Journal of Crop and Weed, 15(2): 120-125 (2019) ISSN- O : 2349 9400 ; P : 0974 6315
http://cwssbckv.org
www.cropandweed.com

A study on seedling demand and economic analysis of chilli nurseries in Karnataka

N. ASHOKA, [1]Y. RAVI , [2]K. R. LINGAMURTHY, [3]B. RAVI KUAMR AND [4] G. ANUPAMA

Department of Agricultural Economics, [2] Department of Vegetable Science, [3] Department of Plant Pathology
College of Horticulture, Munirabad, Koppal-583233, Karnataka
[1] ICAR, National Research Centre on Seed Spices, Ajmer-305206, Rajasthan
[4] Horticulture Training Centre, Munirabad, Koppal-583233, Karnataka

Received : 24.07.2019 ; Revised : 23.08.2019 ; Accepted : 25.08.2019

ABSTRACT

Chilli is a vegetable cum spice crop belonging to the family Solanaceae. The present study attempts to estimate the area under cultivation of chilli in Karnataka and to estimate the demand for chilli seedlings during 2019-20. The primary data on investment pattern of nursery under shade net condition, cost-returns and marketing of chilli seedlings were collected from 30 nursery entrepreneurs randomly from major growing districts of Karnataka with pre tested questionnaire. This study also tried to work out economic feasibility for investment of nursery in shade net condition. The results of the study indicated that the area under chilli cultivation estimated to be 46757 hectare and the demand for chilli seedlings are 138.53 crores in the state of Karnataka for the agricultural year 2019-20. In this connection, profitability analysis and capital budgeting techniques were employed. The results of the study also indicated that, the nursery entrepreneurs have invested ₹ 490747 towards setting up of nursery in an area of 1000 m^2 under shade net conduction. The economic analysis pointed out that entrepreneurs have realized gross income of ₹ 486810 and net returns of ₹ 139056 per cycle of raising seedlings.The capital investment on chilli nursery was found to be economically viable in terms of Net Present Worth (₹ 263134), Benefit Cost Ratio (1.40) and Internal Rate of Returns (102%).

Keywords: Acreage, chilli, demand, feasible, nursery and profit

India serves as the home of various kinds of vegetables, fruits and holds a vital position in the field of production of fruits and vegetables amidst different countries of the world. The vegetables are the main sources of nutrition and are being consumed by the all class of people *viz*., poor to rich class of people. Chilli (*Capsicum annuum*L.) is one of the most important vegetable cum spice crop of India. Pepper (chilli and sweet) market types prevalent in India can broadly be grouped into the following 4 categories: (i) fresh market (green, red, multi-color whole fruits), (ii) fresh processing (sauce, paste, canning, pickling), (iii) dried spice (whole fruits and powder), and (iv) industrial extracts (paprika oleoresin, capsaicinoids and carotenoids) (Vidyashree *et al*., 2018). Chilli occupies an important place in Indian diet. It is an indispensable item in the kitchen as it is consumed daily as a condiment in one form or the other. Among the spices consumed per head, dried chilli fruits constitute a major share. Karnataka is one of the leading producer states in India.

Production of chilli crop consists of two steps. The first step in is to raise healthy and vigorous seedlings (nursery) and secondly transplanting in to the main field. The nursery is pre-requisite for good quality seedling production. Raising healthy seedlings under good nursery management is an important part of successful vegetable production, especially for tomato, chilli, pepper, eggplant and other crops that are commonly transplanted (Lin *et al.,* 2015). Traditionally these seedlings were produced on the raised beds nurseries. Farmers discontinued this method of nursery due to high incidence of pest and diseases, high mortality and non-uniform growth of seedlings. They have to be protected from adverse temperature, heavy rains, drought, wind and etc. Nowadays due to quality assurance, many nurseries are picking up on an entrepreneurial mode. These nurseries are raised in protected structures due to easy monitoring, uniform growth of seedlings, fewer incidence of pests and diseases and lower rate of mortality (Patil *et al*., 2017) Hence, majority of the farmers cultivating these vegetables are depend on commercial nurseries for healthy and risk free seedlings. The establishment of these nurseries in vegetable growing regions will not only help growers to avail healthy seedlings but also promote entrepreneurial ability among growers as well as nursery men. The area under chilli cultivation is highly volatile due to many reasons. From the research works of many scholars and analysts, it is understood that lack of scientific storage facilities in the market yards, low competitive environment in the market due to large scale market concentration between commission agents and traders, lack of scientific grading facilities in the market yards, poor market information network, and ineffective implementation of Pledge loan scheme are some of the

Email : ashokan.abm@gmail.com

major issues additional to the production issues faced by the farmers and occurrence of viral diseases as well as ravages caused by insect pets are significant ones (Rao and Rao, 2014). Hence, the present study is an attempt to estimate the area under the chilli and forecast the demand of the chilli seedlings in major growing districts for the agricultural year 2019-20 and also to examine economic feasibility to establish commercial nurseries of under shade net condition.

MATERIALS AND METHODS

The present study was taken up in the state of Karnataka as Karnataka is one of the leading producers of chilli. The research was based on both primary and secondary data. The primary data was collected from the owners of the selected nursery entrepreneurs from three major growing districts during the year 2019-20. The secondary data on area were collected from Directorate of Economics and Statistics, Bengaluru.

The demand of chilli seedlings in major growing districts and state as a whole was estimated using Compound Annual Growth Rate (CAGR) in area under this crops and per hectare requirement of seedlings as recommended in package of practice. The CAGR in area was calculated with exponential model. The secondary data on area with respect to major growing districts under chilli was collected from Directorate of Economics and Statistics, Bengaluru from 2010-11 to 2018-19. The method of exponential model and computation of CAGR is detailed below (Sathyendra Kumar and Chandrashekar, 2015).

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

Yt = Area under chilli 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

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

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

The growth in area under chilli for the subsequent year was determined by adding actual area under chilli in the previous year with actual area times compound annual growth rate i.e., Area under chilli in 2019-20 = Area under chilli in 2018-19 + CAGR × (Area under chilli in 2018-19). For instance, the CAGR in area under chilli for Karnataka state was 1.84 percent and the area during preceding year was 45911 hectares. The growth in area for the succeeding year will be 45911 x 0.0184= 843 hectares. Hence, the total area under chilli in the succeeding year will be 45911 +843 = 46754 hectares. The demand forecast of the seedlings is estimated by considering total area in succeeding year and seedlings requirement per hectare as recommended in the package of practice, UHS, Bagalkot (29,630 seedlings hectare^{-1} at spacing of 0.75×0.45m).

In order to meet the total demand of seedlings, nurserymen are employing modern techniques of raising seedlings are essential. In this regard, attempts were made to examine whether investment on nurseries enterprise is economically feasible or not using project evaluation technique. Hence, the primary data were collected randomly (simple random sampling) with the help of pre-tested questionnaire on investment pattern, cost-returns structure and constraints in raising chilli seedlings under shade net condition from sample of 30 nurseries from Belagavi, Koppal and Haveri districts of Karnataka (10 from each of the major growing districts). The feasibility of investment on chilli 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.

Discounted cash flow measures

Net present value

The Net Present Value represents the discounted value of the net cash inflows to the project. In the present study, a discount factor of 12 per cent was used to discount the net cash inflows representing the opportunity cost of capital. The project would be considered viable, if NPV is positive. It can be represented by

$$NPV = \sum_{i=1}^{n} Yi\ (1+r)^{-i} - I$$

Where,

Yi = Net cash at the end of the year "i"

r = discount rate (12%)

i = time period (i=1, 2, 3 … 8 years)

I- Initial investment

Benefit-Cost ratio

It is the ratio between the discounted cash inflows and discounted cash outflows and the ratio must be unity or more for an investment to be considered worthwhile. The benefit cost ratio (BCR) was worked out by using the following formula. The project would be considered viable, if project leaves is positive BCR.

$$BCR = \sum_{i=1}^{n} Yi\ (1+r)^{-i} / I$$

Where,
Yi = Net cash at the end of the year "i"
r = discount rate (12%)
i = time period (i=1, 2, 3 … 8 years)
I- Initial investment

Internal rate of return

The rate at which the NPV of project is equal to zero is nothing but Internal Rate of Return (IRR). The net cash inflows were discounted to determine the present worth following the interpolation technique as mentioned under;

Internal Rate of Return (IRR)= LDR + (HDR-LDR)X

$$\left(\frac{\text{NPW at LDR}}{\text{NPW at LDR} + \text{NPW at HDR}}\right)$$

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

The Pay Back Period (PBP) is the duration of time in years taken to liquidate the investment. The payback period was estimated by summing up all the undiscounted net benefits over the years to make up the initial investment incurred for establishment.

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

RESULTS AND DISCUSSION

The CAGR of area under chilli during the study period was worked out separately for major growing districts and state as well and depicted in the table 1. The Karnataka as a one of the leading producer of chilli registered 1.84 per cent of growth rate per annum during the study period. All the major growing districts of Karnataka state have shown similar increased and significant trend of growth rate during the study period except Kolar district i.e., -2.36 per cent per annum. Incidentally Kolar district is the district where chilli extremely cultivated. Farmer of this region gradually reduced the area under chilli as problem of scarcity of water and volatility in the prices. The positive and considerable growth rates were observed in other districts *viz.*, Bidar (20.46 %), Haveri (10.65 %), Chikkaballapura (9.26 %) and Belagavi (5.32 %) as the underground water availability of these distracts are considerably high and hence supply of irrigation water is not a problem. This study is in line with study conducted by (Sathyendra Kumar and Chandrashekar, 2015).

Based on the estimation of growth rates in area under chilli, incremental area in the subsequent year 2019-20 were also estimated for major growing districts and for the state too. Increased area under chilli was noticed in all the districts except Kolar (-138.97 hectares) as reflected in CAGR. The total area of chilli in Karnataka as a whole is going to increase to the tune of 843 hectare. Bidar district witnessed highest increased area to the tune of 734 hectare which is followed by Haveri, Belagavi and Chikkaballapura districts to the tune of 406, 405 and 236 hectares respectively.

Incremental increased / decreased in the area during the subsequent year (2019-20) were added to the area of the proceeding area (2018-19). Using this estimated area, the potential demand for chilli seedling in major growing districts and state as whole were worked out by considering per hectare requirement of seedling as recommended in the package of practice (Anono., 2014). Accordingly, seedling requirement in Karnataka for an estimated area of 46754 hectare were 138.53 crores. The estimated demand for seedling was found to be highest in Belagavi (23.74 crores) followed by Kolar (17.05 crores), Bidar (12.80 crores), Haveri (12.49 crores) and Chikkaballapura (8.25 crores) for the next year 2019-20.

In order to meet the massive demand of chilli seedlings, establishment of profitable nurseries on entrepreneurship mode is unavoidable to facilitate scientific cultivation of chilli. Hence, there is an immense prospective entrepreneurship in nursery activities.

Table 1: Estimated demand for chilli seedlings in Karnataka

Districts	Area under chilli in 2018-19 (ha)	CAGR in area from 2010-11 to 2018-19 (%)	Increase / decrease in area during 2019-20 (ha)	Estimated area in 2019-20 (ha)	Estimated demand for chilli seedlings (Crores)
Belagavi	7609	5.32	405	8014	23.74
Kolar	5895	-2.36	-139	5756	17.05
Haveri	3809	10.65	406	4215	12.49
Bidar	3586	20.46	734	4320	12.80
Chikballapura	2549	9.26	236	2785	8.25
Karnataka total	**45911**	**1.84**	**843**	**46754**	**138.53**

Table 2: Investment structure on chilli nursery in shade net condition (1000 m^2 $annum^{-1}$)

Sl. No.	Particulars	Quantity (No.)	Rate (₹)	Value (₹)	Share (%)
1	Borewell		24678	5.03	
2	Irrigation pumpset			47093	9.60
3	Shade net structure			290345	59.16
4	Construction charges			119527	24.36
5	rose cans/ hose pipe	4	395	1580	0.32
6	Knapsack sprayers	1	2745	2745	0.56
7	Baskets	6	368	2208	0.45
8	Spade	2	328	656	0.13
9	Pickaxes	3	275	825	0.17
10	Sickles	5	218	1090	0.22
11	Total Investment			490747	100.00
12	Subsidized amount			245374	
13	Net Investment		245374		

Table 3: Cost and returns of chilli seedling production under shade net condition (1000 m^2 $annum^{-1}$)

Sl. No.	Particulars	Quantity (No.)	Rate / unit (₹)	Value (₹)	Share (%)
I. Variable cost (A)					
1	Chilli seed (kg)	1523 gm	78/gm	118794	42.47
2	Protrays with 98 cells (no.)	5409	9 / tray	48681	17.41
3	Coco peat (kg)	2598	7.5	19485	6.97
4	Fertilizers (kg)	12	245	2940	1.05
5	PPCs (kg)	16	567	9072	3.24
6	Men labour (family + hired) (mds)	120	250	30000	10.73
7	Women labour (mds)	150	200	30000	10.73
8	Interest on working capital (8%) (₹)			20718	7.41
9	Total variable cost (A)			279690	100.00
II. Fixed cost (B)					
10	Rental value of land (₹)		30000	30000	44.08
11	Land revenue (₹)		100	100	0.15
12	Depreciation on tank, pipe, pump set, pumphouse, sprayer, including shade net etc (Apportioned establishment cost = Establishment cost/8 years life)			30672	45.06
13	Interest on FC (12 %) (₹)			7293	10.71
14	Total fixed cost (B)			68064	100.00
15	Total cost (A+B) =C			347754	
Returns					
16	Chilli seedlings trays (no.)	5409	90	486810	100.00
17	Gross Income (D)			486810	100.00
18	Net income = D-C (₹)			139056	
19	Cost per seedling (₹)			0.66	
20	Profit per seedling (₹)			0.26	

Table 4: Economic feasibility of investment on chilli nursery in shade net condition

Discounted & Undiscounted criterion	Magnitude
Net Present Value (NPV) @ 12%	263134
Benefit-Cost Ratio (BCR)	1.40
Internal rate of Returns (IRR)	102 %
Pay Back Period (PBP)	1.76 years

Table 5: Problems faced by chilli nursery entrepreneurs (n=30)

Sl. No.	Particulars	No. of nursery entrepreneurs	percentage
1	Water scarcity	14	46.67
2	Labour availability	25	83.33
3	Mortality of seedling	10	33.33
4	Sale of seedlings	10	33.33
5	Lack of technical guidance	4	13.33
6	Lack of credit facility	19	63.33
7	Competition among nurseries	20	66.67
8	Pest and Disease incidence	11	36.67

Establishment cost of shade net house

The establishment cost on marketable nursery of chilli seedlings under shade net house condition given in table 2. The whole structure includes investment on shade net, irrigation pump set, digging bore well & motor, construction charges, irrigation facilities and other minor assets. The total capital requirement on commercial chilli nursery activity of 1000 m^2 capable of raising 5409 trays (98 seedlings/portray) was ₹ 490747. The Shade net structure alone constituted 59.16 per cent (₹ 290345) of the total investment followed by construction charges sharing 24.36 per cent (₹ 119527) of total investment. Investment on irrigation facilities was 47093 accounting 9.60 per percent of total investment. It is necessary to supply water to portrays on daily basis during nursery rising. The nurseries depend on bore well for irrigation purpose. The cost of digging bore well constituted ₹ 24678 (5.03%) of the total initial investment. The investment on other miscellaneous accounted around ₹ 9104 (1.86%). Thus, total investment on establishment of chilli nursery under shade net structure was ₹ 490747. The Department of Horticulture, Government of Karnataka (www.horticulture.kar.nic.in) provides 50 per cent subsidy which accounts to ₹ 245374. Hence, the net investments made by entrepreneur in establishing profitable chilli nursery were ₹ 245374. The apportioned depreciation cost was worked out to be ₹ 30672 per year as the economic life of the shade net and other equipments and implements taken eight years.

Economics of chilli seedlings under shade net

The economics of commercial nursery of chilli under shade net condition is depicted in table 3. The shade net structure installed on 1000 m^2 land could accommodate 5409 seedlings. The total cost of raising nursery seedling on 1000 m^2 worked out to ₹ 347754. The variable cost constituted ₹ 279690 (80.43 %) and rest was accounted for fixed cost i.e., 19.57 per cent. The major variable cost was cost of seeds (₹ 118794), followed by protrays (₹ 48681), labour cost for both men and women (₹ 60,000) and coco peat (₹ 19485). Among fixed costs, depreciation (apportioned establishment cost) on tank, pipe, pump set, pump house, sprayer, including shade net etc was accounted ₹ 30672 and interest on fixed capital was worked out at the rate of 12 per cent on investment made by the entrepreneur on commercial chilli nurseries i.e., ₹ 7293. The rental value of land was accounted 44.08 per cent of total fixed cost (₹ 30000 per year). The gross return from sale of 5409 trays of chilli seedlings at the rate of ₹ 90 per tray was accounted ₹ 486810 (considering family labour). The net returns obtained were worked out was ₹ 139056. The average cost per seedling worked out to be ₹ 0.66 and net returns per seedling came to ₹ 0.26. 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 seedling.

Economic viability of investment chilli nurseryentreprise

To evaluate the practicability of investment in chilli 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 chilli seedlings requires vast investment of 4.90 lakhs. Whether the investment on commercial nursery is remunerate 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 chilli nursery enterprise under shade net condition generated wealth of ₹ 263134 over its life period duly accounted for inflation. Positive NPW indicated the economic viability of investment in chilli nursery. Another measure used to judge the viability of investment on project was B:C Ratio which was 1.40 indicating that project generates a returns of ₹ 1.40 for every rupee of investment. Similar findings were reported by Ashoka *et al.* (2017) for investment in jasmine garden.

The value of IRR generally depends on the magnitude of returns realized in each year over the economic life period and more particularly in the initial years of chilli nursery enterprise. It may be noted here that, the IRR was found to be very high (102%), 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 1.76 years. This clearly indicated that it would take less than two years to recover the entire investment. This clearly indicated that a shorter period of less than two year would be required to get back the initial 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 chilli seedlings

Organized marketing mechanism of chilli seedling is lacking. The only one marketing channel is existing for marketing of chilli seedling is nursery entrepreneur → chilli grower.

Problems in raising and marketing of chilli 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 chilli seedling and the results were presented in table 5. From the table, it could be observed that, the 86 per cent of entrepreneurs have expressed scarcity of labour during peak operation as major problem. Tough competition from other nurseries was found to be second major problems which were expressed by 66.67 per cent of the entrepreneurs. The other problems were lack of credit facility to the tune of 63.33 per cent, water scarcity (46.67%), pest & disease incidence (36.67%), mortality of seedling (33.33%) and difficulty in sale of seedlings (33.33%) as chilli seedlings have time bound demand.

The demand for chilli seedlings were highly dependent on market price prevailing in the previous year. Nowadays, chilli farmers prefer the seedling from nurseries rather than raising on their own because of healthy, uniformity and vigor seedling. The time period require to raise the seedling takes 20-25 days. If 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 economically viable as indicated by net profit per seedling (₹ 0.26) and it is also supported by capital budgeting techniques i.e., positive net worth, comfortable B:C ratio and more IRR (102%). Thus, chilli seedling production under shade net condition was found to be profitable activity gaining interest of eventual entrepreneurs.

ACKNOWLEDGEMENT

The authors thank and acknowledge owners of nurseries for sharing their data on investment, cost and returns structure and experience.

REFERENCES

Anonymous, 2014, Package of practice for vegetable crops, University of Horticultural Sciences, Bagalkot, Karnataka, India.

Ashoka, N., Shrinivasulu, G.B., Anupama, G., Harshavardhan, M. and Kattimani, K.N. 2017. Economic Analysis of Production and Marketing of Jasmine in Hyderabad-Karnataka Region: A Case in Koppal District. India. *Int. J. Curr. Microbiol. App. Sci*., **6**(9): 1702-1711.

Lin, L J G C Luther P Hanson (2015): "Raising healthy tomato seedlings". *AVRDC-The World Vegetable Center publication.* pp.15-795.

Linganagouda and Mahajanashetti, S.M. 2016. Economic analysis of vegetable production under hi-tech and field condition. *J. Farm Sci.*,**29**(1): 45-49.

Murthy, D.S., Prabhakar, B.S., Hebbar, S.S., Srinivas,V. and Prabhakar, M. 2009. Economic feasibility of vegetable production under polyhouse: A case study of capsicum and tomato. *J. Hort. Sci.,* **4** :148-152.

Patil, K.R., Adivappar, N., Chinnappa, B. and Manjunatha, G.R. 2017. Economic analysis of commercial tomato nurseries. *J. Crop and Weed.*,**13**(1):137-141.

Rao, V.C. and Rao, G.V.K. 2014. An insight into chilli cultivation and risk management procedures with special reference to Karnataka & Andhrapradesh. *Int. J. Business Admin. Res. Rev.*, **2**(3): 114-154.

Sathyendra Kumar, A.D. and Chandrashekar, H.M. 2015. Production performance of selected horticultural commodities in Karnataka. *Int. J. Mang. Res. Rev*., **5**: 669-675.

Vidyashree, A.B., Allolli, T.B., Ravi, Y. and Mulge, R. 2018. Genetic Variability Studies in Byadagi Chilli (*Capsicum annuum* L.). *Int. J. Pure App. Biosci.*,**6**(5): 1120-1125.