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### An economic analysis of carrot production in Bulandshahr district of Uttar Pradesh, India

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#### Abstract

The present study was conducted to know the cost of cultivation, different costs and benefit-cost ratio incurred in carrot production in different farm size groups that is marginal, small, medium and large. The research was undertaken in Sikandrabad block of Bulandshahr district of Uttar Pradesh, which was selected purposively on the basis of high production and high number of carrot growers in Sikandrabad block from which 110 growers selected from 7 villages of Sikandrabad block. The cost of cultivation of carrot varied among the size groups. The cost of cultivation incurred in carrot production per hectare was highest in large size growers Rupees 150079.63 and lowest for marginal size growers was Rs. 142277.62. Cost incurred for small and medium size growers was Rs. 144496.84 and 147814.17 per hectare respectively. The cost concepts on different size of farm group per hectare, cost A1 was highest for large size of farms Rs. 115371.03 per hectare followed by medium size farms Rs. 108898.24, small size farms Rs. 103536.13, marginal size farms Rs. 102779.54 per hectare respectively. Cost A2 was highest in large size farms Rs. 137371.03 per hectare and lowest for marginal size farm Rs. 124779.54. Cost B was highest in large size of farm groups Rs. 140677.11 per hectare and lowest in marginal size farms Rs. 127465.47 per hectare. Cost benefit ratio was highest in large size farms 1: 1.81 followed by medium size farms 1: 1.71, small size farms 1:1.69 and lowest in marginal farm size 1: 1.66 respectively. The total yield was highest in large size of farm groups which was 60.5 tonne per hectare and lowest in marginal size of farm groups which was 52.6 tonne per hectare.

**Keywords:** Cost of cultivation, benefit-cost ratio, different costs, yield per tonne, net return

#### Introduction

Carrot (*Dacus carota*) is a crucial root vegetable grown all over the globe in spring, summer season and autumn in temperate place and during wintry weather in tropical and sub-tropical regions. It is a dicotyledonous herbaceous crop, under the family Umbelliferae, which is grown as annual crop for its root. Fresh carrots are firm and crisp, with clean and unblemished skin. Vibrant-orange color shows excessive carotene content material, smaller sorts are the maximum soft (Britannica, T., 2020) [3]. Carrot roots are used as a vegetable for soups, stews, curries and pies, grated roots are used as salad, smooth roots as pickles and Gajar Halwa. the roots as circle and cuts can be dried out. Carrot juice is a wealthy supply of beta carotene that is a herbal pigment that is utilized by body to make nutrition A and it has good amount of fibres (Manglani, 2019) [7]. Due to its high yield per unit area and growing significance as a food source for humans, carrot is an important vegetable. Its orange-yellow colour makes food look prettier on a plate and increases its carotene content, which is a precursor to vitamin A. it is rich in nutrients, including fiber, protein,

carbohydrates, vitamin A, potassium, and sodium (Ahmad *et al.*, 2005) [2].

China ranks first in Carrot production in the world. The area under carrot in India was 119 thousand hectares and its production was 0.213 million tonnes. India ranks 14 in carrot production. (Agriculture statistics at glance 2021-2022) [1].

The carrot production in Uttar Pradesh was 178.97 thousand tonnes which covers 6.88 thousand hectares. Among the districts, the leading carrot producing district is Bulandshahr which produces 0.008 million tonnes covering 1.37 thousand hectares followed by Agra which produces 0.0043 million tonnes and covering 0.7 thousand hectares (department of horticulture and food processing. Uttar Pradesh 2022-2023)

#### Materials and Methods

For this study, multi stage sampling technique was used for the selection of district, block, villages and respondents. A total 110 carrot growers were selected by using a random sampling technique from 7 villages of Sikandrabad block of

Bulandshahr district. The growers were categorised in four different categories according to their land holding size. 1<sup>st</sup> category was marginal growers who have land holding size less than 1 hectare, 2<sup>nd</sup> category was small growers who have land holding size between 1-to-2-hectare, 3<sup>rd</sup> category was medium growers who have land holding size between 2 to 10 hectare and 4<sup>th</sup> category was large growers who have land holding size more than 10 hectare. A well-structured and field pre tested interviewing schedule was used for the collection of details related to carrot growers on various aspects of carrot production. In survey data information included was socio-economic profiles of growers, activities involved in carrot production. For economic analysis, benefit cost was used to estimate profitability of carrot farmers. Cost of carrot cultivation was calculated by incorporating all costs such as land preparation costs, different farm operation cost, fertilizers and manures costs, weeding cost, irrigation cost, plant protection cost, harvesting cost, while the secondary data were collected by reviewing various published and unpublished sources as related journal, books and reports

The total cost cultivation calculated by adding total fixed

cost and total variable cost.

The Gross return calculated by multiplying total yield produce per hectare and price received by farmers. The Net return received by carrot growers was estimated by subtracting total cost of cultivation from the gross return.

Benefit-Cost ratio was calculated to estimate the return on per rupee investment through the division of revenues to the total cost. Benefit-Cost ratio = gross return/ total cost of cultivation.

## Results and Discussion

### Detail description of the cultivated land holdings in different sizes of farms

The table 1 revealed that the number of carrot growers in different farm size groups were marginal (43), small (27), medium (28) and large (12) respectively. Altogether 110 farms group were selected for study. Average size of the cultivated holding per hectare for marginal size farms was 0.61 hectare followed by 1.51 hectare for small size farms and 6.73 ha for medium size farms group and for large size of farms groups was 12.75 which constituted on sample average of 5.4 ha respectively.

**Table 1:** Detail description of the cultivated land holdings in different sizes of farms

Sl. No.	Particulars	Size of Farms Group				Sample Average
		Marginal	Small	Medium	Large	
1	Size of Farms group (in no.)	43	27	28	12	27.5
2	Average land holding(ha)	0.61	1.51	6.73	12.75	5.4

(Total number of respondents = 110)

### Distribution of respondents based on their age

The composition of respondents based on their age is indicated in table no. 2: 70 respondents belong to age category of 36-60 years which was highest followed by age category 61 years and above (28 respondents) and age category 18-35 has less no. of respondents which was 12.

**Table 2:** Distribution of respondents based on their age

S. No.	Age Categories	Marginal	Small	Medium	Large	Total
1	18-35	3	4	3	2	12
2	36-60 years	26	16	21	7	70
3	61 years and above	14	7	4	3	28
Total		43	27	28	12	110

### Economics of carrot cultivation (Rs/ha.)

The table 3 reveals that among different size of farms, total cost incurred by the large farms were high (Rs.157009.63/ha) as compared to medium, small and marginal size farms (Rs.147814.17/ha, 144496.84 and Rs.142277.62/ha). Sample average for total cost was Rs.146167.10/ha in different size of farms group.

The cost of human labour for labour-intensive works like harvesting and weeding, as well as the cost of human labour for labour-intensive works like land preparation and intercultural activities, accounted for the majority of variable costs. These costs included labour costs for

humans, fertilizers, and seeds. The operational cost distribution pattern input showed that cost of hired human labour was highest in large size farms (Rs.45664.2 /ha), as compared to medium size farms (Rs.39190.7/ha), marginal (35947.7/ha) and lowest small size farms (Rs.35462.5/ha). Machinery cost was Rs.4059.3/ha in marginal size farms and for small size farms was Rs 4031.48/ha for medium size farms Rs 3985.71/ha and large size farms Rs 3575. The cost of seeds was highest in small size farms (Rs.36435/ha), as compared to medium size farms (Rs.36404/ha) and lowest in large size farms (Rs.35792/ha). As carrot would respond well with chemical fertilizer so the cost of farm yard manure used was ranged from Rs.4983/ha in large size farms, Rs.4805/ha in medium size farms, Rs.3741/ha in small size farms and Rs.33086/ha in marginal size farms. Whereas, the expenditure on fertilizers was highest in large size farms (Rs.4585.83/ha), as compared to small size farm (Rs.4562.59/ha) and medium size farms (Rs.4554.28/ha) and lowest in marginal size farms (4483.25/ha) respectively. Sample average for depreciation on fixed resources Was Rs.2525.78/ha, Interest on working capital Rs.7786.69/ha, and interest on fixed capital was Rs.2949.53, average family labour charges for different size of farms group is Rs.13571.33

The cost of rental value of own land was 22000 per season for all farm size groups.

**Table 3:** Different Costs incurred in carrot crop per hectare in different size of farm groups. Number of respondents = 110 (Value in rupees)

SI. No.	Particulars of farm operation	Size of farms groups				Sample average
		Marginal	Small	Medium	Large	
1	Hired Human Labour	35947.7 (25.27)	35462.5 (24.54)	39190.7 (26.51)	45664.2 (30.42)	39066.275 (27.57)
2	Machinery charge	4059.3 (2.85)	4031.48 (2.79)	3985.71 (2.69)	3575 (2.34)	3912.87 (2.76)
3	Cost of seed	36435 (25.60)	36607 (25.33)	36404 (24.62)	35792 (23.84)	36309.5 (25.63)
4	Cost of farm yard manure	3086 (2.170)	3741 (2.59)	4805 (3.25)	4983 (3.32)	4153.75 (2.84)
5	Cost of Fertilizers	4483.25 (3.15)	4562.59 (3.15)	4554.28 (3.1)	4585.83 (3.05)	4546.48 (3.11)
6	Cost of Irrigation	4827.9 (3.39)	4861.11 (3.36)	4925 (3.33)	4950.83 (3.29)	4891.21 (3.34)
7	Cost of Plant Protection Charge	4208.13 (2.96)	4342.22 (3)	4625 (3.12)	4639.16 (3.1)	4453.62 (3.04)
8	Interest on working Capital @8%	7443.77 (5.23)	7488.65 (5.18)	7879.17 (5.33)	8335.2 (5.55)	7786.69 (5.32)
9	Depreciation on fixed capital	2288.55 (1.61)	2439.33 (1.69)	2529.42 (1.71)	2845.83 (1.89)	2525.78 (1.72)
10	Land Revenue paid to gov.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
11	Rental Value of owned land	22000 (15.46)	22000 (15.22)	22000 (14.88)	22000 (14.65)	22000 (15.05)
12	Interest on Fixed capital@11%	2685.93 (1.88)	2890.22 (2.0)	2915.89 (1.98)	3306.08 (2.20)	2949.53 (2.01)
13	Family Labour Charges	14812.09 (10.41)	16070.74 (11.13)	14000 (9.48)	9402.5 (6.26)	13571.33 (9.28)
14	Total Cost of Cultivation	142277.62 (100)	144496.84 (100)	147814.17 (100)	150079.63 (100)	146167.10 (100)

#### Different cost concept in carrot crop per hectare in different size of farm groups

Table 4 reveals that cost concepts on different size of farms group per hectare. Cost A1, was highest in large size farms (Rs. 115371.03/ha) followed by medium size farms (Rs.108898.24/ha), small size farms (Rs.103536.13) and marginal size farms (Rs.102779.54/ha) respectively. Cost A2 in marginal, small, medium and large size of farms group was Rs.124779.54/ha, Rs.125536.13/ha Rs.130889.24/ha and Rs.137371.03/ha respectively. Cost B

was highest in large size farms (Rs.140677.11/ha) and lowest in marginal size farms (Rs.127465.47/ha) as compared to medium size farms (Rs.,133814.13/ha) respectively. Cost C was highest in large size farms (Rs.150079.6/ha) and lowest in marginal size farms (Rs.142277.6/ha) as compared to small size farms (Rs.144496.8/ha) respectively. Sample average for Cost A1, A2, Cost B and Cost C was Rs. 107646.23/ha, Rs.129643.99/ha, Rs.132595.76 and Rs.146167.05/ha in different size of farms group.

**Table 4:** Cost concept in carrot crop per hectare in different size of farm groups. Number of Respondents = 110

SI. No.	Cost Concepts	Size of Farm groups				Sample Average
		Marginal	Small	Medium	Large	
1	Cost A1	102779.54	103536.13	108898.24	115371.03	107646.23
2	Cost A2	124779.54	125536.13	130889.24	137371.03	129643.99
3	Cost B	127465.47	128426.35	133814.13	140677.11	132595.76
4	Cost C	142277.6	144496.8	142277.6	150079.6	146167.05

#### Measures of farm profitability in carrot crop per hectare in different size of farms groups

Table 5 reveals that cost and returns in carrot cultivation in different size of farms group. Among different size of farms groups, the total cost of cultivation incurred by the large farms were high (Rs. 150079.6/ha) as compared to medium (Rs. 147814.2/ha), small (Rs. 144496.8/ha) and marginal farms (Rs. 142277.6/ha). Sample average for total cost of cultivation was Rs.146167.06/ha in different size of farms group. Yield is less in marginal size farms is 52.6t/ha, as compared to small 54.5t/ha medium 56.3/ha and large size farms group is 60.5t/ha. Sample average for Yield is

55.97t/ha. The gross returns obtained per hectare by large size farms were high (Rs.272250/ha) as compared to medium size farms (Rs.253350/ha), small size farms (Rs.245250/ha) and marginal size farms (Rs.236700)/ha respectively. The net returns per hectare obtained by large size farms were (Rs.122170/ha) as compared to medium size farms (Rs.105536/ha), small size farms (Rs. 100753/ha) and marginal size farms (Rs. 94422.4/ha) respectively. Input output ratio was highest in large size farms (1:1.81) followed by medium size farms (1:1.71), small size farms (1:1.69) and lowest in marginal size farms group (1:1.66).

**Table 5:** Measures of farm profitability in carrot crop per hectare in different size of farms groups.

Sl. No.	Particulars	Size of farm groups				Sample Average
		Marginal	Small	Medium	Large	
1	Total Cost of Cultivation (Rs/ha)	142277.6	144497	147814	150080	146167.15
2	Yield (tonne/ha)	52.6	54.5	56.3	60.5	55.97
3	Cost of Production (Rs/tonne)	2704.89	2651.32	2625.47	2480.65	2615.58
4	Price (Rs/tonne)	4500	4500	4500	4500	4500
5	Gross Return per hectare	236700	245250	253350	272250	251887.5
6	Net return per hectare	94422.4	100753	105536	122170	105720.35
7	Family labour income	14812.09	16070.74	14000	9402.5	13571.33
8	Farm business income	109234.53	116823.65	119535.87	131572.89	119291.73
9	Farm investment income	116422.4	122753	127536	144170	127720.35
10	Benefit Cost Ratio	1: 1.66	1: 1.69	1: 1.71	1: 1.81	1: 1.71

### Conclusion

The study conducted in the Bulandshahr district of Uttar Pradesh provides valuable insights into the economic aspects of carrot production. The majority of carrot growers are aged between 36 to 60 years. Carrot production in the area has witnessed growth attributed to increased productivity and expanded cultivation area. Large farm size carrot growers were more benefited as compared to other farm size groups (small, marginal and medium).

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