Operational Guidelines for Capital Investment Subsidy Scheme for Vegetable and Fruit Market Waste compost, and Biofertilizers – Biopesticides Production Units

Under National Project on Organic Farming
Department of Agriculture and Cooperation
Ministry of Agriculture, Government of India
New Delhi 110 001

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1. Background

In view of the increasing and indiscriminate use of synthetic fertilizers and pesticides and deteriorating soil health and productivity, the concept of organic farming is gaining importance world-over. The present day intensive agriculture practices have resulted into soil fatigue, and gradual deterioration of soil health. To overcome these growing problems emphasis is being given to restore soil health by reducing the use of chemical inputs and increasing the use of biological and organic inputs. Nutrient mobilization and plant protection through natural and biological route should be the first option followed by chemical option to fill the gap. Growing awareness for safe and healthy food has underlined the importance of organic farming, which is a holistic production management system based on basic principle of minimizing the use of external inputs and avoiding the use of synthetic fertilizers and pesticides.

In view of these, there is a need in the country to augment the infrastructure for production of quality organic and biological inputs. Accordingly, under National Project on Organic Farming a Capital Investment Subsidy Scheme for Commercial Production Units for Organic/ biological Inputs has been introduced. The scheme is being implemented by the Department of Agriculture & Cooperation through National Centre of Organic Farming (NCOF) in collaboration with NABARD or NCDC.

2. Objectives

Main objectives of the scheme are

- To promote organic farming in the country by making available the organic inputs such as biofertilisers, Biopesticides and fruit & vegetable market waste compost and thereby better return for the produce.
- To increase the agricultural productivity while maintaining the soil health and environmental safety.
- To reduce the total dependence on chemical fertilizers and pesticides by increasing the availability and improving the quality of biofertilizers, biopesticides and composts in the country.
- To convert the organic waste in to plant nutrient resources.
- To prevent pollution and environment degradation by proper conversion and utilization of organic waste.

3 Eligible Organizations

Biofertilisers and Biopesticides production Unit	Fruit & Vegetable Waste Compost Unit
Individuals, group of farmers/growers, proprietary, and partnership firms, Co-operatives, Fertilizer industry, Companies, Corporations, NGOs	APMCs, Municipalities, NGOs and Private entrepreneurs.

New as well as existing units (for expansion/renovation) engaged in the production are also eligible under the scheme.

4. Conditions for setting up of commercial production unit

4.1 Location

Under the scheme, the entrepreneur will be free to set up the unit at any place provided it is technically feasible and commercially viable. The existing units can also be considered for technological up-gradation or expansion of existing capacity.

4.1.2 Project cost

The project cost will depend upon the capacity, technology, architects, invoice prices of the machines etc. subject to norms of appraisal of financing banks and NABARD. The project should be technically feasible and financially viable. Model project profile for Vegetable and Fruit Market Waste Compost and Biofertiliser-Biopesticide units will be prepared and circulated by National Centre of Organic Farming and NABARD jointly. The estimated cost of establishment of new Fruits and Vegetable Market Wsate Compost unit of 100TPD capacity is about Rs 200 lakh and for Biofertilizer-Biopesticide production unit of installed capacity of 200 tonne/annum is about 160.00 lakh. Project cost can include the cost of land purchased, civil works, plant & machinery, scientific instruments and equipments etc. The value of land to be computed in the project cost should not exceed 10% of the project cost. The cost of the land and civil structures (buildings) should not exceed 50% of the total financial outlay. The cost of land computed in the project cost can be reckoned towards the margin money required to be met by the enterprise. The above is also subject to the following conditions:

1. The cost of land will be computed in the project cost only when the land is to be purchased by the enterprise.
2. The cost of the land should be the purchase value and not the market value.
3. The value of that portion of the land which is need based for the project only will be considered.

5. Quantum of Subsidy

The scheme provides credit linked and back-ended capital investment subsidy @ as described below.

Biofertilisers-Biopesticides unit	**Fruit & Vegetable Market Waste Compost Unit**
25% of total financial outlay subject to the maximum of Rs 40 lakh per unit, whichever is less.	33% of total financial outlay subject to the maximum of Rs. 60 lakh per unit, whichever is less.

The subsidy for expansion/renovation of the existing units will be restricted to 25% in case of Biofertilizer/biopesticide units and 33% of Fruit and Vegetable Market Waste Compost units of the actual expenditure to be incurred by the promoter towards expansion/renovation subject to the maximum ceiling prescribed for each activity, whichever is less.

7. Release of subsidy

- NABARD releases subsidy to the units financed by Commercial Banks, Regional Rural Banks (RRBs), State Cooperative Banks (SCBs), State Co-operative Agricultural and Rural Development Banks (SCARDBs), Scheduled Primary Urban Cooperative Banks (PUCBs), and such other institutions which will be eligible for refinance from NABARD.
- NCDC may release subsidy to projects financed by it in the cooperative sector.

The original TFO sanctioned by the bank or the actual expenditure incurred by the promoter, whichever is less, will be reckoned for deciding the amount of subsidy subject to verification by the Joint Monitoring Committee (JMC).

8. Procedure for Sanction and Release of Subsidy

Subsidy will be released in two installments.

8.1 **Advance subsidy**

Eligible subsidy amount shall be released to NABARD/ NCDC by DAC in advance as per the requirement. NABARD would release 50% advance subsidy to the participating bank for keeping the same in subsidy reserve fund account of the concerned borrower, to be adjusted finally against loan amount of the bank towards the end of the repayment period. This 50% advance subsidy would be released by NABARD to the participating bank on submission of project profile cum claim form after sanction of bank loan and disbursement of first installment of loan. NCDC may release 50% advance subsidy to Cooperative society on submission of project profile cum claim form directly or through any scheduled Cooperative bank.

8.2 **Final installment of subsidy**

The remaining 50% would be disbursed to the participating banks by NABARD or to Cooperative society by NCDC after conduct of an inspection by the Joint Inspection Committee consisting of officials from the financing bank, NABARD/NCDC and NCOF/DAC and their recommendations to the effect.

9. Adjustment of subsidy to Borrower's Account

The subsidy released to the bank for individual project will be kept in a separate borrower-wise account. The adjustment of subsidy will be back-ended. Accordingly, the full project cost including the subsidy amount, but excluding the margin money contribution from the beneficiary, would be disbursed as loan by the banks. The repayment schedule will be drawn on the loan amount in such a way that the total subsidy amount is adjusted after the full bank loan component with interest is liquidated.

10. Utilization Certificate

After release of final installment of subsidy, a Utilization Certificate is required to be submitted by the financing bank certifying that the full amount of subsidy received in respect of the project has been fully utilized (by way of crediting to the "Subsidy Reserve Fund Account - Borrower-wise") and adjusted in the books of Account under the sanctioned terms and conditions of the project within the overall guidelines of the scheme.

11. No interest chargeable on subsidy portion

No interest should be charged on the subsidy by the bank. For the purpose of charging interest on the loan component, the subsidy amount should be excluded. The balance lying to the credit of the subsidy reserve fund A/c will not form part of demand and time liabilities for the purpose of SLR/CRR.

12. Pattern of Assistance

For Biofertilizer-Biopesticide production unit

i) Owner's contribution	25-33%
ii) Subsidy from Government of India subject to the maximum ceiling	25%
iii) Bank Loan	42-50%

For Fruits and Vegetable Market Waste compost unit

i) Owner's contribution	25-33%
ii) Subsidy from Government of India subject to the maximum ceiling	33%
iii) Bank Loan	34-42%

13. Institutional lending

a) Eligible Financing Institutions - The eligible financing institutions under the scheme are i) Commercial Banks, Regional Rural Banks (RRBs), State Cooperative Banks (SCBs), State Co-operative Agricultural and Rural Development Bank (SCARDBs), Scheduled Primary Urban Cooperative Banks (PUCBs), Agricultural Development Finance Companies (ADFCs), North Eastern Development Finance Corporation (NEDFI), and such other institutions which will be eligible for refinance from NABARD. ii) Cooperatives where they seek loan from NCDC.

b) Term Loan – Up to 50% of the project cost can be raised as term loan from the financing banks. As the subsidy is back-ended, eligible amount of subsidy (25%) would be initially allowed as term loan to the beneficiary. The repayment schedule will be drawn on the total loan amount (including subsidy) in such a way that the subsidy amount is adjusted after liquidation of net bank loan (excluding subsidy). The financial institution may provide working capital separately for undertaking the business.

14. Rate of Interest to the ultimate borrower

As decided by the financing bank.

15. Security

The security will be as per norms prescribed by RBI from time to time and as per the norms of financing banks.

16. Repayment period

Biofertilisers/ Biopesticide Unit	Fruit & Vegetable Waste Compost Unit
Repayment period will depend upon the cash flow and may be generally up to 10 years with a grace period of 2 years.	Repayment period will depend upon the cash flow and may be generally up to 10 years with a grace period of 2 years

17. Time limit for completion

A time limit of maximum 15 months is prescribed for completion of the project from the date of sanction by bank. However, if reasons for delay are justified, a further grace period of 3 months may be allowed by the participating bank. If the project is not completed within stipulated period, the benefit of subsidy is withdrawn and advance subsidy has to be refunded forthwith.

18. Insurance

Assets created shall be insured by the entrepreneur till the repayment of loan

19. Refinance Assistance from NABARD

The refinance assistance @ 90% of the term loan (95% in case of SCARDBs and in the North Eastern Region) would be provided to the financing banks.

20. Procedure to be followed for sanctioning of project and release of subsidy

20.1 Projects financed through Banks

a) Interested promoter will submit the project proposal for term loan and subsidy to Bank on application form as prescribed by the concerned Bank along with project report and other documents for appraisal and sanction of loan.

b) Bank after appraisal, sanction and disburse first installment of loan. Furnish a brief project profile-cum-claim form for advance subsidy in the prescribed format given at **Annexure I** along with a copy of bank's sanction letter to Regional Office of NABARD. All claims for release of subsidy need to be forwarded to the NABARD by the Controlling Officers of the banks.

c) NABARD on receipt of project profile cum claim form, from participating bank, will sanction and release 50% advance subsidy to the participating bank for keeping the same in the Subsidy Reserve Fund Account (Borrower-wise). The release of subsidy by NABARD will be subject to availability of funds from MoA/DAC.

d) When the project is nearing completion, the promoter will inform the bank who will initiate action for an inspection by the Committee consisting of officials from bank, NABARD and the implementing agency (DAC/ NCOF) to ensure that the unit conforms to technical & financial parameters. After inspection is conducted, the bank will submit the claim form for final subsidy in the prescribed format given in the **Annexure II** to NABARD. The inspection report of Committee and completion certificate should invariably be enclosed with claim form for final subsidy claim. NABARD shall release the final subsidy to banks which will be replenished by the implementing agency or adjusted against the subsidy amount provided to NABARD in advance.

21. Monitoring

i) The monitoring of each project shall be done by implementing agency through its Regional offices/branches.

ii) An inspection committee consisting of Officials from NABARD/NCDC, implementing agency and participating bank(s) would inspect the project work with in the overall scope of the operational guidelines of the above scheme and would submit its report which should be enclosed with the **Annexure II.** For this purpose, the promoter/participating bank will initiate necessary action to get the inspection conducted at the project site by the committee at the time

when the project is completed, so as to avoid any delay in release/adjustment of subsidy.

iii) After crediting the final installment of subsidy in the reserve fund of the borrower, a utilization certificate as per the format of **Annexure III** is required to be submitted by the participating bank to NABARD to the effect that amount of subsidy received by them has been fully utilized/adjusted in the books of account under the sanctioned terms and conditions of the project, within the overall guidelines of the scheme.

iv) The progress report of the scheme as per the formats shall be sent by NABARD/NCDC to the Ministry of Agriculture, GoI on quarterly basis.

v) NABARD would delegate adequate powers to the Chief General Manger/General Manager/In-charge of the Regional offices of NABARD so as to facilitate expeditious sanction of project and release of refinance/subsidy amount under the scheme.

22. Other Conditions

- The participating banks and NABARD, etc. will adhere to their own norms, for appraisal of the projects.
- A signboard at the site "**Financially Assisted under Subsidy Scheme of National Project of Organic Farming, DAC, Government of India**" will be exhibited.
- Govt.'s interpretation of various terms will be final
- Any other pre & post inspection may be undertaken to find out physical & financial progress as and when required.
- Govt. reserves the right to modify, add, and delete any terms and condition without assigning any reason.

Annexure I

Format for project profile cum claim form for claiming 50% advance subsidy/refinance (To be submitted by Bank in triplicate to NABARD with a copy to NCOF/DAC)

To

1) Regional office, NABARD
2) Regional/Sub-office,
   (nearest, as per address enclosed)
   National Centre of Organic Farming

Capital Investment Subsidy Scheme for Establishment /Expansion of …….. unit.

For use by Bank

1. Name & Address of project.
2. Name & Address of promoter.
3. Name & Address of financing bank.
4. Date of receipt of proposal/ application.
5. (a) Date of sanction of term loan by bank/NCDC.
   (b) Date of disbursement of first installment
6. Means of finance
   - Total financial outlay
   - Promoters contribution
   - Bank loan
7. Item wise financial projection
8. Capacity in MT to be created:
   New
   Expansion / renovation
   Existing unit
9. Rate of interest (to be) charged %
10. Brief coverage on technical
    feasibility and financial viability.
    (Enclose separate sheet along with project report)
11. Other relevant information if any.

12. The project has been appraised and found to be technically feasible and financially viable. We intend/do not intend to avail of refinance from NABARD. The refinance amount is Rs. _____ (if to be availed).

13. An amount of Rs. _____ (Rupees_____) being the 50% of the eligible amount of subsidy may please be released in respect of the project for crediting to the "Subsidy Reserve Fund Account - Borrower wise".

14. We note that a time limit of _____ months is stipulated for completion of the project from the date of sanction of project. If reasons for delay in completion of the project are justified, a maximum grace period of ____ months may be allowed for completion of project. We also note that the advance subsidy has to be refunded forthwith if the project is not completed within the above stipulated period and as per the broad parameters of the scheme. It is further noted that in case of any delay in refund of subsidy, the participating bank/beneficiary will be liable for payment of penal interest.

(_____)

Place : Seal and Signature of the

Authorized signatory of Bank/NCDC

Date :

Annexure - II

Format for project profile cum claim form for claiming final installment of subsidy (To be submitted by Bank in triplicate to NABARD with a copy to NCOF/DAC)

To

3) Regional office, NABARD
4) Regional/Sub-office,
   (nearest, as per address enclosed)
   National Centre of Organic Farming

Capital Investment Subsidy Scheme for Establishment /Expansion of …….. unit.

(For use by Bank/NCDC)

1. Name, address/location of project
2. Name and address of promoter
3. Name & address of financing bank
4. Date of sanction of term loan by Bank/NCDC
5. Date of sanction of refinance by NABARD, if applicable
6. Date & amount of refinance released by NABARD
7. Date of last inspection of project by bank
   (enclose copy of inspection report)
8. i) Total cost of project Rs.
   ii) Promoters contribution Rs.
   iii) Bank loan Rs.
9. Capacity created in TPA
   New
   Expansion
   Renovation
10. Advance subsidy
    i) Date of receipt
    ii) Amount Rs.

11. Rate of interest being charged by financing bank % p.a.

12. Whether construction / expansion has been carried out as per the technical parameters envisaged under the project.

13. Total amount of expenditure incurred in the project - item wise details, duly certified by a chartered accountant (The copy of all receipt & certificate from the chartered accountant are to be enclosed).

14. Various permissions/approvals obtained by the promoters for establishment and commissioning of the project from various Govt. Authorities. (copy of each such approval is to be enclosed).

15. The completion/commissioning certificate is required to be signed by the promoter /s & verified by a qualified/approved engineer/Architect. Such certificate is required to be counter signed by the Branch Manager of the financing bank.

    Since the above project is complete as per terms and conditions stipulated under the scheme and final inspection of the unit has been arranged, an amount of Rs. _____ (Rupees _____ _____) being the final installment of the eligible amount of subsidy may please be released in respect of the project for crediting to the Subsidy Reserve Fund Account Borrower wise.

Copy of the inspection report of J.M.C. is enclosed.

Place :

Seal and Signature of the
Branch Manager (Bank)/NCDC

Date :

Enclosure : Completion certificate, license, inspection report of Joint Monitoring Committee etc.

Annexure III

(For the use of financing bank to be submitted,
in triplicate, to the Regional Office of NABARD)
Capital Investment Subsidy Scheme for Construction/Expansion of

_____

Utilisation Certificate

1. Name, address and location of the beneficiary and project -
2. Name of the financing bank and -
3. Name and address of the financing branch -
4. Date of sanction of loan by bank -
5. Date of inspection by Joint Monitoring Committee -
6. Date of commission of the unit -
7. (i) Total Financial Outlay -Rs.
   (ii) Margin Money -Rs.
   (iii) Bank Loan -Rs.

(iv) Subsidy Received from NABARD	Date of receipt	Amount of the Subsidy (Rs.)	Date of credit to A/c of the Borrower subsidy Reserve Fund

   (a) 50% Advance Subsidy ---------
   (b) Final installment of subsidy ---------

   Total ---------

8. Capacity created
9. Rates of interest charged by financing bank - % p.a.
10. The bank has not availed refinance from NABARD.
11. This is to certify that the full amount of subsidy received in respect of the above project has been fully utilized (by way of crediting to the "Subsidy Reserve Fund Account- borrower-wise) and adjusted in the books of account under the sanctioned terms and conditions of the project within the overall guidelines of the scheme.

Place :

Date :

Seal and Signature of the
Branch Manager (financing bank) /NCDC

Annexure IV

Format of Half yearly (March / September) Progress Report of individual organic input production units set up under Capital Investment Subsidy scheme (CISS) for Fruit and Vegetable market waste/agro-waste compost units and Bio-fertilizer / Bio-pesticide production units

a) Fruit and Vegetable market waste/agro-waste compost units

S.N.	Name and Address of Compost Production Units	Year of sanction	Funding Source NABARD/ NCDC/DAC	Total Funds/ subsidy released	Total Prod. capacity of unit (MT)	Date of production commenced	Total Production/ Progress (MT)	Total Quantity Marketing (MT)	Total Income from sale (Rs.)	Remarks

b) Bio-fertilizer / Bio-pesticide production units

S.N.	Name and Address of Bio-fertilizer Production Units	Year of sanction	Funding Source NABARD/ NCDC/DAC	Total Funds/subsidy released	Total Prod. capacity of unit (MT)	Date of production commenced	Total Prod. /Progress (MT)	Total Quantity Marketing (MT)	Total Income from sale (Rs.)	Remarks

c) Vermiculture Hatchery

S.N.	Name and Address of Vermiculture Hatchery Units	Year of sanction	Funding Source NABARD/ NCDC/DAC	Total Funds/ subsidy released	Total Prod. capacity of unit (MT)	Date of prod. commenced	Total vermi compost Prod./ Progress (MT)	Total vermi culture prod.	Total Income from Sale (Rs.)	Remarks

Date…….

Signature

Head of the Organisation

Annexure V

Format for submission of Half Yearly Production Progress Report to be submnitted by the Beneficiary

(Progress must be submitted to NCOF and Concerned RCOF both in Hard & Soft Copies
(MS Excel Format only)

Details about Biofertiliser / Biopesticide Production Unit and Fruit & Vegetable Waste Compost Unit

A. Particulars of Units

S.No.	Name and address of unit with phone no and e-mail	Designation & Address of Controlling Officer	Installed Production Capacity (in tons)	Date of starting Production

B. Production Data (to Submitted as on 30th September and 31st March of each financial year)

S.No.	Name of Biofertiliser / Biopesticide Inoculant or F&V Compost (as the case may be)	Trade Name under which being sold	Production in Metric Tons		
			1st April to 30th Sept.	1st Oct. to 31 March	Total
Biofertilisers					
1.	Azotobacter				
2.	Rhizobium				
3.	PSB				
4.	Azospirillum				
5.	Acetobacter				
6.	Trichoderma				
7.	Mycorrhiza				
8.	Any other (Pl. Specify)				
Biopesticide					
Fruit & Veg. Waste Compost					

Annexure VI

Format for submission of Half Yearly Progress Report by NABARD to NCOF/DAC

(Progress must be submitted to NCOF / DAC both in Hard & Soft Copies (MS Excel Format only)

Claim No	Name of the RO	Name of borrower with complete postal address and phone nos.	Activity	Bank	Type of Bank	Estimated TFO
1	2	3	4	5	6	7

Total Eligible Subsidy (Total Commitments)	Advance Subsidy Confirmed for release	Final Subsidy Confirmed for release	Date of confirmation of Advance Subsidy	Date of confirmation of Final Subsidy	Refund	Refund date
8	9	10	11	12	13	14

Annexure VII

Format for submission of Monthly Progress Report by NABARD to NCOF/DAC

(Progress must be submitted to NCOF / DAC both in Hard & Soft Copies (MS Excel Format only) on last day of every month)

(Rs. In Lakh)

SNo.	Name of State	Bio-fertiliser Units (Target:….)			Amount of Final Subsidy
		SU	GU	Amount of Advance Subsidy	
1	**2**	**3**	**4**	**5**	**6**

Bio-pesticide Units (Target:….)			Amount of Final Subsidy
SU	GU	Amount of Advance Subsidy	
7	**8**	**9**	**10**

Fruit and Vegetable Compost Units (Target:….)			Amount of Final Subsidy
SU	GU	Amount of Advance Subsidy	
11	**12**	**13**	**14**

Total Units		Estimated TFO	Total amount of eligible subsidy (Adv+final)	Total amount of advance subsidy confirmed	Total amount of final subsidy confirmed
SU	GU				
15	**16**	**17**	**18**	**19**	**20**

Total amount of subsidy confirmed (Adv+Final)	Subsidy Refunded	Nett Subsidy released
21	**22**	**23**

Annexure VIII

Format for submission of Report by Joint Monitoring Committee (JMC)

(This report must be signed by each of the JMC and member and should be submitted to NCOF or concerned RCOF with full project report and necessary documents in support of claim)

JOINT MONITORING & INSPECTION OF BIOFERTILIZER / BIOPESTICIDE PRODUCTION UNIT / FRUIT AND VEGETABLE WASTE COMPOST PRODUCTION UNIT UNDER NATIONAL PROJECT ON ORGANIC FARMING

A committee was constituted for joint monitoring & inspection of the ……(Type of Unit) production unit financed by ……(Name of financing bank). The committee was constituted with the following members.

1. Representative of NCOF / RCOF/DAC
2. Representative of NABARD
3. Representative of Financing Bank

The committee visited the unit at _____ on Dated _____

The report of the committee is enclosed

1. Representative of NCOF/RCOF/DAC

   Name: _____

   Signature: _____

   Date: _____

2. Representative of NABARD

   Name: _____

   Signature: _____

   Date: _____

3. Representative of Financing Bank, _____

   Name: _____

   Signature: _____

   Date: _____

Annexure IX

Capital Investment Subsidy Scheme for Commercial production of Organic Inputs under "National Project on Organic Farming"

JMC Report

Biofertilizer/Biopesticide/Fruit & Vegetable Waste Compost Unit

1. Name & Address of Project:

2. Name & Address of promoter:

3. Name & Address of financing bank:

4 (a) Date of sanction of term loan by bank:

4 (b) Date of disbursement of first installment:

5. Means of finance
   - Total outlay:
   - Promoters contribution:
   - Bank Loan:

6. Capacity in MT to be created:
   - New
   - Expansion /renovation
   - Existing Unit

7. Advance subsidy
   (i) Date of receipt:
   (ii) Amount:

8. Date of completion of the project:

9. Date of visit of Joint Inspection Team:

10. Whether construction/expansion has been carried out as per the technical parameters envisaged under the project.

11. Total amount of expenditure incurred in the project-item wise details, duly certified by a chartered accountant (The copy of all receipt & certificate from the chartered accountant are to be enclosed).

12. Various permissions/approvals obtained by the promoters for establishment and commissioning of the project from various Govt. Authorities. (Copy of each such approval is to be enclosed)

13. The completion/commissioning certificate is required to be signed by the promoter/s & verified by a qualified/approved engineer/architect. Such certificate is required to be counter signed by the Branch Manager of the financing bank.

14. Whether sign board is erected near the units: Yes/No

Observation and recommendation of the Joint Inspection Team

Since the above project is complete as per terms and conditions stipulated under the scheme, final inspection of the unit has been done on _____ and an amount of Rs. _____ (Rupees _____) is recommended being the final installment of subsidy to be released for crediting to the Subsidy Reserve Fund Account Borrower/Group wise.

Other observation if any for compliance by bank/entrepreneur

Representative of NCOF/RCOF/DAC,	Representative of NABARD
Name:	Name:
Designation:	Designation:
Signature:	Signature:
Date:	Date:

Financing Bank Branch Manager

Name:

Designation:

Signature:

Date:

Model Project Report for Establishment of Fruit and Vegetable Waste / Agro Waste Compost Production Unit

Model Project Report for Establishment of Fruit and Vegetable Waste / Agro Waste Compost Production Unit

1. Introduction

Chemical fertilizers have played a significant role in Indian Agriculture facilitating green revolution and making the country self reliant in food production. However, it is not balanced plant nutrition and supply is limited to a few elements only. Further, it disturbs the soil health, leading to acidification, micro nutrient depletion, soil degradation, reduction in the activity of micro flora and micro fauna, poor crop health and lower crop yield and quality. Besides, use of chemical fertilizers may contribute to environmental risks like increase in global warming, ground and surface water pollution etc. In view of such emerging scenario, it is desirable to adopt sustainable and environment friendly approaches to sustain nutrient availability and ensure quality food production. Use of compost is one of such approaches for sustenance of soil fertility and soil life under all agricultural systems. With the increasing awareness of organic farming, use of compost is receiving much higher attention.

2. Composting Process

Composting is microbiological conversion of biodegradable organic wastes into suitable humus by indigenous micro flora including bacteria, fungi and actinomycetes. During composting, micro organisms such as bacteria and fungi break down complex organic compounds into simpler substances and produce carbon dioxide, water, minerals and stabilized organic matter. The process produces heat which can destroy pathogens (disease causing micro-organisms) and weed seeds. Raw materials are composted faster when conditions that encourage the growth of micro organisms are established and maintained. Recently earthworms are also increasingly being used for conversion of waste biomass into vermi-compost. In vermi-composting process, the biomass is first partially digested microbiologically and after thermophillic phase it is fed to the earthworms which after ingestion yield nutrient rich compost.

3. Objectives

The purpose of this scheme is to provide financial support for setting up fruits and vegetable waste compost unit with the twin objectives of:-

- Making mandi areas clean with the removal/disposal of these wastes and
- Converting all these wastes into compost as plant nutrient resources.

4. Scope

It is estimated that the organic resources available in our country can produce about 20 million tonnes of plant nutrient (NPK). The five major crops i.e. paddy, jowar, wheat, bajra and maize alone are estimated to yield approximately 141.2 million

tonnes (mt) of straw and leguminous crops produce another 10 million tonnes. Further, the estimated domestic waste is about 25 million tonnes, cattle manure 320 million tonnes and poultry manure of 3.3 million tonnes is generated annually in India. Total quantum of fruit and vegetable waste is yet to be estimated. However, the quantity of municipal solid waste generated in India is estimated to be 27.4 million tonnes per year of which the fruit and vegetable processing waste is about 4.5 million tonnes per year. Simultaneously, 760 million tonnes of potato residue is also available for use as manure. Thus, there is enough raw materials besides remains of fruits and vegetables which can be used for production of organic manure.

5. Benefits

Compost prepared from fruits and vegetable waste and other agro waste offers several benefits as indicated below :

Benefits to Agricultural Sector

- Enhances soil fertility and soil health, improve water holding capacity of soil.
- Improves soil biodiversity
- Support vigorous growth and high quality yield thereby increases productivity
- Rich source of plant nutrients
- No pesticide residues, weed seeds, heavy metals, sand, termite, wax, plant root diseases, etc.

Benefits to State

- Reduces the requirement of land for disposal of fruit and vegetable waste in near future.
- Create better environment, thus reduce ecological risk
- Stop wastage of rich raw material presently dumped into landfills and the same is being used for making compost.
- Avoidance/reduction of disposal and soil amendment costs.

6. Composting Process

Generally, the Composting methods are as follows: (a) aerated, (b) un-aerated, (c) covered & (d) uncovered. The composting methods include passive piles, windrow composting, static piles and in-vessel composting. It has been found that (after two decades of research) for Indian conditions, the Aerobic windrow composting with the help of microbes is the most effective and efficient method. Recently vermicomposting process has also been found to be effective and can be used. In this method the waste is partially decomposed microbiologically followed by feeding to earth worms to obtain vermicompost. The desired characteristics for the composting process is given in **Annexure I.**

6.1 Aerobic composting

When the organic material is decomposed in the presence of oxygen, the process is called aerobic.

6.1.1 Raw material:

As the objective of the scheme is to set up "Fruit and Vegetable Waste Compost Production Units", the raw material can be fruit and vegetable waste. In the absence of sufficient quantity of fruit and vegetable waste, other agricultural wastes, crop residues, other agro-wastes and kitchen waste can also be used.

The suitable materials for composting are : vegetable and fruit scraps, fallen leaves, tea leaves and tea bags, coffee grounds, vacuum cleaner dust, soft stems, dead flowers, used vegetable cooking oil, egg shells, old newspapers, lawn clippings, wood ash etc.; the unsuitable materials for composting are : meat and dairy products, diseased plants, metals, plastic, glass, fat magazines, large branches, weeds that have seeds or underground stems, bread or cake, bones, any other material containing either heavy metals or pathogens.

Fig. 1. Flow Diagram Showing Various Steps in Compost Production

Receiving Fruit & Vegetable waste

↓

Segregation of non bio degradable materials

↓

Windrows

↓

Addition of Culture/Inoculants/Bulking agents

↓

Covering the windrows by polythene

↓

Turning

↓

Watering

↓

Repeat Turning & Watering

↓

Drying

↓

Segregation of non biodegradable materials

↓

Screening (4 stages)

↓

Mature compost

↓

Value addition

↓

Packing

↓

Storage

↓

Distribution

While selecting the location of the unit and accessing the raw material requirements, the following points may be looked into:-

- material source and type
- collection frequency
- condition of material as delivered (may be different when it was collected)
- amount of each material type
- daily delivery schedule
- regulatory constraints
- content of chemical, organic and physical contaminants
- compatibility with the composting technology
- impact of odour generation
- cost and availability
- C - N ratio, moisture content.

6.1.2 Process

The garbage received is subjected to segregation of non bio-degradable materials such as plastic, glass etc. before arranging in windrows.

6.1.2.1 Windrow

The windrow composting involves placing mixed materials in long narrow piles and turning or agitating them regularly. Windrows are typically 1m to 3.6 m. high, 3 m to 3.6 m wide and hundred meter long, formed by using front-end loader or auger and are turned with special equipments or specialized turning device. For accelerating the compositing process, special microbial cultures or inoculants such as cellulytic and lignolytic or cowdung slurry are added. However, the fruit & vegetable waste usually contains the micro flora necessary for decomposition, the addition of inoculants/culture is optional. Various useful microbes like Azotobacter, phosphate solubilizing bacteria/ fungi (PSM) etc are also added for enriching the compost.

6.1.2.2 Turning & Watering

The turning operation mixes the compositing materials and enhances the aeration. The frequency of turning depends upon the rate of decomposition, moisture content

etc. Greater the frequency of turning, quicker is the process of conversion in to compost. During decomposition process, the temperature rises and reaches around 65-70 degree C, which creates optimum conditions for certain microorganisms and kills all unwanted pathogens. Water is sprayed as and when required to keep the moisture content in the desired range of 40 - 65%.

6.1.2.3 Screening

Composting is usually completed within 7 to 8 weeks and from the semi-processed compost, the wastes like plastic, glass etc. are again separated manually which ensures clean job and makes mechanization highly feasible. The compost thus obtained is then fed to the screening machineries of different mesh size to produce different grades of organic manure. The finished product is uniformly dark brown with a pleasant earthy aroma. The compost can also be enriched with rock phosphate, bio fertilizers and other prescribed additives.

Before packing, the product is tested in a lab for its organic quality such as humus content, organic carbon, nitrogen, phosphorus, potassium and micro nutrients including the population of useful bacteria, fungi etc. The compost is also tested for pathogens, presence of inert material and odour. The compost is then packed in HDPE/LDPE bags.

The important feature of this composting method is the controlled fermentation/degradation, resulting in production of enriched compost with desired specifications and devoid of toxicity. The end product, the enriched manure is therefore safe for use in agricultural and horticultural crops.

7. Components of commercial production units

7.1 Land

About 2 ha. land will be needed to set up 100 tonnes per day (TPD) fruits and vegetable wastes processing unit. The centre shall have site for staging, windrows, screening area shed, building / shed for finished product, office, lab and green belt/buffer zone. The entrepreneur may have his own land or may be purchased or taken on lease for a minimum period of 15 years.

7.2 Concrete Yard and Windrows

Windrows composting is one of the composting method where decomposition of organic matter takes place in windrows. These windrows are periodically turned using a bucket loader/front/end loader/ auger. Water is sprayed over the windrow to control temperature and moisture content. For a 100 TPD composting unit, it is desirable to have 2000-4000 sq mt of concrete yard. It is desirable to raise windrows in concrete yard (impervious layer) to prevent erosion of nutrients and smooth operation of machinery over it. The concrete yard may have

- 2 to 4 percent slope
- slope should be towards a collection pond
- build bunds around the perimeter to control run-off and run-on

7.3 Building

When the activity is taken up on a large scale on commercial lines, considerable amount may have to be spent on building to house the office, space for processing / screening, store the finished goods, space for packing, sales counter, space for laboratory, minimum accommodation to the Manager and workers. The cost of building, along with electrification may have to be included. Besides, reasonable amount could also be considered for furnishing the office, store, racks and other office equipment. This provision enhances the efficiency of operations.

7.4 Plant and Machinery

Equipment requirements depend on the technology used. For a windrow operation, the equipment might include a front end loader or inclined conveyor / auger, tipper, tub grinder, sieving and stitching conveyor, screen sieves (depending on the end use), JCB, tractor, weighing machine, packing machine, laboratory equipments with glass wares and chemicals and minimum tools etc. All machinery is manufactured in the country. Some of the suppliers undertake to install the unit on a turnkey basis. Detailed list of plant and machinery needed for the unit with cost is furnished in **Annexure III.**

7.5 Fencing and Roads/ Path

The site needs development for construction of structures and development of roads/ paths for easy movement of raw materials and finished goods, fencing in the periphery with gate to prevent trespass by animals and unwanted elements. Provision for green belt and buffer zone development and environmental requirements if any may also be considered. The cost under the above heads may be kept low, as these investments may be essential for a production unit, yet would not lead to increase in production.

8. Backward Linkages

8.1 Raw Material

The raw material for the unit is fruit and vegetable waste which is presently transported / dumped for land fill by the APMC/Municipality/Mandi authority by their vehicles. This raw material may be transported to the unit by the municipality (mandi authority) free of cost. In case, municipality / mandi authority is not able to supply raw material on account of any disturbance, strike, etc, the company may take up the responsibility of collecting the wastes from the mandi.

8.2 Transport

Adequate transport arrangements may be made by the unit for transport of raw material from the mandi in consultation with APMC/ Municipality / Mandi Authority. The transport for lifting of final produce and the waste like plastic materials etc. is to be arranged by the company and the cost of the same will be borne by the entrepreneur.

9. Forward Linkages

Marketing of the product is an important component in setting up the fruits and vegetables wastes compost unit. When the unit is set up by an established company having marketing network, there may not be much problem for marketing. But for the first generation entrepreneurs marketing linkages need to be developed. However, it is always desirable to enter into some buy back arrangement with pre-determined price.

10. Environmental aspects and pollution control

No hazardous effluents are generated from a compost production unit using fruit and vegetable waste.

11. Project profile

11.1 Capital cost of the project

Broadly, the capital cost includes the cost of land, development of land fencing/compound wall, civil works (concrete yard, processing shed, office, store, residential accommodation) plant & machinery, preliminary and pre-operative expenses etc. The capital cost of a model compost production unit from fruit and vegetable waste of 100 TPD has been estimated at Rs.190 lakh **(Annexure III).**

11.2 Financial analysis

The techno economic parameters, income - expenditure statement, working capital requirement and depreciation calculation are given in **Annexures II, IV, V and VI** respectively. The cash flow statement covering the Benefit Cost Ratio (BCR), Net Present Worth (NPW) and Internal Rate of Return (IRR) are given in **Annexure VII.** Normally, the BCR should be greater than 1, NPW should be positive and IRR should be greater than 15%. For the model project under consideration, the BCR is 1.29, NPW is Rs.166.90 lakh and IRR is 31.31%. The DSCR is 1.646. The entire bank loan can be repayable in eight years including two years grace period during which only interest will be recovered (details are given in **Annexure VIII)**. The break-even analysis is given in **Annexure IX.** The economics have been worked out without the subsidy component. With subsidy, the viability and bankability for the unit will be better.

12. Technical collaboration / Consultancy Services

Although composting from vegetable and fruit wastes is very simple, prior experience / knowledge about the same is very much essential for success of the unit. Few of the agencies who have expertise and experience have offered their services for setting-up of the units. The entrepreneur may visit some of the existing successful units before starting the project. However for the model scheme, the consultancy charges have not been included.

13. Raw material availability and Technology tie-up

For smooth functioning of the unit - it is necessary to enter into agreement / sign MOU between the different partners those are associated with supply of raw

materials and the entrepreneur / agency setting up the unit. Salient features of the deed may be as under:-

- Govt./ Municipality may allot required acres of land on lease basis for a period of 15 years for setting up the plant and dumping the waste at the site.
- APMC /Municipality may supply 100 MT (approx.) of fruits and vegetable waste every day.
- Agreed lease rent of land may be paid to the Govt./ Municipality for certain period as per agreement.
- The financial terms and conditions may be reviewed and decided after a certain period, as agreed by the parties.

Further, a second MOU may be signed by the promoter and consultancy agency (in case services of consultancy are needed). Accordingly, the promoter may make necessary investment for setting up the plant including payment of mutually agreed consultancy fees and the latter in turn would provide technical knowhow, the required amount of culture at the prevailing prices, project consultancy towards selection of plant and machinery, commissioning of the plant and marketing support / buy back arrangement, etc.

ANNEXURE – I

Desired Characteristics for the Composting Process

Sl. No.	Characteristics for the Composting Process	Metric Unit	Common unit	Range
1	Carbon to Nitrogen (C:N) ratio	----	---	20:1 – 25:1
2	Moisture Content	g water per g of compost	(% W/W)	15-25% W/W of final product
3	Inerts or sand contents	g inerts per g compost	%(dw)	<10%
4	pH	---	---	6.5 – 7.5
5	Bulk Density	g compost per cm^3 of compost	---	0.7 – 0.9
6	Colour	---	---	Dark brown to black
7	Particle size	---	% passing sieve	>90% passes through 4mm sieve
8	Total Organic Carbon	mg kg^{-1}	%	Min. 16-20%
9	Conductivity	dSm^{-1}	---	<4 dSm^{-1}
10	Pathogens	---	---	Free from pathogens

ANNEXURE – II

Parameters for 100 TPD Fruit & Vegetable Waste composting Unit

Installed capacity (TPD)	100
No of working days Working Hours/day	240 8
Installed capacity (Mt/annum)	24000
Capacity Utilisation	Year 2 - 40% Year 3 - 50% Year 4 - 70% Year 5 Onwards - 90%
Recovery of compost	30% (7200 ton per year)
Cost of culture (Rs/kg) Culture requirement (kg/tonne of raw material) Cost of packing materials (Rs/50kg bag)	50 1 15
Power load (KVA) Power factor Cost of power (Rs/unit) Units / year	50 0.8 4.5 76800
Fuel Consumption (litre/Mt) Cost of fuel (Rs/litre) Fuel charges (Rs/Mt)	1 40 40
Water charges (Rs/month)	50,000
Sale price of compost (Rs/kg)	3.00
Administrative expenses	1% of sales
Selling & Marketing expenses	Year 2 - 10.0% Year 3 - 10% Year 4 onward - 5%
Rent, taxes & insurance Repair & Maintenance	5.0% of sales 3% of sales
Working capital loan	20.00 lakh
Rate of interest on term loan	9%
Rate of interest on working capital	9%
Depreciation Building & Civil works Plant & Machinery Misc. Fixed assets	 5% 10% 10%
Income tax	33.22%

* Year 1 is the implementation period.

ANNEXURE – III

Project Outlay- Model Project on 100 TPD Fruit & Vegetable Waste composting Unit.

S. No.	Particulars	Quantity	Rate (Rs)	Cost (Rs lakh)	Remarks
1	Cost of land	2-3 ha			on lease
2	Civil Works				
	Land development including approach & internal road		LS	5.00	
	Processing shed	1000 sqm	2000	20.00	
	Concrete yard	2000 sqm	100	20.00	
	Drainage for storm water & leachate collection system		LS	3.00	
	Green belt & buffer zone development & environmental requirements		LS	3.00	
	Office & Store	100 sqm	8000	8.00	
	Water source supply system including over head tank		LS	2.00	
	Sub total			**61.00**	
3	Plant & Machinery				
	Rotary trauma screens with screen cloth of spring steel and suitable drives and chutes	4	1.50 lakh	6.00	
	different sieve size as per requirement	4	7.50 lakh	30.00	
	Inclined belt conveyor with drive, feed hopper, chutes, scrappers, cover plates, guards etc	1	4.00 lakh	4.00	
	Belt feeder, inclined, full seurt board with VFD and discharge chutes	1	3.00 lakh	3.00	
	Hoppers for additives	2	1.00 lakh	2.00	
	Bucket elevators, paddle mixers, cutters and crushers	1	4.00 lakh	4.00	
	Stitching bag conveyor, stitching machine, weighing scale etc	1	4.00 lakh	4.00	
	De-stoner	1	3.00 lakh	3.00	
	Vehicle/JCV/Tractor/DCM	3	16.00 lak	48.00	
	Misc. Equipments / other attachments		LS	2.00	
	Sub total			**106.00**	
4	Misc. fixed assets				
	Plant and machinery erection, commissioning	LS	LS	7.00	
	Power connection, transformers & electrical fixtures etc.		LS	8.00	
	Lab equipments, chemicals, glassware etc.		LS	3.00	
	Furniture, fixture, computers with accessories and tools etc		LS	5.00	
	Sub total			**23.00**	
5	**Total project cost**			**190.00**	
6	Margin money	33%		62.70	
7	Subsidy	33% or Rs. 60.00 lakh max.		60.00	
8	Bank loan	>34%		67.30	

Annexure III (A)

Manpower Requirement - 100 TPD Fruit & Vegetable wastes composting unit

S.No.	Type of manpower	Number	Salary (Rs./month) Wages (Rs./day)	Total	
1	Manager	1	12000	12000	
2	Marketing Officer	1	10000	10000	
3	Clerk/ Accountant	1	7000	7000	
4	Plant Operator/ Drivers	6	5000	30000	
5	Mechanics/ Electrician	2	5000	10000	
6	Supervisor	1	3500	3500	
7	Security Guards	2	3000	6000	
8	Skilled labourers	2	120	4800	
9	Unskilled labourers	4	100	8000	
	Total	**20**		**91300**	

Annexure IV

Income and Expenditure - Model Project on 100 TPD Fruit & Vegetable waste composting unit

(Rs.lakh)

S.No	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
1	Installed Capacity (Mt)	24000	24000	24000	24000	24000	24000	24000	24000	24000	24000	24000	24000
2	Capacity utilisation (Mt)	0%	40%	50%	70%	90%	90%	90%	90%	90%	90%	90%	90%
3	Capacity utilised (Mt)	0	9600	12000	16800	21600	21600	21600	21600	21600	21600	21600	21600
4	Recovery of compost (Mt)		2880	3600	5040	6480	6480	6480	6480	6480	6480	6480	6480
5	Income												
	Sale of compost		86.400	108.000	151.200	194.400	194.400	194.400	194.400	194.400	194.400	194.400	194.400
	Total Income	**0**	**86.400**	**108.000**	**151.200**	**194.400**	**194.400**	**194.400**	**194.400**	**194.400**	**194.400**	**194.400**	**194.400**
6	**Expenditure**												
	Royalty charges towards raw material		4.320	5.400	7.560	9.720	9.720	9.720	9.720	9.720	9.720	9.720	9.720
	Culture/ inoculants		4.800	6.000	8.400	10.800	10.800	10.800	10.800	10.800	10.800	10.800	10.800
	Packing material		8.64	10.8	15.12	19.44	19.44	19.44	19.44	19.44	19.44	19.44	19.44
	Power	0.750	1.382	1.728	2.419	3.110	3.110	3.110	3.110	3.110	3.110	3.110	3.110
	Fuel		3.840	4.800	6.720	8.640	8.640	8.640	8.640	8.640	8.640	8.640	8.640
	Water	0.100	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000
	Wages		0.614	0.768	1.075	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.382
	Salaries		9.420	9.420	9.420	9.420	9.420	9.420	9.420	9.420	9.420	9.420	9.420
	Selling & marketing expenses		8.640	10.800	7.560	9.720	9.720	9.720	9.720	9.720	9.720	9.720	9.720
	Administrative expenses		0.864	1.080	1.512	1.944	1.944	1.944	1.944	1.944	1.944	1.944	1.944
	Rent, taxes, insurance		4.320	5.400	7.560	9.720	9.720	9.720	9.720	9.720	9.720	9.720	9.720
	Repair & Maintenance		2.592	3.240	4.536	5.832	5.832	5.832	5.832	5.832	5.832	5.832	5.832

S.No	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
	Transport of plastic materials etc. to landfill		1.728	2.160	3.024	3.888	3.888	3.888	3.888	3.888	3.888	3.888	3.888
	Interest on working capital		1.907	2.232	2.783	3.405	3.405	3.405	3.405	3.405	3.405	3.405	3.405
	Total expenditure	**0.850**	**59.068**	**69.828**	**83.690**	**103.022**	**103.022**	**103.022**	**103.022**	**103.022**	**103.022**	**103.022**	**103.022**
7	Gross Surplus (PBDIT)	*-0.850*	*27.332*	*38.172*	*67.510*	*91.378*	*91.378*	*91.378*	*91.378*	*91.378*	*91.378*	*91.378*	*91.378*
8	Depreciation	0	15.950	14.508	13.202	12.019	10.948	9.977	9.098	8.300	7.576	6.920	6.324
9	Interest on Term Loan	15.276	15.276	15.276	14.774	12.958	9.938	6.645	3.050	0.000	0.000	0.000	0.000
10	Profit after Depreciation and Interest	-16.126	*-3.894*	*8.388*	*39.535*	*66.401*	*70.493*	*74.756*	*79.231*	*83.078*	*83.802*	*84.458*	*85.054*
11	Tax @ 33.22%		0.000	2.787	13.134	22.059	23.418	24.834	26.320	27.599	27.839	28.057	28.255
12	Surplus available for Repayment	-0.850	27.332	35.385	54.377	69.320	67.960	66.544	65.058	63.780	63.539	63.321	63.123
13	Debt Service Coverage Ratio												
	Coverage Available	0.000	27.332	35.385	54.377	69.320	67.960	66.544	65.058	63.780	63.539	63.321	63.123
	Debt	15.276	15.276	19.462	29.907	38.126	37.378	36.599	28.467	0.000	0.000	0.000	0.000
	Value	1	1	1	1	1	1	1	1	1	1	1	1
	DSCR	0.000	1.789	1.818	1.818	1.818	1.818	1.818	2.285				
Average DSCR 1.646													

Annexure V

Calculation of Working Capital - Model Project on 100 TPD Fruit & Vegetable Waste Composting Unit

(Rs. lakh)

S.No	Particular	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
1	Installed capacity (MT)	24000	24000	24000	24000	24000	24000	24000	24000	24000	24000	24000
2	Capacity Utilised (MT)	9600	12000	16800	21600	21600	21600	21600	21600	21600	21600	21600
3	Raw Material (15 days)	1.110	1.388	1.943	2.498	2.498	2.498	2.498	2.498	2.498	2.498	2.498
4	Work in Progress (45 days)	9.098	10.649	13.752	16.856	16.856	16.856	16.856	16.856	16.856	16.856	16.856
5	Finished Product (15 days)	3.033	3.550	4.584	5.619	5.619	5.619	5.619	5.619	5.619	5.619	5.619
6	Debtors (30 days)	7.145	8.450	10.113	12.452	12.452	12.452	12.452	12.452	12.452	12.452	12.452
7	Sundry Creditors (30 days)	2.220	2.775	3.885	4.995	4.995	4.995	4.995	4.995	4.995	4.995	4.995
8	Working Capital Required	18.165	21.261	26.507	32.429	32.429	32.429	32.429	32.429	32.429	32.429	32.429
9	Margin Money on Working Capital	4.541	5.315	6.627	8.107	8.107	8.107	8.107	8.107	8.107	8.107	8.107
10	Bank Loan for Working Capital	13.624	15.946	19.881	24.322	24.322	24.322	24.322	24.322	24.322	24.322	24.322
11	Interest on Working Capital	1.907	2.232	2.783	3.405	3.405	3.405	3.405	3.405	3.405	3.405	3.405

Annexure VI

Calculation of Depreciation (WDV) - Model Project on 100 TPD Fruit & Vegetable Waste Composting Unit

(Rs.lakh)

S.No	Particular	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
1	Civil Structure	61.000	57.950	55.053	52.300	49.685	47.201	44.841	42.599	40.469	38.445	36.523
	Depreciation	3.050	2.898	2.753	2.615	2.484	2.360	2.242	2.130	2.023	1.922	1.826
	Depreciated Cost	57.950	55.053	52.300	49.685	47.201	44.841	42.599	40.469	38.445	36.523	34.697
2	Plant & Machinery	106.000	95.400	85.860	77.274	69.547	62.592	56.333	50.699	45.630	41.067	36.960
	Depreciation	10.600	9.540	8.586	7.727	6.955	6.259	5.633	5.070	4.563	4.107	3.696
	Depreciation Cost	95.400	85.860	77.274	69.547	62.592	56.333	50.699	45.630	41.067	36.960	33.264
3	Miscellaneous Assets	23.000	20.700	18.630	16.767	15.090	13.581	12.223	11.001	9.901	8.911	8.020
	Depreciation	2.300	2.070	1.863	1.677	1.509	1.358	1.222	1.100	0.990	0.891	0.802
	Depreciation Cost	20.700	18.630	16.767	15.090	13.581	12.223	11.001	9.901	8.911	8.020	7.218
	Total Depreciation	15.950	14.508	13.202	12.019	10.948	9.977	9.098	8.300	7.576	6.920	6.324

Annexure VII

Calculation IRR, BCR & NPW - Model Project on 100 TPD Fruit & Vegetable Waste Composting Unit

(Rs. lakh)

S. No	Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	
1	Capital	190.000												
2	Recurring Cost	0.850	59.068	69.828	83.690	103.022	103.022	103.022	103.022	103.022	103.022	103.022	103.022	
3	Total Cost	190.850	59.068	69.828	83.690	103.022	103.022	103.022	103.022	103.022	103.022	103.022	103.022	**568.70**
4	Benefits	0.000	86.400	108.000	151.200	194.400	194.400	194.400	194.400	194.400	194.400	194.400	194.400	
5	Depreciated Cost of Structures												75.178	
6	Total Benefits	0.000	86.40	108.00	151.20	194.40	194.40	194.40	194.40	194.40	194.40	194.40	269.57	**735.60**
7	Net Benefits	-190.850	27.332	38.172	67.510	91.378	91.378	91.378	91.378	91.378	91.378	91.378	166.55	
8	Discounting Factor	0.150												
9	NPW @ 15% DF	**166.90**												
10	IRR	**31.31%**												
11	BCR	**1.29**	**: 1**											

Annexure VIII

Repayment Schedule - Model Project on 100 TPD Fruit & Vegetable Waste Composting Unit

(Rs. lakh)

Years	Bank loan O/S at the beginning of the year	Surplus available for repayment	Payment of Interest @ 12%	Repayment of Principal	Total Outgo	Bank loan O/S at the end of the year	Surplus available after repayment	
1	127.300	0.000	15.276	0.000	15.276	127.300	-15.276	
2	127.300	27.332	15.276	0.000	15.276	127.300	12.056	
3	127.300	35.385	15.276	4.186	19.462	123.114	15.923	
4	123.114	54.377	14.774	15.134	29.907	107.981	24.470	
5	107.981	69.320	12.958	25.168	38.126	82.813	31.194	
6	82.813	67.960	9.938	27.441	37.378	55.372	30.582	
7	55.372	66.544	6.645	29.955	36.599	25.417	29.945	
8	25.417	65.058	3.050	25.417	28.467	0.000	36.591	

Model Project Report for Establishment of Biofertilizer and Biopesticide Production Unit

Model Project Report for Establishment of Biofertilizer and Biopesticide Production Unit

1. Introduction

1.1 Sustainable crop production requires self generating, environment friendly-non degrading technologies for nutrient management and plant protection. Growth of crop plants depend much on good soil health. Soil health maintenance warrants optimum combination of organic and inorganic components of the soil. Repeated and excessive use of chemical fertilizers adversely affects soil biota. In nature, there are number of useful soil micro organisms which can help plants to get nutrients. Their utility can be enhanced with human intervention by selecting efficient organisms, culturing them and formulating them into ready to use products for use on seed, plant roots or in soil. The cultured micro organisms beneficial for crop growth and soil fertility, formulated into carrier based powdered form or in liquid form are called biofertilisers.

Similarly for sustainable crop protection there are large numbers of microorganisms and other bio-agents which act as enemies of crop pests and control their spread through antagonism or by causing pathogenicity. With research many such microorganisms (bacteria and fungi) have been identified which on application to soil and plant attack the pests and inhibit or control their spread. Such laboratory cultured antagonistic or pathogenic microorganisms formulated into ready to use products are called bio-pesticides.

2. Major advantages of Biofertilisers

2.1 Biofertilisers enhance the nutrient availability to crop plants (by process like fixing atmospheric nitrogen or dissolving insoluble phosphorous present in the soil); and also impart better health to plants and soil thereby enhancing crop yields in a moderate way. Biopesticides on the other hand on application through seed, foliar spray or as soil treatment increase their activity and prevent the growth of pathogenic fungi through their antagonistic activity or develop pathogenicity in target inspect pests. These are natural, pollution free and eco friendly methods. In the vast areas of low input agriculture, these products will be of much use to give sustainability to production. In view of the priority for the promotion of organic farming and reduction of chemical residues in the environment, special focus has to be given for the production of biofertilisers and biopesticides.

3. Commercial prospects

3.1 The biofertilisers are being produced both under public and private laboratories/ production units and are being distributed to the farmers. Depending upon the method of application 200gm to 4 kg of biofertilizer is needed for 1 acre, costing about Rs. 10 to 200 per acre. The benefits obtained by the use of biofertilizers

are not as visible as that of chemical fertilizers. As the results are not dramatic, many farmers are not aware of the significance, excepting in States like Maharashtra, Gujarat, part of Karnataka and Tamil Nadu, where these are more commonly used with Government's support. But looking to the increased awareness about the sustainability of the system and increasing awareness about organic farming their demand is on the rise.

3.2 It is estimated that the production of biofertilisers and biopesticides in the country by the existing units is about 28,000 and 40,000 TPA respectively against the installed production capacity of about 80,000 TPA as on 2009-10 (Most of the production units produce both biofertilizers and biopesticides). This is far below the potential requirement of 7.6 lakh TPA of biofertilizers and 15 lakh tones of biopesticides in the country.

4. Biofertiliser and Biopesticide production Technology

The technology used is indigenous and the scientific aspects of production are standardized by Agricultural Universities and Research Laboratories of GOI and research institutions. Machines and laboratory equipments are available from various manufacturers and some are of BIS standards. The details of technology is given in the following pages.

5. Objectives of the Project

The primary objective of the project is production of various strains of good quality biofertilisers and biopesticides using most modern technology. The infrastructure and laboratory facilities required for the production of these two commodities are similar and both can be produced with common facilities. Multi product range ensures economical viability of the project. Among the biofertilizers which can be produced in such units, include Rhizobium, Azotobacter, Azospirillum, PSB, Mycorrhiza and Trichoderma. Important biopesticides include Trichoderma, Pseudomonas fluorscens, Metarhyzium anisopliae, Bauveria bassiana and Verticillium lacini.

6. Requirements of Project

In line with the technology and objective of biofertiliser/biopesticide production, various facilities are required for the successful implementation of such projects which are indicated below.

6.1 **Land** - It is required to set up laboratory and other facilities and office. Space may also be required for installing tube well / dug well and parking of vehicles. A minimum of 1500 - 3000 sq.mt of land is required for setting up of a 200 TPA unit. Preferably, the entire site should be fenced with barbed wire or compound wall with gates at suitable places. The boundary may be planted with thick and all season growing tree species like Asoka, Eucalyptus etc to filter air and reduce dust.

6.2 **Layout and buildings** - The civil works comprises of factory building for laboratory, Carrier preparation and enrichment, sterilization, Inoculation and quality control, maturation of culture, mixing and packing, storage/staff etc,. The total covered area of about 6000-9000 sq ft is required for the product manufacturing and other utilities. Rest of the area of land will be required for future expansion up to 300 to 600 Tons per Annum.

6.3 **Plant and Machinery** - Manufacture of biofertilisers/biopesticides needs a good number of laboratory equipments as well as other production facilities such as fermenters, culture medium tank, fermenter assembly, autoclaves, boiler, broth dispensers, demineralising plant, air compressor etc,. The section wise equipment required, their specifications, quality required and average costs etc are indicated in **Annexure I**. All the machines are manufactured in the country. Some of the suppliers may undertake the installing of units on a turnkey basis.

6.4 **Manufacturing process and Source of technology** - The mother culture of various strains of biofertiliser are supplied from Agricultural Universities, Research Institutes and National / Regional Centres of Organic Farming (MOA). Biopesticide strains are available with technology dissimination centres and as per the requirements of license. The operations involved in the manufacturing process are given in the form of a flow diagram (**Fig 1 A & 1B**). The unit generally comprises of media preparation room, media store room, inoculation room, growth room, culture transfer room, sterilization, mixing and packing etc. The floor plan should be designed to promote maximum efficiency and minimum contamination. The design should facilitate maintenance of optimum temperature, humidity and ventilation. Inside air of the unit should be free from dust particles.

6.5 **Infrastructural Facilities for raw material, carrier material and utilities** - The raw material required for biofertiliser/biopesticide production include ingredients for growth medium for the production of broth, carrier, packing materials like polythene packets, bottles, corrugated boxes, etc,.

Utilities :-

i) Power

Normally a three phase electric supply is required for these plants. The normal requirements of a 200 TPA unit is about 40-75 KVA (depending upon the type of machineries and fuel used). Depending upon the position of power supply, stand by generator may be needed.

ii) Water

A Biofertiliser/biopesticide production unit requires water mainly for steam generation for sterilization of carrier, broth preparation and cleaning of

equipments. Accordingly well / bore well of appropriate capacity and according to the quality of water demineralisation equipments are to be installed. The average per day requirement of water for 150 TPA capacity shall be about 2500 to 3000 liters.

iii) Compressed air

It will be required for various pneumatic operations as well as for controlled air supply to fermenters, sterilization / cleaning operations etc,

6.6 Manpower

For a unit manufacturing 200 TPA biofertilisers the requirements of manpower is as under:

1	Chief Biologist / Micro Biologist
2	Assistant Microbiologists
2	Sales Officer
1	Accountant and clerical Assistant
2	Drivers
1	Floor Supervisor / Production Supervisor
1-2	Technical Staff (boiler operation where boiling operation is required, mechanical maintenance, packing machine operations, electrical maintenance)
4-5	Skilled laborers
5-8	Semi-skilled laborers, depending upon the volume of production

7. Unit of Size

The size of a biofertiliser/biopesticide unit could be expressed in terms of the capacity of production for various types/strains of biofertilisers/ biopesticide per annum. The projects so far set up in our country vary from 10 TPA to 2000 TPA. The size envisaged in the present model is 200 TPA in one shift. The capacity can be easily expanded by adding a few additional equipments like fermenters and automation in packaging.

Fig. 1 a. schematic diagram showing multiplication stages of biofertiliser/ biopesticide mother culture

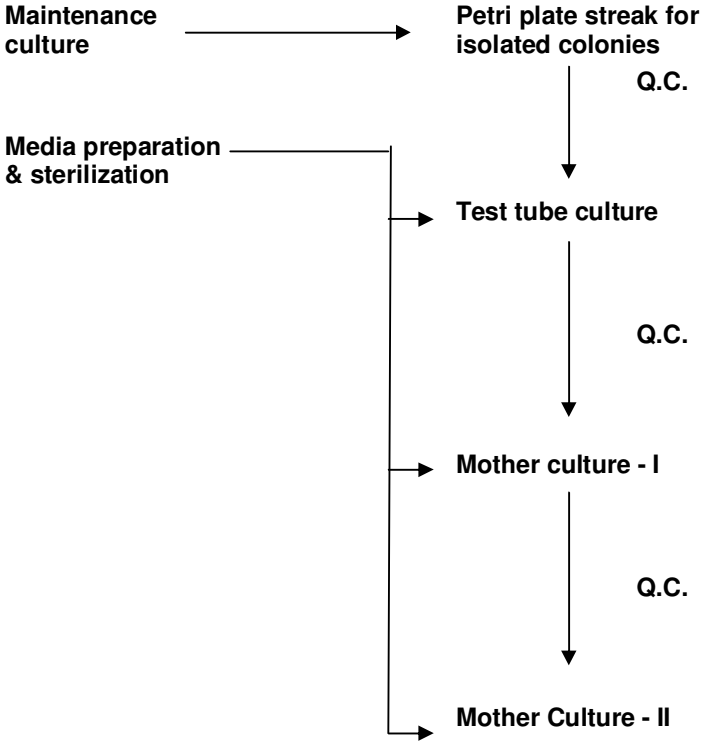


FIG. 1 B Chart showing steps in production

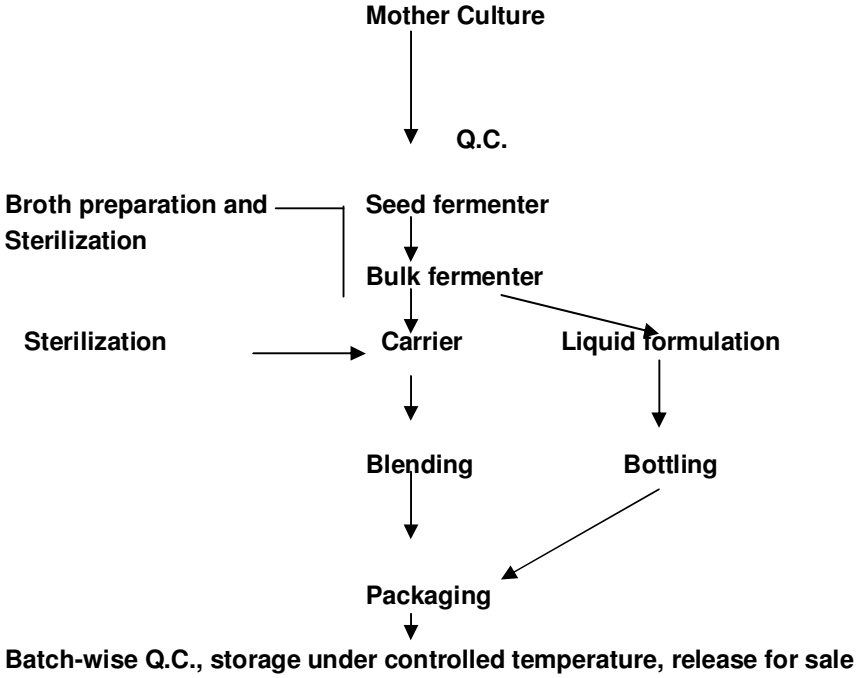
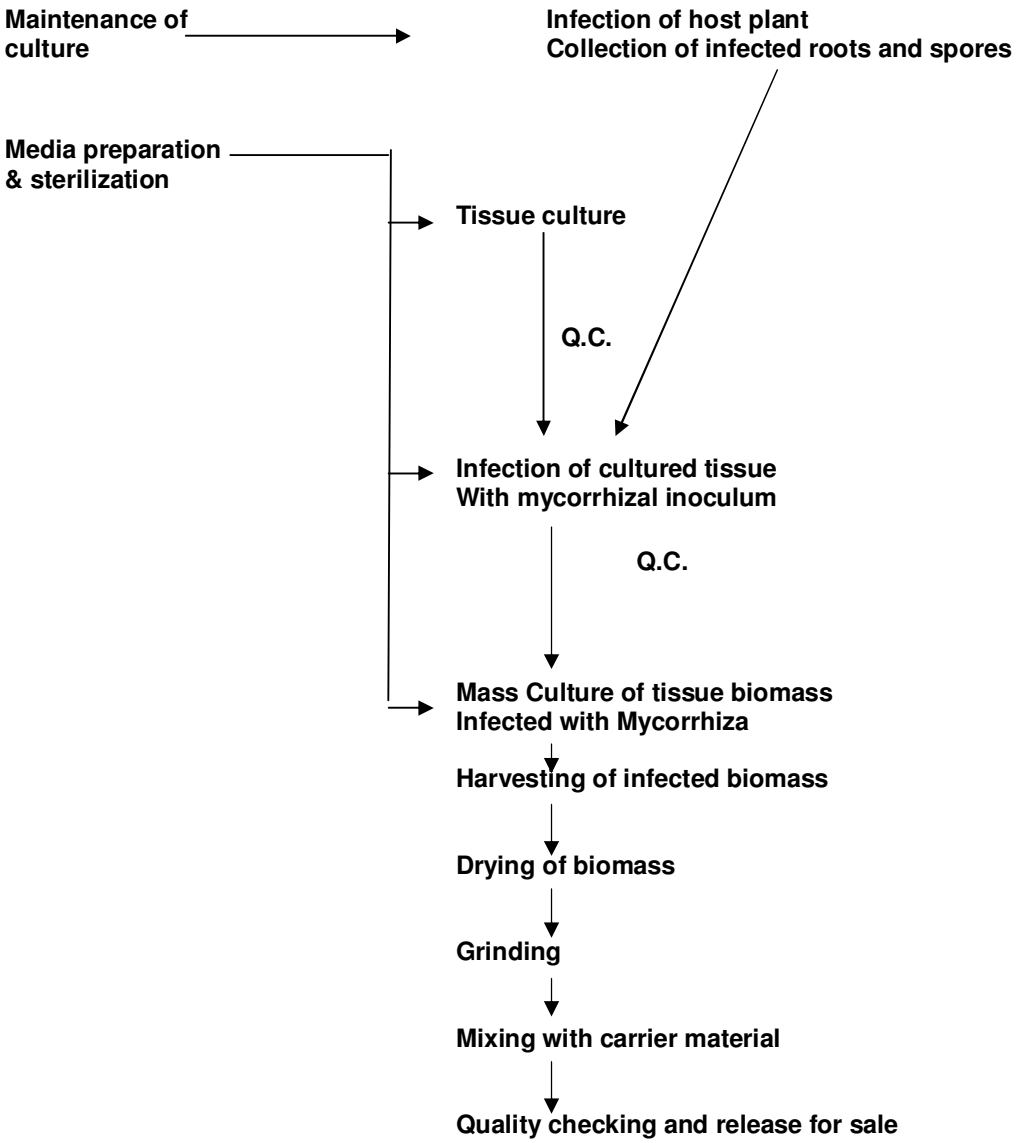


Fig. 2 Production Flow Chart for Mycorrhizal Biofertilizers



8. Environmental aspects and Pollution Control

No hazardous effluents are generated from biofertiliser/ biopesticide unit.

9. Requirement of Registration/license

Biofertilizers are covered under Fertilizer Control Order of Essential Commodities Act. Specifications for Rhzobium, Azotobacter, Azospirillum, PSB and Mycorrhiza have been specified. All production facilities and trading units are required to register and obtain necessary license for production/ sale of biofertilizers from state controlling authorities (Department of Agriculture). Biopesticides are covered under Central Insecticides Act and all manufacturers are required to obtain mandatory license from Central Insecticides Board, Govt of India, Faridabad.

9.1 Capital cost of the project

Broadly, the capital cost includes the cost of land, development of land, fencing, civil works (plant building, office, godown etc) plant and machinery, preliminary and preoperative expenses etc,. Capital cost of model biofertiliser/biopesticde unit with a capacity of 200 TPA will be Rs. 160.00 lakhs. The details of project cost are given in **Annexure II**.

10. Subsidy from Govt of India

Ministry of Agriculture, Department of Agriculture and Cooperation, Government of India is implementing a National Project on Organic Farming (NPOF) for the production, promotion & market development of organic farming in the country through National Centre of Organic Farming (NCOF), Ghaziabad and its six Regional Centre of Organic Farming (RCOF) located at Bangalore, Bhubaneswar, Hissar, Imphal, Jabalpur & Nagpur. One of the important components of the project includes financial assistance for setting up of commercial biofertiliser/ biopesticide production units.

Under the project subsidy is being provided through NABARD / NCDC @ 25% of total financial out lay (TFO) or Rs. 40 lakh per unit whichever is less for establishment of biofertiliser/ biopesticide production units with installed production capacity of 200 MT per year. Assistance is also available to the existing units for technological up-gradation, strengthening and capacity addition on similar terms and conditions restricted to 25% of financial out lay for additional cost, restricted to Rs. 40 lakh whichever is less. Subsidy assistance is available through commercial banks as credit linked back-ended subsidy.

11. Economics of the project

Based on the various techno-economic parameters, the economics of the project have been worked out for the project period or till the repayment of bank loan. The items of income includes sale of biofertilisers and biopesticides. While the expenditure includes the cost of raw material, transportation and commission, power, fuel, packing, distribution, wages and salary, repairs and maintenance, insurance, advertisement and other overheads. The income as well as expenditure for each year are worked out and subjected to cash flow analysis. For the model 200 TPA the relevant techno-economic parameters are furnished in ***Annexure III and IV***. The Income and Expenditure statement is furnished in ***Annexure V.***

12. Financial analysis

The cash flow statement **(Annexure VI)** covering the Benefit Cost Ratio (BCR), Net Present Worth (NPW) and Internal / financial rate of return (IRR/FRR) have been worked out for the project. Normally the BCR should be greater than 1, NPW should be positive and IRR/FRR should be greater than 15%. For the model project under consideration the BCR is 1.294, NPW is Rs.132.857 lakh and IRR is more than 15% i.e.22%. The DSCR is 2.79. The entire bank loan can be repayable in ten years with grace period of one year during which only interest will be recovered.

Financial Indicator	Estimated	Requirements
IRR	22%	15%
BCR	1.294	Should be >1.000
DSCR	2.79	should be > 1.500

As all the financial indicators meet the requirement, the biofertiliser production unit will be viable as well as bankable.

Sensitivity analysis of the unit was carried out with 3% increase in costs and 3% decrease in benefits and it is found that project is viable.

TECHNICAL ASPECTS OF BIO-FERTILISERS

1. What are Bio-fertilizers and Biopestiocides

Bio-fertilizers, in strict sense, are not fertilizers which directly give nutrition to crop plants. These are cultures of micro organisms like bacteria, fungi, packed in a carrier material or liquid form which helps the plants indirectly to get nutrients through biological Nitrogen (N) fixation or phosphorous solubilisation etc.

Biopesticides are live active culture of microorganisms (bacteria and fungi), packed in carrier material or in liquid form which on application to seed/ soil or crops either control the growth of pathogenic organisms through antagonism or create pathogenicity in target pests and help in control of their spread and growth. These microorganisms are host specific and cause antagonism or create pathogenecity only against target pets and are safe for other animals, cattle and human beings.

2. Mode of Action

Biofertilizers

The mode of action depends on the species of the organism. Some agents like *Rhizobium* cultures enhance N fixation in legumes by imparting effective nodulation as they are symbiotic bacteria living in association with leguminous plants.

There are free living bacteria like Azotobacter and Azospirillum, when applied to soil, enhance the N availability. Besides these there are certain other organisms which act on the soil minerals and dissolve the native nutrients like P which is otherwise not readily soluble. The most commonly produced and marketed biofertilizers are

i. Rhizobium -strains depending upon the legumes as they are host specific
ii. Azotobacter
iii. Azospirillum
iv. Phosphate Solubulizing Bacteria like Bacillus sp, Pseudomonas sp.
v. Blue Green Algae and Azolla - on- farm level.
vi. VA-Mycorrhiza

Biopesticides

Microbial biopesticides contributes to pest management through two different processes. Some biopesticides such as Trichoderma and Pseudomonas florescens

secrete antagonistic or fungistatic substances, which inhibit the growth of some pathogenic fingi and bacteria. Other biopesticides such as Metarhyzium, Bauveria, Verticillium, Nuclear polyhedrosis viruses etc create pathogenicity in target insect pests and help in controlling their population. Most commonly produced and marketed biopesticides are:

i. Trichoderma viride
ii. Trichoderma harzenium
iii. Pseudomonas florescens
iv. Metarhyzium anisopliae
v. Bauveria bassiana
vi. Verticillium lacini

3. Critical factors responsible for effectiveness

The critical factors which are responsible for the effectiveness of these bio-inputs are as follows:

- Suitability of the species to the target crop/pest
- Suitability of the stain
- Identification of strains as suited to the agro-eco system, particularly the soil pH and moisture conditions. Through research, specific strains as suited to a particular soil and environmental conditions have been identified and pure mother cultures are maintained in research labs for supply to the commercial manufacturers,
- The aseptic conditions of manufacturing, the cell count of living organism present in the carrier material, purity and level of contamination.
- The conditions of carrier material in which the culture is packed and the quality of the packing material, which determine the shelf life.
- The conditions in which the packed materials are stored, distributed and kept with the farmers before it is applied.
- Soil conditions particularly pH, organic matter content and moisture level; and agronomic practices.

4. Level of Benefits

The benefits usually obtained are not as visible as that of chemical inputs except in some critical conditions. Biofertilisers can add nitrogen from 20 kg/ha to 200 kg/ha depending upon the optimum conditions. Pastures and forage legumes respond more than grain crops. The yield increase usually range between 10-35%. However, in the vast areas of low input agriculture and in the context of imparting sustainability to crop production at reduced chemical pollution, this product will be of much use. Rhizobium culture treatment becomes essential when new types of legumes like soybeans are introduced in new areas. On the other hand, the application of PSB helps plant to get phosphorous as its nutrient.

Antagonistic biopesticides help in reducing the incidence of soil borne disease and are being widely adopted by farmers as alternative to chemical seed dressers. Other microbial biopesticides help in control of targets pests below economical threshold

limit. Under organic management system where chemical pesticides are prohibited biopesticides are ideal substitutes.

5. The Outlines for Commercial Manufacture of Bio-fertilizers :

The manufacturing process in short involves

i. Selection of suitable strain of the organism for which market demand is identified.
ii. Mass multiplication.
iii. Mixing of the culture with carrier material and packing. (Recently liquid biofertiliser is also getting popularity).

The steps involved are as follows:

5.1 Culture selection and maintenance:

The pure mother cultures of various strains are being maintained in Agricultrual Universities, IARI, some ICAR institutions, National /Regional Centres of Organic Farming of MOA, etc. There are international sources of supply also like NifTAL, IRRI etc. The mother culture in test tubes of desired strain can be purchased from the identified sources. They have to be further sub-cultured and maintained purely for mass production by adopting standard techniques under the supervision of trained microbiologist.

5.2 Culture augmentation:

In the next stage the culture need to be up-scaled in steps from small mother culture to broth in required quantities. A defined synthetic medium (specific to each organism) is prepared, sterilized and inoculated by requisite mother culture. Fully grown bacterial broth is ready within 5-7 days time. Depending upon the quantity to be harvested a series of fermentation vessels are needed.

5.3 Formulation of product

5.3.1 Carrier sterilization (for carrier based powdered formulations):

While the broth is getting ready in the fermenter the carrier material, which may contain contaminants, is sterilized in autoclaves and kept ready for mixing with the both. Peat imported from countries like U.S., Australia is reported to be the best source of carrier material. However, lignite or charcoal is used extensively in India. The carrier is either sterilized in bulk or it is packed and then the packets are sterilized. However the system will depend on the specific methodology which has been standardized.

5.3.2 Mixing and packing:

There are 2-3 alternatives depending upon the sophistication and automation of the unit.

i. Under non sterile system, the broth is harvested from the fermenter and mixed with sterilized carrier - the mixing is done mechanically under aseptic condition and packed in polythene bags of desired quantity.

ii. In a slightly upgraded method, the broth and sterilized carrier are poured and sealed in polythene bags simultaneously under sterile conditions through automatic form-fill and seal machines. Prepared packets are manually smudged to ensure mixing. In such cases carrier need to be fortified with suitable dispersing agents.

iii. Under a completely sterile system the carrier is packed in autoclavable polypropylene bags and sealed. These packets are then autoclaved to make them sterile. Broth from fermenter is directly injected into these packets with the help of measured volume dispenser. The injection hole is immediately sealed. The packets are kept for incubation for about a week before transferring to store room.

Sterile system of packing using auto syringe and dispenser is recommended to be the best method and all new units should follow and adopt this system.

5.4 Formulation and packaging of liquid biofertilizers

Liquid formulations are formulated into final product in the fermenters at the time of fermentation and are packed directly into pre-sterilized polypropylene bottles with the help of automatic bottle filling machines under sterile conditions. Absolute sterility can be obtained by placing these machines in sterile cabins provided with forced sterile air facilities.

5.5 Equipment needed:

The equipments needed for manufacture and lab are listed in Annexure I. They are available through scientific and lab equipment suppliers.

5.6 Layout of the production unit:

The biofertilizer plant should be housed in a suitable building complex. The main production unit should have separate channels for bacteriological work, carrier making and mixing and customer and visitor/marketing way. In addition there should be rooms with separate entrance for utilities like power, steam generator and stores. Appropriate design can be adopted in consultation with scientists/engineers.

5.7 Raw material :

The chief raw materials needed for the production of biofertilizers are as follows.

- Mother cultures
- Chemicals for growth medium
- Carrier material – lignite, peat, charcoal or vermiculite or other materials of desired quality in powder from (100-200 mesh) etc.
- Polythene bags, polypropylene bottles, HDPE bags, cardboard cartons

5.8 Quality Control :

Since March 2006, Biofertilizers are covered under Fertilizer Control Order (FCO) and specifications and quality requirements are prescribed. All the requirements under FCO are mandatory and need to be followed.

5.9 Limitations and constraints

The major limiting factors include:

At product level

- Narrow genetic base of mother cultures and lack of efficient and virulent strains suitable to various agro-environments.
- Unsatisfactory carrier material in respect of uniformity and good quality against imported peat material.
- High contamination in broth mixing and packing stages, not using completely closed system of production.
- Unsatisfactory packing material which reduces shelf life.
- Unsatisfactory storing conditions, particularly during the distribution period. Exposure to high temperatures and sunlight destroy the microbial culture. They should be preferably kept in cold storage conditions.
- Not employing properly trained microbiologist.
- Lack of awareness among farmers for its proper application.

At field level :

The efficiency when applied to soils is limited by several factors; most important among them being, drought and high summer temperature, water logging, unfavorable soil pH, contamination by other organisms and nutrient deficiency. There is an acute shortage of awareness among the farmers on the subject.

Specifications of Biofertilizers under FCO

(i)	Base	Carrier based moist ory powdered or granulated*or liquid based
(ii)	Viable cell count	CFU minimum $5x10^{7}$ cell/g of carrier material or $1x10^{8}$ cell/ml of liquid material.
(iii)	Contamination level	No contamination at 10^{5} dilution
(iv)	pH	6.5-7.5
(v)	Particles size in case of carrier based material.	All material shall pass through 0.15-0.212mm IS sieve
(vi)	Moisture percent, in case of carrier based.	30-40%
(vii)	Efficiency character	**For Rhizobium** - Should show effective nodulation on all the species listed on the packet. **For Azotobacter & Azospirillum** - The strain should be capable of fixing at least 10 mg of nitrogen per g of sucrose consumed. **For PSB** - The strain should have phosphate solubilizing capacity in the range of minimum 30%

Specifications of Mycorrhiza under FCO

i.	Form/base	Fine Powder/ tablets/ granules/ root biomass mixed with growing substrate
ii.	Particle size for carrier based powder formulations	90% should pass through 250 micron IS sieve (60 BSS)
iii.	Moisture content percent maximum	8 -12
iv.	pH	6.0 to 7.5
v.	Total viable propagules/ gm of product, minimum	100 /gm of finished product
V.	Infectivity potential	80 infection points in test roots/gm of mycorrhizal inoculum used

Annexure I

List of Equipments and Plant and Machinery
(Production capacity 200 MT carrier based and liquid)

A. Essential equipments, for strain maintenance and quality control glassware, plastic ware etc (Rs.lakh)

S.No.	Item	Quantity required(No)	Rate	Amount
1	Vertical Autoclave 600x350 mm	2	0.8	1.600
2	Hot air Oven 24x24x24”	1	0.3	0.300
3	Refrigerator 300 lit	2	0.3	0.600
4	BOD Incubator 290 lit	2	1.2	2.400
5	Laminar air flow work station , working table size 3' x 2'	2	1.5	3.000
6	Rotary shaker (capable of holding 25no., flasks of 100-500 ml capacity)	2	1.25	2.500
7	Binocular research microscope with phase contrast attachment (MOST IMPORTANT) having turret condenser and matching phase objectives of 10x, 40x and 100x magnification, 10x wide field eye pieces and telescopic centering eyepiece.	1	2	2.000
8	pH Meter(Micro Processor based)	1	0.3	0.300
9	Small oil free air compressor	2	0.5	1.000
10	Airconditioners 1.5 ton split type	4	0.3	1.200
11	Miscelleneous equipments and tools such as colony counter, balances, microliter pipettes etc	-	LS	2.500
12	Glassware and plastic ware aids		LS	2.200
13	Centrifuge	1	0.35	0.350
14	Deep Freeze – 300 lit capacity (For culture storage or culture Bank)	1	0.4	0.400
	Total for A			**20.350**

B. Fermentation and biomass up-scaling equipments and machines				
1	Mother culture glass vessels/ fermenters 1-2 lit cap.	30	0.05	1.500
2	Stainless steel seed fermenters 50 lit cap., aerated, stirred type with auto pH, aeration and temperature control	4	4.0	16.000
3	Stainless steel fermenters, aerated, stirred type, with auto pH, aeration and temperature control. Total vessel cap 750 lit and working cap. 500 lit.	3	10.0	30.000
4	Air compressor oil free type, 2,000 lit air/min cap with moisture cum oil trap and filters	2	2.0	4.000
5	Chiller 1 ton cap	2	2.0	4.000
6	Automatic steam generator 100 kg cap.	1	6.5	6.500
7	Fittings, pipe lines, filters, miscellaneous items		LS	3.000
	Total for B			**65.000**
C. Product handling, packaging equipments and machines and storage equipments				
1	Autoclave Horizontal 2x2x4 ft chamber size	1	4.5	4.500
2	Automatic bottle filling machine with necessary conveyor system and laminar air-flow provision at filling chamber	1	13.5	13.500
3	Capping and labeling machines and miscellaneous items	1	5.0	5.000
4	Miscellaneous fittings, electrical installation, other tools and equipments		LS	3.000
5	Air conditioners for storage	4	0.5	2.000
6	Peddal Mixer or Ribbon Blender	1	0.5	0.500
7	Generator (DG Set of 65 KVA)	1	4.0	4.000
	Total for C			**32.500**
Grand total for A+B+C				**117.850**

Annexure – II

Project Outlay – Model Project on 200 TPA / Shift Bio-fertiliser Unit.

(Rs.lakh)

Sr. No.	Particulars	Quantity	Rate	Cost
Land and Building				
1	Cost of Land	2000 sq. mt.	0	0
2	Land Levelling	Lumpsum	Lumpsum	1.000
3	Fencing and Compund Wall and Gates	Lumpsum	Lumpsum	5.000
4	Civil Structure	5,000 sq ft	600/sq ft	30.000
	Sub Total			**36.000**
Plant, Machinery and Equipments				
5	As per annexure I	-		**117.850**
Other expanses capitalised				
6	Interest during gestation/construction period and first year expenses captialised		Lumpsum	3.500
14	Margin money for Working Capital			2.373
15	Preliminary and Pre-op. Expenses		Lumpsum	2.200
16	Total Project outlay			**161.923**
	Say			**162.000**
	Margin Money	25%		40.500
	Bank Loan	>50%		121.50
	Subsidy	25% of Project Cost or Rs.40 lakh whichever is lower		**40.000**

Annexure - III

Techno-economic Parameters

S.No.	Components	Quantity / value/
1	Installed Capacity (in TPA)	200
2	Capacity Utilisation	50% in 1st year, 60% in 2nd year, 80% in 3rd year and 90% from 4th year onwards
3	Sale price of biofertilizer (Rs /kg or /lit)	40.00 for powder
		160.0 for liquid
4	Power/ Fuel charges (Rs.lakh/year)	6.000
5	Media preparation (Rs.lakh/year)	6.000
6	Water charges (Rs.lakh/year)	5.000
7	Carrier material (Rs.lakh/year)	10.000
8	Packing material (Rs.lakh/year)	16.000
9	Salary (Rs.lakh/year)	5.040
10	Administrative expanses (Rs.lakh/year)	3.000
12	Wages (Rs.lakh/year)	4.455
13	Insurance (% of sales)	2.00%
14	Repair and maintenance (% of sales)	3.00%
15	Selling and marketing expanses (% of sales)	10%
16	Rate of interest on term loan	12%
17	Rate of interest on working capital	14%
18	Margin (% of out lay)	25%
19	Subsidy (% of total financial out lay)	25%
20	Depreciation	
	1. Civil structure	5%
	2. Implements and machinery	10%
	3. Misc. assets	10%
21	Income tax	32.30%

Annexure - IV

Parameters for 200 TPA Bio fertiliser & Bio Pesticide unit

Installed capacity (Mt)	200			
Product Mix	%		MT	
1 Kg. Packet	60%			
5 Kg. Packet	20%			
For 1000 ml Pet Bottle	25%			
For 500 ml Pet Bottle	5%			
	Year 1	**Year 2**	**Year 3**	**Year 4 onwards**
Capacity utilization (in %)	50%	60%	80%	90%
Sales Price (Rs. Per Kg of Biofertiliser/Biopesticide)		40000	(per tonne)	
1 Kg. Packet	40	40000	(per tonne)	
5 Kg. Packet	38	38000	(per tonne)	
For 1000 ml Pet Bottle	160	160000	(per 1000 lit)	
For 500 ml Pet Bottle	85	85000	(per 1000 lit)	
Power load (KVA)		65		
Power factor		0.8		
Cost of power (Rs / unit)		4.5		
Units / year		2500	585000	
		Say	600000	
Rate of Interest on Bank Loan		12%		
Rate of Interest on Working Capital		14%		
Margin		25% of project Outlay		
Loss due to Contamination*		5%		

Annexure IV contd.

	Year 1	Year 2	Year 3	Year 4 onwards
Power Charges (Rs.lakh)	3.000	3.600	4.800	5.400
Medium preparation (Rs.lakh)	3.000	3.600	4.800	5.400
Wages (Rs.lakh)	2.228	2.673	3.564	4.010
Salary (Rs.lakh)	5.040	5.040	5.040	5.040
Water Charges (Rs.lakh)	2.500	3.000	4.000	4.500
Packing Material (Rs.lakh)	8.000	9.600	12.800	14.400
Carrier Material (Rs.lakh)	5.000	6.000	8.000	9.000
Insurance (Rs.lakh)	3.240	3.240	3.240	3.240
Repair & Maintenance (Rs.lakh)	4.860	4.860	4.860	4.860
Administrative Expenses	3.000	3.000	3.000	3.000
Marketing Expenses & Selling Expenses	8.100	9.720	12.960	14.580
Mother Culture**	0.120	0.120	0.120	0.120
No. of Strains	6	6	6	6
No. of Tubes	200	200	200	200
Rate (Rs.)	10	10	10	10
Depreciation(%)				
Civil Structures	5			
Plant & Machinery	10			
Miscellaneous Assets	10			

Annexure - V

Calculation of IRR, BCR & NPW – Model Project on 200 TPA/ Shift Bio-fertiliser Unit (Rs.lakh)

Particulars	***Year 1***	***Year 2***	***Year 3***	***Year 4***	***Year 5***	***Year 6***	***Year 7***	***Year 8***	***Year 9***	***Year 10***	***TOTAL***
Capital Cost	*162.000*										*162.000*
Recurring Cost	*41.442*	*48.57*	*63.704*	*71.268*	*71.268*	*71.268*	*71.268*	*71.268*	*71.268*	*71.268*	*652.598*
Total Cost	*203.442*	*48.57*	*63.704*	*71.268*	*71.268*	*71.268*	*71.268*	*71.268*	*71.268*	*71.268*	*814.598*
Benefits	*73.850*	*88.62*	*118.16*	*132.93*	*132.93*	*132.93*	*132.93*	*132.93*	*132.93*	*132.930*	*1211.140*
Depreciated Cost of Structure										*41.092*	*41.092*
Total Benefits	*73.850*	*88.62*	*118.16*	*132.93*	*132.93*	*132.93*	*132.93*	*132.93*	*132.93*	*174.022*	*1252.232*
Net Benefits	*-129.592*	*40.04*	*54.456*	*61.662*	*61.662*	*61.662*	*61.662*	*61.662*	*61.662*	*102.754*	*437.634*
Discounting Factor @ 15%	*0.87*	*0.76*	*0.66*	*0.57*	*0.5*	*0.43*	*0.38*	*0.33*	*0.28*	*0.25*	
NPW	*-112.745*	*30.43*	*35.941*	*35.147*	*30.831*	*26.515*	*23.432*	*20.348*	*17.265*	*25.688*	*132.857*
PWC	*176.994*	*36.91*	*42.045*	*40.623*	*35.634*	*30.645*	*27.082*	*23.518*	*19.955*	*17.817*	*451.231*
PWB	*64.250*	*67.35*	*77.986*	*75.770*	*66.465*	*57.160*	*50.513*	*43.867*	*37.220*	*43.505*	*584.087*
BCR	***1.294***										
IRR	***22%***										

Sensitivity analysis :

1.03

0.97

Increase in cost by 3%	*209.545*	*50.03*	*65.615*	*73.406*	*73.406*	*73.406*	*73.406*	*73.406*	*73.406*	*73.406*	*839.036*
Decrease in benefit by 3%	*71.635*	*85.96*	*114.61*	*128.94*	*128.94*	*128.94*	*128.94*	*128.94*	*128.94*	*168.801*	*1214.665*
Net Income	*-137.910*	*35.92*	*49.000*	*55.536*	*55.536*	*55.536*	*55.536*	*55.536*	*55.536*	*95.395*	*375.629*
DF at 15 %	*0.87*	*0.76*	*0.66*	*0.57*	*0.50*	*0.43*	*0.38*	*0.33*	*0.28*	*0.25*	
NPW	*-119.98*	*27.31*	*32.34*	*31.66*	*27.77*	*23.88*	*21.10*	*18.33*	*15.55*	*23.85*	*375.63*
PWC	*182.304*	*38.02*	*43.306*	*41.841*	*36.703*	*31.565*	*27.894*	*24.224*	*20.554*	*18.352*	*464.768*
PWB	*62.322*	*65.33*	*75.646*	*73.497*	*64.471*	*55.445*	*48.998*	*42.551*	*36.104*	*42.200*	*566.565*
BCR	***1.219***										
IRR	***16%***										

Annexure - VI

Calculation of Working Capital – Model project on 200 TPA/Shift Bio-fertiliser & Biopesticide Unit
(Rs.lakh)

Particular	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
installed capacity (MT)	200	200	200	200	200	200	200	200	200	200
Capacity Utilized (MT)	100	120	160	180	180	180	180	180	180	180
Raw Material (1 month)	6.070	7.284	9.712	10.926	10.926	10.926	10.926	10.926	10.926	10.926
Work in Progress(10)	2.023	7.284	9.712	10.926	10.926	10.926	10.926	10.926	10.926	10.926
Finished Production (15 days)	3.035	2.023	2.023	2.023	2.023	2.023	2.023	2.023	2.023	2.023
Debtors (15 days)	3.035	3.642	4.856	5.463	5.463	5.463	5.463	5.463	5.463	5.463
Sundry Creditors	2.023	3.642	4.856	5.463	5.463	5.463	5.463	5.463	5.463	5.463
Working Capital Required	9.491	2.428	3.237	3.642	3.642	3.642	3.642	3.642	3.642	3.642
Margin Money on Working Capital	2.373	19.019	24.684	27.517	27.517	27.517	27.517	27.517	27.517	27.517
Bank Loan for working Capital	7.118	4.755	6.171	6.879	6.879	6.879	6.879	6.879	6.879	6.879

Annexure - VII

Income and expenditure – Model Project on 200 TPA/Shift bio-fertiliser Unit.
(Rs.lakh)

Sr. No.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
1	Installed Capacity in MT	200	200	200	200	200	200	200	200	200	200
2	Capacity Utilization (in %)	50%	60%	80%	90%	90%	90%	90%	90%	90%	90%
	Capacity Utilized in MT	100	120	160	180	180	180	180	180	180	180
3	INCOME {RS lakh}										
	1 Kg Packet	24.000	28.800	38.400	43.200	43.200	43.200	43.200	43.200	43.200	43.200
	5 Kg Packet	7.600	9.120	12.160	13.680	13.680	13.680	13.680	13.680	13.680	13.680
	1000 ml bottle	40.000	48.000	64.000	72.000	72.000	72.000	72.000	72.000	72.000	72.000
	500 ml bottle	4.250	5.100	6.800	7.650	7.650	7.650	7.650	7.650	7.650	7.650
	Less due to Contamination	2.000	2.400	3.200	3.600	3.600	3.600	3.600	3.600	3.600	3.600
4	**Total Income**	73.850	88.620	118.160	132.930	132.930	132.930	132.930	132.930	132.930	132.930
5	**EXPENDITURE**										
	Power	3.000	3.600	4.800	5.400	5.400	5.400	5.400	5.400	5.400	5.400
	Medium Preparation	3.000	3.600	4.800	5.400	5.400	5.400	5.400	5.400	5.400	5.400
	Wages	2.228	2.673	3.564	4.010	4.010	4.010	4.010	4.010	4.010	4.010
	Water Charges	2.500	3.000	4.000	4.500	4.500	4.500	4.500	4.500	4.500	4.500
	Packing Material	8.000	9.600	12.800	14.400	14.400	14.400	14.400	14.400	14.400	14.400
	Carrier material	5.000	6.000	8.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000
	Taxes and Insurance	1.477	1.772	2.363	2.659	2.659	2.659	2.659	2.659	2.659	2.659

Sr. No.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
	Salary	2.520	3.024	4.032	4.536	4.536	4.536	4.536	4.536	4.536	4.536
	Administrative Expenses	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000
	Selling expenses	7.385	8.862	11.816	13.293	13.293	13.293	13.293	13.293	13.293	13.293
	Mother Culture	0.120	0.120	0.120	0.120	0.120	0.120	0.120	0.120	0.120	0.120
	Interest on working capital	0.997	0.666	0.864	0.963	0.963	0.963	0.963	0.963	0.963	0.963
6	**Total Expenditure**	41.442	48.576	63.704	71.268	71.268	71.268	71.268	71.268	71.268	71.268
7	**Gross Surplus (PBDIT)**	32.408	40.044	54.456	61.662	61.662	61.662	61.662	61.662	61.662	61.662
8	Depreciation	13.585	12.317	11.170	10.135	9.198	8.352	7.586	6.894	6.267	5.700
9	Interest on Term Loan	14.580	14.580	12.960	11.340	9.720	8.100	6.480	6.480	4.860	3.240
10	Profit after Depreciation Interest	4.243	13.148	30.326	40.187	42.744	45.210	47.596	48.288	50.535	52.722
11	Tax	0	0	9.80	12.98	13.81	14.60	15.37	15.60	16.32	17.03
12	Profit after Depreciation, Interest and Tax	0	0	1.359	1.359	1.359	1.359	1.359	1.359	1.359	1.359
13	Surplus available for Repayment	32.408	40.044	54.456	61.662	61.662	61.662	61.662	61.662	61.662	61.662
14	Debt Service coverage Ratio										
	Coverage Available	32.408	40.044	54.456	61.662	61.662	61.662	61.662	61.662	61.662	61.662
	Debt	14.58	28.08	26.46	24.84	23.22	21.6	19.98	18.36	16.74	15.12
	Value										
	Value	1	1	1	1	1	1	1	1	1	1
	DSCR	2.223	1.426	2.058	2.482	2.656	2.855	3.086	3.358	3.684	4.078
	Average DSCR	2.791									

Annexure - VIII

Calcualtion of Depreciation (WDV) – Model Project on 200 TPA Bio-Fertiliser & Bio Pesticide Unit.

(Rs.lakh)

Sr. No.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
1	Civil Structures	36.000	34.200	32.490	30.866	29.322	27.856	26.463	25.140	23.883	22.689
	Depreciation @ 5%	1.800	1.710	1.625	1.543	1.466	1.393	1.323	1.257	1.194	1.134
	Depreciated Cost	34.200	32.490	30.866	29.322	27.856	26.463	25.140	23.883	22.689	21.555
3	Plant & Machinery	117.850	106.065	95.459	85.913	77.321	69.589	62.630	56.367	50.731	45.658
	Depreciation @ 10%	11.785	10.607	9.546	8.591	7.732	6.959	6.263	5.637	5.073	4.566
	Depreciated Cost	106.065	95.459	85.913	77.321	69.589	62.630	56.367	50.731	45.658	41.092
	Total Depreciation	13.585	12.317	11.170	10.135	9.198	8.352	7.586	6.894	6.267	5.700

Annexure - IX

Break Even Analysis – Model Project on 200t Bio-fertiliser & Bio Pesticide Unit.
(Rs.lakh)

Sr.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
1	Installed capacity	200	200	200	200	200	200	200	200	200	200
2	Capacity Utilised	100	120	160	180	180	180	180	180	180	180
3	Sales revenue	73.85	88.62	118.16	132.93	132.93	132.93	132.93	132.93	132.93	132.93
4	**Variable cost**										
	Power	3.000	3.600	4.800	5.400	5.400	5.400	5.400	5.400	5.400	5.400
	Medium Preparation	3.000	3.600	4.800	5.400	5.400	5.400	5.400	5.400	5.400	5.400
	Wages	0.557	0.557	0.557	0.557	0.557	0.557	0.557	0.557	0.557	0.557
	Water Charges	2.500	3.000	4.000	4.500	4.500	4.500	4.500	4.500	4.500	4.500
	Packing Material	8.000	9.600	12.800	14.400	14.400	14.400	14.400	14.400	14.400	14.400
	Interest on working capital	0.997	0.666	0.864	0.963	0.963	0.963	0.963	0.963	0.963	0.963
	Carrier Material	5.000	6.000	8.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000
	Selling Expenses	7.385	8.862	11.816	13.293	13.293	13.293	13.293	13.293	13.293	13.293
	Mother Culture	0.120	0.120	0.120	0.120	0.120	0.120	0.120	0.120	0.120	0.120
	Total variable cost	30.559	36.005	47.757	53.633	53.633	53.633	53.633	53.633	53.633	53.633
5	**Fixed cost**										
	Rent, rates, Taxes and Insurance	1.477	1.772	2.363	2.659	2.659	2.659	2.659	2.659	2.659	2.659
	Administrative Expenses	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000
	Repair & Maintenance	2.216	2.659	3.545	3.988	3.988	3.988	3.988	3.988	3.988	3.988
	Salary	2.520	3.024	4.032	4.536	4.536	4.536	4.536	4.536	4.536	4.536
	Depreciation	13.585	12.317	11.170	10.135	9.198	8.352	7.586	6.894	6.267	5.700
	Interest on Term loan	14.580	14.580	12.960	11.340	9.720	8.100	6.480	6.480	4.860	3.240
	Total fixed cost	**37.378**	37.352	37.070	35.657	33.101	30.634	28.249	27.556	25.310	23.123
7	Sale revenue per /tonne of biofertiliser	0.739	0.739	0.739	0.739	0.739	0.739	0.739	0.739	0.739	0.739
8	Variable Cost / tonne of biofertiliser	0.306	0.300	0.298	0.298	0.298	0.298	0.298	0.298	0.298	0.298
9	contribution / unit	0.433	0.438	0.440	0.441	0.441	0.441	0.441	0.441	0.441	0.441
10	Break even point (MI)	86.34	85.19	84.25	80.94	75.14	69.54	64.12	62.55	57.45	52.49
11	Break even point (%)	86.34%	52.62%	45.99%	45.99%	42.39%	38.91%	35.52%	32.22%	28.49%	26.06%
12	Break even point (Sales revenue)	63.76	62.91	62.22	59.77	55.49	51.35	47.35	46.19	42.43	38.76

Annexure -X

Repayment Schedule – Model Project on 200 TPA Bio-fertiliser and Bio Pesticide Unit.

(Rs.lakh)

Years	Bank Loan O/S at the beginning of the year	Surplus available for repayment	Payment of Interest @ 12%	Repayment of Principal	Total Outgo	Bank Loan O/S at the end of year	Surplus available after repayment	Equal instalments of Principal
Construction period	0		3.5		3.5	121.500	0.000	
1	121.50	32.408	14.580	0.000	14.580	121.500	17.828	13.5
2	121.50	40.044	14.580	13.500	28.080	108.000	11.964	
3	108.00	54.456	12.960	13.500	26.460	94.500	27.996	
4	94.50	61.662	11.340	13.500	24.840	81.000	36.822	
5	81.00	61.662	9.720	13.500	23.220	67.500	38.442	
6	67.50	61.662	8.100	13.500	21.600	54.000	40.062	
7	54.00	61.662	6.480	13.500	19.980	40.500	41.682	
8	40.50	61.662	4.860	13.500	18.360	27.000	43.302	
9	27.00	61.662	3.240	13.500	16.740	13.500	44.922	
10	13.50	61.662	1.620	13.500	15.120	0.000	46.542	

Annexure -XI

Man power requirement for 200 TPA Bio-fertilizer & Bio Pesticide unit

Sr. No	Manpower requirement	Number	Rs/month & Rs/day	Rs/year
I	Biologist / Micro Biologist	1	10000	120000
2	Sales Officer	1	8000	96000
3	Accountant and clerical Assistant	1	8000	96000
4	Drivers	1	4500	54000
5	Floor Supervisor i Production Supervisor	1	7000	84000
6	Technical Staff (boiler operator if required, mechanic / electrician)	1	4500	54000
7	Skilled labourers	2	225	148500
8	Semi- skilled labourers, depending upon the volume of production	3	175	173250
9	Unskilled	3	125	123750
		12		**949500**