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RESEARCH NOTE

Economic Analysis of Brinjal Seedling Nursery Enterprise in Karnataka

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ABSTRACT

Brinjal also known as Eggplant is the second most important solanaceous crop after tomato. This study was a modest attempt to estimate the area under cultivation of brinjal in Karnataka and also to estimate the demand for brinjal seedlings during 2019-20. In addition, this study has also tried to work out the economic feasibility of investment on nursery under shade net condition. The results indicated that the area under brinjal cultivation was estimated to be 17238 hectares and the demand for brinjal seedlings worked out to 23.94 crores in the state of Karnataka for the year 2019-20. The capital budgeting technique indicated that, the nursery entrepreneurs had invested ₹ 2,59,735/- towards setting up of nursery in an area of 1000m^2 under shade net. Further the economic analysis pointed out that entrepreneurs have realised gross income of ₹ 2,74,540/- and net returns of ₹ 62,608/- per crop rotation The capital investment on brinjal nursery was found to be economically viable in terms of net present worth (₹ 1,21,723), benefit-cost ratio (1.30) and Internal Rate of Return (89 per cent).

Keywords: Brinjal, Cultivation, Nursery, Demand, Feasibility, Enterprise profit.

JEL.: D13, Q11. Q13. Q16

I

INTRODUCTION

Vegetables play an important role in food trade in India. The diverse climatic conditions in India ensure availability of all varieties of vegetables for consumption and throughout the year. Eggplant, also known as brinjal or Aubergine (*Solanum melongena* L.) together with tomato is the most widely known edible vegetable of the Solanaceae family (Daunay, 2008). It is the fourth most important vegetable grown after potato, onion and tomato in India. It is popularly called as eggplant and is grown extensively in India, Bangladesh, Pakistan, China and the Philippines. Eggplant is a warm-season crop, which requires 60–85 days to complete the cycle. The plant needs a 10-12 hours photoperiod and grows best at relatively high temperatures (the optimum being around 23°C-26°C) (Sekara *et al*., 2007). Thus, the crop is grown during the summer season. In India, brinjal is mainly cultivated in the states of Andhra Pradesh, Bihar, Karnataka, Maharashtra, Orissa, Tamil Nadu, Uttar Pradesh and West Bengal. Brinjal cultivation in India is estimated to cover about 8.14 per cent vegetable area with a contribution of 9 per cent to total vegetable production

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(www.mssrfcabc.res.in). It is one of the most common, popular and principal vegetable crop grown throughout the country except in higher altitudes.

In order to fulfil the requirement of 300g vegetables per day per capita and also to meet the demand for fresh, export and processing industries, there is a urgent need to increase the production and productivity of vegetables through adoption of various methods such as use of high quality seeds of improved varieties and hybrids, following high-tech production and protection technologies and quality seeds and seedlings forms the foundation for bumper harvest. Healthy seeds and seedlings are the first and necessary prerequisite for achieving full yield potential of any vegetable crop. In recent years, vegetable growers have become highly conscious of the importance of quality seeds or seedlings (Pandiyaraj *et al*., 2017). A major portion of the area under vegetable cultivation in India is now sown with hybrid seeds, which are costly but give higher yields and quality produce. In view of the high cost of seeds, brinjal is being transplanted after growing in nursery under protected conditions to achieve maximum germination count and healthy plant establishment. It is primarily grown by small and marginal farmers and is an important source of income for them. Brinjal cultivation faces a number of problems which cause enormous yield losses. Among different problems faced by commercial brinjal growing farmers, lack of quality seedlings is one among them. Keeping in view of above factors, which influences the growth, yield and income of brinjal growers, this study was conducted to assess the economic status of vegetable nursery entrepreneurs in terms of feasibility and seedlings demand of brinjal crop for the current season in the major growing districts Karnataka. The study aims to serve as a better guide and also may be useful to the extension workers, vegetable growers, nursery entrepreneurs and other stakeholders of brinjal production.

II

METHODOLOGY

Raising the quality seedlings is a specialised technique which requires skill and technical knowhow. Good seeds and seedlings give better field stand and abundant yield. Quality seed and seedlings with proper management condition are able to increase 20-25 per cent yield. The present study was taken up in the state of Karnataka as it is one of the leading producers of brinjal. Brinjal is cultivated in all most all districts of Karnataka. The demand for brinjal seedlings in major growing districts and state as a whole was estimated using Compound Annual Growth Rate (CAGR). The total area under this crop and per hectare requirement of seedlings was projected as per recommended package of practice (Anon., 2014). The CAGR in area was calculated with the exponential model. The secondary data on area with respect to major growing districts under brinjal was collected from Directorate of Economics and Statistics, Bengaluru from 2010-11 to 2018-19 (www.des.kar.nic.in). The method

of exponential model and computation of CAGR is detailed below (Sathyendra Kumar and Chandrashekar, 2015).

$$Y_1 = \beta_0 \beta_1^t e^{U_1}$$

Yt = Area under brinjal in hectares during 't' time period in major districts and state
β0= Intercept
β1= Slope coefficient
t = Time in years (2010-11 to 2018-19)
ut = Stochastic term

The estimable form of the model was obtained by natural logarithmic transformation. The parameters of the model were estimated using ordinary least squares method:

i.e., $Ln = Y_t = \ln\beta_0 + t\ln\beta_1 + U_t$

The compound annual growth rate (CAGR) in area was obtained from the expression given as CAGR = (antilog (lnβ1)-1)*100.

The growth in area under brinjal for the subsequent year was determined by adding actual area under brinjal in the previous year with actual area times compound annual growth rate i.e., area under brinjal in 2019-20=area under brinjal in 2018-19 + CAGR × (area under brinjal in 2018-19). For instance, the CAGR in area under brinjal for Karnataka state was 1.84 per cent and the area during preceding year was 17043 hectares. The growth in area for the succeeding year will be 17043 X 0.0144= 195 hectares. Hence, the total area under brinjal in the succeeding year will be 17043 +195 = 17238 hectares. The demand forecast of the seedlings is estimated by considering total area in succeeding year and seedlings requirement per hectare (13888 seedlings hectare^{-1} at spacing of 1.20×0.60 m) as recommended in the package of practice, University of Horticultural Sciences, Bagalkot (Anon., 2014).

In order to meet the total demand of seedlings, nurserymen were employing modern techniques of raising seedlings which were very much essential. In this regard, an attempt was made to examine whether investment on nurseries enterprise is economically feasible or not using project evaluation technique. In order to fulfill this objective, a sample of 10 nurseries from each of the districts viz., Belagavi, Haveri and Kolar in Karnataka were randomly selected. The feasibility of investment on brinjal seedling production under shade-net structure was determined by using discounted and undiscounted cash flow techniques (Murthy *et al*., 2009). The discount rate of 12 per cent was considered in the present study since it is close to opportunity cost of capital in India. The research was based on both primary and secondary data. The primary data was collected from the owners of the selected

nursery entrepreneurs during the year 2019-20. The secondary data on area were collected from Directorate of Economics and Statistics, Bengaluru.

Discounted Cash Flow Measures

Net Present Worth (NPW) = $$\sum_{t=1}^{15} \frac{B_t}{(1+r)^t} - \sum_{t=1}^{15} \frac{C_t}{(1+r)^t}$$

Benefit Cost Ratio (BCR)= $$\frac{\sum_{t=1}^{15} \frac{B_t}{(1+r)^t}}{\sum_{t=1}^{15} \frac{C_t}{(1+r)^t}}$$

where,
Bt is the benefit stream of the project in 't-th' period
Ct is the cost stream of the project in 't-th' period,
r is the discount rate assumed as 12 per cent (opportunity cost of capital),
t is the life span of the project (15 years)

Internal Rate of Return (IRR) = LDR + (HDR-LDR) X $$\left[\frac{\text{NPW AT LDR}}{\text{NPW at LDR+NPW at HDR}}\right]$$

LDR is lower discount rate is the discount rate which leaves positive NPW and HDR is Higher discount rate is the discount rate which leaves negative NPW.

Undiscounted Cash Flow Measures

Pay Back Period (years) = $$\frac{\text{Initial investment}}{\text{Annual net cash revenue}}$$

III

RESULTS AND DISCUSSION

Nursery is a place where horticultural plants like fruit, ornamental flowers and seedlings of various fruits and vegetables were raised, multiplied, propagated and supplied to the growers. Nursery management has gained a status of commercial venture where retail nurseries sell planting materials to the growers and to the general public. There is huge demand for vegetable seedlings during *kharif, rabi* and summer seasons. Most of the farmers prefer readymade seedlings prepared in commercial nurseries. The compound annual growth rates in brinjal area, for the study period (2010-11 to 2018-19) was estimated. The change in the area for the next year and estimated demand for brinjal seedlings are depicted in Table 1. The CAGR of area under brinjal in Karnataka state was 1.14 per cent per annum during the study period. Belagavi and Bidar districts registered positive and significant growth rates during

the study period, i.e., 10.73 and 1.07 per cent per annum respectively. Contrary to this, Haveri, Kolar and Chikkaballapura districts witnessed negative growth rates to the tune of 3.48, 1.14 and 0.63 per cent per annum. This may due to scarcity of irrigation water and increase in pest and disease incidence as well as volatility in market prices. Patil *et al.,* (2017) reported similar results in case of tomato growth in Karnataka. The farmers of Belagavi district are skillful in cultivation of brinjal as the population of North Karnataka demand brinjal as a staple vegetable in their daily diet. This is the reason attributed for sharp increase in CAGR of area under brinjal cultivation in Belagavi district.

TABLE 1. ESTIMATED DEMAND FOR BRINJAL SEEDLINGS IN KARNATAKA

Districts (1)	Area under brinjal in 2010-11 (ha) (2)	Area under brinjal in 2018-19 (ha) (3)	CAGR (per cent) in area from 2010-11 to 2018-19 (4)	Increase/ decrease in area during 2019-20 (ha) (5)	Estimated area in 2019-20 (ha) (6)	Estimated demand for brinjal seedlings (crores) (7)
Belagavi	2139	3212	10.73	344.56	3557	4.94
Kolar	1235	1023	-1.14	-15.21	1314	1.82
Haveri	1443	1329	-3.48	-35.56	987	1.37
Bidar	1089	1203	1.07	12.81	1216	1.69
Chikkaballapura	1032	980	-0.63	-6.22	974	1.35
Karnataka total	16465	17043	1.14	194.73	17238	23.94

Based on the CAGR of area under brinjal in major growing districts and state as well, incremental (increases or decrease) area for the next year (2019-20) was estimated. Karnataka state as a whole witnessed increase in the area under brinjal to the tune of 194.73 hectares for the coming year. The highest increase in area under brinjal was reported in Belagavi (344.56 ha) and Bidar district witnessed a marginal increase to the tune of 12.81 hectares whereas the districts of Haveri, Kolar and Chikkaballapura registered a decline in the area under brinjal cultivation during the subsequent year. The respective changes in the CAGR are the main reason attributed for incremental change in area under brinjal in the major growing districts and Karnataka as well.

The change (increase/decrease) of area under brinjal cultivation during the subsequent year added to the area of previous year to work out the area during 2019-20 for the major growing districts and Karnataka as well. With this estimated area of 2019-20, the potential demand for brinjal seedlings were estimated considering the per hectare requirement of seedlings as recommended in the package of practice (13888 plants/ha) (Anon, 2014). Accordingly, the brinjal seedlings requirement for Karnataka during 2019-20 for an area of 17238 hectares was about 23.94 crores. The estimated demand for brinjal seedlings was found to be highest in Belagavi district to the tune of 4.94 crores followed by Kolar (1.82 crorers), Bidar (1.69 crores), Haveri (1.37 crores) and Chikkaballapura (1.35 crorers). Hence, in order to meet the estimated total demand of brinjal seedlings there is a necessity of investing in seedling raising activity on a massive scale. However, there is increasing scope for

nursery agripreneurship as brinjal crop is gaining slowly in area under cultivation in Karnataka over the years.

Establishment Cost of Shade Net House

The establishment cost on marketable nursery of Brinjal seedlings under shade net house condition is given in Table 2. The entire investment structure include investment on shade net structure, irrigation pump set, digging bore well and motor, construction charges, irrigation facilities and other minor assets. The total capital requirement on commercial brinjal nursery activity of 1000 m^2 capable of raising 3922 trays (98 seedlings/tray) under shade net condition was ₹ 5,19,470/-. The shade net structure alone constituted 61.73 per cent (₹ 3,20.670) of the total investment followed by construction charges sharing 23.48 per cent (₹ 1,21.983) of total investment. Investment on irrigation facilities was ₹ 40,205 accounting for 7.40 per cent of the total investment. It is necessary to supply water to portrays on daily basis during nursery rising. The nurseries depend on borewell for irrigation purpose. The cost of digging borewell constituted 4.95 per cent (₹ 25,732) of the total initial investment. The investment on other miscellaneous accounted around ₹ 10,880 (2.09 per cent) The Deptartment of Horticulture, Government of Karnataka (www.horticulture.kar.nic.in) provides 50 per cent subsidy which works out to ₹ 2,59,735. Hence, the net investment made by entrepreneur in establishing profitable nursery was ₹ 2,59,735.

TABLE 2. INVESTMENT STRUCTURE ON BRINJAL NURSERY IN SHADE NET CONDITION

(*1000 M^2/annum*)

Sl. No. (1)	Particulars (2)	Quantity (No.) (3)	Rate (₹) (4)	Value (₹) (5)	Share (per cent) (6)
1.	Borewell			25732	4.95
2.	Irrigation pumpset			40205	7.74
3.	Shade net structure			320670	61.73
4.	Construction charges			121983	23.48
5.	Rose cans/ hose pipe	5	400	2000	0.39
6.	Knapsack sprayers	2	2540	5080	0.98
7.	Baskets	5	250	1250	0.24
8.	Spade	3	325	975	0.19
9.	Pickaxes	3	275	825	0.16
10.	Sickles	5	150	750	0.14
11.	Total investment			519470	100.00
12.	Subsidised amount (50 per cent by Dept. of Horticulture)			259735	
13.	Net investment			259735	

Economics of Brinjal Seedlings Under Shade Net

The economics of commercial nursery of Brinjal under shade net condition is depicted in Table 3. The shade net structure installed on 1000 m^2 land could accommodate 3922 protrays. The total cost of raising nursery seedling on 1000 m^2

worked out to ₹2,11,931. The variable cost constituted ₹1,41,879 (66.95 per cent) and the rest was accounted for fixed cost i.e., ₹70,053 (33.05 per cent). The major variable cost was cost of protrays[1] (₹35,298), followed by seeds (25,335), labour cost for both men and women (₹40,500) and coco peat[2] (₹20736). Among fixed costs, depreciation on tank, pipe, pump set, pump house, sprayer, including shade net etc was accounted 32,467 and interest on fixed capital was worked out at the rate of 12 per cent on investment made by the entrepreneur on commercial brinjal nurseries i.e., ₹7,506. The rental value of land was accounted 42.83 per cent of total fixed cost (₹30,000 per year). The gross return from sale of 3,922 trays of brinjal seedlings at the rate of ₹70 per tray was accounted ₹2,74,540. The net returns obtained was worked out was ₹62,609. The average cost per seedling worked out to be ₹0.55 and net returns per seedling came to ₹0.15. Linganagouda and Mahajanasetti (2016) reported similar results from seedling production under hi-tech condition. Depending up on the demand from farming community, nursery entrepreneur can raise the seedlings.

TABLE 3. COST AND RETURNS OF BRINJAL SEEDLING PRODUCTION UNDER SHADE NET CONDITION

(1000 M^2/annum)

Sl. No.	Particulars	Quantity (No.)	Rate /unit (₹)	Value (₹)	Share (per cent)
(1)	(2)	(3)	(4)	(5)	(6)
I. Variable cost (A)					
1.	Brinjal seeds (gm)	1689 gm	15/gm	25335	17.86
2.	Protrays with 98 cells (no.)	3922	9.0 / tray	35298	24.88
3.	Coco peat (kg)	3456	6	20736	14.62
4.	Fertilisers (kg)	20	250	5000	3.52
5.	PPCs (kg)	20	225	4500	3.17
6.	Male labour (man-days)	90	250	22500	15.86
7.	Female labour (man-days)	90	200	18000	12.69
8.	Interest on working capital (8 per cent) (Rs.)			10510	7.41
9.	Total variable cost (A)			141879	100.00
II. Fixed cost (B)					
10.	Rental value of land (₹)		30000	30000	42.83
11.	Land revenue (₹)		80	80	0.11
12.	Depreciation on tank, pipe, pump set, pumphouse, sprayer, including shade net etc.			32467	46.35
13.	Interest on Fixed Capital (12 per cent) (₹)			7506	10.71
14.	Total fixed cost (B)			70053	100.00
15.	Total cost (A+B) = C			211931	
Returns					
16.	Brinjal seedlings trays (no.)	3922	70	274540	100.00
17.	Gross Income (D)			274540	100.00
18.	Net income = D-C (₹)			62609	
19.	Cost per seedling (₹)			0.55	
20.	Profit per seedling (₹)			0.16	

Economic Viability of Investment Brinjal Nursery Enterprise

To evaluate the economic viability of investment on brinjal nursery, the criteria such as net present worth, benefit cost ratio, payback period and internal rate of

return were employed and the results were presented in Table 4. Scientific production of brinjal seedlings requires a huge investment of ₹2,59,735. Whether the investment on commercial nursery is remunerative or not was examined by employing discounting and un-discounting cash flow procedure (Patil *et al*., 2017). As indicated by net present worth, the investment on brinjal nursery enterprise under shade net condition generated wealth of ₹1,21,723 over its life period duly accounting for inflation. Positive NPW indicated the economic viability of investment in brinjal nursery in the long run. Another measure used to judge the viability of investment on project was B:C Ratio which was 1.30 indicating that the project generates a return of 1.30 for every rupee of investment. Similar findings were reported by Ashoka *et al*., (2017) for investment in jasmine garden.

TABLE 4. ECONOMIC FEASIBILITY OF INVESTMENT ON BRINJAL NURSERY IN SHADE NET CONDITION

Discounted and Undiscounted criterion (1)	Magnitude (2)
Net present value @ 12 per cent	121723
Benefit-cost ratio	1.30
Internal rate of returns (per cent)	89
Pay back period (years)	4.15

The value of IRR generally depends on the magnitude of returns realised in each year over the economic life period and more particularly in the initial years of brinjal nursery enterprise. It may be noted here that, the IRR was found to be very high (89 per cent), compared to the opportunity cost of capital or rate of interest paid on borrowed capital. Hence, the investment in nursery enterprise was highly profitable, economically feasible and financially sound. Payback period is the period required to recover the initial investment incurred in establishing the garden and in the present study the payback period was found to be 4.15 years. This clearly indicated that it would take four years to recover the entire investment. This could be attributed to the fact that the initial investment itself was lower, besides a higher rate of returns. Patil *et al*. (2017) reported similar results for investment in tomato nurseries in Karnataka state.

Marketing of Brinjal Seedlings

Organised marketing mechanism of brinjal seedling is lacking. The only one marketing channel that exist for marketing of brinjal seedling is nursery entrepreneur → brinjal grower.

Problems in Raising and Marketing of Brinjal Seedling

Even though nursery is a profitable venture, it has no exception from the constraints. Opinion survey was conducted about the production and marketing

constraints of brinjal seedling and the results were presented in Table 5. From the table, it could be observed that, the 86.67 per cent of entrepreneurs have expressed lack of credit facilities as the major problem followed by scarcity of water (76.67 per cent). This is followed by other problems like tough competition to the tune of 60.00 per cent, labour availability during peak season of operation (46.67 per cent), pest and disease incidence (26.67 per cent), mortality of seedling (16.67 per cent) and difficulty in sale of seedlings (16.67 per cent) as brinjal seedlings have time bound demand.

TABLE 5. PROBLEMS FACED BY BRINJAL NURSERY ENTREPRENEURS

Sl. No. (1)	Particulars (2)	No. of nursery entrepreneurs (3)	Percentage (4)
1.	Water scarcity	23	76.67
2.	Labour availability	14	46.67
3.	Mortality of seedling	5	16.67
4.	Sale of seedlings	5	16.67
5.	Lack of technical guidance	7	23.33
6.	Lack of credit facility	26	86.67
7.	Competition among nurseries	18	60.00
8.	Pest and disease incidence	8	26.67

IV

CONCLUSION

Raising a healthy nursery is a specialised technology which requires knowledge and skill about various operations and scientific management of nurseries. Brinjal nursery production has become a highly commercialised business, wherein most farmers buy their seedlings from professional entrepreneurs. During 2019-20, the area under brinjal in Karnataka state is expected to increase to the tune of 195 hectares and the total area would be 17,238 hectares. The forecast of the study indicated that, 23.94 crores of seedlings are required to cultivate estimated area of 17,238 hectares in Karnataka. Nowadays, brinjal farmers prefer the seedling from nurseries rather than raising on their own because of consistency in healthy, uniformity and vigour of the seedling. The time period require to raised the seedling is about 20-25 days. If there is a sudden increase or decrease in demand for the seedlings, nurseries should be able to raise and supply the required number of seedlings at right time. Seedling raising under shade net house was highly economically viable as indicated by net profit per seedling (₹0.15) and it is also supported by capital budgeting techniques i.e., positive net worth, comfortable B:C ratio and more IRR (89 per cent). Thus, brinjal seedling production under shade net condition was found to be profitable activity gaining interest of eventual entrepreneurs.

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NOTES

1. Protray: The blocks of plastic tray are in cone shape which helps in the proper growth and development of the roots. It is used for the production of good variety seedlings and to save place. For the preparation of disease and pest free hybrid seeds, seedling should be ready in poly house or net house.

2. Coco Peat: It is sterilised growing medium. Coir Pith Blocks are used in vegetable nurseries extensively as a soil conditioner and substitute for soil. The coco peat is a by-product of coir industry and it has high water holding capacity as, it contains low nutrients and high lignin content.

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