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BUSINESS MODEL: AGROFORESTRY

EUCALYPTUS WITH SUGARCANE

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

01

BACKGROUND

Agroforestry in its simplest sense refers to a combination of forestry and agriculture (crops or livestock) resulting in enhanced productivity of land. Agroforestry systems can provide a wide range of economic, socio-cultural, and environmental benefits and are crucial to smallholder farmers – as they have the potential to enhance food supply, income and health[1].

In the context of India, agroforestry has a great significance considering the large number of smallholders in the country. 86% of the farmers in India are categorised as small and marginal farmers owing less than 2 ha land while such farmers own merely 47.34% of the total cultivated area in the country[2]. Moreover, a majority of the smallholder farms are rainfed are lowly productive and agroforestry practices help farmers in securing food and economic security.

Agroforestry also provides a wide range of ecological benefits for the farmers as it has the potential of climate moderation, halting land degradation and increasing biomass production[3]. Studies also reveal that agroforestry systems have the potential to generate employment significant employment opportunities.

Agroforestry in India

As mentioned above, agroforestry has tremendous significance for the Indian farmers and is being widely practiced across the country. Although the calculation of exact area under agroforestry in the country is a challenging task but as per estimates by the Central Agroforestry Research Institute (CAFRI), Jhansi and Bhuwan LISS III the area under agroforestry is 13.75 m ha while according to estimates by the Forest Survey of India (FSI) agroforestry covers as 11.54 m ha, which is 3.39% of the geographical area of the country. These figures indicate that agroforestry is being widely practiced by Indian farmers and is emerging as a viable economic model for the farmers.

Figure 1: State-wise agroforestry area (m ha) in India[4]

[1] *http://www.fao.org/forestry/agroforestry/80338/en/*
[2] *Agriculture Census 2015-16 (Phase I) Provisional results.*
[3] *Agroforestry Annual Report 2013-14. National Research Centre for Agroforestry, Jhansi.*
[4] *CAFRI, Jhansi and FSI, Dehradun c.f. Ibid*
[5] *Chavan, S.B., Dhyani, S.K., Handa, A.K., Newaj, R., Rajarajan, K. (2015). National Agroforestry Policy in India: A low hanging fruit. Current science. 108. 25-2015.*

In fact, India became the first nation in the world to launch a separate agroforestry policy (National Agroforestry Policy, 2014) which aims at coordination and convergence between various elements of agroforestry, scattered across various existing missions, programme and schemes under different ministries—agriculture, rural development and environment. This opens up huge opportunities for the promotion of agroforestry in the country.

Rapid industrial development, particularly of wood-based industries (paper, plywood etc.) has meant that there is a growing demand for wood. Till a few decades ago the requirement of wood for paper and plywood industries was met from forests but due to promotion of agroforestry, majority of this requirement is now being met through farm forestry and agroforestry.

Some agroforestry models have been already developed in the country, however there is still a need to mainstream and replicate viable models of agroforestry and popularise their adoption.

02

CHALLENGES IN AGROFORESTRY

Agroforestry sector in India is constrained by various factors, which are limiting wide-scale adopting of agroforestry by the small and marginal farmers in particular. The major challenges include:

- **Lack of awareness:** It has been observed that many farmers are reluctant to grow the trees on farm land as they feel that growing trees together with crops would drastically reduce crop production.
- **Lack of technical know-how:** Farmers lack technical inputs about choosing appropriate agroforestry models for their farms – including choice of tree species as well as the choice of intercrop. They also lack technical knowledge regarding post-cultivation techniques related to tree species. In fact, there is also a lack of information with the farmers related to suitable agroforestry models (combination of tree and crop species) based on diverse agro-climatic conditions.
- **Regulation on harvest of trees from farmlands:** Government regulations related to tree feeling/harvesting, transportation and marketing limit the wide-scale adoption of agroforestry in the country. For example, in Uttar Pradesh the farmers are free to harvest tree species like Eucalyptus, Poplar and Subabul from farm lands while for certain other species they require permission for harvesting, transporting and marketing. However, majority of farmers do not have clear understanding of regulatory procedures related to tree felling and hence, they refrain from cultivation of trees on their farmlands.
- **Poor market linkages:** Marketing linkages for sale of trees by farmers are not well developed and the farmers are exploited by middlemen. In fact, there are frequent fluctuations in the market prices of eucalyptus and poplar and farmers are often not aware of the market scenario.
- **Lack of institutional mechanism:** There is a lack of organisation of farmers and also lack of dedicated institutions such as Producers Groups (PGs), Farmer Interest Groups (FIGs), Farmer Producer Organisations (FPOs), Cooperatives and Farmer Producer Companies (FPCs) etc. in the agroforestry sector. The absence of institutional development results in lack of effective extension, value-chain development, financial support for farmers and transparent market system.
- **Lack of market support mechanism:** Unlike the agriculture sector Minimum Support Price (MSP) system is yet to be introduced in agroforestry sector by the government with the result that farmers are exposed to frequent price fluctuations of wood and also exploited by middlemen.

03

PROJECT IDEA

This business idea aims to promote agroforestry sector by creating an enabling system wherein farmers can obtain quality saplings for plantation, adopt improved Package of Practices (POPs), access financial services, engage in value-addition and leverage their collective strength to negotiate remunerative prices for their produce.

The basic approach is to promote a cluster-based approach wherein farmer groups would be federated in the form of FPO that shall link agroforestry farmers to the mainstream markets. The FPO would also support the farmers in a variety of activities viz. identification of most suitable agroforestry species, providing quality planting material, introducing improved POPs, maintenance of trees, harvesting, grading, transportation and marketing.

3.1 Proposed agroforestry model

The proposed model is based on the cultivation of eucalyptus as the tree species. Based on agro-climatic conditions and preference of farmers several intercrops can be taken up along with eucalyptus. These include wheat, sugarcane, chickpea, and maize.

However, under the present model the cultivation of eucalyptus with sugarcane as the intercrop is being prescribed. Detailed cost estimates of this agroforestry model are being discussed in the subsequent sections of this report.

3.2 Intervention Strategies

It is being proposed that the interventions in agroforestry sector must be taken up on at least 150 ha of land. This would form an agroforestry cluster wherein targeted farmers would be organised into FIGs while at the cluster level FPO would be formed. Under this broad framework, the following specific interventions are proposed to be implemented:

(i) At the level of farmers

Support may be provided through a local competent NGO or an existing FPO for the following interventions:

a. Farmer mobilisation/sensitisation for adoption of agroforestry practices collectively (grant/subsidy).

b. Extension services and capacity building to adopt POPs in agroforestry sector (grant/subsidy).

c. Facilitation/guidance to farmers on selection of tree species as well as intercrops for plantation.

d. Facilitate farmers to assess and develop risk management strategy in the agroforestry sector.

e. Training, capacity building and input services to farmers.

f. Building capacities of farmers to engage into primary processing of wood.

g. Facilitate farmers to obtain financial benefits under different promotional schemes of central and state government.

h. Sale of wood through FPO.

(ii) At the level of FPO

a. Farmer mobilisation for adoption of agroforestry.

b. Training and extension services for the farmers on POPs in agroforestry sector.

c. Support to farmers relating to selection of tree species as well as intercrops for plantation.

d. Channelising credit to FIGs/members of FIGs for adopting agroforestry (credit flow may be need based and FPO may charge a small percentage of interest to recover facilitation costs).

e. Facilitating input services for farmers.

f. Linkages with financial institutions for providing loans to FPOs and FIGs.

g. Crop insurance services to minimise the risk at farmer's level.

h. Developing a robust supply chain in agroforestry sector.

i. Creation of post-harvest infrastructure namely at the FPO level.

j. Convergence with various enabling schemes.

k. Creating buyers and seller network.

The funds can either flow directly to the FPOs or through an NGO, which will have the overall responsibility of farmer mobilisation and formation of FPO.

3.3 Case Example: Star Paper Mills Ltd., Saharanpur

The project idea is based on a model developed by Star Paper Mills Ltd., an ISO 9001:2000 & ISO 14001:2004 company promoting agroforestry in Western U.P. Haryana, Punjab and Uttarakhand. This model has been quite successful in engaging a large number of farmers to take up agroforestry practices. The key highlights of the model are as follows:

(i) The model was initiated to provide pulpwood for Star Paper Mills while enhancing economic gains for the farmers. Around 3441 lakh seedlings have been distributed and planted so far, approximately 1.37 lakh hectare land is covered under Popular and Eucalyptus plantation.

(ii) 14 decentralised nurseries have been established for supplying poplar and eucalyptus saplings at the subsidised rate to the farmers.

(iii) To enhance production and productivity in the agroforestry sector improved variety of clonal plants are also being made available to the farmers by setting up a tissue culture facility and creating a network of decentralised sales depots.

(iv) Various decentralised outlets for purchase of wood have also been established. These outlets are referred to as Supplier Owned Depots and each such outlet caters to a cluster of villages.

(v) The owners of the depots act as standalone entrepreneurs and possess the necessary infrastructure to handle the procurement of wood.

(vi) Over the years, wood production capacity has increased from 6000 MT to 72000 MT per annum in the catchment area of Star Paper Mills (SPM).

(vii) The incomes of the farmers have been significantly enhanced and this model has been widely adopted in the region.

3.4 Business model with flow chart representation

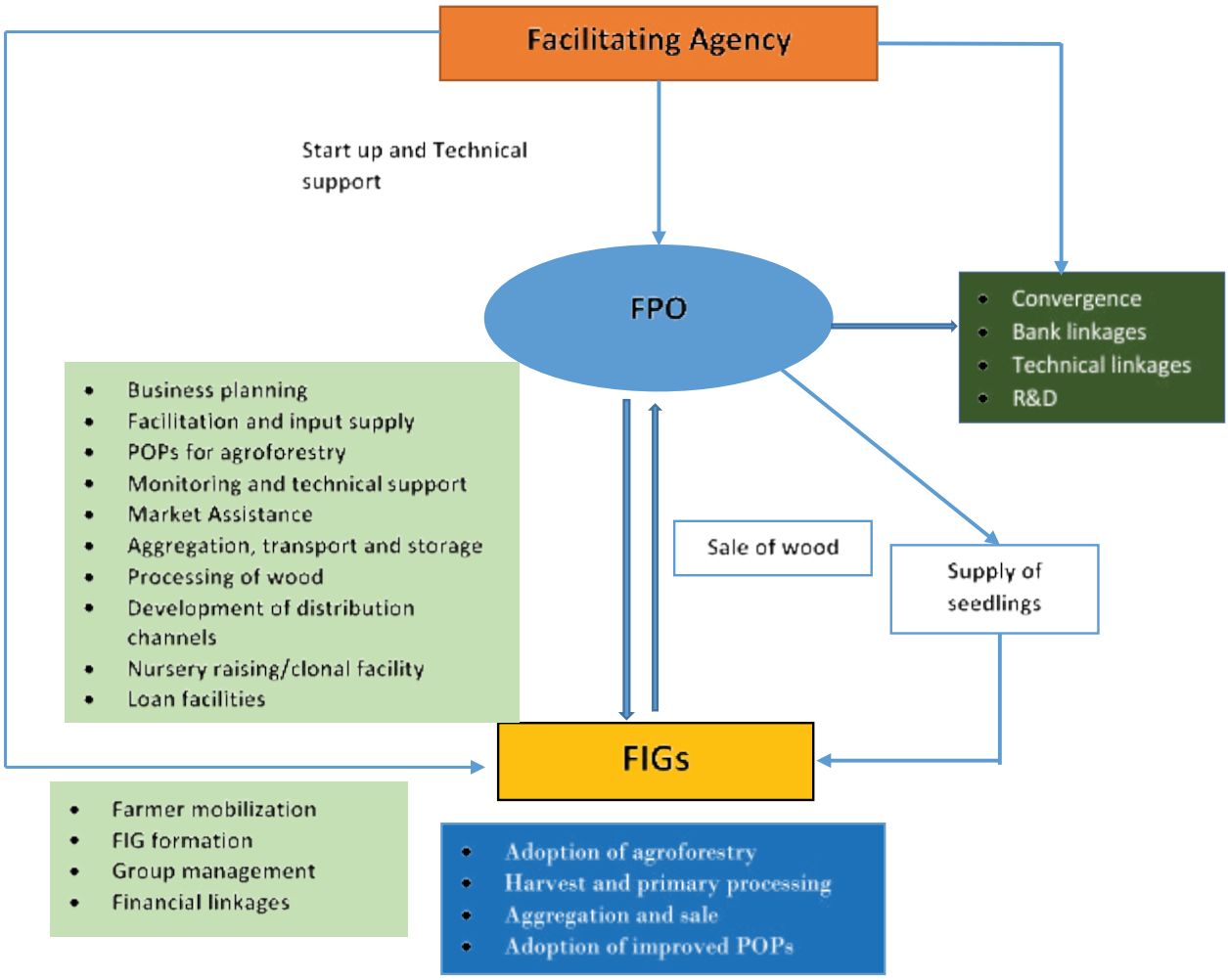
Under this model, it is proposed that an established NGO could initially take up community mobilisation and organisation of farmers in the form of FIGs and later federate/collectivise the FIGs in the form of an FPO. It is felt that in order to promote agroforestry and to provide greater economic benefits to farmers it is important to organise farmers and set up an FPO that could ensure better market prices to the farmers.

The FPO could obtain loan (along with grant/subsidy - if applicable) - from NABARD or commercial banks – for establishing enabling infrastructure and establishment of systems for collection of wood from farmers and for processing of wood. For the purpose of meeting the operational costs as well as for meeting working capital requirements for purchase of produce from the farmers, FPO could also take working capital loan.

The NGO or the FPO can also channelise loans for the farmers (through banks) after keeping a fixed margin on interest rates to meet its administrative cost. The FPO could also set up nurseries or facilities for making clonal seedlings available to the farmers while also building their capacities in agroforestry practices. It is recommended that for purchase of wood from the farmers the FPO may set up decentralized purchase depots. The sale depots for seedlings and also decentralized purchase depots may be run by private entrepreneurs thereby securing additional employment opportunities.

The following flow chart represents the role of various institutions within the business model and also depicts the flow of inputs and outputs:

Figure 2: Diagrammatic representation of the proposed business model



3.5 Potential for up-scaling

Considering the economic viability of agroforestry in enhancing incomes of farmers, this model has significant potential for upscaling. Similar model is already been implemented in Uttar Pradesh and it could be upscaled while this model could also be taken up in other parts of the state. In addition, this model could be replicated in other sugarcane growing states of the country that include Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Gujarat, Bihar, Haryana and Punjab.

04

IMPACTS AND SUSTAINABILITY

4.1 Impacts – Social, Economic and Environmental

It is expected that this model of agroforestry will bring significant social, economic and ecological impacts which are explained below:

Social Impacts

- Vibrant economic institutions developed in the form of FIGs in the villages to address issues that relate to the economic, social and environmental well-being of the habitants.
- Awareness, education and skill development of the farmers in agroforestry.
- Enhanced leadership among the small and marginalized farmers due to their role in business decision making, management of production, infrastructure and supply chain.
- Agroforestry is expected to generate additional employment opportunities (nurseries raising, sale of plants, harvesting, transportation of wood and managing procurement depots) at the local level.

Economic Impacts

- Agroforestry is expected to enhance the income levels of farmers while also increasing employment opportunities for marginal and small farmers and landless.
- Reducing economic exploitation of farmers by middlemen and integrating them with the markets through FPO. This will make them free from the exploitative intermediary-based marketing system.
- Linking farmers to financial institutions for improving their access to credit while also increasing their propensity to engage in savings.
- Increase in productivity of soil thereby resulting in higher yields from intercrops.

Environmental Impacts

- Raising of trees in farmlands would lead to increase in green cover and thereby contributing in carbon sequestration and climate change mitigation.
- Increasing availability of fuelwood at the farms and thereby reducing pressure on forests
- Improving soil heath at the farms through nutrient cycling and reducing soil erosion.
- Fulfilling industrial demand (paper mills, match stick manufacturing units etc.) through trees grown on farm lands and thereby conserving natural forests.

4.2 Climate change resilience

Agroforestry has the potential to become an important tool to build resilience of farmers against threats of climate change and natural calamities. Agroforestry also has the potential to enhance ecosystem services through carbon storage, prevention of deforestation, biodiversity conservation, and soil and water conservation. In addition, when strategically applied on a large scale, with appropriate mix of species, agroforestry enables agricultural land to withstand extreme weather events, such as floods and droughts, and climate change.

4.3 Sustainability

The proposed model is based on the experience gained in Western Uttar Pradesh and Haryana, in the program areas of Star Paper Mills Ltd. This model seeks to address the pertinent issues relating to the sustainability of the intervention. It is strongly felt that with the initial financial and handholding support – comprising of FIGs and FPO – this model would be able to achieve sustainability after a period of 5 to 6 years. The major factors that are expected to contribute towards sustaining this model are:

- Facilitating agency would provide initial facilitation, startup and handholding support - helping in mobilization of farmers and in the institutionalization of FPO.
- Adequate capacities of FIGs and FPOs would be built related to governance, business planning and financial management including DRR in agro-forestry sector.
- Linkage development with technical institutions, research and development institutions, private agencies and banks, financial institutions.
- Convergence with government schemes and extension of insurance services.
- The economics of this model indicate moderate to high returns for the farmers and FPO.
- This model factors plantation of Eucalyptus with sugarcane - however farmers would have a choice of various intercrops and would be free to choose as per the agro-ecological situations prevailing in the intervention area.

05

FINANCIAL DETAILS

5.1 Scope of financing and subsidy

Under this model farmers would require loan for purchasing planting materials, cost of manure, plant protection costs as well as primary processing and transportation costs.

For initiating agroforestry in one-ha land it is estimated that a farmer would require a loan of INR 1 lakhs to meet the cost of plantation and cultivation for 5 year-cycle of Eucalyptus (this is excluding labour costs). Although the farmer may meet their working capital requirement partly from different schemes of state and center government however under this proposed model the entire working capital requirement has been projected through bank loans. The facilitating agency and/or the FPO would assist the farmers in obtaining loans.

The FPO is expected to require capital assistance (for setting up primary processing unit and equipment) to the tune of INR 84.65 lakhs and working capital assistance to the tune of INR 164 lakhs. Working capital requirement would be met primarily through loan from NABKISAN and other banks while capital costs would be met partially through loans while efforts would also be made to mobilize grant assistance to meet the capital costs.

The facilitating agency/ FPOs may look at the following schemes in order to meet out the cost of FIGs / FPOs.

Sub-Mission on Agroforestry (SMAF): After the launch of Agroforestry Policy 2014 Govt. of India has formulated a sub-mission to promote agroforestry in the country. Under this sub-mission the following provision have been made:

- Nursery Development for quality planting material (NDQPM): Small nursery (minimum capacity 25,000 plants per annum), big nursery (minimum capacity of 50,000 plants per annum) and high-tech nursery (minimum capacity of 100,000 plants per annum) assistance would be available up to 50% of the total cost of the project subject to a ceiling of INR 10 lakhs, INR 16 lakhs and INR 40 lakhs respectively.
- Peripheral and Boundary Plantation (PBP) and Low Density Plantations on farmlands- Financial assistance will be provided upto a maximum of Rs. 70 per plant and will be distributed over a period of four years in a proportion of 40:20:20:20.
- High Density Block Plantation (HDBP): Assistance would be based on the number of trees planted per ha. For 500 to 1000 trees it would be a maximum of INR 30000; for 1000 to 1200 trees INR 35000; 1200 to 1500 trees INR 4500 and for more than 1500 trees INR 50000. For sustaining the plantation activities, the assistance would be spread across four years in the proportion of 40:20:20:20.
- Capacity Building & Trainings: States can utilize up to 5% of the allocated funds for capacity building and training activities.

Note:

(i) It is to be noted that at least 50% of the allocated budget is to be utilized for small, marginal farmers of which 30% should be women farmers. Further 16% & 8% of the total allocation or in proportion of SC/ ST population in the district will be utilized for Special Component Plan (SCP) and Tribal Sub Plan (TSP) respectively.

(ii) The SMAF is underway nationwide except in 8 states of NE and Himalayan States. Farmers would be given a financial assistance up to 50% of the actual cost (limited to 50% of the estimated cost as indicated in the Cost norms) for the respective interventions.

(iii) Farmers groups/ Cooperatives/Farmer Producers Organization (FPO) can also avail the benefit of the programme but the assistance can be accessed as per norms and provisions applicable to the individual farmers.

PM Kishan Samman Nidhi Yojana: This scheme is underway nationwide since its announcement on 1st February 2019. Farmers can avail upto Rs. 6000 in 3 equal tranches to meet out the cost of planting material, inputs and any other cost.

Pradhan Mantri Krishi Sinchai Yojana (PMKSY): Under PMKSY, Financial Assistance of 55% for Small and marginal farmers and 45% for other farmers for adoption of Micro Irrigation system is available. This scheme is available for all crops including horticulture plantation.

NABARD Refinance: In tune with the National priorities, NABARD extends refinance support for promoting wasteland development/ agro-forestry through Eucalyptus cultivation at a concessional rate of interest.

Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA): Farmers can meet the plantation cost from MGNREGA. The activities such as land leveling, pond digging, nurseries raising can be included under MGNREGA.

5.2 Cost Economics

The proposed business model provides estimates of cost-benefits at two levels i.e. at the level of individual farmer and at the level of the FPO engaged in agro-forestry sector-wood sales and marketing.

5.2.1. Cost-benefit for farmers[6]

The following tables provide details of the expected cost of cultivation and the expected revenue for individual farmers engaged in eucalyptus and sugarcane cultivation on one-ha land.

[6]It must be mentioned that the costing and yield taken under this model are based on experiences from Saharanpur, U.P. Therefore, the cost-benefit estimates would be valid under similar geographic conditions. However, costing and yield may show slight variations from region to region.

Table 1: Cost-benefits for individual farmers engaged in eucalyptus-based agroforestry (1 ha landholding)

Sr. No.	Particulars	Unit	Quantity	Unit cost (INR)	Cost INR					
A.1	Sowing practices				Year 1	Year 2	Year 3	Year 4	Year 5	Total Cost
1.1	**Land preparation (including pit digging)**									
	Eucalyptus	L/S			10000					10000
	Sugar Cane	Nos.	4	1667	6667	6667				13333
1.2	**Cost of planting material**									
	Eucalyptus clonal saplings	**Nos.**	1600	15	24000					24000
	Vegetative cuttings (Sugarcane)	**Qtl.**	45	400	18000	18000				36000
1.3	**Labour cost for plantation**									
	Eucalyptus	L/S			4000					4000
	Sugar Cane	L/S			5000	5000				10000
	Total (A.1)				67667	29667				97333
A.2	**Main field cultivation**									
2.1	**Cost of Fertilizer/ manure**	MT	3	2750	8250	5500				13750
2.2	Weeding and maintenance of crop field	Person Days	10	350	3500	3500				7000
2.3	Irrigation	Nos.	10	500	5000	5000				10000
2.4	Plant Protection	L/S			2000	2000				4000
2.5	Harvesting cost									
	Eucalyptus	L/S							10000	10000
	Sugar Cane	Person Days	10	350	3500	3500				7000
	Total (A.2)				22250	19500			10000	51750
A.3	**Post-harvest expenses**									
3.1	**Transportation cost**									
	Eucalyptus	L/S							10000	10000
	Sugar Cane	L/S			1200	1000				2200
3.2	Primary processing									
	Eucalyptus	Ha	L/S	L/S					10000	10000
	Sugar Cane	Ha	L/S	L/S	2000	2000				4000
	Total (A.3)				3200	3000			20000	26200

A.3	**Other costs**									
10	Crop Insurance (per ha)	Per annum								5000
11	Interest on working capital				12000	13440	12413	11262	9974	59089
	Total (A.4)				12000	13440	12413	11262	9974	64089
	Cost of cultivation (A.1+A.2+A.3+A.4)				**105117**	**65607**	**12413**	**11262**	**39974**	**239372**
B	**Productivity**									
B.1	**Production per ha**									
	Eucalyptus	MT	130	4200					546000	546000
	Sugar Cane	MT	65	3110	202150	171828				373978
B.2	Total Revenue				202150	171828			546000	919978
C	**Net Returns (B-A)**									**680605**

Assumptions:

- If required the FPO could arrange bank loan for the farmers for meeting the cost of cultivation for one year.
- The above assumption does not factor in drip irrigation system. In case drip irrigation is factored in then the yields are expected to increase by about 10 to 20%.
- The labour costs are included while calculating the above costs but in-case farmer engages in performing various agricultural operations then the cost of labour may be a saving for the farmer.
- Working Capital includes cost of planation of Eucalyptus and its maintenance for 5 years (excluding labour costs) and cost of cultivation of sugarcane for one year.
- Farmers would be able to get two crops of sugarcane (during the first two years). Once the plants attain height sugarcane cultivation is not a viable option. Also, the yield from sugarcane declines by 15% in the second year.
- Interest on working capital has been included in the above costs.

Economic analysis

Under the proposed model, farmers are able to get total net returns of around INR 6.85 lakhs over a period of 5 years. Although the returns from Eucalyptus are realized only after 5 years but under the present model farmers also get annual returns (for the first 2 years) though sale of sugarcane. Benefit Cost ratio (over a 5-year period) for an individual farmer is calculated to be 3.29 which indicates the financial viability of this model.

Table 2: Economic analysis of Eucalyptus agroforestry cultivation in one ha landholding

Particulars	Amount in INR					
	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Capital cost	0	0	0	0	0	
Recurring cost	105117	65607	12413	11262	39974	
Total cost	105117	65607	12413	11262	39974	234372
Total benefits	202150	171828	0	0	546000	919978
Net benefits	**97033**	**106221**	**-12413**	**-11262**	**506026**	**685605**
Net present worth of cost @15%	175527					
Net present worth of benefits @15%	577134					
Benefit Cost Ratio	3.29					

LOANS

Under this model farmers would be able to generate revenues through sale of sugarcane during the first two years and subsequently sale of Eucalyptus would be possible from in the fifth year. From an economic perspective it is felt that farmers would require working capital to meet the initial cultivation and maintenance cost of Eucalyptus and also sugarcane and would be able to repay the working capital in annual instalments starting from the 2nd year onwards.

Table 3: Working capital loan for farmers

Working capital loan	INR in Lakhs									
	Y 1	Y 2	Y 3	Y 4	Y 5	Y 6	Y 7	Y 8	Y 9	Y 10
Working Capital Requirement	100000									
Repayment	0	22000	22000	22000	22000	22000	22000	22000	22000	6715
Interest on net working capital loan (Diminishing) @ 12% per annum	12000	13440	12413	11262	9974	8531	6914	5104	3077	-
Total Loan outstanding	224000	250880	230986	208704	183748	155798	124494	89433	50165	-

5.2.2 Cost-benefit for FPOs

Details of cost-benefit of FPO engaged in aggregation and marketing of Eucalyptus is provided under the following table:

Table 4: Cost-benefits for FPO engaged in aggregation and marketing of Eucalyptus (150 acres)

Sr. No.	Particulars	Unit	Quantity	Cost (Rs.)	Amount in INR lakhs				
					Year 1	Year 2	Year 3	Year 4	Year 5
A.1	**Capital Cost**								
1.1	Office	Sq. ft.	200	700	1.40	0.00	0.00	0.00	0.00
1.2	Storage for storing wood	Sq. ft.	5000	400	20.0	0	0	0	0
1.3	Office equipment (Chairs, table, computer, printer etc.)	Lumpsum	1	75000	0.75	0	0	0	0
1.4	Weighing bridge- Electronics/ Truck Scale	**Lumpsum**	1	250000	2.50	0	0	0	0
1.5	Wood processing machines- Primary level-cutters, peelers, rounders etc.	**Lumpsum**	1	500000	5	0	0	0.00	0
1.6	Purchase of vehicle for transportation	Nos	1	1500000	15.00	0	0	0	0
1.7	Setting up of tissue culture facility (including land, laboratory and equipment, green house and equipment, furniture and fixtures)	Lumpsum			40.00				
	Total capital cost				**84.65**	**0.00**	**0.00**	**0.00**	**0.00**
A.2	**Recurring cost**								
2.1	Development cost of Eucalyptus clonal saplings	Nos.	240000	6	7.20	15.12	15.88	16.67	17.50
2.2	Mobilisation of farmers, capacity building in POPs and technical guidance on Eucalyptus and intercropping (per year for 5 years)	Ha.	150	3000	2.25	4.73	4.96	5.21	5.47
2.3	Procurement of Eucalyptus wood from farmers	MT	19500	4200	819.00	859.95	902.95	948.09	995.50

2.4	Staff, administration, travel, coordination, vehicle operation, marketing etc.	Month	12	200000	24.00	25.20	26.46	27.78	29.17
2.5	Interest on loan for working capital (12%)	Per annum			19.66	18.17	16.52	14.66	12.58
2.6	Interest on loan for capital cost (12%)	Per annum			10.16	9.46	8.67	7.79	6.81
	Total recurring cost	**882.26**	**932.63**	**975.43**	**1020.21**	**1067.03**			
	Total cost - capital and recurring (A1+A2)	**966.91**	**932.63**	**975.43**	**1020.21**	**1067.03**			
B	**Income/ Benefits**								
B.1	**Production**								
1.1	Total plants for sale (20% mortality taken into account)		225000	15		33.75	35.44	37.21	39.07
1.2	Sale of Eucalyptus wood (after 5% weight loss)		18525	4800	889.2	933.66	980.34	1029.36	1080.83
	Total benefits				**889.20**	**967.41**	**1015.78**	**1066.57**	**1119.90**
			Net returns (B-A)		**6.94**	**34.78**	**40.35**	**46.36**	**52.87**

Assumptions:

In the above analysis the following assumptions have been made:

- The above analysis assumes that the FPO is promoting agroforestry plantations on Eucalyptus with about 150 to 500 farmers cultivating an aggregated area of 150 ha.
- The FPO would engage in mobilisation of farmers and engage in capacity building in POPs, technical guidance and intercropping for Eucalyptus farmers.
- The storage infrastructure will be made of low-cost materials.
- Loan will be obtained for INR 4.50 crores as working capital for procurement of Eucalyptus wood from farmers. This has been calculated at 20% of total cost of procurement per year and is based on the assumption that harvest of Eucalyptus would be done round the year by the farmers.
- Although new Eucalyptus plantation would take 5 years to mature but this model assumes that the FPO would start procurement with existing Eucalyptus farmers while also promoting new plantations.
- A loan of INR 0.85 crores would be obtained for meeting the capital costs.
- An increment of 5% each year for price escalation in the market value of Eucalyptus (selling price) has been factored in each year.
- An increase of 5% each year in the cost of procurement as well as in administrative costs has been factored.
- The staff of FPO will coordinate the entire business operation while services of experts would be obtained for capacity building.
- The costs include infrastructure cost for establishment of tissue culture lab for Eucalyptus for 2.5 lakh saplings.
- It is assumed that in the first year 50% of the saplings would be produced while the lab would work at full capacity from second year onwards.

- The seedlings would be sold to the farmers at reasonable prices from the second year onwards – a mortality of 10% saplings has been factored in.

ECONOMIC ANALYSIS

- The economic analysis seems to suggest that from the first year of operation onwards the FPO would gain sizeable revenues (around INR 181 lakhs excluding the capital costs) over a five-year period. The Benefit Cost ratio is calculated to be 1.24 which is very good and which indicates that this business model is viable.

Table 5: Economic analysis of operations of FPO

Particulars	Amount in INR Lakhs					
	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Capital cost	85	0	0	0	0	
Recurring cost	882	933	975	1020	1067	
Total cost	967	933	975	1020	1067	4962
Total benefits	889	967	1016	1067	1120	5059
Net benefits	-78	35	40	46	53	97
Net present worth of cost @15%	**3302**					
Net present worth of benefits @15%	**3340**					
Benefit Cost Ratio	**1.01**					

LOANS

It is envisaged that for this business model the FPO would require a loan of INR 84.65 lakhs for capital expenditure and a loan of INR 163 lakhs for meeting the working capital requirements for procurement of Eucalyptus from farmers.

Working capital requirement has been calculated at 20% of total cost of procurement per year and is based on the assumption that procurement of Eucalyptus would be done round the year from the farmers. The working capital loan is expected to be paid over a period of 10 years.

Table 6: Working capital loan for FPO

Working Capital Loan	INR in Lakhs									
	Y 1	Y 2	Y 3	Y 4	Y 5	Y 6	Y 7	Y 8	Y 9	Y 10
Yearly Working Capital Requirement	163.80									
Repayment		32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	13.41
Interest on net working capital Loan (Diminishing) @ 12% per annum	19.66	18.17	16.52	14.66	12.58	10.25	7.64	4.71	1.44	
Loan outstanding	183.46	169.63	154.15	136.80	117.38	95.63	71.26	43.97	13.41	

The repayment of loan for capital expenditure would be initiated from second year onwards and it is expected to be repaid over a period of 10 years.

Table 7: Capital expenditure loan for FPO

Capital expenditure loan	INR in Lakhs									
	Y 1	Y 2	Y 3	Y 4	Y 5	Y 6	Y 7	Y 8	Y 9	Y 10
Capital expenditure	84.65									
Repayment		16	16	16	16	16	16	16	16	14.33
Interest on capital loan (Diminishing) @ 12% per annum	10.16	9.46	8.67	7.79	6.81	5.70	4.47	3.09	1.54	0.00
Total loan outstanding	94.81	88.26	80.94	72.73	63.54	53.24	41.71	28.80	14.33	0.00

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