TISSUE CULTURE LABORATORY

1. INTRODUCTION:

Keeping in view that trees provide food, shelter, medicine, fuel and wood our culture promotes the idea of producing, planting, protecting and donating trees to the society. Conserving a tree is a pious action. Due to fast growth combined with high returns this project has very good demand in the market.

A whole plant can be regenerated from a small tissue or plant cells in a suitable culture medium under controlled environment. The plant lets so produced are called tissue-culture raised plants. These plant lets are a true copy of the mother plant and show characteristics identical to the mother plant. For example, if the mother plant is a high yielding plant the plant lets will also be high yielding. Many plant species are presently being propagated through tissue culture successfully. This capacity of a single cell to grow into a complete plant is termed as Totipotency, which was first put forward by a German Botanist Haberlandt in 1902. Tissue culture is the propagation of plants wherein a part/tissue of the plant is placed in nutrient media that favours the production of shoots, roots following which they are hardened and transferred to soil. Quality planting material of economically important species can be produced in a large scale/desired quantity through tissue culture.

2. PRODUCT & ITS APPLICATION:

Commercial tissue culture was born in India in 1987 when A.V. Thomas and Company Kerala (AVT) established their first production unit in Cochin for clonal propagation of superior genotypes of selected cardamom plants. This was based on a small scale laboratory technology indigenously developed and released to the company by the National Chemical Laboratory (NCL) Pune, India. This technology was later refined and scaled up by the company in collaboration with a UK based firm to make the method more production

oriented so that the process is cost and quality effective and could guarantee an efficient delivery system. This pioneering effort in the application of biotechnology research by AVT was followed by several other entrepreneurs who entered the field. In 1988, a second company Indo-American Hybrid Seeds at Bangalore, Karnataka, who were in the nursery business in hybrid flowers and vegetables, imported a tissue culture laboratory and green houses with a capacity of 10 million plants/ annum.

3. DESIRED QUALIFICATIONS FOR PROMOTER:

Graduate in any graduate.

4. INDUSTRY LOOK OUT AND TRENDS

Tissue culture refers to the process of removing cells and tissues from a plant or an animal and subsequently growing them in controlled artificial environment with conducive temperature, nutrition, and humidity conditions. The process of separating the cells or tissues from their natural environment and shifting them to an artificial environment, called cultivation, involves removing the cell/tissues directly and disaggregating by a mechanical or enzymatic procedure or deriving them from an artificially established cell line.

Over the past several decades of continuous developments, cell culture has emerged as one of the key tools used in molecular and cellular biology to study cell physiology, effects of toxins and various drugs on cells, and biochemistry, mutagenesis, and carcinogenesis of cells. Cell and tissue cultures are also used for the large scale production of biological compounds such as therapeutic proteins and vaccines, and for the screening and development of a variety of therapeutic drugs. The advantage of being able to obtain consistent results from the use of a batch of cultured cells continues to encourage the increased usage of cell and tissue culture for such applications.

5. MARKET POTENTIAL AND MARKETING ISSUES, IF ANY:

Demand for tissue cultured plant lets is growing rapidly. India, with its low cost skilled labour as well as scientific manpower (both of which are essential for tissue culture) has a natural advantage. Additional favourable factors are the wide range of plant biodiversity in the country and favourable tropical climate (which enables greenhouses with low energy consumption). The potential for the domestic market is enormous and by conservative estimates it is around Rs. 200 crores with an annual growth rate of 20%. There are more than 70 established commercial tissue culture units. Their production capacity ranges between 0.5 million to 10 million plants per annum with an aggregate production capacity of about 200 million plants lets per year. The protocols have either been developed in-house or transferred through the various research institutions and universities engaged in development of the protocols through support of the Department of Biotechnology (DBT) Currently, the focus of the companies is mainly banana, floriculture, sugar-cane and potato. With increasing awareness about the advantages of tissue culture raised plants in improving yield and quality, their domestic consumption.

6. RAW MATERIAL REQUIREMENTS:

The basic inputs for the production of micro propagated plant lets include meristems of elite and disease free plants, ready to use culture medium, sucrose and agar.

7. MANUFACTURING PROCESS:

The cultures are observed daily for growth and any signs of infection/contamination. Cultures, that do not show good growth or infected, are discarded. The healthy cultures grow into small shoot buds. These are sub-cultured on the fresh medium after 4 weeks. The number of subcultures required is specific to the plant species, which are standardized. The shoots generally develop after 4 weeks. After enough number of shoots is developed in each container (10 to 15), to a minimum height of 2 cm they are transferred to another medium for initiating the process of rooting. The constituent of rooting medium for each plant species are specific. Roots are generally formed within 2 to 4 weeks. Plants at this stage are delicate and require careful handling.

Due to very high humidity inside the culture vessel and artificial conditions of development, the plant lets are tender and are therefore are not ready for coping up with the filed conditions. The plants removed from the sterile medium are washed and are maintained under intermittent mist or are covered with clean transparent plastic. After 10 to 15 days under high humidity, the plants are transferred to green house and maintained for another 4 to 6 weeks. They are then ready to be transferred to net house or the field. Normally, the tissue culture plants are sold either as ex-agar plants or hardened plants from the green house.

8. MANPOWER REQUIREMENT:

The enterprise requires 8 employees as detailed below**:**

Sr. No.	**Designation of Employees**	**Salary Per Person**	**Monthly Salary ₹**	**Number of employees required**				
				Year-1	**Year-2**	**Year-3**	**Year-4**	**Year-5**
1	Machine Operators	12,000	12000.00	1	1	1	1	1
2	Helpers	8,000	24000.00	3	3	3	4	4
3	Production supervisor	15,000	15000.00	1	1	1	1	1
4	Accounts/Stores Asst	12,500	12500.00	1	1	1	1	1
5	Office Boy	9,000	9000.00	1	1	1	1	1
	Total		72500.00	7	7	7	8	8

9. IMPLEMENTATION SCHEDULE:

The project can be implemented in 3 months' time as detailed below:

Sr. No.	**Activity**	**Time Required*(in months)***
1	Acquisition of premises	1.00
2	Construction (if applicable)	1.00
3	Procurement & installation of Plant & Machinery	1.00

4	Arrangement of Finance	2.00
5	Recruitment of required manpower	1.00
	Total time required *(some activities shall run concurrently)*	3.00

10. COST OF PROJECT:

The project shall cost ₹ 20.80 lacs as detailed below:

Sr. No.	Particulars	₹ in Lacs
1	Land	2.00
2	Building	2.00
3	Plant & Machinery	10.00
4	Furniture, Electrical Installations	1.00
5	Other Assets including Preliminary / Pre-operative expenses	1.00
6	Working Capital	4.80
	Total	**20.80**

11. MEANS OF FINANCE:

Bank term loans are assumed @ 75 % of fixed assets.

Sr. No.	Particulars	₹ in Lacs
1	Promoter's contribution	5.20
2	Bank Finance	15.60
	Total	**20.80**

12. WORKING CAPITAL CALCULATION:

The project requires working capital of ₹ 4.80 lacs as detailed below:

Sr. No.	Particulars	Gross Amt	Margin %	Margin Amt	Bank Finance
1	Inventories	2.40	0.25	0.60	1.80
2	Receivables	1.20	0.25	0.30	0.90

3	Overheads	1.20	100%	1.20	0.00
4	Creditors	-		0.00	0.00
	Total	4.80		2.10	2.70

13. LIST OF MACHINERY REQUIRED:

A detail of important machinery is given below: Power Requirement: 5 HP

Sr. No.	Particulars	UOM	Qtty	Rate (₹)	Value (₹ in Lacs)
	Plant & Machinery / equipments				
a)	***Main Machinery***				
i.	green house machineries	NOS.	1	700000	7.00
	and equipments				
ii.	cooling and heating equipments	Nos	2	100000	1.00
iii.	water treatment equipments	Nos	1	100000	1.00
IV	Installation, erection electr.			100,000	0.50
V	taxes and transportation			100000	0.50
	sub-total Plant & Machinery				**10.00**
	Furniture / Electrical installations				
a)	Office furniture	LS	1	50000	0.50
Sr. No.	**Particulars**	**UOM**	**Qtty**	**Rate (₹)**	**Value**
b)	Stores Almirah	LS	1	0	0.00
c)	Computer & Printer	L. S.	1	50000	0.50
	sub total				**1.00**
	Other Assets				
a)	preliminary and preoperative				1.00
	sub-total Other Assets				1.00
	Total				**12.00**

All the machines and equipment are available from local manufacturers. The entrepreneur needs to ensure proper selection of product mix and proper type of machines and tooling to have modern and flexible designs. It may be worthwhile to look at reconditioned imported machines, dies and tooling. Some of the machinery and dies and tooling suppliers are listed here below:

- Kamdhenu Agro Machinery
  Plot No. 6, Near Power House,
  Wathoda Road, Wathoda
  Nagpur - 440035
  Maharashtra, India

- Future Industries Private Limited
  Shed No. 15, Ambica Estate,
  Corporation Municipal Plot,
  Opposite Sadvichar Hospital,
  Naroda, Ahmedabad - 382330,
  Gujarat, India

- The Global Pharma Equipments
  Star Industrial Estate,
  D-32, Naik Pada,
  Near Hanuman Mandir,
  Opposite Dwarka Industrial Estate,
  Vasai East, Vasai - 401208,
  Maharashtra, India

14. PROFITABILITY CALCULATIONS:

Sr. No.	Particulars	UOM	Year-1	Year-2	Year-3	Year-4	Year-5
1	Capacity Utilization	%	60%	70%	80%	90%	100%

2	Sales	₹. In Lacs	14.40	16.80	19.20	21.60	24.00
3	Raw Materials & Other direct inputs	₹. In Lacs	3.98	4.65	5.31	5.98	6.64
4	Gross Margin	₹. In Lacs	10.42	12.15	13.89	15.62	17.36
5	Overheads except interest	₹. In Lacs	4.30	4.57	5.11	5.27	5.38
6	Interest	₹. In Lacs	1.56	1.56	1.04	0.78	0.62
7	Depreciation	₹. In Lacs	7.00	5.00	3.50	2.50	2.25
8	**Net Profit before tax**	₹. In Lacs	**-2.45**	**1.02**	**4.24**	**7.07**	**9.11**

The basis of profitability calculation:
The growth of selling capacity will be increased 10% per year. (This is assumed by various analysis and study; it can be increased according to the selling strategy.)

Energy Costs are considered at Rs 7 per Kwh and fuel cost is considered at Rs. 65 per litre. The depreciation of plant is taken at 10-12 % and Interest costs are taken at 14 -15 % depending on type of industry.

15. BREAKEVEN ANALYSIS:

The project shall reach cash break-even at 34.59 % of projected capacity as detailed below:

Sr. No.	Particulars	UOM	Value
1	Sales at full capacity	₹. In Lacs	24.00
2	Variable costs	₹. In Lacs	6.64
3	Fixed costs incl. interest	₹. In Lacs	6.00
4	BEP = FC/(SR-VC) x 100 =	% of capacity	34.59%

16. STATUTORY / GOVERNMENT APPROVALS

As per the allocation of business rules under the Constitution, labour is in the concurrent list of subjects. It is dealt with by the MOLE at the Central and Departments of Labour under State Governments in respective States / UTs. The MOLE has enacted workplace safety and

health statutes concerning workers in the manufacturing sector, mines, ports and docks and in construction sectors.

Further, other Ministries of the Government of India have also enacted certain statutes relating to safety aspects of substances, equipment, operations etc. Some of the statutes applicable in the manufacturing sector are discussed below:

The Static and Mobile Pressure Vessels (Unfired) Rules, 1981

These (SMPV) Rules are notified under the Explosives Act, 1884. These rules regulate storage, handling and transport of compressed gases. These rules stipulate requirements regarding construction and fitments, periodic testing, location, fire protection, loading and unloading facilities, transfer operations etc. in respect of pressure vessels whose water capacity exceeds one thousand litres. These rules are enforced by the Chief Controller of Explosives under the Ministry of Industry and Commerce, Govt. of India (PESO).

The Manufacture, Storage and Import of Hazardous Chemicals Rules (MSIHC), 1989

These MSIHC Rules are notified under the Environment (Protection) Act, 1986. These rules are aimed at regulating and handling of certain specified hazardous chemicals. The rules stipulate requirements regarding notification of site, identification of major hazards, taking necessary steps to control major accident, notification of major accident, preparation of safety report and on-site emergency plan; prevention and control of major accident, dissemination of information etc. These rules are notified by the Ministry of Environment and Forests (MOEF) but enforced by the Inspectorates of Factories of respective States / UTs in the manufacturing sector.

The Factories Act, 1948 and State Factories Rules

The Factories Act, 1948 is very comprehensive legislation dealing with the matters of safety, health and welfare of workers in factories. The Act places duties on the occupier to ensure

safety, health and welfare of workers at work. Some of the salient provisions of the Act include:

- Guarding of machinery
- Hoists and Lifts; Lifting Machines and Appliances
- Revolving Machinery
- Pressure Plant
- Excessive Weight
- Protection of Eyes
- Precautions against dangerous fumes, gases etc.
- Explosive or inflammable dust, gas etc.
- Precautions in case of fire
- Safety of buildings and machinery
- Permissible limits of exposure of chemical and toxic substances
- Entrepreneur may contact State Pollution Control Board where ever it is applicable.

17. BACKWARD AND FORWARD INTEGRATIONS

Chemical companies often become integrated and undergo other activities outside the chemical industry. Increased competition prompts many companies to reduce supply chain costs by looking outside the chemical sector at suppliers and customers. While most companies within the chemicals sector primarily produce chemicals, some companies also conduct other manufacturing activities. The exact proportion of chemicals sector companies that are integrated with other sector activities is unknown, but many companies actively seek vertical integration. Many manufacturers pursue vertical integration to secure suppliers and customers for their products.

Mergers and acquisitions are a common way for companies to undertake new chemical ventures. By purchasing their chemical suppliers, some manufacturers secure future chemical feedstock for their products or other chemicals that they use in manufacturing. The

company making the purchase obtains valuable expertise and equipment. Some mining and petrochemical production is more cost-effective when integrated within a chemical company. Energy and feedstock costs are often a significant expense for chemical companies. Integrating chemical production with activities that secure supplies of chemical feedstock and energy is relatively common as chemical companies grow. Chemical companies are located near mines, oil fields, ammonia factories and water supplies. This reduces transportation costs and increases the reliability of supplies by reducing the distance between feedstock and the factory.

Some companies, such as Sino-Coking Coal and Coke Chemical Industries Incorporated, own their mines. BHP Billiton operates a broad range of mines and is primarily a mining company. It does, however, also produce petrochemical feedstock for the chemical industry and therefore operates within the chemical industry as well. These companies technically operate within both the chemical and mining industries in their normal business operations.

Integrating a chemical company with other activities provides several direct benefits for the company and is becoming increasingly common. High energy costs necessitate greater control of energy resources and minimal reliance on expensive transportation. Chemical companies experience volatile profitability due to fluctuations in feedstock and energy expenses. Some companies control this volatility through careful supply chain management and by charging supply surcharges. Actively researching and developing alternative feedstock and energy supplies helps the company reduce costs.

Vertical integration supports these activities by eliminating redundant activities at multiple companies and increasing efficiency. By consolidating activity among multiple, similar operations, chemical companies achieve cost savings that contribute to higher profitability. End products are often very profitable, and some chemical companies purchase their former customers to take advantage of the marked-up prices of products further along in the supply chain.

Integration may become more common for many chemical companies as competition strengthens and traditional feedstock becomes more expensive. Market demand for chemical

feedstock increases as emerging market economies grow and result in increased consumer spending around the world.

18. TRAINING CENTERS AND COURSES

There is no such training required to start this business but, basic chemical bachelor's degree is plus point for enterpriser. Promoter may train their employees in such specialized institutions to grow up the business. There are few specialised Institutes provide degree certification in chemical Technology, few most famous and authenticate Institutions are as follows:

1. Department of chemical LD college of engineering
No.120, Circular Road, University Area, Navrangpura,
Opposite Gujarat University, Ahmedabad, Gujarat 380015

2. MIT College of chemicalEngineering**, Pune**
Gate.No.140, Raj Baugh Educational Complex,
Pune Solapur Highway,
Loni Kalbhor, Pune – 412201
Maharashtra, India

Udyamimitra portal (link : www.udyamimitra.in) can also be accessed for handholding services viz. application filling / project report preparation, EDP, financial Training, Skill Development, mentoring etc.

Entrepreneurship program helps to run business successfully is also available from Institutes like Entrepreneurship Development Institute of India (EDII) and its affiliates.

Disclaimer:

Only few machine manufacturers are mentioned in the profile, although many machine manufacturers are available in the market. The addresses given for machinery manufacturers

have been taken from reliable sources, to the best of knowledge and contacts. However, no responsibility is admitted, in case any inadvertent error or incorrectness is noticed therein. Further the same have been given by way of information only and do not carry any recommendation.