

**ROLE OF JAMUN (*Syzygium cuminii*) IN ENHANCING THE AGRIPRENEURIAL STATUS
OF A FARMER – A CASE STUDY IN DINDIGUL DISTRICT OF TAMIL NADU**

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ABSTRACT

Producers of fruits are mainly concentrating on the major fruits like Mango, Jack, Banana and other major fruits. Though there is potential in the minor fruits or underutilized fruits, its cultivation, exploitation and its distribution is not scientifically or commercially carried out in the research stations and in the farm lands of progressive farmers. It is mainly due to poor awareness creation and popularization of technologies. One such underutilized fruits which is less utilized and exploited is Jamun. A progressive farmer belonged to the village of J.Mettur of Dindigul District of Tamil Nadu is able to cultivate the Jambu Jamun which is brought from the Rajahmundry of Andhra Pradesh and cultivating the Jamun and he is realizing considerable yield. The harvested fruits are packed and distributed by the farmer himself to different consuming ends at the rate of Rs 140 per kg. Rest of the fruit is utilized for value addition and the Jamun juice is packed in 700 ml containers and the same are also distributed to different consuming ends through the dealers at the rate of Rs 240 per litre. Jamun is rich in essential nutrients and hence it is consumed by different segments. Such a useful fruits and its production is financially assessed for its investment worthiness and the parameters revealed that the Jamun cultivation and utilization is highly profitable and at the same time it is less competitive in open markets and hence the farmer is able to realize high price per unit. All these are discussed in detail in this paper. Progressive farmers and entrepreneurs who are really interested can explore this venture for profitability.

KEYWORDS: Jamun, Under Utilized Fruits, Minor Fruits, Economic Worthiness, Post Harvest and Value Addition, Nutritional Status of Jamun.

INTRODUCTION

Jamun (*Syzygium cuminii*) is a tall evergreen tree of tropical and subtropical regions and had its origin probably India and the East Indies. It is one of the hardiest fruits and best

suited for wastelands and drylands. At the same time it also tolerates water stagnation and marshy lands, where other fruit crops cannot be grown to the desired level. The wood is used as a timber in building and railway sleepers. The fruits of the tree are loved by almost all age groups from children to the aged. The fruits of the tree are good to the sugar patients and the nut is used in siddha formulations and hence it is most demanded in home and in the industries. It is also used to make beverages, squash, jam, jelly and wine. Fruit extract is also used in curing intestinal disorders.

Climatic Requirements

Jamun is adapted to tropical and subtropical conditions requiring a dry climate during flowering and fruiting seasons. Early rains resulting in better soil moisture will help in growth and development and ripening of fruits. Well drained deep loamy soil would be ideal though it can grow on a wide range of soil conditions. In the initial stages of its establishment there should not be any drought and hence one should take utmost care in providing irrigation periodically for its establishment. When the tree has grown sufficiently it can tolerate any type of drought and flooding (Veeraragavathatham et al.2004).

The Cultivars

In Northern Parts of India, a cultivar known as 'Ra Jamun' with big sized fruits is being cultivated widely. One seedless type (with Under Developed Ovule) was isolated at Horticultural College and Research Institute, Periyakulam is being grown in Agricultural Research Station, Paramakudi, Tamil Nadu which is small in size. Preferably, the farmer, in Dindigul District has the cultivar named 'Jambu Naval' which is drawn from Rajahmundry of Andhra Pradesh is also cultivated in Tamil Nadu. An improved variety Konkan Bahdoli has been recommended for cultivation in Maharashtra.

Silvicultural Practices

The propagation of true to the type quality planting material is an integral part of Jamun cultivation, since Jamun has a long gestation period. The utmost care is required in the selection of genuine planting material at the time of planting. Jamun is monoembryonic. It is heteroxygous in nature hence it does not produce true to the type planting material. However, seedlings are being raised as rootstocks. Hence, knowledge of both methods of propagation is important.

Seed Propagation

Seed propagation is the most common method of propagating Jamun. Jamun seeds have no dormancy; hence fresh seeds can be sown 4-5 cm deep in the nursery within 10-15 days. The seeds germinate 10-15 days after sowing. The seedlings become ready for transplanting in spring or next monsoon. If the seeds are sown too deep, seedling emergence is delayed and there may be some rotting due to poor aeration. Seeds may also be sown in polythene bags, as it facilitates in easy handling of rootstocks and grafted plants. There is occurrence of polyembryony in Jamun to the extent of 20 to 50 per cent, hence nuclear seedlings may be utilized to produce true to the type plants (Singh and Thakur, 1977). The seeds of Jamun took 24 to 61 days for total germination under Bihar conditions. Whereas, in Tamil Nadu, it took only 15 to 20 days for germination. Studies revealed that seed extraction of Jamun after heaping the fruits for a single day was better for getting good quality seeds in comparison to the extraction of seeds immediately after collection (Srimathi et al. 2003). Sasthri et al. (2001) recorded that large sized seeds had higher germination percentage (98-99 Per cent) than the small sized seeds (79-89 per cent).

The seeds of Jamun are sown in the poly ethylene bags filled with soil and FYM at the rate of 3:1 for raising the rootstocks. Seeds can also be sown in the raised nursery beds in open or polyhouses. Transplanting of young seedlings of 2-4 leaf stage in the polythene bags gives 80 per cent success. About 9-12 months old seedlings of uniform size having stem of pencil thickness are used as rootstock for budding and grafting. Plants raised in the polybags can easily be transported to distant places and give higher transplanting success (Singh et al.2011).

Soft Wood Grafting

About 15-20 cm long mature shoots of 2-3 months old are defoliated 12-15 days prior to grafting operation. These shoots are detached from the mother plant with the help of secateurs or sharp grafting knife for grafting by cleft method. For this, soft portion of seedling rootstock is cut at 20-35 cm height and the top portion is removed. With the help of knife, 5 cm long vertical downward incision is made in the center of the rootstock. A sharp cut of 5 cm is made on both the sides on the base of the scion shoot to make wedge shape. Thereafter, prepared scion was carefully inserted in vertical slit of the rootstock and tightly secured with the help of 200 gauge thick and 2 cm wide polythene strips. The polythene strips should carefully be removed after the completion of the union. This method is proved

to be better for in-situ grafting under rainfed conditions. Chovatia and Singh (2000) recorded 41.67 per cent success in soft wood grafting in June under Gujarat Conditions.

High Density Planting

High density planting system ensures better utilization of land, labor and solar radiation and higher yield in the initial years of planting, because of accommodating higher number of plants per unit area. High density orcharding appears to be the most appropriate answer to the problem of low productivity and for early economic returns from the Jamun orchards. Good soil conditions, planting geometry and manipulation in the spacing are important means in obtaining higher production and productivity.

Water Management

Irrigation is not normally practiced in Jamun cultivation. But it promotes better growth during the period of establishment and the early stages of growth, especially during the dry seasons. In the early stage, plants require 8 to 10 irrigations per year while, bearing trees require 4-5 irrigations during the time of fruit development and ripening. In dry areas, the use of water harvesting techniques during the rainy season will be useful for ensuring proper irrigation to improve subsequent growth and yield of Jamun. Use of mulch is very much beneficial for successful cultivation of Jamun. Mulching can be done with Polythene or any suitable organic material. Mulching with grasses, paddy straw and rice husk reduces the weed population and conserves the moisture in the soil. Microbial and earthworm population in the basin soil increases with the use of paddy straw and grasses as mulch. Leaf litter of Jamun under the canopy is effective to retain soil moisture during the summer.

Canopy Management

The basic concept in canopy management of a perennial tree is to make the best use of the land and the climatic factors for increased productivity in a three dimensional approach. Tree vigor, light, temperature and humidity play a vital role in the production and quality of the fruits. Young plants should be trained with 3-5 well spaced branches to develop into the main scaffold structure of the tree. Framework of branches is allowed to develop above 60-100 cm from the ground level. Jamun trees may be trained through the following training systems.

Central Leader

The trees are trained on a main central leader with 6 to 10 strong lateral scaffold branches, spread in all directions. This system of training provides unnecessarily large tree which creates harvesting problem.

Open Centre

The central leader is removed about one meter above ground level and four to six well spaced tertiary branches are retained. Secondary scaffold branches are encouraged to develop the fruiting canes. Both primary and secondary scaffold branches produce fruit bearing laterals. Training by this system keeps the centre of the tree open, permitting entry of adequate sunlight throughout the tree, but due to development of weak framework, plants do not resist high velocity winds resulting in breaking of branches.

Modified Leader

In this system, the main central leader is allowed to grow for few years, until 8-10 scaffolds develop around the central leader. The central leader is then cut to develop the side laterals, which in due course, will grow as a modified leader. In this type of training, the tree develops well spaced limbs with strong crotches. The top being open, allows more sunlight to penetrate deep inside the tree canopy. This system is appropriate for training of Jamun plants (Singh et al. 2011).

Pruning

Pruning is a tool to regulate tree size and shape to achieve a desired architecture of the canopy and also to reduce the foliage density by removing the unproductive branches to make the tree open. Regular pruning in Jamun plant is not required. However, dry, weak and diseased branches should regularly be removed. To maintain the dwarf framework of the Jamun tree, topping of main stem (4-6 meters) is needed. It will facilitate easy harvesting of the fruits. It is also observed that pruning of 50% annual extension growth after harvesting was effective to reduce the plant canopy and to improve the fruit quality attributes.

Plant Protection

Leaf eating caterpillars can be controlled by spraying dimethoate / malathion. White fly damages all parts and even fruits get wormy. Affected, dropped fruits should be collected and

burnt. At the time of flowering, if spraying has to be taken up, only a safe insecticide to honey bees like endosulfan may be sprayed. Leaf spot and fruit spot caused by *Glomerella* can be controlled by Indofil Z.78 (2 gram per litre) (Veeraragavathatham et al. 2004).

Harvesting Practices and Yield

The fruit ripens in June-July. The main characteristic of ripe fruit at full size is deep purple or black in color. The Jamun fruit should be picked immediately when it ripens. It cannot be retained on the tree at the ripe stage. The ripe fruits are picked singly by hand and in all cases care is taken to avoid all possible damage to fruits. For harvesting, the picker climbs on the tree with bag of cotton slung on the shoulder. When the bag is full, the picker comes down from the tree and empties bag in the basket or hangs the bag down to the ground with the help of rope and another person standing below the tree catches the bag and empties it in baskets. The fruits of Jamun are generally harvested daily and sent to market on the same day. The average yield of fruits from a full-grown Jamun tree is about 80-100 kg and from a grafted one the yield will be 60-70 kg per tree per year (Singh et al. 2011).

Processing of Jamun for Value Addition

Jamun exhibits heavy post harvest losses. It is therefore, necessary to process the fruits into different value added products to utilize marketable fruits and add value to fresh fruits to avoid crash to the price during the peak season due to gluts. The fruits may be utilized for jam, jelly, beverages, wine, vinegar and pickles (Kadam, 2001).

Marketing Practices

Marketing practices are more in Jamun due to their high degree of perishability and short season of fruit availability. An analysis of the marketing cost had indicated that the commission agent and the transport charges account for 80 to 90 per cent of the total marketing cost (Krishnamurthy and Sudhakar Rao, 2001). About 75 per cent of the farmers sell their produce at the farm level to the village merchants, retailers, big producers or pre-harvest contractors. They cannot afford to transport their produce to distant markets on account of the non availability of transport facilities, expensive transport and malpractices in the market. Information regarding demand, supply, price, market outlook, knowledge of the consumer's preference, marketing channels is important for marketing the produce like Jamun.

Problem Focus

Above marketing constraints revealed that the studies are not much focused and conducted towards production and marketing of minor fruits like Jamun. Amidst these constraints, there were progressive farmers who are entered into these ventures and are making inroads to promote the underutilized fruits. In Tamil Nadu, Jamun orchard is established by one such progressive farmer in Dindigul District, was specially approached and the production and value addition practices were analyzed and documented here as a case study to highlight the experiences of the progressive farmer as a paradigm to other locale. With this in mind, the study focuses on the pattern of investment made by the progressive farmer in Jamun orchard and the value addition practices practiced by the farmer to earn higher dividend from the Jamun orchard.

Design of the Study

Jamun is one of the most hardy fruit corps and can easily be grown in the neglected and marshy areas, arid and semi arid areas, resource poor areas and wastelands where other fruit trees cannot be grown successfully. Information regarding area and production of this fruit in India is not available because it is not grown on plantation scale but trees in patches are common in the villages in many states. In Tamil Nadu, orchards in Jamun are being practiced in the farm lands by the progressive and innovative farmers. One such farmer is Mr. Jeyakumar hailing from J. Mettur village of Dindigul District of Tamil Nadu is cultivating the Jamun in one acre with the plant density of 86 trees per acre in an espacement of 20 X 20 feet and also having an idea of expanding the area under Jamun additionally to an area of 3.50 acres at an espacement of 25 X 25 feet with the intention of cultivating guava as intercrop. With regard to the marketing, the farmer is having the practice of selling the fruits directly to the retail outlets located in important cities and also involved in extracting Jamun fruit squash from the residual Jamun fruits and hence a case approach is practiced to study the aspects of investment made in the Jamun plantation and its value addition aspects practiced in the farm. For that purpose, a questionnaire was prepared and pre-tested with the farmer and the details of land use, costs involved in establishing the plantation, returns realized and the details of value addition etc. were collected, tabulated and interpreted using conventional percentage analysis.

Results and Discussion

India is emerging as a major stakeholder in the global horticulture scenario accounting for 10 per cent of the world production of fruits. This has been made possible due to concerted efforts of scientists and progressive farming community. Jamun fruit is a good source of nutrients and it is used for curing diabetes for its hypoglycemic properties. The case farmer has visited the plantation in Andhra Pradesh after the advice of an expert from Tata Energy Research Institute (TERI). TERI had conducted a training at Tanjore in which the case farmer was a trainee and came to know that the 'Jambu' variety of Jamun capable of yielding higher output per unit area and capable of yielding from the fourth year onwards was purchased and planted in his establishment. The farmer is found to be an innovator because of adoption of newer technologies from different parts of the globe. Because of its demand in the open market, the farmer has started cultivating the Jamun in his farm lands and hence special effort has been taken to share the experiences of the farmer following a case study approach and the results are discussed in the following headings.

- Land Use and Cropping Pattern Prevalent among the Case Farm
- Cost and Return associated with Jamun Orchards
- Details of Output Produced in the Case Farm
- Details of Distribution of Output
- Constraints associated with Production and Distribution of Output

1. Land Use and Cropping Pattern Prevalent among the Case Farm

A Case Study approach normally deals with A to Z Practices practiced in the farm lands. In this respect, first, the land use and cropping practices prevalent among the case farm is analyzed and the results are presented in Table 1.

Table 1: Land Use Pattern Prevalent in the Case Farm of Dindigul District

Sl. No	Particulars of Land Use	Spacing in Feet	Area in Acres	Age of the Plantation/ Infrastructure	Percentage to Total Area
01	Jamun (Naval)	20 X 20	01.20	11.00	09.16
02	Jamun (Naval) And Guava (L 46) (Intercrop)	25 X25	03.50	00.01	26.72
03	Amla	20 X 20	03.60	12.00	27.49
04	Coconut (in Rows)	20X 20	00.40	12.00	03.05
05	Other Crops		01.30	00.00	09.92
05	Farm House		00.10	11.00	00.76
06	Fruit Processing Unit		01.00	08.00	07.63
07	Parking Area Shed and Farm Road		02.00	00.00	15.27
	Total		13.10 Acres or 05.20 Ha		100.00

Table 1 revealed that the Size of holding available with the case farm is arrived at 13.10 acres (5.20 Ha). Among this, the Jamun Plantations were established in 1.20 acres (0.48 Ha) and 3.50 acres (1.40 Ha) which are having the respective age group of 11 years and very young plantation of one month old are respectively accounted for 9.16 per cent and 26.72 per cent to the total size of holding. The Jamun orchards of 11 years old was established in an espacement of 20 X 20 feet and the young plantation of one month old was established in an espacement of 25 X 25 feet. The very purpose of establishing Jamun at higher spacing is mainly for establishing Guava (L 46) as an intercrop in the inter row spaces of Jamun.

In addition to Jamun, the case farm has also established Amla plantation in an espacement of 20 X 20 feet in an area of 3.60 acres (1.44 Ha) which is accounted for 27.49 per cent to the total size of holding and the Coconut was established in rows in an espacement of 20 feet along the periphery of the case farm which is accounted for 3 per cent to the total size of holding. Other field crops also were in the farm which is occupied 1.30 acres (0.52 Ha) which is accounted for 10 per cent to the total size of holding. Remaining areas are earmarked for processing unit, Farm road, parking area and shed and residential building which are in Toto accounted for 24 per cent to the total size of holding.

To sum up, the cropping program occupied 76 per cent of the total size of holding and the remaining 24 per cent of the land was under farm roads and permanent infrastructure like buildings, parking area, shed and processing units which are essentially required for production and value addition of output produced in the case farm.

2. Costs and Returns Associated with Jamun Orchards

Most of the farmers are unaware about the costs and returns associated with the establishment of perennial trees especially Jamun and hence the spread of Jamun orchards were poor in Tamil Nadu and other parts of India amidst increasing demand. Analyzing and presenting the details of costs associated with the establishment of Jamun plantation and the possible returns realized from Jamun orchards could motivate other progressive farmers also to take up such venture. In this respect the details of cost and the returns are analyzed and are presented in the following sub heads as a motivation tool.

- Establishment Cost
- Maintenance Cost Over the Years
- Revenue realized from Jamun Orchards

2.1. Establishment Cost involved in Jamun Orchards

The researchers normally classify the costs involved in perennial crops into the establishment, maintenance and harvesting costs. According to Sekhar et al. (1990) the costs are classified costs into three viz. , (i) establishment costs, (ii) maintenance and (iii) harvesting costs. Establishment cost involved in kapok plantations were ploughing of land, preparation and layout, manures, cost of seedling, pitting and planting costs, cost of irrigation, soil working and weeding. Maintenance costs included cost of irrigation, weeding and soil working, gap filling. Harvesting costs included collection, packing, forwarding and transportation costs.

Harswarup Singh(1988) classified costs into two viz., (i) fixed costs (establishment cost) and (ii) recurring and maintenance cost. The fixed cost consisted of all the expenditure on goods and services (excluding the value of land) required for the establishment of trees. These included preparations of land and layout, digging and filling of pits, cost of plant material, transportation of seedlings including loading and unloading charges, planting cost, manures and fertilizers, plant protection and miscellaneous costs. Recurring and maintenance costs were those which are incurred every year. These expenses included manures and fertilizers, irrigation, plant protection, labour, interest on establishment and opportunity cost of land (rental value). Harvesting costs were not included as standing trees were sold. In this study, the establishment cost concept given by Sekhar et.al is used.

In establishing Jamun Orchards, the establishment costs were presented as those costs involved prior to the bearing of fruits and the maintenance costs presented were those costs incurred towards maintenance of the orchards from the year of bearing of fruits onwards and hence the establishment costs were categorized item wise and the details are presented in Table 2.

Table 2: Establishment Cost Involved in Jamun Plantation Established in the Case Farm of Tamil Nadu

Sl. No	Particulars of Cost	Year			Total Cost	Percentage to Total Est. Cost
		01	02	03		
1.0	Establishment Cost	01	02	03		
1.1	Preparation of Land – Ploughing 5 Times @ Rs 1500 per Plough	7500	00	00	7500	04.96
1.2	Cost of 90 Pits (1X1X1 Feet) per Acre @ Rs 5 per Pit	0450	00	00	0450	00.30
1.3	Cost of 100 Jamun Seedlings @ Rs 100 per Seedlings	10000	00	00	10000	06.61
1.4	Cost of Fertilizers and its	1100	1100	1100	03300	02.19

	Application					
1.5	Watering to Plants on Weekly Basis @ Rs 300 per Man Day per week. Assume that per Watering, the Man Day requirement will be half Man Day only	5200	4300	4300	13200	08.72
1.6	Pruning of Plants during the Eighth Month after planting @ Rs 300 per Man Day	0600	0900	0900	03000	01.98
	Sum of Working Capital	24850	6300	6300	37450	24.76
1.7	Interest on Working Capital	01491	0378	0378	02247	01.48
	Total Variable Cost	26341	06678	06678	39697	26.24
2.0	Fixed Expenses					
2.1	Annual Cost of Installation of Electrical Implements	5000	00	00	5000	03.30
2.2	Cost of Ladder Type of Furniture	2100	00	00	2100	01.39
2.3	Rental Value of Land used for Jamun Plantation	32000	32000	32000	96000	63.44
2.4	Insurance and other Cost associated with Fixed Items	1200	1200	1200	3600	02.38
2.5	Land Tax	1500	1500	1500	4500	02.97
2.6	Depreciation Charges	0142	0142	0142	0426	00.28
	Total Fixed Cost	41942	34842	34842	111626	73.76
3.0	Total Establishment Cost	68283	41520	41520	151323	100.00

Table 2 revealed that the Total establishment cost involved in establishing the Jamun plantation is arrived at 1.51 lakhs. In that, the first year of establishment of Jamun consumed Rs 0.68 lakhs; second and third years of establishment consumed respectively of 0.41 and 0.41 lakhs to the total establishment cost. Among the total establishment cost, the rental value of land alone consumed Rs 96000 which is accounted for 63 per cent which is followed by watering to the Jamun orchards accounted for 8.72 per cent and the cost of Jamun seedlings which is drawn from Rajahmundry of Andhra Pradesh state consumed Rs 10000/ for one hundred saplings which is accounted for 6.60 per cent to the total establishment cost.

In respect of Fertilizer application at the time of planting, the farmer is adding 5 kgs of Farm Yard Manure plus 5ml Azospyrillum, Phosphobacteria and Pseudomonas per pit to enhance the easy establishment of saplings of Jamun. After pruning, 150 kgs of Farm Yard Manure or 15 kgs of vermicompost is also applied for health establishment of trees. Associated costs of fertilizer are presented in Table 2 which is accounted for only 2 per cent of the total

establishment cost. The Case farmer performs intensive travel abroad periodically to Indonesia, Malaysia, Singapore, Thailand and Sri Lanka and the newer technologies were brought to India and adopted. One such technology is extraction of Jamun Squash and he is exporting the same to different parts of India.

2.2. Maintenance Cost

Under the head of maintenance cost, Weeding and basin formation, pruning of branches, watering, fertilizer and its application to each trees, pesticide and its application and harvesting of Jamun fruits are the main items under the variable expenses. Under the head of fixed expenses, the rental value of land, insurance premium charges, depreciation and the land tax payable annually are incorporated and the details are analyzed and presented in Table 3.

The maintenance cost over the years included are classified as variable expenses and the fixed expenses. The Variable expenses per annum during the 10th year of establishment is arrived at Rs 32224/- and the fixed expenses was arrived at Rs 34842/- which are respectively accounted for 48 per cent and 52 per cent to the total maintenance cost involved during the tenth year.

Among the variable expenses under maintenance cost, harvesting cost alone consumed 18 per cent to the total maintenance cost followed by watering to the Jamun orchards consumed 9.69 per cent of the total maintenance cost and the pruning and fertilizer applications found to consume respectively of 6.26 per cent and 5.96 per cent of the total maintenance cost.

Among the fixed expenses included under the maintenance cost, the rental value of land alone consumed 48 per cent of the total maintenance cost followed by the insurance premium, depreciation and the land tax found to consume only around 4 per cent of the total maintenance cost required for the Jamun Orchards.

To sum up, the maintenance cost involved in the Jamun plantation was found to be of almost equal for the variable and fixed expenses included in the analysis. Among the fixed expenses, the rental value of land alone consumed around 48 per cent of the total maintenance cost incurred during the tenth year of establishment of Jamun orchards.

2.3. Revenue Realized from Jamun Orchards

Revenue realization is possible from Jamun orchards through sale of fruits, value addition of Jamun fruits and sale of fuel wood which is derived from periodical pruning of orchards. The

details of price realized per unit of fruits and the gross income derived are analyzed and the details are presented in Table 4.

Table 4 revealed the details of price realized per kg of Jamun, Gross income realized and the net income realized from Jamun plantation and the cost of production per kg of Jamun. The price of Jamun fruit per kg during the fourth and fifth year was arrived at Rs 100 and the price of Jamun was Rs 120 during the sixth and seventh year of maintenance and Rs 130 per kg during the eighth and ninth year of maintenance and Rs 140 per kg during the tenth year of maintenance have generated a gross income of Rs 35600, Rs 87600, Rs 156800, Rs 260400, Rs 415400, Rs 673600 and Rs 845800 during the period of 4th to 10th years respectively.

The net income generated from the Jamun orchard was found to be negative during the fourth year and the same was found to be on the positive side from fifth year to the tenth year. The net income generated during the tenth year of the plantation was found to be 8.45 lakhs per acre. The cost of production of Jamun per kg was arrived at Rs 137 during the fourth year due to less yield and the same was arrived at Rs 11.15 per kg during the tenth year of establishment of Jamun orchards due to abundant yield during the tenth year and the yield started to sustain after the tenth year and hence the profit from the plantation was found to be appreciable after sixth year of establishment of the Jamun plantation. The average cost of production per kg (4th to 10th Year) was arrived at Rs 42.66. The average sale price of Jamun fruit per kg was arrived at Rs 120 revealed that the farmer is able to reap 185 per cent increased return over the cost of production of Jamun per kg.

To sum up, the average cost of production of Jamun fruit was arrived at Rs 43 per kg. However, the average sale price was arrived at Rs 120 per kg which revealed that the case farm is able to reap 185 per cent increased return over the cost involved in producing the Jamun per kg and the farmer is able to sustain his annual income from the fifth year of establishment of Jamun orchards.

Table 3: Maintenance Cost Involved for Establishing the Jamun Plantation in the Case Farm

Sl.No	Particulars of Variable Expenses	Fourth Year	Fifth Year	Sixth Year	Seventh Year	Eighth Year	Ninth Year	Tenth Year
1.1	Weeding and Basin Formation	1200	1200	1200	1200	1200	1200	1200 (01.79)
1.2	Pruning of the Branches	600	600	900	1900	2600	3200	4200 (06.26)
1.3	Watering to Plants	5200	5200	5200	6500	6500	6500	6500 (09.69)
1.4	Cost of Fertilizer and its Application	1450	1650	1850	2400	2800	3200	4000 (05.96)
1.5	Pesticide Charges and its Application	1400	1550	1700	1900	2050	2200	2300 (03.44)
1.6	Harvesting of Jamun Fruits	1800	2400	2900	6200	8800	10800	12200 (18.19)
	Sum of Working Capital	11650	12600	13750	20100	23950	27100	30400 (45.33)
1.7	Interest on Working Capital	0699	0756	0825	1206	1437	1626	1824 (02.72)
1.8	Total Variable Cost	12349	13356	14575	21306	25387	28726	32224 (48.05)
2.0	Fixed Cost							
2.1	Rental Value of Land	32000	32000	32000	32000	32000	32000	32000 (47.70)
2.2	Insurance Premium and other Associated Costs	1200	1200	1200	1200	1200	1200	1200 (01.79)
2.3	Depreciation	0142	0142	0142	0142	0142	0142	0142 (00.21)
2.4	Land Tax	1500	1500	1500	1500	1500	1500	1500 (02.25)
2.5	Total Fixed Cost	34842	34842	34842	34842	34842	34842	34842 (51.95)
	Total Maintenance Cost (1.8 + 2.5)	47191	48198	49417	56148	60229	63568	67066 (100)

(Figures in Parentheses Indicate Percentage to Total Maintenance Cost)

Table 4: Revenue Realized from Jamun Orchards

Sl.No	Details of Revenue Realized	04	05	06	07	08	09	10
1.0	Price of Jamun (Rs/Kg)	100	100	120	120	130	130	140
2.0	Yield of Jamun (Kgs per Acre)	0344	0860	1290	2150	3440	5160	6020
3.1	Revenue from Sale of Fruits	34400	86000	154800	258000	412800	670800	842800
3.2	Revenue from Sale of Fuel Wood	1200	1600	2000	2400	2600	2800	3000
4.0	Gross Income in Rs	35600	87600	156800	260400	415400	673600	845800
5.0	Net Income in Rs	(-) 11591	39402	107383	204252	355171	610032	778734
6.0	Cost of Production (Rs/Kg)	137.18	56.05	38.31	26.12	17.51	12.32	11.15

The cost incurred in establishing the Jamun Plantation and the returns realized from the Jamun orchards over the years were analyzed using the discount factor at 12 per cent to find out the present value of cost and benefit stream and the results are presented in Table 5.

Table 5: Discounted Cash Flows from Jamun Orchards

Year	Cost in Rs	Gross Income in Rs	Net Income in Rs	Discount Factor 12%	Discounted Costs	Discounted Benefits
0	41942	0	-41942	1.000	41942	0
1	26341	0	-26341	0.893	23519	0
2	41520	0	-41520	0.797	33099	0
3	41523	0	-41523	0.712	29555	0
4	47191	35600	-11591	0.636	29991	22624
5	48198	87600	39402	0.567	27349	49707
6	49417	156800	107383	0.507	25036	79440
7	56148	260400	204252	0.452	25399	117792
8	60229	415400	355171	0.404	24325	167773
9	63568	673600	610032	0.361	22923	242907
10	67066	845800	778734	0.322	21593	272325
Sum	543143	2475200			304732	952568
Net Present Value (NPV)				647836		
Benefit Cost Ratio (BCR)				3.13		
Internal Rate of Return (IRR) (%)				43.98		

Table 5 revealed the details of cost incurred and benefits accrued from the Jamun orchards over the years. The data on cost and benefits were discounted using the 12 per cent discount rate. The Net Present Value (NPV) realized from the Jamun orchards is arrived at Rs 6.48 lakhs. The Benefit Cost Ratio (BCR) derived from the cost and benefit stream derived from Jamun orchards is arrived at 3.13 revealed that for a rupee of investment, the Jamun orchards could generate a return of Rs 3.13. The Internal Rate of Return (IRR) realized from the plantation is arrived at around 44 per cent which is above the cut off rate indicating that the investment in Jamun orchard is highly profitable according to the parameters. The farmers who are intending to establish Jamun type of plantations can invest confidently which could generate profit on a sustainable way. The only aspect that every farmer should care is watering and fertilization and other periodical maintenance could enhance income further besides arranging the distribution mechanisms as and when harvest is over. If not the fruits can well be value added and the same may be converted into squash and then tie up

mechanisms may be made with Pasumai Angadies, Retail Bazaars and Ayurvedic and Siddha medicine formulating companies.

3. Details of Output Produced in the Case Farm

Besides establishment of plantation developmental activities by the case farmer, other inputs which are used in the plantations were also produced and distributed to other farmers in the district. He is the leader for 70 farms in and around Dindigul District and hence whatever the inputs and outputs he could sell it in the open market very easily and hence these details are analyzed and the results are presented in Table 6.

Table 6: Details of Output Produced in the Case Farm

Sl. No	Details of Output Produced in the Case Farm	Quantity Produced	Cost of Production Per Unit	Sale Price Per Unit
01	Production of Bio Boost (in Litres)	60000	060.00	0200.00
02	Production of Bio Complex (in Tonnes)	0100	6000.00	9500.00
03	Production of Jamun Fruit (Kgs) per Annum From 10 th Year	6020	042.66	140.00
04	Production of Jamun Juice (in Litres)	1500	NA	240.00

(NA: Not Available from the Case Farm)

3.1. Bio Boost

Table 6 revealed the details of output produced in the case farm. It revealed that the case farm is producing Bio Boost around 60000 litres which is used as an input mainly for foliar application. The cost of production of Bio Boost per litre is arrived at Rs 60 and the same was sold to other farmers is around Rs 200 per litre. From that he is generating a net return of Rs 140 per litre. However, the secrets and its detailed cost involvements were not disclosed as he is preparing the liquid based on his own formulations after the visits abroad.

3.2. Bio Complex

Bio complex is another output produced by the case farmer which is used as fertilizer to the plantations produced to the tune of 100 tonnes per annum. The cost of production of Bio Complex fertilizer per ton is arrived at Rs 6000 and the same is priced and sold at Rs 9500 per tonne. Around 80 per cent of the quantity is consumed in the farm itself and only 20 per cent of the output is sold to the farms under his consultancy.

3.3. Jamun Fruits

Production of Jamun fruit is another output in the case farm. The total production of Jamun fruit per annum from tenth year onwards is arrived at around 6 tonnes. The average cost of production of Jamun fruit per kg is arrived at Rs 43 and the fruit is sold to the retail outlets like Big Bazaar, Pazha mudhir Nilayam, Pasumai Angadies and the Departmental Stores in Theni, Madurai, Coimbatore and Dindigul Districts at the rate of Rs 140 per kg.

3.4. Jamun Squash

Production of Jamun Squash is another output produced in the processing unit established in the case farm itself.

3.4.1. Requirements for the Preparation of Jamun Squash

- Jamun Pulp: One Kg
- Sugar: 01.80 Kg
- Citric Acid: 38.00 Gram
- Sodium Benzoate: 02.40 Gram
- Water: 1150 MI

3.4.2. Methods of Preparation of Jamun Squash

- Select the sound ripe Jamun fruits which are free from infection and decay
- Wash the Fruits thoroughly without any damage to the fruits
- Crush the Fruits into Pulp without causing any damage to the seeds
- Separate the seed and extract the Juice
- Prepare the sugar syrup by mixing the sugar and water and boil
- The dirt is Skimmed off. Filter the syrup and cool it
- Add citric acid to the cool Jamun syrup
- Jamun juice is blended with clean sugar syrup
- Add preservative in s small portion of juice and add to the whole part of the juice
- Fill the juice in the pet bottles of 700 ml size leaving the head space of 1.20 cm to 2.50 cm.
- Keep the pet bottles filled with juice in the appropriate storage

The processing unit available with the case farm is producing around 1500 litres during the season and the litre of Jamun Juice is priced at Rs 240. However, the cost of production of Jamun Juice is unable to be arrived for want of data as the farmer is declined to reveal almost all the details needed in this regard and hence certain data are unable to be given in a detailed manner.

3.4.3. Health Tips to Human

Jamun fruit is very useful for curing Diarrhea. It is stomachic, carminative and diuretic, apart from having cooling and digestive properties, Jamun is used to treat diabetes and dysentery. It markedly lowers blood pressure. The seed powder reduces sugar in urine very quickly and permanently. It is also used for curing of ring worm in the stomach.

To sum up, the outputs produced in the case farm were found to be Bio Boost, Bio Complex which are on the input side and the output side, the Jamun fruit and Jamun Squash is produced in the farm. Both inputs and outputs were sold to the other farms under his consultancy.

4. Details of Distribution Mechanisms

Such a dynamic case farm is sustaining its output means the distribution mechanisms should be sound enough and of more supportive and hence the distribution details are discussed and the details are presented in Table 7.

Table 7: Details of Distribution Centers for the Jamun Juice Produced in the Case Farm

Sl. No	Details of Value Added Output Sold to the Dealers / Stores	Number of Dealers	Quantity Sold in Litres	Sale Price Per Unit
01	Chennai	03	450	240.00
02	Karaikkudi	02	150	240.00
03	Nagercoil	02	150	240.00
04	Coimbatore	03	250	240.00
05	Kerala	02	500	240.00
	Total	12	1500	240.00

Table 7 revealed that the Jamun Juice is distributed to different dealers present in Tamil Nadu and Kerala. In Tamil Nadu, around 10 dealers on an average are receiving 1000 litres from the case farm. Chennai is able to receive 450 litres of Jamun juice which is supplied through 3 dealers who are regularly receiving the juice from the case farm. Karaikkudi is another town capable of receiving 150 litres of Jamun Juice through two dealers. Similarly, the Nagercoil town and Coimbatore city are respectively receiving 150 and 250 litres of Jamun Juice from the case farm. All these centres are receiving the juice at the rate of Rs 240 per litre. On sale of 1500 litres of Jamun Juice, a gross income of Rs 3.60 lakhs is received which is a handsome income to the case farm. One would be interested to know why this Jamun Juice is well received among the consumers of different locale is important.

5. Nutrients Available in Jamun Fruits

Health awareness is more among the consumers of different city. They wanted to consume quality output which is nutritionally enriched, sweet to the taste buds of different consumers of different age and income groups. If these are met out, what ever the produce produced, all will be acceptable to the consumers at a price prescribed in the produce. The nutrients available in the Jamun fruit is analyzed and presented by Veeraragavathatham et al during 2004 is produced in the form of a Table and the results are presented in Table 8.

Table 8: Nutrients Available in One Hundred Grams of Jamun Fruits

Sl. No	Particulars of Nutrients in 100 Grams of Jamun	Unit in Grams	Percentage of Nutrients to Total
01	Carbohydrates	19.70	87.83
02	Protein	00.70	03.13
03	Iron	01.00	04.46
04	Calcium	00.02	00.08
05	Phosphorous	00.01	00.04
06	Fat	00.10	00.45
07	Fibre	00.90	04.01
	Total Nutrients in Grams	22.43	100.00

(Source: Veeraragavathatham, 2004)

Table 8 revealed the details of nutrients available per one hundred gram of Jamun fruit. Among the different nutrients, Carbohydrates is found to have 19.70 grams which is accounted for 87.83 per cent to the total nutrients available in the fruit. Presence of Iron and Fibre are respectively accounted for 4.46 per cent and 4.01 per cent. Protein is available in the Jamun fruits which is accounted for 3.13 per cent to the total available nutrients in the fruit. Fat, Calcium and Phosphorous are also present in the fruit only to the very little amount revealed that the essential nutrients are present in the fruit and could save the health of the consumers.

The only constraint the case farmer revealed is that the output produced could not be stored well for considerable point of time and hence a storage facility is required at rural settings. Hence, the Department of Agricultural Marketing and Agribusiness can explore the possibilities of erecting a cold storage facility in the important production sites in the rural environs so as to help the farming community further after exploring the needs analysis.

Summary and Conclusions

The cropping program occupied 76 per cent of the total size of holding and the remaining 24 per cent of the land was under farm roads and permanent infrastructure like buildings,

parking area, shed and processing units which are essentially required for production and value addition of output produced in the case farm. The plantations established were Jamun and Amla in the case farm. Since the study is focusing only on Jamun, the details of Amla are ignored in this study. Among the total establishment cost, the rental value of land alone accounted for 63 per cent which is followed by watering to the Jamun orchards accounted for 8.72 per cent and the cost of Jamun seedlings which is drawn from Rajahmundry of Andhra Pradesh state consumed Rs 10000/ for one hundred saplings which is accounted for 6.60 per cent to the total establishment cost. The average cost of production of Jamun fruit was arrived at Rs 43 per kg. However, the average sale price was arrived at Rs 120 per kg which revealed that the case farm is able to reap 185 per cent increased return over the cost involved in producing the Jamun per kg and the farmer is able to sustain his annual income from the fifth year of establishment of Jamun orchards.

The Net Present Value (NPV) realized from the Jamun orchards is arrived at Rs 6.48 lakhs. The Benefit Cost Ratio (BCR) derived from the cost and benefit stream derived from Jamun orchards is arrived at 3.13 revealed that for a rupee of investment, the Jamun orchards could generate a return of Rs 3.13. The Internal Rate of Return (IRR) realized from the plantation is arrived at around 44 per cent indicating that the investment in Jamun orchard is highly profitable according to the parameters. The outputs produced in the case farm were found to be Bio Boost, Bio Complex which is on the input side and the output side, the Jamun fruit and Jamun Juice is produced in the farm. Both inputs and outputs were sold to the other farms under his consultancy.

The only constraint the case farmer revealed is that the output produced could not be stored well for considerable point of time and hence a storage facility is required at rural settings. Hence, the Department of Agricultural Marketing and Agribusiness can explore the possibilities of erecting a cold storage facility in the important production sites in the rural environs so as to help the farming community further after exploring the Needs Analysis.

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