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Estimation of cost and income structure of tomato grower in Ballia district of Uttar Pradesh

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Abstract

In India, Production of tomato is expected to be around 212.38 Lakh Tonne in 2023-24 (Second Advance Estimates) compared to around 204.25 Lakh tonnes in 2022-23, District Ballia is one of the highest producing districts in the state of Uttar Pradesh, which covered an area of 495 hectares and produced18347.55 Metric Tonnes with their productivity 370 quintal per hectare. (DHO, Ballia) The research title "Estimation of cost-income structure of tomato growers in Ballia District of Uttar Pradesh" has been under taken with following specific objectives are 1. To investigate the cropping pattern of across farms size.2. To determine the cost and income per hectare and input-output ratio of tomato cultivation of sample farms. The research study is related to primary data as well as secondly data had collected through pre structured schedule by personal interview with helps of farmers associated with production of tomato profitability. The secondary data were obtained farm book, journals, Internet, reports magazines, thesis and record of block and district profile and topic related various books, BBS, web site etc. A list of villages growing area of tomato crop was obtained of block official record and five villages gradually Maldepur, Nasirabad, Sagarpali, Darampur, Khoripakar taken were selected for the study. Thus 100 respondents were selected randomly; total number of samples was not equally distributed in to the farm size example 69 on marginal size group, 21 on small and 10 on medium group respectively. An overall average cost of cultivation of cost C3 is ₹69902.05 and the cost of cultivation per hectare was maximum at ₹72982.82 in medium size of farms followed by small and marginal at ₹68052.74and ₹68699.09 respectively. An overall average cost of production of input: out ratio of all size groups varies from 1:4.39 to1:2.09.

Keywords: Tomato, Cultivation, Farmer, Crop, Uttar Pradesh

1. Introduction

Tomato (*Lycopersicon esculentum.* L) an important short duration solanaceous vegetables crop grown worldwide under both *rabi* and *kharif* season, country like as USA, Italy, Turkey, and Egypt. Total cultivated area under tomato is 45, 82,438 thousand ha with production of 15051381 thousand tones and productivity of 32.8 tones/hectare in the world (year 2014-15 FAOSTAT). The estimated total world production in 2022 was 186,107,972 metric tonnes, a decrease of 1.7 % from 189,281,485 metric tonnes in 2021. China was the largest producer, accounting for nearly 37 % of global production followed by India producing 2,06,94,000 tonnes of tomato. In India, tomato is harvested over 843000 ha area with the yield 245480 (100 g/ha).(Food and Agriculture Organization Corporate Statistical Database (FAOSTAT),

2024). In India, Production of tomato is expected to be around 212.38 lakh tonne in 2023-24 (Second Advance Estimates) compared to around 204.25 lakh tonnes in 2022-23, an increase by 3.98% Lakh tonnes also the area under tomato cultivation is increased from 843000 ha in 2021-22 to 849000 ha in 2022-23 (PIB India 2024). In India, amongst states Uttar Pradesh is the 10th highest tomato producing state, first being Madhya Pradesh having production of 3249.82 (Thousands metric tonnes). In UP total area under tomato cultivation was 23.41 thousand ha) and total production was 920.14 (thousands Metric tonnes) during2022-23. (DA & FW India Statistics 2023), and it contributes of4.50 percent in national production. District Ballia is one of the highest producing districts in the state of Uttar Pradesh, which covered an area of 495 ha and produced18347.55 metric tonnes with their productivity 370 quintal /ha. (DHO, Ballia) Keeping the view of real evaluation of these factors are necessary, how to be increase of the production is to be continued. The information would be great importance to policy makers and researcher. Therefore, an attempt is made to study cost-income estimation of tomato growers in Ballia district of Uttar Pradesh" has been under taken.

Location -The Ballia district is located in the eastern part of Uttar Pradesh state between 250 33' to26011' northern latitudes and 830 38' to 840 39' eastern longitude. The topography of district is generally plain. Ganga and Ghaghara are the main rivers. The climate is generally moist dry and the normal temperature ranges between 5.40 ^{0}C to 44.0 ^{0}C, December and January are coldest and May and June are hottest months the relative humidity ranges between 43 to 58 percent.

Materials and methods

Sampling procedure

In this research study three stages stratified random sampling techniques were used to selected block and villages and cultivators finally 100 cultivators were selected for detailed survey.

(A) Selection of the district- Ballia district of Uttar Pradesh was selected purposively to avoid the operation in convent of the researcher**.**

(B)Selection of the block- There were 17 blocks in Ballia district of Uttar Pradesh arranged in ascending order of area under tomato the one block namely Hanumanganj having highest area covered was selected purposively for the study.

(C)Selection of villages- A list of villages growing area of tomato crop was obtained of block official record and five villages gradually Maldepur, Nasirabad, Sagarpali, Darampur, Khoripakar taken were selected for the study.

(D)Selection of cultivators- From each selected village, prepared a list of all the cultivators along with agricultural holding size and then it was arranged in ascending order on the basis of operational holding. The cultivation was grouped into three categories viz. Below 1 ha. (Marginal),1-2 ha. (Small) and 2-4 ha. (Medium)Thus finally, hundred, farmers were selected randomly from five selected villages. The numbers of the farms in each size group of farms in the selected sample were in proportion to the number of farms in the population.

Selection of farm household

A list of the farmers of selected block in respect of size of holding was prepared along with the help of available record; the whole population was categorized in to the three groups. The farmers having less than one-hectare is belongs to marginal size of farms group, one to two hectares as small farms size

group, those farmers included 2 to 4 hectares of land is known as medium farms size groups. Thus 100 respondents were selected randomly; total numbers of sample farmers were distributed in to separate farm size groups such as 69 on marginal, 21 on small and 10 on medium group size respectively.

Source of data and type

Primary data- Present research study primary data were collected through restructured schedule by personal interview with helps of farmers associated with production of tomato profitability.

Secondary data- The secondary data were obtained farm book, journals, Internet, reports magazines, thesis and record of block and district profile and topic related various books, BBS, web site etc

Period of the study- Data for the study were collected during the month of Agricultural year July 2023 to June 2024.

Methods of analysis

The data collected by personal interview from the cultivators were analysed and treated with certain statistical techniques. The weighted average is used to analysis of the collected data. The formula used to estimate the weighted average is as

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

Estimation of costs and returns

The farm management, cost concept approach is widely used in India for evaluating crop profitability in production. The cost concepts in brief, are Cost A1, A2, B1, B2, C1, C2, and cost C3.

COST A1- This gives the total cash expenses incurred by the owner or operator. It includes the following terms of costs.

1. Value of hired human labour.
2. Value of bullock labour.
3. Value of machinery charges
4. Value of fertilizers and manures.
5. Value of seeds.
6. Value of insecticides, pesticides and weedicide.
7. Irrigation charges.
8. Depreciation on farm implements
9. Interest on working capital.
10. Land revenue paid to government.

COST A2 = Cost A1+ Rent paid for leased in land, if any.
COST B1 = Cost A1 + Interest on value of owned fixed capital assets.
COST B2 = Cost B1 + Rental value of owned land less land revenue.
COST C1 = Cost B1 + Imputed value of family labour.
COST C2 = Cost B2 + Imputed value of family labour.

COST C3 = Cost C2 + 10% of Cost C2 on account of managerial functions performed by the farmer.

In this study, the rent paid for leased in land was zero, as none of the sample farmers took land on lease

basis. Hence, cost A1 and cost A2 are similar.

Rates of Returns over Different Cost Concepts

Gross Income: Yield of main product (in qt./kg) × prices (₹)

Net Income: Gross Income – Cost C.
Farm Business Income: Gross Income – Cost A2
Farm Investment Income: Farm business income-Wages family labour
Family Labour Income: Gross Income – Cost B
Cost of production: The cost of production was worked by the following formula: -

$$\textbf{Cost of production/qt} = \frac{\textbf{Cost of cultivation/ha}}{\textbf{Quantiy of main production/ha}}$$

Results and discussion

Average size of holding of sample farms

The average size of holding of different size sample farms group (table -1) deals with 100 sample farmers in which, it's divided in three size groups namely marginal (below 1ha), small (1-2 ha) and medium (2-4ha) with respect to total cultivated area. It is clear from the table an overall average size of holding was 1.68 ha. Whereas average size of holding was found in different size group as 0.44, 1.58 and 3.42 ha in marginal, small and medium farms group respectively. And also, it is presented in the table total cropped area of sample farms were 31.08, 33.11 and 34.42 percent covered under the marginal, small and medium farms groups respectively.

Table-1 Average size of holding of sample farms under different size groups.

S.No.	Different size group of farms	No. of sample farms	Total Cultivated area (ha.)	Average size of holding (ha.)
1	Marginal (below 1ha)	69	30.36 (31.08)	0.44
2	Small (1-2 ha)	21	33.11 (33.89)	1.58
3	Medium (2-4ha)	10	34.22 (35.03)	3.42
All farms		100	97.69 (100.00)	1.81

(Figures in parenthesis indicated the percentage to the total cultivated area.)

Cropping pattern

It is the portion of the area under different crops at point of time conventionally in single year. It is indicating the yearly sequence and spatial arrangement of crops followed in particular area. The cropping pattern all size of groups presented in the table -2 it is clear from the table mainly 16 crops were grown in which tomato was growing in specially rabi season stand in first position which covered maximum an area of 23.18 percent, different total area of various crops such as potato, berseem, pea + cauliflower and bottle gourd along with mixed crop were grown 6.81, 1.43, 4.61, and 6.53 percent further mixed crop with mustard were 4.89 per cent observed. Area under vegetables crops such as Bitter Gourd, Chili,

Ladyfinger, Onion were found 4.38,1.77,1.40, 2.18 per cent. But in regards of pulses crops like as gram, total cropped area was found 4.89 per cent respectively.

Table-2 Cropping pattern on different size group of farms in the learn area.

S.No	Crops grown under different season	Size of groups			
		Marginal	Small	Medium	Overall average
1	Tomato	0.41 (33.06)	0.56 (20.66)	0.79 (15.80)	0.59 (23.18)
2	Pointed gourd	0.30 (24.19)	0.43 (15.87)	0.72 (14.40)	0.48 (18.15)
3	Pea	0.03 (2.02)	0.27 (9.96)	0.09 (1.84)	0.13 (4.61)
4	Mustard	0.04 (2.90)	0.14 (5.17)	0.33 (6.60)	0.17 (4.89)
5	Ladyfinger	0.01 (0.40)	0.06 (2.29)	0.08 (1.52)	0.05 (1.40)
6	Potato	0.02 (1.21)	0.25 (9.23)	0.50 (10.00)	0.26 (6.81)
7	Onion	0.01 (0.65)	0.07 (2.69)	0.16 (3.20)	0.08 (2.18)
8	Cauliflower	0.04 (2.90)	0.04 (1.59)	0.76 (15.20)	0.28 (6.56)
9	Bottle Gourd	0.09 (7.26)	0.22 (8.12)	0.21 (4.20)	0.17 (6.53)
10	Gram	0.02 (1.77)	0.16 (5.90)	0.35 (7.00)	0.18 (4.89)
11	Bitter Gourd	0.11 (8.87)	0.09 (3.28)	0.05 (0.98)	0.08 (4.38)
12	Chili	0.02 (1.77)	0.05 (1.96)	0.08 (1.58)	0.05 (1.77)
13	Cabbage	0.03 (2.42)	0.07 (2.44)	0.76 (15.24)	0.29 (6.70)
14	Berseem	0.02	0.05	0.04	0.04

		(1.61)	(1.8)	(0.84)	(1.43)
15	Paddy	0.01 (0.81)	0.05 (1.81)	0.05 (0.92)	0.04 (1.18)
16	Wheat	0.10 (8.06)	0.20 (7.38)	0.04 (0.72)	0.11 (5.39)
Gross Cropped Area		**1.24** **(100.00)**	**2.71** **(100.00)**	**5.00** **(100.00)**	**2.98** **(100.00)**

(Figures in parenthesis indicate in percentage to the total crop area.)

Cost and income structure

The separate cost of concept such as costA1/A2, B1/B2, C1/C2 and C3 were used for analysis of the data. Likewise various income such as gross income, farm business income, family, labour income and farm investment income were calculated for different size of sample farms. And thereafter cost of production of tomato crop ₹ /quintal input-output relationship workout on the basis of different cost.

Cost of cultivation of tomato

Cost of production per hectare of tomato crop on various input factor workout and presented in table-3. This table illustrated an overall average cost of cultivation was ₹ 69911.55. The cost of cultivation was higher on medium farms as ₹72982.82 followed by marginal₹68699.09 and small₹68052.74 respectively. it was observed the per hectare cost was maximum on medium farm due to heavy expenditure of tractor charged for cultivation, variety of seed and resources of irrigation.

Table-3 Cost of cultivation of Tomato of different size groups of study area farms (₹/ha)

S.No.	Items	Size group of farms			
		Marginal Farms	Small Farms	Medium Farms	Over all farms
		Value (₹)	Value (₹)	Value (₹)	Value (₹)
1	Family labour	8965.00 (13.05)	4346.20 (6.38)	2104.63 (2.88)	5138.61 (7.35)
2	Hired labour	2250.70 (3.27)	3284.30 (4.82)	4095.52 (5.61)	3210.17 (4.59)
3	Total	11215.70 (16.33)	7630.50 (11.21)	6200.15 (8.49)	8348.78 (11.94)
4	Tractor /cultivation Charges	7247.47 (10.55)	9869.80 (14.50)	10059.42 (13.78)	9058.89 (12.95)
5	Seed	5600.20 (8.15)	6900.60 (10.14)	8300.90 (11.37)	6933.90 (9.91)
6	Irrigation Charges	8500.60 (12.37)	5752.37 (8.45)	5248.29 (7.19)	6500.42 (9.29)
7	Manure & Fertilizer	6750.53 (9.83)	5326.70 (7.82)	5973.25 (8.18)	6016.66 (8.60)
8	Plant Protection	2580.40 (3.75)	3240.70 (4.76)	3795.21 (5.20)	3205.43 (4.58)
9	Total Working Capital	41894.90 (61.00)	38720.17 (56.89)	39577.22 (54.22)	40064.09 (57.31)
10	Interest on working Capital (3.5%)	1466.32 (2.13)	1355.20 (1.99)	1385.20 (1.89)	1402.24 (2.00)

11	Total	43361.22 (63.14)	40075.37 (58.88)	40962.42 (56.12)	41466.33 (59.32)
12	Rental Value on land	10500.00 (15.29)	10500.00 (15.42)	10500.00 (14.38)	10500.00 (15.02)
13	Interest on fixed capital	8565.23 (12.47)	11290.76 (16.59)	14885.60 (20.39)	11580.53 (16.56)
14	Sub Total	62426.45 (90.90)	61866.13 (90.90)	66348.02 (90.90)	63546.86 (90.90)
15	10% Marginal of Sub Total	6242.64 (9.09)	6186.61 (9.09)	6634.80 (9.09)	6354.68 (9.09)
16	Grand Total	68699.09 (100)	68052.74 (100)	72982.82 (100)	69911.55 (100)

(Figures in parenthesis indicate percentage of cost of cultivation of tomato.)

Measurement of Cost and Return

Per hectare cost and return of tomato crop cultivation was measured on different categories of farms were carried out and presented in table 4 .It is illustrated from the table that an overall average cost of cultivation cost C3 is ₹69902.05 and per hectare was maximum at ₹72982.82 in medium size of farms followed by small and marginal at ₹68052.74and ₹68699.09 respectively it observed that cost of cultivation was maximum on medium size of farms due to more investment variety of seed at ₹8300.90 and tractor charges₹9869.80, whereas in marginal size farms maximum investment was on irrigation charges at ₹8500.60 and also observed that in small farms, maximum expenditure on family labours, irrigation ,manure and fertilizer at ₹4346.20, ₹5752.37 and ₹5973.25respectively.It was observed from the table that cost of cultivation has no positive relation with increasing size of farm. It is concluded that medium farmers were aware. They were using latest technology for increasing production, but small farmers have not self-resources of cultivation, they hired by others and paid maximum Rs/hour of cultivation of land, also observed in marginal farmers that more family members engaged in agriculture due to lack of employment and they have not self-resources of cultivation. As well as in the context of income measure observed from the table that an overall gross income was calculated to ₹168090 of all size of farms. Gross income per hectare was maximum to ₹179025.00 in medium size of farms followed by small and marginal farms corresponding to ₹167700.00and ₹157537.00 respectively. And also, other income measures such as net income, farm business income, and family income farm investment income were also calculated and presented in the table. It is revealed from the study marginal farmers were much aware regarding use of improved technologies in order to found more yield from their scarce holding. Cost of production of per quintal of tomato was calculated on the C1, C2 and C3 basis is displayed in the table .4 that per quintal cost of production on the basis of C1similarly input –output analysis was done on the basis of Cost A1 to cost C3. An overall average cost of production of input: out ratio of all size farm groups varies from 1:4.39 to1:2.09 and also were observed that the ratio of input and output in case of marginal farms is varies from 1:4.17 to1:2.08, small farms 1:4.88 to1:2.11 and medium farms 1:4.42 to 1:2.09 respectively.

Table - 4 Measures of Cost and Returns in the study area. (₹/ha)

S.No.	Items	Size group of farms			
		Marginal	Small	Medium	Average
1	Cost A1 /A2	34396.22	35729.67	38857.79	36327.89

2	Cost B1	42961.45	47020.43	53743.39	47908.42
3	Cost B2	53461.45	57520.43	64244.39	58408.76
4	Cost C1	51926.45	51366.63	55848.02	53047.03
5	Cost C2	62426.45	61866.63	66349.02	63547.37
6	Cost C3	68669.09	68052.4	72982.82	69902.05
7	Yield (Quintal)(M.P.)	210.05	223.60	238.70	224.12
8	Yield (Quintal)(B.P.)	-	-	-	-
9	Price /q(M.P.)	750.00	750.00	750.00	750.00
10	Total Income (M.P.)	157537.50	167700.00	179025.00	168090.00
11	Price /q (B.P.)	-	-	-	-
12	Total Income (B.P.)	-	-	-	-
13	Gross Income	157537.50	167700.00	179025.00	168090.00
14	Net Income	88868.41	99646.76	106041.18	98185.45
15	Farm Business Income	123141.28	131970.33	140167.21	131759.61
16	FamilyLabour Income	104076.05	110179.57	114780.61	109678.74
17	Farm Investment Income	114176.28	127624.13	138062.58	126621.00
18	Input-Output Ratio				
(i)	On the Cost ‘A1/A2’ basis	1:4.17	1:4.88	1:4.42	1:4.39
(ii)	On the Cost ‘B1’ basis	1:3.19	1:3.17	1:2.88	1:3.11
(iii)	On the Cost ‘B2’ basis	1:2.63	1:2.64	1:2.44	1:2.59
(iv)	On the Cost ‘C1’ basis	1:2.70	1:2.78	1:2.68	1:2.72
(v)	On the Cost ‘C2’ basis	1:2.28	1:2.33	1:2.30	1:2.30
(vi)	On the Cost ‘C3’ basis	1:2.08	1:2.11	1:2.09	1:2.09

Conclusion

The research villages ware located in nearest Ballia city approximate within four kilometers, farmers were growing tomato crop as cash crop and they were adopting diversification farming and can be say that this crop is a major source of income of farmers. The result found that in this context the medium farms group were cultivating maximum area followed by small and marginal farms tomato and pointed guard examined as main vegetable crops which having first and second ranked. And potato, Pea and tomato considered as cash and commercial crop by all farm size of categories. Maximum sample farms

were grown consumption purpose. It was observed that per hectare cost was higher on medium farm due to heavy expenditure of tractor charged for cultivation, variety of seed and resources of irrigation.

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