



## RESEARCH PAPER

# Investment feasibility analysis of dragon fruit farming

Pithunglo L. Kikon\*, Dipanjan Kashyap<sup>1</sup>, Jharna Choudhury<sup>2</sup>, H. Aisolia Devi and Rajkumari R. Devi  
Department of Agri Business, Assam Agricultural University, Jorhat (Assam) India  
(Email: [pithungkiks@gmail.com](mailto:pithungkiks@gmail.com))

**Abstract :** Dragon fruit is a climbing cacti and a new introduction in India, also known as ‘The wondrous fruit of the 21<sup>st</sup> Century’ due to its nutraceutical properties. The study was conducted in Dream Dragon Fruit Farm in Nagaland state of India. To estimate the economics of the farm, investment feasibility analysis was performed. The Net Present Value was found positive (Rs. 2,08,29,478.00), which indicates worthy investment of the proprietor. Benefit Cost Ratio was also greater than 1 (2.04), which also favours the investment. Internal Rate of Return of 11.78 clearly indicates a sound financial position of Dream Dragon Fruit Farm and hence the liabilities of the farm could be met easily during any unexpected closure in future. There is a wide scope in taking up dragon fruit farming and with proper Government intervention can lead to massive success for the farmers and a boon for the whole country.

**Key Words :** Dragon fruit, Investment, Feasibility analysis, Prospects

**View Point Article :** Jainuddin, S.M., Seema, Suhasini, K. and Lavanya, T. (2021). Price and non-price decision making factors for groundnut production in Karnataka: An evidence from Nerlove’s supply response approach. *Internat. J. agric. Sci.*, 17 (2) : 265-270, DOI:10.15740/HAS/IJAS/17.2/265-270. Copyright@2021: Hind Agri-Horticultural Society.

**Article History :** Received : 22.02.2021; Accepted : 14.03.2021

## INTRODUCTION

Dragon Fruit is a tropical fruit belonging to the climbing cacti (Cactaceae) family which is originated from Mexico, Central America and North America (Mizrahi *et al.*, 1997 and Daubresse Balayer, 1999) and are now found in six continents. It is a fruit of several cactus species indigenous to Americas and is commonly known as “dragon fruit” or “strawberry pear” or “pitaya” and considered to be among the most nutritious and exotic fruits in the world. Many varieties are found all over the world such as *Hylocereus undatus* (Pitaya blanche or white-fleshed pitaya) which has a pink skinned fruit with white flesh, *Hylocereus costaricensis* (Pitaya roja or

red fleshed pitaya) has red skin fruit with red flesh, *Pysical graffiti* (Pink fleshed), *Hylocereus megalanthus/ Selenicereus megalanthus* (Pitaya amarilla or yellow pitaya) has yellow skinned fruit with white flesh, among which *Hylocereus undatus* is the most cultivated species in the genus. *Hylocereus* genus is mainly characterized by climbing vine cactus with aerial roots that bear a glabrous attractive berry with large scales (Fournet, 2002). The *Hylocereus* comprises of 16 species, which are endemic to Latin America and they are not very well known among the growers and researchers and have only recently been the subject of studies.

Dragon fruit is a semi epiphytic vine plant which

\* **Author for correspondence :**

<sup>1</sup>Department of Agricultural Economics, Assam Agricultural University, Jorhat (Assam) India

<sup>2</sup>Krishi Vigyan Kendra (AAU), Darrang (Assam) India

can climb naturally to any natural or artificial support (trees, wood or cement posts, stone walls, etc.) due to the presence of aerial roots (Rondon, 1998). The crop is a long day plant and fruiting starts from August-November depending on the varieties. It grows well in climate with good rainfall up to 600-1300 mm per annum and requires highly organic or composted soils. Excess water systematically results in the abscission of flowers and young fruits (Barbeau, 1990 and Le Bellec, 2004). It prefers a dry tropical or sub tropical climate with an average temperature of 21-29°C. A well-drained soils and high organic matter is feasible. Windy areas are avoided for site selection as strong consistent winds can damage the trellises. Pruning is done after harvesting for enhancing the flow of light and air as it induces flowering and stem branching.

The benefits of dragon fruit for human health can be explained by its essential nutrients such as vitamins, minerals, complex carbohydrates, dietary fibres and antioxidants. Dragon fruit is also an essential source of betacyanin which serves as a red/purple pigment with antioxidative properties. The Dragon Fruit is a low caloric fruit containing less sugar and a lot of antioxidants, vitamins and minerals. It has surprisingly rich phytonutrients and antioxidants, Vitamin C (equivalent to 10% of daily value), polysaturated (good) fatty acids, several B vitamins for carbohydrate metabolism, carotene and protein. The fruit have zero complex carbohydrates and the phytochemical captin is used as a medication to treat heart problems and its oil seed operates as a mild laxative and are considered to have a high anti-oxidative potential.

Dragon fruit a recently introduced super fruit in Indian market. It is getting tremendous popularity among growers because of its attractive fruit colour and mouthwatering pulp with edible black seed imbedded inside the pulp, nutraceutical value, excellent export potential and highly remunerative in nature (Perween *et al.*, 2018). The fruit is oblong to oval shape; 10-15 cm sized with texture similar to kiwi fruit because of the presence of its crunchy black seeds with soft flesh and normally weights from 150-600 grams or may even reach up to 1 kg. It fruits after 18-24 months of plantation. One pole of plant yields approximately 15 to 25 kg of fruit every year and are sold at 250- 400 per kg in Indian markets. The fruit also has good potential to be processed and value added due to its high nutritional value and attractive features.

The production data for most new and expanding tropical fruits are rarely available; evidence suggests that Dragon fruit production is expanding in many countries like Vietnam, China, Mexico, Colombia, Nicaragua, Ecuador, Thailand, Malaysia, Indonesia, Australia and United states and also commercially grown widely (Chen and Paul, 2019). India is a tropical country with moderate climate all round the year and hence it is very suitable for dragon fruits as it grows well in tropical climates. It is gaining popularity in India as a nutritious and medicinal fruit and being eaten due to its high nutritional value and medicinal values. Literature review had showed that only few research works have been done on this crop in India (Perween *et al.*, 2018). Although it is commercially cultivated in other countries, it has not attained commercial cultivation status in India. Marketability of dragon fruit in the country is expected to be very high because of limited number of commercial producers and high demand (Karunakaran and Arivalagan, 2019). In this paper, an attempt was made to study the investment feasibility analysis of dragon fruit farming in Indian condition. It is expected that the results explained in the next sections will surely motivate Indian farmers to cultivate dragon fruit in their farms in the days to come.

## MATERIAL AND METHODS

The study was conducted in Dream Dragon Fruit Farm, located at Shitovi village of Dimapur district in Nagaland state of India. The farm in Shitovi village is located 25 kms away from the commercial hub of the state and it is the first successful commercial farm where exotic dragon fruits are produced and sold. It is also the pioneer producer of dragon fruit plant saplings and the farm supplies the saplings throughout Nagaland and other neighbouring state.

The study was carried out in the financial year 2019-20 and the data collected were analyzed with the help of following analytical tools to meet up the objective of the study.

### Compound Growth Rate (CGR):

The compound growth rate was worked out by using exponential potential function of the form

$$Y = ab^t$$

$$\ln y = \ln a + t \ln b$$

$$\text{CGR} = (\text{Antilog } b - 1) \times 100$$

where,

y = Dependent variable  
 a = Intercept  
 b = Regression coefficient  
 t = Time in years

$$\text{IRR} = \text{Lower discount rate} + \left( \frac{\text{Net present value at lower discount rate}}{\text{Absolute different between the Net present values at two discount rates}} \right) \times (\text{Different between the two discount rates})$$

### Net present value:

The net present value of an investment is the sum of the discounted value of all cash inflows less sum of all discounted cash outflows of the project during its lifetime. It is calculated by the formula:

$$\text{Net present value (NPV)} = \sum_{t=1}^n B_n - \frac{C_n}{(1+i)^n}$$

where,

$B_n$  = Benefits or present (discounted) value of cash inflows in each year

$C_n$  = Costs or present (discounted) value of cash outflows in each year

n = Number of years

i = Discount Rate

### Benefit Cost Ratio:

The benefit-cost ratio gives the return per rupee invested during the entire productive life period.

The benefit-cost ratio of an investment is the ratio of the sum of the discounted value of all cash inflows to the sum of the discounted value of all cash outflows during the life of the project. It is calculated by the formula:

$$\text{BCR} = \frac{\sum_{t=0}^n \frac{B_t}{(1+i)^t}}{\sum_{t=0}^n \frac{C_t}{(1+i)^t}}$$

where,

$B_t$  = Benefits or present (discounted) value of cash inflows in each year

$C_t$  = Costs or present (discounted) value of cash outflows in each year

n = Number of years

i = Discount Rate

### Internal rate of return:

This is otherwise known as the discounted cash flow rate of return. The internal rate of return is that rate which makes the present value of benefits equal to the present value of cost or reduces the net present value to zero. It is calculated by the formula:

## RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

### Dream Dragon Fruit Farm: An introduction:

The *Dream Dragon Fruit Farm* is a family owned dragon fruit farm established in 2013. The farm has been commercially established in 5 ha land area located at Shitovi village in Dimapur. The farm has 3,500 pillars with 14,000 plants and current yield is 20,000 kg of fruits per year. The farm has been selling the fruits from the farm gate to online business and has high demand especially for weddings and festivals. A value addition is undergoing for launching an exotic dragon fruit wine which will certainly be one of its kind in India and will certainly add revenue as well as fulfill the needs of the consumers. The farm has 6 varieties of dragon fruit, i.e. white fleshed dragon fruit (*Hylocereus undatus*), pink/purple fleshed dragon fruit (*Physalis gratifiti*), red fleshed dragon fruit (*Hylocereus costaricensis*), yellow skin dragon fruit (*Hylocereus megalanthus/ Selenicereus megalanthus*), orange skin dragon fruit and Opuntia variety. It also maintains a nursery and various exotic tropical fruits. Several exotic tropical fruits grown in the farm are, Avocado, Durian, Fig, Longan, Mangosteen, Rambutan and Soursop/ Gaviola.

The farm has been producing fruits since 2014 and the yield has been increasing each year. It produced

**Table 1 : Area and production details of Dream Dragon Fruit Farm**

Year	Area (ha)	Dragon fruit production (kg)	Dragon fruit sapping production (nos.)
2014-15	5 ha	4,500	4,000
2015-16	5 ha	7,000	3,500
2016-17	5 ha	8,750	4,000
2017-18	5 ha	10,500	90,425
2018-19	5 ha	12,250	4,000
2019-20	5 ha	20,000	5,000
CGR (%)		30.51***	14.16

\*\*\* indicates significance of value at P=0.01 probability level

4,500 kgs of fruit and 4,000 numbers of saplings initially in 2014-15 and then it increased to 7,000 kgs, 8,750 kgs, 10,500 kgs, 12,250 kgs and 20,000 kgs fruits and 3,500 nos., 4,000 nos., 90,425 nos., 4,000 nos. and 5,000 nos. of cuttings respectively from the period of 2015-16 to 2019-20. The compound growth rate of dragon fruit production (30.51) was found positive and highly significant. In 2017-18, the farm had received government order of producing 90,000 dragon fruit saplings, which were later distributed to different interested farmers of the state.

### Utilization of inputs in the farm:

Dragon fruit cuttings and pillars are considered as primary inputs in dragon fruit production. A total of 3,500 pillars were erected in the farm at the rate of 700 pillars per ha. Fourteen thousand (14,000 nos.) dragon fruit saplings/cuttings were planted in the farm at the rate of 2,800 saplings per ha. Manures and neem water were also used for proper growth and maintenance at the rate of 162 kg/ha and 144 litres/ha, respectively.

**Table 2 : Utilization of inputs in Dream dragon fruit farm**

Sr. No.	Items	Total input	Input/ha
1.	Dragon fruit pillars (nos.)	3,500	700
2.	Saplings (nos.)	14,000	2,800
3.	Manures (kg)	810	162
4.	Neem water (litres)	720	144

### Fixed costs incurred by the farm:

The owner of the farm had purchased the land at Rs. 44,75,000.00 and had spent Rs. 18,00,000.00 for construction of the farm house. For construction of cement pillars and greenhouse Rs. 40,00,000.00 and Rs. 6,00,000.00 were spent, respectively. A sum of Rs. 7,00,000.00 and Rs. 60,000.00 were spent by the owner for purchase of generator and, tools and equipments, respectively. A total of Rs. 7,00,000.00 was spent for

**Table 3 : Fixed costs incurred by Dream Dragon Fruit Farm**

Particulars	Costs (Rs.)
Land	44,75,000
Farm House	18,00,000
Pillars (3500 nos.)	40,00,000
Greenhouse	6,00,000
Generator	7,00,000
Tools and Implements	60,000
Saplings	7,00,000
Total	1,23,35,000

purchase of 14,000 dragon fruit saplings at the rate of Rs. 50/sapling. The total fixed costs of the farm was Rs. 1,23,35,000.00.

### Operational costs incurred by the farm:

It is observed from Table 4 that the farm had spent Rs. 4,80,000.00 per year for giving salaries to its permanent staff. Additionally, the farm had spent Rs. 11,250.00 per year for payment of hired labours. Costs associated with fertilizers, plant protection chemicals and electricity were found Rs. 1,50,000.00, Rs. 50,000.00 and Rs. 24,000.00 per year, respectively. Hence, the farm had spent an amount of Rs. 7,15,250.00 as operational costs in the last financial year.

**Table 4 : Operational costs incurred by Dream Dragon Fruit Farm**

Particulars	Costs (Rs./yr)
Hired labour	11,250
Permanent/Owned labour	4,80,000
Manure/Fertilizer cost	1,50,000
Plant protection chemical	50,000
Electricity charges	24,000
Total	7,15,250

### Investment feasibility analysis of the farm:

In order to estimate the economics of Dream Dragon Fruit Farm investment feasibility analysis was performed by using the data. A total of 20 years were considered to find out the investment analysis considering 20 years productive life of dragon fruit plants. The results were found as follows (Table 5).

$$\begin{aligned} \text{Net Present Value (NPV)} &= \text{Rs. } (4,07,61,994.00 - 1,99,32,516.00) \\ &= \text{Rs. } 2,08,29,478.00 \end{aligned}$$

$$\begin{aligned} \text{Benefit cost ratio (BCR)} &= \frac{\text{Rs. } 4,07,61,994.00}{\text{Rs. } 1,99,32,516.00} \\ &= 2.04 \end{aligned}$$

$$\begin{aligned} \text{Internal Rate of Return (IRR)} &= 11 + \frac{6,80,860}{6,80,860 - (-1,90,751)} \times (12 - 11) \\ &= 11.78 \end{aligned}$$

The Net Present Value was found positive (Rs. 2,08,29,478.00), which indicates worthy investment of the proprietor. Benefit Cost Ratio was also greater than 1 (2.04), which also favours the investment. Internal Rate of Return was found as 11.78. This clearly indicates a sound financial position of Dream Dragon Fruit Farm and hence the liabilities of the farm could be met easily during any unexpected closure in future.

Investment feasibility analysis of dragon fruit farming

**Table 5 : Investment feasibility analysis of Dream Dragon Fruit Farm**

Year		Establishment cost	Operational cost	Total cost	Yield/ha (kg)	Return from fruit (@ Rs. 300/kg)	Sapling prod (nos.)	Return from sapling (@ Rs. 55/no.)	Total return
2013	0	91,75,000	7,15,250	98,90,250	-	-	-	-	-
2014	1	18,00,000	7,15,250	25,15,250	-	-	-	-	-
2015	2	6,60,000	7,15,250	13,75,250	4,500	13,50,000	4,000	2,20,000	15,70,000
2016	3	7,00,000	7,15,250	14,15,250	7,000	21,00,000	3,500	1,92,500	22,92,500
2017	4	-	7,15,250	7,15,250	8,750	26,25,000	4,000	2,20,000	28,45,000
2018	5	-	7,15,250	7,15,250	10,500	31,50,000	90,425	49,73,375	81,23,375
2019	6	-	7,15,250	7,15,250	12,250	36,75,000	4,000	2,20,000	38,95,000
2020	7	-	7,15,250	7,15,250	14,000	42,00,000	4,000	2,20,000	44,20,000
2021	8	2,00,000	7,15,250	9,15,250	15,750	47,25,000	4,000	2,20,000	49,45,000
2022	9	-	7,15,250	7,15,250	17,500	52,50,000	4,000	2,20,000	54,70,000
2023	10	-	7,15,250	7,15,250	17,500	52,50,000	4,000	2,20,000	54,70,000
2024	11	-	7,15,250	7,15,250	17,500	52,50,000	4,000	2,20,000	54,70,000
2025	12	-	7,15,250	7,15,250	17,500	52,50,000	4,000	2,20,000	54,70,000
2026	13	2,00,000	7,15,250	9,15,250	17,500	52,50,000	4,000	2,20,000	54,70,000
2027	14	-	7,15,250	7,15,250	17,500	52,50,000	4,000	2,20,000	54,70,000
2028	15	-	7,15,250	7,15,250	17,500	52,50,000	4,000	2,20,000	54,70,000
2029	16	-	7,15,250	7,15,250	17,500	52,50,000	4,000	2,20,000	54,70,000
2030	17	-	7,15,250	7,15,250	17,500	52,50,000	4,000	2,20,000	54,70,000
2031	18	2,00,000	7,15,250	9,15,250	17,500	52,50,000	4,000	2,20,000	54,70,000
2032	19	-	7,15,250	7,15,250	17,500	52,50,000	4,000	2,20,000	54,70,000
2033	20	-	7,15,250	7,15,250	17,500	52,50,000	4,000	2,20,000	54,70,000

Contd. Table 5

Year	D.F. at 8%	PV of total cost	PV of total Return	NPW	D. F. at 11%	PV of NPW	D.F. at 12%	PV of NPW
2013	1.000	9890250.00	-	-9890250.00	1	-9890250.00	1	-9890250.00
2014	0.926	2328935.20	-	-2328935.00	0.901	-2098140.00	0.893	-2079406.00
2015	0.857	1179055.20	1346022.00	166966.74	0.812	135513.90	0.797	133104.90
2016	0.794	1123471.10	1819860.00	696389.33	0.731	509193.90	0.712	495676.20
2017	0.735	525730.10	2091160.00	1565429.80	0.659	1031197.00	0.636	994859.00
2018	0.681	486787.13	5528633.00	5041845.40	0.593	2992090.00	0.567	2860878.00
2019	0.630	450728.83	2454511.00	2003781.90	0.535	1071304.00	0.507	1015178.00
2020	0.583	417341.51	2579028.00	2161686.00	0.482	1041194.00	0.452	977837.00
2021	0.540	494481.10	2671630.00	2177148.50	0.434	944722.40	0.404	879313.80
2022	0.500	357803.07	2736362.00	2378558.80	0.391	929837.50	0.361	857732.10
2023	0.463	331299.14	2533668.00	2202369.20	0.352	775640.30	0.322	709104.00
2024	0.429	306758.47	2345989.00	2039230.80	0.317	647013.90	0.287	586230.10
2025	0.397	284035.62	2172212.00	1888176.60	0.286	539718.00	0.257	484647.90
2026	0.368	336535.53	2011308.00	1674772.10	0.258	431277.70	0.229	383814.50
2027	0.340	243514.76	1862322.00	1618807.10	0.232	375554.90	0.205	331240.00
2028	0.315	225476.63	1724372.00	1498895.50	0.209	313275.70	0.183	273842.60
2029	0.292	208774.66	1596641.00	1387866.20	0.188	261324.40	0.163	226391.00
2030	0.270	193309.87	1478371.00	1285061.30	0.170	217988.30	0.146	187161.90
2031	0.250	229040.42	1368862.00	1139821.80	0.153	174190.00	0.130	148222.00
2032	0.232	165732.05	1267465.00	1101732.90	0.138	151684.00	0.116	127918.70
2033	0.215	153455.61	1173579.00	1020123.10	0.124	126529.90	0.104	105752.90
		19932516.00	40761994.00	20829478.00		680859.80		-190751.00

### Conclusion:

The dragon fruit is very high investment farming and can carry out only with proper planning and maintenance with effective labours in the farm. Since the fruit is a new introduction in the country, very little people or farmers are aware of its farming procedures and benefits of its consumption. The fruit has a wide scope in the prospects of its future performance as in its first introduction itself it is performing well. Dragon fruit appear to have numerous selling points; they are attractive in shape and colour, and very good nutraceutical property which will attract growers from all over India. Fruits are easy to keep fresh under room condition. Several processed products can also be made from the pulp of the fruit. The crop is hardy and can survive in any type of climatic condition favourable for flowering and fruiting and soil condition provided with good drainage. In general, it could be concluded that dragon fruit farming is economically beneficial and hence it could become 'Super fruit' of India in future.

### REFERENCES

- Barbeau, G. (1990).** La pitahaya rouge, un nouveau fruit exotique. *Fruits*, **45**:141-174.
- Chen, N. J. and Paull, R. E. (2019).** Overall dragon fruit production and global marketing. *In: Agricultural value chains (policy article)*. FFTC Agricultural Policy Platform (FFTC-AP).
- Daubresse, Balayer. (1999).** M. Le pitahaya. *Fruits Oubliés*, **1**:15-17.
- Fournet, J. (2002).** Flore illustrée des phanérogames de Guadeloupe et de Martinique, Tome 1, Famille des Cactaceae, Inra-Cirad-Gondwana, Paris, France. pp. 224-240.
- Karunakaran, G. and Arivalagan, M. (2019).** Dragon Fruit - A New Introduction Crop with Promising market. *Indian Horticulture*, **63**(1):8-11.
- Le Bellec, F. (2003).** La pitaya (*Hylocereus* sp.) enculture de diversification à l'île de la Réunion, Inst. Natl. Hortic. (INH), Mém. Angers, France. p. 55.
- Mizrahi, Y., Nerd, A. and Nobel, P. S. (1997).** Cacti as a crop. *Hort. Rev.*, **18**:291-320.
- Perween, T, Mandal, K. K. and Hasan, M.A. (2018).** Dragon fruit: An exotic super future fruit of India. *Journal of Pharmacognosy and Phytochemistry*, **7**(2): 1022-1026.
- Rondón, J. A. (1998).** Cactáceas epifitas y trepadoras de la reserva forestal de Caparo, estado Barinas, Venezuela. *Rev. For. Venez.*, **42**:119-129.

★ ★ ★ ★ ★ of Excellence ★ ★ ★ ★ ★  
17<sup>th</sup> Year