RESEARCH ARTICLE

Techno-Economic Analysis of Vegetable Production under Protected Cultivation in Kolar district of Karnataka

N. Harisha[1*], J. Tulsiram [2] and Amritha T. Joshi[3]

10.18805/ag.D-4930

Abstract

Vegetable cultivation is an excellent business in India. However, it is difficult to judge how they are safe for human consumption as farmers spray a large amount of pesticides, which not only increases the cost of cultivation but also leaves residual toxicity in vegetables. To address these challenges, protected cultivation technology, i.e., poly house, shade net, micro tunnel etc., have been globally accepted in the horticultural sector and there is a scope for the economic viability of tomato and capsicum under shade net for profitable agriculture. The present study was conducted during 2016-17 to analyze the economic viability of vegetable production under protected cultivation the Kolar, Malur, and Mulbagal taluks of Kolar district of Karnataka by involving 80 vegetable growers. The viability of Investment in the Shade net for cultivation of capsicum and tomato were analyzed by using project analysis parameters such as net present value (NPV), benefit-cost ratio (BCR), internal rate of return (IRR) and payback period (PBP). The cash flow analysis was calculated based on estimated expenditure and returns for both capsicum and tomato crops over the 15 years for analyzing the economic viability. The study highlighted that Investment on shade net for capsicum (BCR = 1.69:1) cultivation is more profitable than tomato (BCR = 1.48:1). The fixed costs for the cultivation of both the crops capsicum and tomato under shade net were found to be same. The labor cost for capsicum (Rs.59, 493) cultivation was nearly equal to tomato (Rs.59,181) cultivation under shade net in a one-acre area. The variation in gross income and net income of both the crops was mainly due to a stable price in the market for capsicum as compared to tomato. Finally concluded that capsicum crop is more economical than tomato under shade net, which creates a pathway for continues profitability as well as the sustainability of agriculture.

Keywords: Capsicum, Profitability, Shade net, Sustainability

Agricultural Science Digest (2019)

Introduction

Vegetable cultivation is an awesome business in India, but under open field conditions by following traditional cultivation practices it is difficult to manage various abiotic and biotic stresses. These stresses not only reduce productivity levels but they are also responsible for poor quality produce specifically during rainy and post-rainy season. Mostly to manage biotic stresses farmers spray large quantity of different chemicals, this not only increases the cost of cultivation but it also leaves residual toxicity in the freshly produced vegetables, which is ultimately hazardous to human health. To address these challenges protected cultivation technology i.e., polyhouse, shade net, micro tunnel etc., which have been globally accepted for achieving sustainability in horticultural sector. Even though the application of chemicals for controlling biotic stresses is also low under protected structures which gives a high quality safe vegetables for human consumption. (Singh and Gupta, 2011)

At present, about 115 countries in the world are practising protected vegetable production commercially. Nearly 6, 23,302 ha is under protected cultivation, while total estimated world protected vegetable production area is 4,02,981ha. In the total world protected vegetable growing area, soilless/ hydroponic culture systems account for 95, 000 ha. In the World, China has the highest area (2,760,000 ha) under protected cultivation followed by Korea (57,444 ha), Spain (52,170 ha) and Japan (49,049 ha). India has 25,000 ha of area under protected cultivation. (Chandan and Singh, 2015)

[1]Department of Agricultural Extension, Agricultural College, Bapatla-522101

[2]Dean PG studies, University of Agricultural Sciences, Raichur-584102

[3]Department of Agricultural Economics, College of Agriculture, Raichur.

Corresponding Author: Harisha N., Department of Agricultural Extension, Agricultural College, Bapatla-522101, Email: harishnmuni@ gmail.com

How to cite this article: Harisha, N., Tulsiram, J. and Amritha T. Joshi (2019). Techno-Economic Analysis of Vegetable Production under Protected Cultivation in Kolar district of Karnataka. Agricultural Science Digest, 39(3): 224-227

Source of support: Nil

Conflict of interest: None

Submitted: 16-04-2019 **Accepted:** 20-07-2019 **Published:** 05-10-2019

In Karnataka, Kolar district though termed as a backward industrial district, has made considerable progress in the horticultural sector. The district comprises of five taluks namely, Bangarpet, Kolar, Malur, Mulbagal, and Srinivasapura. The total horticulture area is 1,06,262 hectares which comprises of 46.07% of the total cultivable area of district. It has great potential for vegetable cultivation due to its proximity to metropolitan city Bangaluru since it provides an international market for vegetables. Demand is always high due to higher population density in urban area and

high income of the people residing in these areas. The district has greater scope for protected cultivation due to scarcity of water resources. Shade nets are the major protected cultivation structures constructed in district.(www.kolardistrict at a glance.kar.nic.in)

The vegetables such as capsicum and tomato are the major crops cultivating under shade nets. Protected structures need huge investment while bank loan is the major source of finance for the cultivation of crops. There is a scope for economic analysis of protected cultivation structures and crops for the sustainability of farmer's economic conditions.

Materials and Methods

The study was undertaken during the year 2016-17 in the selected three taluks of Kolar district of Karnataka state. Based on a maximum number of shade net structures under protected cultivation, Kolar, Malur and Mulbagal taluks were selected for the study. From each taluk respondents were 32, 28, and 20 selected by using purposive sampling procedure to constitute a sample size of 80 for the study. Majority of the farmers are growing capsicum and tomato under protected cultivation (Shade net). The viability of investment in the Shade net for the cultivation of capsicum and tomato were analyzed by using project analysis parameters such as (NPV), BCR, IRR and PBP. The Cash flow analysis was calculated based on estimated expenditure and returns for both capsicum and tomato crops over the 15 years for analyzing the economic viability.

The project appraisal techniques such as NPV, IRR, BC ratio and PBP were calculated by using the following formulas

Net Present Value (NPV)

Net present value (NPV) is a popular measure of profitability used for assessing a given project's potential return on investment (ROI). Because of the time value of the money, NPV takes into account the compounding of the discount rate throughout the project. The NPV is the present value of an investment's expected cash inflows minus the costs of acquiring the Investment. It is calculated by using the following formulae

$$NPV = R \times \frac{1-(1+i)^{-n}}{I} - \text{Initial investment}$$

- *When cash inflows are even:*

  Where,

$$NPV = \left[\frac{R_1}{(1+i)^1} + \frac{R_2}{(1+i)^2} + \frac{R_3}{(1+i)^3} + \ldots.\right] - \text{Initial investment}$$

  R = Net cash inflow expected to be received in each period

  i = Required rate of return per period

  n = Number of periods during which the project is expected to operate and generate cash inflows.

- *When cash inflows are uneven:*

  Where,

  i = target rate of return per period;

  R1 = net cash inflow during the first period;

  R2 = net cash inflow during the second period;

  R3 = net cash inflow during the third period, and so on.

In any projects, accept a project only if its NPV is positive, reject it if its NPV is negative and stay indifferent between accepting or rejecting if NPV is zero.

Internal Rate of Return (IRR)

The IRR is the discount rate at which the net present value (NPV) of future cash flows from an investment is equal to zero. Functionally, the IRR is used by investors and businesses to find out if an investment is a good use of their money. It can

$$NPV = \left[\frac{R_1}{(1+i)^1} + \frac{R_2}{(1+i)^2} + \frac{R_3}{(1+i)^3} + \ldots.\right] - \text{Initial investment}$$

be calculated by using the following formula

Where,

R_1 and R_2 are the randomly selected discount rates

NPV_1 and NPV_2 are the higher and lower net present values, respectively.

Benefit-Cost ratio (BCR)

The BCR is calculated by dividing the total discounted value of the benefits by the total discounted value of the costs. If a project has a BCR > 1, it indicates that the NPV of the project benefits outweighs the NPV of the costs. Therefore, the project should be considered if the value is significantly greater than 1. If the BCR = 1, the ratio indicates that the NPV of expected profits equals the costs. If a project's BCR is less than 1, the project's costs outweigh the benefits, and it should not be considered.

Results and Discussion

Estimation of cost and returns of protected cultivation (Shade net)

- *Cash flow analysis of protected cultivation of capsicum under Shade net during its economic life period (one acre)*

The viability of Investment in the shade net for the advancement of capsicum was analyzed by using project analysis parameters such as NPV, BCR, IRR and PBP. The cash flow analysis was calculated based on estimated expenditure and returns for both capsicum and tomato crops over the 15 years for analyzing the economic viability.

It could be observed from the Table 1, the net present value of the capsicum (Rs. 29,18,455/-) being positive, the BCR (1.69: 1) being more than one and the internal rate of return (22.25%) is more than its opportunity cost/interest rate and PBP is 2 years. The present investment in Shade net for the cultivation of capsicum is economically viable because of capsicum having high foreign demand as well as domestic

Table 1: Cash flow analysis of protected cultivation of capsicum under shade net during its economic life period (One acre)

Year	*Cash outflow*	*Cash inflow*	*Net cash flow*	*Discounted cash outflow @12%*	*Discounted cash inflow @12%*	*Discounted net cashflow @12%*
1	1873490	979700	-893790	1873490	979700	-893790
2	345420	990750	645330	308411	884598	576188
3	364280	997520	633240	290402	795217	504815
4	371560	1030410	658850	264469	733425	468956
5	510450	1042160	531710	324400	662312	337911
6	375850	1059420	683570	213267	601143	387876
7	385260	1078243	692983	195185	546271	351087
8	388170	1085496	697326	175588	491023	315435
9	395280	1091100	695820	159647	440677	281030
10	520560	1150463	629903	187719	414868	227149
11	398250	1168412	770162	83739	245680	161941
12	410000	1178950	768950	50268	144546	94277
13	425120	1212418	787298	30392	86676	56284
14	429450	1235687	806237	17902	51510	33608
15	640245	1285645	645400	15562	31249	15687
Total				41,90,441	71,08,896	29,18,455

NPV = discounted cash inflow -Discounted cash outflow @ 12 %	29,18,455
BCR = discounted cash inflow/ Discounted cash outflow @ 12 %	1.69
PBP = no. of years taken for recovering the initial investment	2 years
IRR = lower disc rate+NPV at a lower discount rate/Sum of NPVs at two discount rates)*difference of two discount rates	22.25 %

Table 2: Cash flow analysis of protected cultivation of tomato under Shade net during its economic life period (one acre)

Year	*Cash outflow*	*Cash inflow*	*Net cash flow*	*Discounted cash outflow @12%*	*Discounted cash inflow @12%*	*Discounted net cashflow @12%*
1	1750000	515691	-1234309	1750000	515691	-1234309
2	110428	525183	414755	98596	468913	370317
3	112756	556810	444054	89917	444027	354110
4	120112	575650	455538	85521	409867	324346
5	250186	585415	335229	159048	372160	213112
6	125152	625110	499958	71037	354817	283780
7	131963	640750	508787	66878	324727	257850
8	136456	651258	514802	61745	294690	232945
9	140160	677123	536963	45157	218155	172998
10	280682	679245	398563	64387	155814	91428
11	155140	681456	526316	20200	88729	68529
12	168456	688145	519689	12450	50858	38408
13	180562	695458	514896	6038	23257	17219
14	198452	718751	520299	5926	21461	15536
15	350258	720451	370193	9338	19207	9869
Total				25,46,238	37,62,375	12,16,138

NPV = discounted cash inflow -Discounted cash outflow @ 12 %	12,16,138
BCR = discounted cash inflow/ Discounted cash outflow @ 12 %	1.48
PBP = no. of years taken for recovering the initial Investment	4 years
IRR = lower disc rate + NPV at the lower discount rate/sum of NPVs at two discount rates)*Difference of two discount rates	35.35%

urban demand. The above findings are in the line of results of Singh and Punitha (2012)

- *b. Cash flow analysis of protected cultivation of tomato under Shade net during its economic life period (one acre)*

The cash flow analysis of tomato under shade net are presented in Table 2, the net present value of the capsicum (Rs. 12,16,138) being positive, the benefit-cost ratio (1.48: 1) being more than one and the internal rate of return (35.35 %) is more than its opportunity cost/interest rate and payback period was four years. The present investment in shade net cultivation of tomato-less economically viable than capsicum.

From the above findings concluded that the Investment on shade net for capsicum (BCR = 1.69:1) cultivation is more profitable than tomato (BCR = 1.48:1). The above findings are in the line of results of Lakhwat *et al.* (2015)

Conclusion

In the era of climate change, crop production is the challenge for the farming community, to increase the production as well as productivity of crops and climate-resilient technology called protected cultivation technologies like polyhouse, shade net, micro tunnel, etc., which are capable of producing resource-efficient, exportable quality, the quantity of vegetables. The crops like capsicum are more economical than tomato under shade net by using projective techniques for 15 years. Therefore farmers should try to adopt the shade net technology, which is highly cost-effective, ventilated and can grow all type of crops. Shade nets create a pathway to make agriculture as a profitable sector and better opportunity to smallholders for well socio-economic improvement.

References

Chandan S .A and D. K Singh, (2015), Protected cultivation of vegetables-sustainable vegetable production through of greenhouse cultivation, International Journal of Current Research.7(6): 152-156.

Lekhwat, S. S., Rao, P. S. and Bhakar, S. R., (2015), A case study on Economic Feasibility and Identification of Suitable Crop (Capsicum and Tomato) for Protected Cultivation under Insect Net House in Udaipur District of Rajasthan. The Journal Rural and Agricultural Research, 15 (1):1-4.

Singh. B and Gupta. R.M, (2011), Performance of sweet pepper (Capsicum annum) varieties and economics under protected and open field condition at Uttarakhand, Indian Journal of Agricultural Sciences. 81(10):973-975.

Singh, S. B. and Punitha, P., (2012), Entrepreneurship development through Anthurium flower - A case study of Mizoram, North-East India. Indian Research Journal Extension. Education. 12 (3):74-78.

www.kolardistrict at a glance.kar.nic.in