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## A study of the cost of cultivation and profit measures of Cauliflower grower in Varanasi District of Eastern Uttar Pradesh

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### Abstract

Keeping in view the importance of the vegetable crops in nutritional security and generating the income and employment to the farm population a study on economics of cauliflower cultivation in Chiraigaon block of Varanasi district of U.P. was conducted in agriculture year 2016-2017. Stratified purposive cum random sampling technique was applied to select the sample respondents primary data were collected through interview method. Tabular and function analysis was done to present the result. Overall average size of holding was 0.78 ha. which were 0.56 ha., 1.19 ha. and 2.76 ha. at marginal, small and medium size of farms respectively. Cost of cultivation and different income measures were also had the positive trend with size of farms. Output – Input ratio were 1:1.98, 1:2.02, 1:2.11 on marginal, small and medium size group of farm which was recorded as 1:2.00 at overall farm. Cauliflower cultivation was found profitable on each size group of farms and it was characterized of decreasing returns to scale as sum of elasticity were less than one in all categories of farms. Value of multiple coefficient of determination ( $R^2$ ) shows 93.65, 80.67 and 95.87 per cent variation in output due to all included input factors in study. MVP of all the input factors in every farms size except few were more than one which showed the further possibility of increased expenditure to receive additional profit. Technical, managerial, financial and miscellaneous problem were faced by the sample farmers which were suggested to solve by having some extension activities as and when possible and little more support of financial institution for credit. At last cauliflower cultivation was found more suitable for the farmers of the study area.

**Keywords:** Weighted Mean, Tabular and, Functional Analysis

### Introduction

Indian subcontinent has been endowed by nature with vast diversity of land, soil and agro-climate condition found suitable to produce various types of vegetable crops. There is substantial increase in production and productivity of vegetables crop. The area and production of vegetables are increasing year after the green revolution, owing to growing of improved varieties and adoption of improved cultivation technologies. Further, the country has made quantum jump since independence scoring more than seven times increase in vegetables production. However, the production of different vegetables is comparatively low in comparison with that of other developed countries.

Most of the developing countries of the world including India, population is growing rapidly than food availability. In turns these countries are struggling with the problem of protein and calories. Malnutrition which is easily visible among the vulnerable of coming decade is not only to provide more food to meet calories need of our burgeoning population but it is equally important to make availability of low cost protein and vitamin. Even in advanced countries like America where animal protein and milk product are available in abundance.

Cauliflower is one of the most important winter vegetables in India. It was introduced in India during 1822 from France. Cauliflower is grown for its tender head or curd. It is a delicate crop and needs more care to grow successfully than most of the other vegetable. It can be grown in all types of soil with good fertility and good water regime. However, for early crops, in tropical and subtropical regions, a light to light medium soil may be preferred so that the drainage is easier in the rainy season. Therefore, in the cultivation of Cauliflower steady growth is important since rampart growth may retard the formation of curd and it may also slow the growth of bracts. Under the Indian conditions, especially in North India the mid-season crop and late crop will grow very well in medium heavy and heavy soils when temperature is 10-16<sup>0</sup> C for curd formation. In the plain region of India, it is available from September to May.

The optimum pH for cauliflower cultivation is 6-6.5. However, it has been reported that maximum yield of cauliflower is obtained at soil having pH between 5.5-6.5. Cauliflower is sensitive to high acidity. It is delicious cool season vegetable. The head is eaten while the stalk and surrounding thick, green leaves are used in vegetable broth or discard.

India is the second largest producer of Cauliflower in the world after China followed by Italy, France and Spain. Cauliflower cover an area of 414 mha in India, its production is 7897 million tonnes and productivity is 19.1 tonnes/ha which constitutes 21.92% of world Cauliflower production. Production of China is 806 million tonnes & worldwide highest productivity recorded in Japan. In India, major Cauliflower producing State are West Bengal, Orissa, Bihar, Maharashtra and Assam. In Uttar Pradesh during 2014 area, production and productivity of Cauliflower was reported 10.15mha, 222.62 million tonnes and 21.9 tonnes/ha, respectively. In district Varanasi, area, production and productivity of Cauliflower were reported 356 ha, 7223 tonnes and 20 tonnes/ha, respectively (Anonymous. 2015). Within last two decades the production of vegetables in India has increased two times. More than 40 types of vegetables belonging to different groups namely solanaceous, cucurbitaceous, leguminous, cruciferous (Cole crops) root crops and leafy vegetables are grown in India in tropical subtropical and temperate regions.

Vegetables play an important role in balanced nutrition for human being as they are valuable source of proteins, vitamins and minerals. The per capita consumption of vegetables in India is 170g per day per person as against recommendation of 280gm per day per person (Food and Agriculture Organization, India). At present, more than 65% of our population is engaged in agriculture over an area of 320 mha out of these hardly about 1-2% of the total cultivated area is under vegetable crop. These figure showed the necessity of vegetable cultivation on large area to fulfill the required quantity of vegetable for balance diet. It is comparatively more remunerative crop than field crops. The wider adaptability of vegetables to different kinds of abiotic stresses like water, soil, weather offer the possibility to increase the acreage under these crops.

Fresh Cauliflower is an excellent source of vitamins, its 100gm provide about 48.2mg or 80% daily recommended value vitamin-C is a proven antioxidant that helps to fight against harmful free radical. It contains good amount of many vitamin-B complex group of vitamins, such as floats pantothenic acid (vitamin B<sub>1</sub>) niacin (B<sub>3</sub>), as well as, vitamin K. These vitamins are in the sense that body requires them from external source to replenish. Further it is good source of minerals, such as, Mn is used in the body as co-factor for the antioxidant enzyme. (Anonymous 2016)

Cauliflower is a crop which is grown three times in a year as early, mid & late season crops which further offer great opportunity of income an employment generation to the community mainly involves in its cultivation. Since, prices of inputs like seeds, manures, fertilizer, chemical, irrigation and labour charges are increasing every year. Thus it is of utmost importance to study the economics of Cauliflower cultivation, in order to present the real scenario of economic Cauliflower cultivation. Keeping in view of these facts the study entitled "Study on Economics of Cauliflower cultivation in Chiraigaon block of Varanasi district U.P" India.

## Materials and methods

Methodological aspect of study on Economics of Cauliflower cultivation has been discussed under the following four heads.

1. Sampling technique.
2. Collection of data and method of enquiry.
3. Period of enquiry.
4. Analytical tools

**Sampling Technique:** Multistage stratified purposive cum random sampling technique was used for the selection of District, Block, Villages and Respondents (Cauliflower grower).

**Selection of District:** In the first stage Varanasi District of Utter Pradesh was selected purposively because of large amount of vegetable trading takes place in Varanasi.

**Selection of Block:** There were 8 Blocks in Varanasi district *i. e.*

(i) Arajiline (ii) Baragaon (iii) Chiraigaon (iv) Harhua (v) Cholahpurvi (vi) Kashi Vidyapith (vii) Pindara (viii) Sewapuri  
Out of 8 Blocks of Varanasi District 1 block namely Chiraigaon was selected purposively where Cauliflower grower are in large numbers.

**Selection of villages:** Out of 94 villages of selected block5 Villages namely Bariyanpur, Gaurakala, Rustampur, Chiraigaon and Umarahan were selected purposively where maximum number of farmers grow Cauliflower on large scale.

**Selection of farmers/growers:** A separate list of Cauliflower growers of selected villages was prepared along-with their size of holding obtained from record (Khasara and Khatauni) available at Tehsil level and further it was grouped into three categories *i. e.*

1. Marginal farmer (< 1 ha)
2. Small farmer (1-2 ha)
3. Medium farmer (2-4ha)

At last 100 respondents were selected following the proportionate random sampling technique.

**Collection of Data and Method of Enquiry:** The primary data on production aspects were collected on well prepared schedule by survey method. Frequent visits were done by the investigator to the selected respondents and required data were recorded by personal interview. Accuracy of the data were assured through cross-checking. The secondary information was compiled from the published report at Block, Tehsil and District offices. The data were collected to the main-season crop of the 2016-2017.

**Analytical tools:** The data collected from the sample cultivators were analyzed and estimated with certain statistical techniques which are mentioned below.

**Average:** The simplest and important measures of average which have been used into statistical analysis was the weighted average. The formula used to estimate the weighted average is:

$$W.A. = \frac{\sum W_i X_i}{\sum W_i}$$

Where,

W. A. = Weighted average

X<sub>i</sub> = Variable

W<sub>i</sub> = Weights of X<sub>i</sub>

## Result and Discussion

**Table 1:** Per hectare costs of different inputs used in Cauliflower production (Rs.)

S. No	Particulars	Size group of farms			
		Marginal	Small	Medium	Overall average
1.	Human Labour	26275.46 (28.89)	26441.79 (27.01)	27542.41 (27.10)	26382.44 (28.53)
2.	Machinery Charges	5074.57 (5.58)	5175.87 (5.28)	5512.12 (5.42)	5116.34 (5.53)
3.	Seed/Seedlings	6726.92 (7.40)	8006.00 (8.17)	8488.34 (8.35)	6990.91 (7.56)
4.	Manure and fertilizer	20766.51 (22.83)	23886.45 (24.4)	24477.91 (24.08)	21369.50 (23.11)
5.	Irrigation	5976.17 (6.57)	6059.79 (6.19)	6538.65 (6.43)	6024.74 (6.51)
6.	Plant Protection	5030.12 (5.53)	6500.47 (6.64)	6945.65 (6.83)	5325.94 (5.76)
7.	Total working capital	55661.09 (61.20)	63311.58 (64.67)	67482.9 (66.40)	57330.17 (62.00)
8.	Interest on working capital	371.07 (0.40)	422.07 (0.43)	449.88 (0.44)	382.19 (0.41)
9.	Rental value of land	12000.00 (13.19)	12000.00 (12.26)	12000.00 (11.80)	12000.00 (12.97)
10.	Interest on fixed capital	456.37 (0.50)	508.89 (0.52)	435.52 (0.42)	460.68 (0.49)
11.	Sub total	82677.19 (90.90)	89001.33 (90.91)	92390.48 (90.90)	84052.77 (90.90)
12.	Managerial Cost @10% of sub-total	8267.71 (9.09)	8900.13 (9.09)	9239.04 (9.09)	8405.26 (9.09)
	Grand total	90944.90 (100)	97901.46 (100)	101629.52 (100)	92458.04 (100)

(Figure in parentheses indicate the percentage)

The table a. indicate that, costs of cultivation was highest on medium farms (Rs.101629.52) followed by small farms (Rs.97901.46) and marginal farms (Rs.90944.90) respectively. The overall average costs of cultivation was observed Rs.92458.04 on sample farms. The major component of the cost were Human labour (28.53 per cent),

manure and fertilizers (23.11 per cent), seed/seedling cost (7.56 per cent), irrigation charges (6.51 per cent), plant protection (5.76 per cent) and machinery charge (5.53 per cent) respectively of the total costs of cultivation. It is concluded from the table the per hectare cost of cultivation of cauliflower increases with an increase in size of farm.

**Table 2:** Per hectare costs and income measures of cauliflower cultivation (Rs.)

S. No.	Particulars	Size group of farms			Overall average
		Marginal	Small	Medium	
1.	Cost A1/A2	56032.16	63733.65	67932.78	57712.37
2.	Cost B1	56488.53	64242.54	68368.30	58173.16
3.	Cost B2	68488.53	76242.54	80368.30	70173.06
4.	Cost C1	70677.19	77000.54	80390.48	72052.69
5.	Cost C2	82677.19	89001.33	92390.48	84052.78
6.	Cost C3	90944.90	97901.46	101630.00	92458.08
7.	<b>Yield (head/ha.)</b>				
a.	M.P.	190.00	211.23	221.92	194.57
b.	B.P.	77.53	63.61	75.06	75.82
8.	Grass Income	180692.40	198059.30	214659.72	184980.50
a.	M.P	171000.00	190107.00	205276.00	175501.10
b.	B.P	9692.38	7952.26	9383.72	9479.36
9.	Net return over cost C3	89747.48	100157.80	113029.72	92522.37
10.	Family Income	112203.90	121816.70	134291.42	114807.40
11.	Farm investment income	110471.60	121566.80	134704.76	113388.40
112.	Farm Business income	124660.20	134325.60	146726.94	127268.10
13.	Cost of production (q/ha.)	450.50	444.17	438.07	450.18
14.	<b>Input-Output ratio</b>				
a.	On the basis of cost A1	1:3.22	1:3.10	1:3.15	1:3.20
b.	On the basis of cost B1	1:3.19	1:3.08	1:3.13	1:3.17
c.	On the basis of cost B2	1:2.63	1:2.59	1:2.67	1:2.63
d.	On the basis of cost C1	1:2.55	1:2.57	1:2.67	1:2.56
e.	On the basis of cost C2	1:2.18	1:2.22	1:2.32	1:2.20
f.	On the basis of cost C3	1:1.98	1:2.02	1:2.11	1:2.00

**Per hectare costs and incomes from cauliflower cultivation:** The cost and return have been summarized in this part on the sample farms. Beside the estimate of total costs, on the basis of six cost concept *i.e.* Cost A<sub>1</sub>/A<sub>2</sub>, cost B<sub>1</sub>, cost B<sub>2</sub>, cost C<sub>2</sub>, and cost C<sub>3</sub>, have been worked out for estimation of cost. Similarly, the various measures of farm profits, such as net income, family labour income, farm investment income, farm business income, input-output ratio have also been worked out.

The Table b. revealed that, on an average cost A<sub>1</sub>/A<sub>2</sub>, cost B<sub>1</sub>,

cost B<sub>2</sub>, cost C<sub>1</sub>, cost C<sub>2</sub> and cost C<sub>3</sub> came to Rs.57712.37, Rs.58173.16, Rs.70173.06, Rs. 72052.69, Rs.84052.78 and Rs. 92458.08 respectively. On an overall average, gross income was recorded Rs. 184980.50 and net income came to Rs.92522.37. On medium farms, gross income was highest, which was recorded Rs.214659.72 followed by small farms Rs. 198059.30 and lowest on marginal farms *i.e.* Rs.180692.40 respectively.

Likewise the net income was also highest on medium farms Rs. (113029.72) followed by small farms Rs. (100157.80) and

marginal farms Rs. (89747.48). On an average family labour income, farm investment income and farm business income were observed to Rs. 114807.40, Rs. 113388.40 and Rs. 127268.40, respectively. Family labour income was highest on medium farms followed by small and marginal farms & farm investment income was highest on medium farms followed by small and marginal farms and farm business income was highest on medium farms followed by small farms, and marginal farms. On an average, cost of production per quintal and yield per hectare were estimated to Rs. 154.33 per quintal and 541.97 quintal respectively.

On an average input output ratio regarding costs  $C_3$ ,  $C_2$ ,  $C_1$ ,  $B_2$ ,  $B_1$ , and  $A_2/A_1$  were recorded 1:2.00, 1:2.20, 1:2.56, 1:2.63, 1:3.17 and 1:3.20 respectively. On the basis of cost  $C_3$  input output ratio was highest on medium farms (1:2.11) followed by small (1:2.02) and marginal (1:1.98) respectively. It may be concluded from the table that total cost of cultivation and income received from cauliflower cultivation had the direct association with farm size of the sample farm.

### Conclusion

The importance of vegetable crops in our country can be judge from the fact that majority of the Indian population is vegetarian. Vegetables are the main source of minerals and vitamins and other nutritive ingredients in vegetarian diet. It plays a significant role in balance nutrition and assured the nutritional security to the people since the nutritional security is an important requirement thus special affords on intensification of production and supply of vegetables are necessary with increasing population and negligible scope of growth in net area sown. The Indian economy in general and Uttar Pradesh in particular likely to witness a scenario of declining per capita availability of land. A situation like this calls for the choice of the enterprises that generate the maximum gain to the farming community per unit of time and area.

Cauliflower is the one of the most important winter vegetable in India. It is grown for its tender heads or curd. India is second largest producer of the cauliflower in the world after China. It is a labour and capital intensive short duration cop which generate the better possibilities for income and employment to the farm family.

Multistage stratified purposive cum random sampling technique was used for the selection for district, block, villages and respondents. Accordingly the Chiraigaon block of Varanasi district were chosen for this study and one hundred respondents from five selected villages of Chiraigaon block were chosen from three categories of farms size *i.e.* marginal, small and medium. Pre structured schedule were used to collect the primary data from sample farmers with personal interview method and secondary data were collected from official records at block and district offices. Simple tabular and functional analysis of data were done to interpretate the result.

Objective wise results obtained from the analysis of data revealed that among different components of farm structure land holding was found as 0.78 ha. On overall average basis which was 0.56, 1.19 and 2.76 hectare on marginal, small and medium size group of farms. Cost of cultivation of cauliflower per hectare came to Rs. 92458.04 on overall average basis which was maximum on medium farms *i.e.* Rs. 101629.52 followed by small and marginal farmers which accounted for Rs. 97901.46 and Rs. 90944.90 per hectare. Major component of per hectare cost of cauliflower cultivation were found as human labour 28.53 per cent and

manure and fertilizers 23.11 per cent cost of cultivation increases with increase in farm size. Gross income per hectare come to Rs. 184980.50 on overall average basis which was minimum on marginal farms *i.e.* Rs. 180692.40 it increases with increase in farms size and found to Rs. 198059.30 and Rs. 214659.72 on small and medium farms. It may be concluded that per hectare costs of cultivation and various income measure were having positive trend with size of sample farms. Output-input ratio was also found in same manner it increases with the size of farms. This relationship of costs and income with land holding shows better utilization of other input factor in order to get the maximum possible farm income.

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