60%	7.17
TOTAL	100%	11.94

6.0 PROFITABILITY STATEMENT

(Rs. in lacs)

Particulars	Yr 1	Yr 2	Yr 3
A. INCOME			
Yield of dry leaves per annum (in kg)	9000	9000	9000
Price of dry leaves (Rs. per kg)	100	100	100
Income from sale of spikes (Rs lakh)	9.00	9.00	9.00
B. OPERATING EXPENSES			
Manures & Fertilizers	0.36	0.06	0.06
Weed control & Intercultural Operations	0.45	0.45	0.45
Harvesting	0.72	0.72	0.72
Post Harvest Operations	0.72	0.72	0.72
Power	0.09	0.09	0.09
Salary	1.08	1.08	1.08
Repair & Maintenance	0.04	0.05	0.06
Miscellaneous Expenses	0.09	0.09	0.09
Total Operating Expenses	3.55	3.26	3.27
Less: operating expenses capitalised	1.90	0.00	0.00
Operating profit	7.35	5.74	5.73

C. FINANCIAL EXPENSES

Depreciation	0.18	0.18	0.18
Interest on Term Loan	0.57	0.39	0.14
Expenses on purchase seedlings written off	1.50	1.50	1.50
Expenses on land preparation written off	0.05	0.05	0.05
Expenses on planting written off	0.15	0.15	0.15
Net Profit	4.91	3.47	3.71
Net cash accruals	6.78	5.35	5.59
Principle repayment	0.80	3.19	3.19

6.1 Estimation of Production: Production of dry leaves is estimated as below.

Particulars	Unit	Quantity	
Yield of fresh herbs/ha/harvest	kg	5000	
Area under crop	ha	3	
Total yield	kg	15000	
Recovery of dry leaves from fresh herbs	percent	20%	
Yield of dry leaves/harvest	kg	3000	
	Yr 1	Yr 2	Yr 3
No. of harvests/annum (3 year crop cycle & gestation period of 3 months)	3	3	3
Yield of dry leaves per annum (in kg)	9000	9000	9000

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)
Application of Nitrogen (Basal dose)	20	Urea	46%	43	5.50	239	3	717
Application of Phosphorus	30	SSP	16%	188	4.00	750	3	2250
Application of Potassium	45	MOP	60%	75	12.00	900	3	2700
Application of Nitrogen (2nd dose)	20	Urea	46%	43	5.50	239	3	717
Application of Nitrogen (3rd dose)	20	Urea	46%	43	5.50	239	3	717
						Yr 1	Yr 2	Yr 3
Annual schedule of application of fertilizers (Nos)						1	1	1
Expenses on fertilizers/annum (Rs)						6385	6385	6385
Application of Manures during land preparation in Year 1 (50000 kg/ ha @ Rs 0.20/ kg)						30000		
Expenses on manures & fertilizers/annum (Rs)						36386	6386	6386

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

Particulars	Mandays/ha	Rate (Rs)	Area under crop (ha)	Cost/annum (Rs)
Engagement of labour for weed control & intercultural operations	75	200	3	45000
		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)		45000	45000	45000

6.4 Harvesting: Expenses on harvesting is estimated as below.

Particulars	Mandays/ ha	Rate (Rs)	Area under crop (ha)	Cost/harvest (Rs)
Engagement of labour for harvesting	40	200	3	24000
		Yr 1	Yr 2	Yr 3
No. of harvests/annum (3 year crop cycle & gestation period of 3 months)		3	3	3
Expenses on harvest per annum (Rs)		72000	72000	72000

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

Particulars	Mandays/ ha	Rate (Rs)	Area under crop (ha)	Cost/operation (Rs)
Engagement of labour for post harvest operations	40	200	3	24000
		Yr 1	Yr 2	Yr 3
No. of post harvest operations/annum		3	3	3
Expenses on post harvest operations per annum (Rs)		72000	72000	72000

6.6 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	4	0.10	0.36	8	2.88
Power requirement/day (kwh)					5.12

Days/annum	360
Rate per unit (Rs)	5
Expenses on power per annum (Rs)	9212

6.7 Salary: Expenses on salary is estimated as given below.

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

6.8 Repairs & Maintenance: Expenses on repairs & maintenance in the 1st year is estimated as given below. It is assumed that expenses on repairs & maintenance will increase @ 25% every subsequent year.

Particulars	Cost (Rs)	Rate	Amount (Rs lacs)
Building & Civil Works	3.67	1%	0.04
Misc. Assets	0.85	1%	0.01
Total			0.05

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.

Description	Cost (Rs)	Rate	Amount/annum (Rs lacs)
Building & Civil Works	3.67	3.34%	0.12
Misc. Assets	0.85	6.23%	0.05
Total			0.18

6.11 Interest on Term Loan & Principal Repayment: Interest rate has been assumed at 8%. 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	1	2	3
Month 1	Opening balance	7.17	6.37	3.19
	Repayment	0.00	0.27	0.27
	Interest (8%)	0.05	0.04	0.02
	Closing balance	7.17	6.11	2.92
Month 2	Opening balance	7.17	6.11	2.92
	Repayment	0.00	0.27	0.27
	Interest	0.05	0.04	0.02
	Closing balance	7.17	5.84	2.65
Month 3	Opening balance	7.17	5.84	2.65
	Repayment	0.00	0.27	0.27
	Interest	0.05	0.04	0.02
	Closing balance	7.17	5.57	2.39
Month 4	Opening balance	7.17	5.57	2.39
	Repayment	0.00	0.27	0.27
	Interest	0.05	0.04	0.02
	Closing balance	7.17	5.31	2.12
Month 5	Opening balance	7.17	5.31	2.12
	Repayment	0.00	0.27	0.27
	Interest	0.05	0.04	0.01
	Closing balance	7.17	5.04	1.86
Month 6	Opening balance	7.17	5.04	1.86
	Repayment	0.00	0.27	0.27
	Interest	0.05	0.03	0.01
	Closing balance	7.17	4.78	1.59
Month 7	Opening balance	7.17	4.78	1.59
	Repayment	0.00	0.27	0.27
	Interest	0.05	0.03	0.01
	Closing balance	7.17	4.51	1.33
Month 8	Opening balance	7.17	4.51	1.33
	Repayment	0.00	0.27	0.27
	Interest	0.05	0.03	0.01
	Closing balance	7.17	4.25	1.06
Month 9	Opening balance	7.17	4.25	1.06
	Repayment	0.00	0.27	0.27
	Interest	0.05	0.03	0.01
	Closing balance	7.17	3.98	0.80
Month 10	Opening balance	7.17	3.98	0.80
	Repayment	0.27	0.27	0.27
	Interest	0.05	0.03	0.01
	Closing balance	6.90	3.72	0.53
Month 11	Opening balance	6.90	3.72	0.53
	Repayment	0.27	0.27	0.27
	Interest	0.05	0.02	0.00
	Closing balance	6.64	3.45	0.27
Month 12	Opening balance	6.64	3.45	0.27
	Repayment	0.27	0.27	0.27
	Interest	0.04	0.02	0.00
	Closing balance	6.37	3.19	0.00

	Principal Repayment	0.80	3.19	3.19
	Interest	0.57	0.39	0.14

7.0 DEBT SERVICE COVERAGE RATIO (DSCR)

(Rs. in lacs)

Year	1	2	3	TOTAL
Profit After Tax (Net Profit)	4.91	3.47	3.71	
Depreciation	0.18	0.18	0.18	
Interest	0.57	0.39	0.14	
Total	5.65	4.04	4.03	13.71
Interest	0.57	0.39	0.14	
Loan repayment	0.80	3.19	3.19	
Total	1.36	3.58	3.32	8.27
DSCR	4.14	1.13	1.21	

Average DSCR = 1.66

8.0 BREAK EVEN POINT (BEP)

(Rs. In lacs)

Year	1	2	3
A. Net sales (Rs. lakh)	9.00	9.00	9.00
B. Variable cost			
Manures & Fertilizers	0.36	0.06	0.06
Weed control & Intercultural Operations	0.45	0.45	0.45
Harvesting	0.72	0.72	0.72
Post Harvest Operations	0.72	0.72	0.72
Power	0.09	0.09	0.09
Miscellaneous Expenses	0.09	0.09	0.09
Total variable cost	2.44	2.14	2.14
C. Contribution (A-B)	6.56	6.86	6.86
D. Fixed & Semi-fixed Costs			
Salary	1.08	1.08	1.08
Repair & Maintenance	0.04	0.05	0.06
Interest on Term Loan	0.57	0.39	0.14
Depreciation	0.18	0.18	0.18
Total fixed cost	1.86	1.69	1.45
E. BREAK EVEN POINT	28%	25%	21%

TECHNICAL CONSULTANT

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