



ISSN (E): 2277- 7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2022; SP-11(4): 1727-1730  
© 2022 TPI  
[www.thepharmajournal.com](http://www.thepharmajournal.com)  
Received: 19-02-2022  
Accepted: 21-03-2022

**Madhusudan Chaudhary**  
M.Sc. Student, Department of  
Agricultural Economics, Sam  
Higginbottom University of  
Agriculture, Technology and  
Sciences, Prayagraj,  
Uttar Pradesh, India

**Dr. Ramachandra**  
Advisor, Department of  
Agricultural Economics, Sam  
Higginbottom University of  
Agriculture, Technology and  
Sciences, Prayagraj,  
Uttar Pradesh, India

**Corresponding Author**  
**Madhusudan Chaudhary**  
M.Sc. Student, Department of  
Agricultural Economics, Sam  
Higginbottom University of  
Agriculture, Technology and  
Sciences, Prayagraj,  
Uttar Pradesh, India

## Cost of cultivation and farm business basis of litchi production in Muzaffarpur district, Bihar

**Madhusudan Chaudhary and Dr. Ramachandra**

### Abstract

This study is aimed at economic analysis of production and export performance of litchi in Muzaffarpur district of Bihar with specific objectives of determining the production and export trend and estimating the cost of production and farm profitability of litchi in the study area. A total of eight villages in the four sampled block viz., Mushahari, Kanti, Bochaha and Minapur blocks were selected randomly for the study. Altogether 120 litchi grower farmers which were classified in to small, medium, and large farmers, in these 40, 40 and 40 respondents were sampled, respectively. The cost incurred by different farm size groups in various operations of litchi cultivation is analyzed using the primary data. On an average Rs. 56988.80 per hectare were spent on litchi cultivation. The total working capital of small farm size group was highest followed by medium and large group whereas among the different components of cost cultivation Annualized establishment cost accounted for the Overall portion (15.82%) followed by hired human labour (7.92%) and manuring (7.81%). The other major components were Fertilizers (N, P and K), Machinery (Tractor), And through Benefit-cost ratios in litchi cultivation we find that at overall level the benefit costs ratios were 6.50, 4.21 and 4.17 at Cost "A" Cost "B" and Cost "C" respectively. At Cost "A" it was 7.05 for small group followed by 6.39 for large and 6.02 for medium group. The increasing trend was same at Cost "B" and Cost "C". This shows the litchi cultivation was profitable for the entire group. Due to intense cultivation the benefit cost ratio was highest for small (4.54) group at Cost "C" followed by large (4.01) and medium (3.90). The higher benefit cost ratio of large relative to medium despite similar yield was due to economy of scale and greater bargaining power of large grower.

**Keywords:** Litchi, profitability, litchi production, cost, gross return, net profit, benefit cost analysis

### Introduction

Litchi (*Litchi chinensis*) is the important Sub-tropical evergreen fruit crop, belonging to the family Sapindaceae and originated from China 3000 years ago. Litchi reached India from Myanmar by the end of the 17th century and then spread over in many tropical and subtropical areas of the world. It's Homeland, China remains the biggest producer of Litchi. India is the second-largest Litchi producing country in the world besides India it is cultivated extremely in temperature reason of Australia, South America, Thailand, Mauritius and Hongkong etc. Litchi is a popular and delicious fruit of India it cultivated is confirmed to Northern and some North-Eastern states of India. There has been a substantial increase in the area and production of Litchi in India during the last 50 years. The area has increased from 9,400 hectares during (1949-50) to 86,000 (2016-17). The contribution of Litchi to the total area under fruit has increased from 0.75 to nearly 2%.

Litchi has a limited distribution in India particularly in the Indo Gangetic plain from Bengal to Punjab. It has grown in Bihar, Tripura, West Bengal, Uttarakhand, Uttar Pradesh, Punjab, and Haryana of the total production of Litchi in India. 45 per cent contributed by Bihar followed by West Bengal, Jharkhand, Assam, and Chhattisgarh productivity is highest in Punjab which almost double the double to the national average. Bihar is the largest producer and it produces about 80.0 percent of the total litchi production of India. Over 80 percent area under this fruit crop lies in the Muzaffarpur district of Bihar which is now divided into three districts viz. Muzaffarpur, Sitamarhi and Vaishali. It is also successfully grown in the districts of East and West Champaran, Samastipur and Darbhanga. In Bihar, which has the largest area under litchi in India, the total number of litchi cultivars is not less than 33.

The food value of litchi mainly lies in its sugar content which varies from variety to variety. The fruit is also rich in Vitamin B1, Riboflavin & Vitamin C apart from proteins (0.7%), fats (0.3%), carbohydrates (9.4%), minerals (0.7%), fibrous matter (2.25%), calcium (0.21%), phosphorus (0.31%), iron (0.03%) and carotene. Litchi Known for their sweet and flowery flavour, they're typically eaten fresh and sometimes used in ice creams or processed into juice,

wine, sherbet, and jelly.

Muzaffarpur is a prominent district in North Bihar. This district has been the hub for Horticultural commodities, especially in fruits like Litchi, Mango, Guava. Muzaffarpur district is famous for litchi not only in India but also internationally for the Shahi ‘which is grown extensively in this district. The district is the top producer of Litchi in India. The climatic conditions prevailing in various tracts of the district are suitable for communal cultivation of Shahi and China varieties of Litchi. For this crop, black loamy soil is most suitable which has water retention capacity. Also, the Litchi plant sustains well with adequate lime soil and moisture with moderate temperature during summer. Excessive heat wave adversely affects plant flowering and fruit growth.

**Materials and Methods**

The primary source of data collection was door-to-door bench-mark survey. The data for cultivation and production of Litchi were obtained through the pre-tested questionnaire from the litchi cultivators in Muzaffarpur District of Bihar. The secondary data were collected from the records of the publication reports, journals, bulletins, folders, books agriculture department records, block development office, village heads and other relevant sources.

**Tools of analysis**

**1. Cost of production**

Cost of production = Fixed cost + Variable cost

Where,

- a. **Fixed costs:** In agriculture, land in some sense is a fixed capital. The other important items of fixed costs are implements and tools, machinery, farm buildings, work animals’ etc.
- b. **Variable costs:** These costs vary with the production. One can increase or decrease their use. In agriculture, cost of seed, manures and fertilizers, irrigation, labour are the variable costs.

**2. Price spread**

In the marketing of agricultural commodities, the difference of price paid by consumer and price live by the producer for an equivalent quantity of farm produce is called price spread.

Price spread = Pp-Pr

Where,

Pp=Price paid by the consumer

Pf=Price received by the farmer

**3. Production function analysis**

The data were therefore subjected to functional analysis by using the following form of Cobb-Douglas type of production

function.

$$Y = aX_1^{b_1}X_2^{b_2}X_3^{b_3}X_4^{b_4}..... X_n^{b_n} u$$

In this functional form Y“ Is a dependent variable, Xi ‘s are independent variables, ‘a’ is the constant representing intercept of the production function and ‘bi’s are Regression coefficients of the respective resource variable. The sum of regression coefficients i.e.  $\sum$  ‘bi’ indicates the nature of returns to scale.

**4. Selection of input variables**

For fitting production function in respect of litchi crop six inputs were considered. The equation fitted was of the following form

$$Y = aX_1^{b_1}X_2^{b_2}X_3^{b_3}X_4^{b_4}X_5^{b_5}u$$

Where,

Y=Yield in MT/ha.

X1= Age of orchard (yrs.)

X2= No. of trees in an orchard.

X3= Human labour in man equivalent (days/ha.)

X4=Expenses on manure and fertilizers (₹/ha).

X5=Expenses on plant protection (₹/ha).

X6= Expenses on other working capital(₹/ha).

a=Constant.

bi“s=Regression coefficients

U= Error term

The coefficients of independent variables were tested by Students ‘t’ test for their significance and coefficient of determination R<sup>2</sup> was estimated for judging the suitability of variable selected and their Explanatory power.

**5. Estimation of marketing cost**

The marketing cost includes the grading, packaging transportation charge, commission, weight deduction charges, etc. The cost paid by the pre-harvest contractors was considered and analysed.

**Results and Discussion**

Table 1 shows by different breakup of the cost incurred by different farm size groups in various operations of litchi cultivation. On an average Rs. 56988.80 per hectare were spent on litchi cultivation. The total working capital of small farm size group was highest (Rs. 26828.22) followed by medium (Rs. 23643.89) and large (Rs. 21490.56) group whereas among the different components of cost cultivation Annualized establishment cost accounted for the Overall portion (15.82%) followed by hired human labour (7.92%) and manuring (7.81%).

**Table 1:** Per hectare resource use for litchi cultivation in different size groups

S. No.	Particulars	Size of holding			overall
		Small	Medium	Large	
1.	Hired human labour	4668.65 (10.14)	3212.14 (7.53)	2418.08 (6.11)	3433.24 (7.92)
2.	Bullock labour	671.49 (1.45)	162.56 (0.38)	121.03 (0.30)	318.36 (0.71)
3.	Machinery (Tractor)	2034.23 (4.42)	2269.13 (5.31)	2450.92 (6.20)	2251.43 (5.31)
4.	Seedlings	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
5.	Manures	1446.67	4047.18	4282.72	3258.86

		(3.14)	(9.48)	(10.83)	(7.81)
6.	Fertilizers (N, P and K)	2839.13 (6.16)	2197.15 (5.14)	2117.48 (5.35)	2384.59 (5.55)
7	Plant protection	641.54 (1.39)	705.35 (1.65)	619.02 (1.56)	655.3 (1.53)
8.	Irrigation	1728.11 (3.75)	1087.37 (2.54)	479.47 (1.21)	1098.32 (2.50)
9.	Repairs	386.24 (0.83)	428.9 (1.00)	322.77 (0.81)	379.31 (0.88)
10.	Annualized establishment cost	7743.51 (16.82)	6320.32 (14.81)	6261.00 (15.84)	6774.94 (15.82)
11.	Total working capital	26828.22 (58.29)	23643.89 (55.41)	21490.56 (54.39)	23987.55 (56.03)
12.	Interest on working Capital @ 13%	1743.83 (3.78)	1536.85 (3.60)	1396.88 (3.53)	1559.18 (3.63)
13.	Land revenue	35.42 (0.07)	37.64 (0.08)	36.59 (0.09)	36.55 (0.08)
14.	Depreciation	1042.13 (2.26)	2488.88 (5.83)	1940.39 (4.91)	1823.80 (4.33)

The other major components were Fertilizers (N, P and K) (5.55%), Machinery (Tractor) (5.31%), Depreciation (4.33%), Interest on working Capital @ 13% (3.63%), Irrigation (2.50%), Plant protection (1.53%), repairs (0.88%), bullock labour (0.71) and Land revenue (0.08). The cultivation of litchi requires additional labour use for harvesting and cutting, application of irrigation and transplanting/ sowing and as such the share of human labour accounted for the highest share of Rs. 23987.55.

**Income Measures**

The proportional estimates of different costs involved in litchi cultivation for different farm size groups are depicted in Table

2. It is illustrated that the total cost of cultivation, C, (Rs 46017.91/hectare) of litchi was highest in small size group followed by Rs 42663.46 in medium and Rs 39511.22 in large size group farms. In small size farm group the cost A, was Rs 29649.60 per hectare which was highest followed by medium (Rs 27707.26) and low (Rs 24864.42) in large size farm groups. In case of costs of cultivation, costs B, were Rs 44909.42, 42488.30 and Rs 40097.76 respectively in small, medium and large size farm groups. The cost could have increased in small size farm group due to small size of landholdings. Thus, it was observed that the cost decreases as the size of landholding increases and vice versa as reported by Naduvinamani (2007)<sup>[1]</sup>.

**Table 2:** Cost of cultivation (Rs) of litchi on different farm business income has sis of farm size group

S. No.	Particulars	Size of holding			overall
		Small	Medium	Large	
1.	Cost 'A'	29649.60 (57.91)	27707.26 (64.94)	24864.42 (62.93)	27407.09 (61.92)
2.	Cost 'B'	44909.42 (97.59)	42488.30 (99.58)	39453.48 (99.85)	42283.73 (99.00)
3.	Cost 'C'	46017.91 (100)	42663.46 (100)	39511.22 (100)	42730.86 (100)

Comparisons of different farm business incomes from litchi cultivation are presented in Table 3. The returns from litchi cultivation revealed that Cost "C" was highest (Rs. 42730.86) with Rs. 46017.91, Rs. 42663.46 and Rs. 39511.22 of small, medium and large farm size groups respectively in comparison to Cost "A" and Cost "B". Small farm produced highest yield with their respected value 84.47 Q/ha, overall gross value was 178267.55, profit at Cost "A" was higher

with small farm size group i.e. 179393.36 in comparison to Cost "B" and Cost "c". Cost of cultivation i.e., Cost "C", marketing cost, Total cost of Production and Per ha net profit at total cost was highest with small size farm group and their respected values are 46017.91, 68916.53, 114934.44 and 94108.52. Per quintal cost of production was highest in medium size farm group i.e. 1395.61.

**Table 3:** Costs, returns and net returns of litchi (/ha) on different size groups per hectare

S. No.	Particulars	Size of holding			overall
		Small	Medium	Large	
1.	Cost "A"	29649.60	27707.26	24864.42	27407.09
2.	Cost "B"	44909.42	42488.30	39453.48	42283.73
3.	Cost "C"	46017.91	42663.46	39511.22	42730.86
4.	Yield (Q/ha)	84.47	73.59	74.02	75.08
5.	Gross value	209042.96	166798.78	158960.91	178267.55
6.	Profit at				
	Cost "A"	179393.36	139091.52	134096.49	138172.17
	Cost "B"	164133.54	124310.48	119507.43	135983.82
	Cost "C"	163025.05	124135.32	119449.69	135536.69
7.	Cost of cultivation i.e., Cost "C"	46017.91	42663.46	39511.22	42730.86
8.	Marketing cost	68916.53	60039.87	60390.69	63115.69

9.	Total cost of Production (7+8)	114934.44	102703.33	99901.91	105846.56
10.	Per quintal cost of production	1360.65	1395.61	1349.66	1368.64
11.	Per ha net profit at total cost	94108.52	64095.45	59059.00	72420.99

The data given in Table 4 shows Benefit-cost ratios in litchi cultivation. It can be seen from the table that at overall level the benefit costs ratios were 6.50, 4.21 and 4.17 at Cost "A" Cost "B" and Cost "C" respectively. At Cost "A" it was 7.05 for small group followed by 6.39 for large and 6.02 for medium group.

The increasing trend was same at Cost "B" and Cost "C". This shows the litchi cultivation was profitable for the entire group. Due to intense cultivation the benefit cost ratio was highest for small (4.54) group at Cost "C" followed by large (4.01) and medium (3.90). The higher benefit cost ratio of large relative to medium despite similar yield was due to economy of scale and greater bargaining power of large grower.

**Table 4:** Benefit-cost ratios in litchi cultivation

S. No.	Particulars	Size of holding			overall
		Small	Medium	Large	
1.	Cost "A"	7.05	6.02	6.39	6.50
2.	Cost "B"	4.65	3.92	4.02	4.21
3.	Cost "C"	4.54	3.90	4.01	4.17

### Summary

The per hectare yield was highest (84.47 QTLs) in the small group followed by the large (74.02 qtls) and medium (73.59 qtls). At the overall level, the per hectare yield was 75.08 quintals. The average per hectare gross value of litchi was ₹178267.55, and was ₹209042.96, ₹166798.78 and ₹158960.91 to small, medium, and large group respectively. The per quintal cost of production was 1368.64 an overall basis. The per hectare net profit at the total cost was highest to the small group (₹163025.05) and it was ₹135536.69 at overall level. 77.33 per cent variation in the output was jointly explained by the independent variables at the overall level. The production elasticities of the age of the orchard (X1) were significant for small, medium, and overall levels were only non-significant for the large group. The production elasticities of no of trees for small, medium, and large sized holdings were 0.79, 0.76 and 1.01 respectively. The human labour use per hectare (X3) was significant for small, large, and overall levels but non-significant for medium group growers. The factor Expenses on manures and fertilizer per hectare (X4), expenses on plant protection per hectare (X5) and expenses on other working capital (X6) were found significant for medium group only, while the factor expenses on other working capital (X6) was significant on overall level also.

### Conclusion

As the size of holding increased the costs decreased. The Cost "A", Cost "B" and Cost "C" were maximum in the small group followed by medium and large.

### References

1. Naduvinamani R. Economics of red banana production under the contract farming in Karnataka. MSc (Agric) thesis, University of Agricultural Sciences, Dharwad, Karnataka, India, 2007
2. Choubey M, Atteri BR. (Economic evaluation of litchi production in Bihar. Bihar J Agric Mktg. 2000;8:123-31.
3. Gosh SP. Study on attractive export opportunity. The

Hindu Survey of Indian Agriculture, 1995, 118.

4. Arora VPS. Marketing and export of horticultural products of Uttaranchal; Status, Potential and Strategies. Indian Journal of Agricultural Marketing (conf. Spl.), 2005;19(2):194-206.
5. Ashutosh-Nidhi. An analytical study of marketing of litchi (*Litchi chinensis* Sonn.) in Muzaffarpur district (Bihar). Progressive-Horticulture. 1992;24(1/2):26-31.