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An economic analysis of production of watermelon in Allahabad District, Uttar Pradesh India

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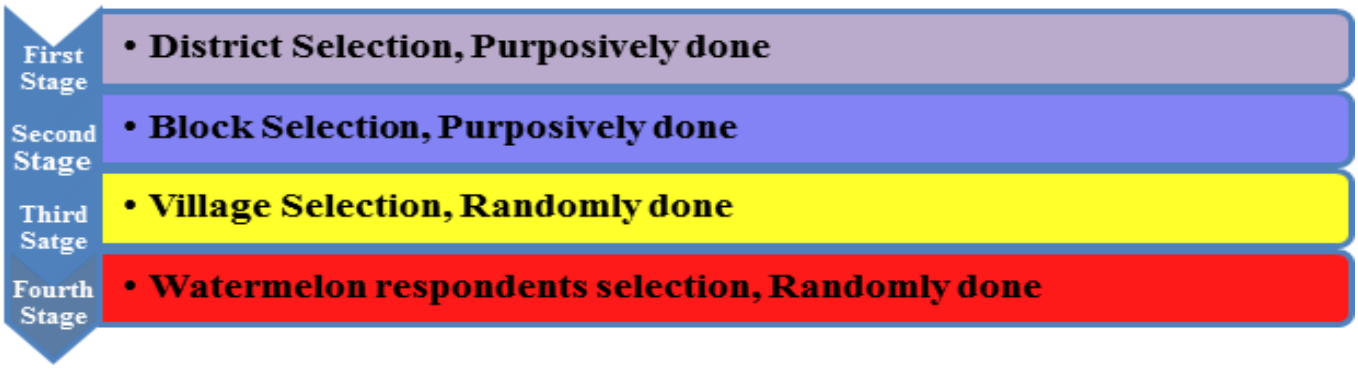
Abstract
The present research entitled "An Economic Analysis of Production of Watermelon in Allahabad District (UP) India" was carried out during the year 2016-17 in Soraon block of Allahabad district. The main objectives of the study are to analyze, socio economic characteristic of sample respondents, analyzing of costs per hectare, return and profitability of watermelon production and evaluation of cost of production per quintal. Soraon block is more potential for watermelon production with comparison to other blocks. Out of the total villages of Soraon block, in total fourteen (14) villages and (140) respondents were selected randomly. Average size of land holding of respondents 2.65 hectares and most of the respondents were belonged to age group of 20 to 49 years (90 %), level of education is mostly primary (44.29%) and intermediate (36.43 %). Mean household size is nine persons, the highest cropping intensity was found in Saraigopal village (158.89) and the average cropping intensity of the block is 139.91. Family and hired human labour utilization is 159 man days/ha in different size farm groups. The cost of cultivation of watermelon per hectare in small, medium and large farm groups is Rs. 42840.87, Rs. 44393.88 and Rs. 47321.19 respectively. Overall, estimated gross return of watermelon was Rs/ha 79329.83 and obtained net return was Rs/ha 34477.85, the benefit received on per rupee investment was 0.77. The average yield per hectare of watermelon came to 226.33 quintals and the cost of production, on an average was worked out to 198.17 Rs/qt on the sample farm groups.

Keywords: cost of production, returns and profitability

1. Introduction
Watermelon (*Citrullus lantus*) is a native of tropical Africa, where it has long been used by the wild tribes. It came to India by the fourth century AD. The sweet juicy *pulp* of the ripe fruit is eaten fresh. Watermelon is a valuable alternative to drinking water in desert areas. The dried parched seeds are chewed, particularly in Southern China. Watermelon is made up of almost 95 per cent water. The remaining 5 per cent comprises fiber, proteins, fat and minerals. The fruit has juicy, pink, red or yellow flesh with numerous small black seeds. Watermelon is grown largely in China, Turkey, India and Iran in Asia, in Egypt and Algeria in Africa; in USA and Mexico in North America; in Bulgaria in Europe; in the Russian Federation; and in Brazil in South America. Traditionally, watermelon cultivation in India was confined to the riverbeds of the Yamuna, Ganges and Narmada in the north, and the Kaveri, Krishna and Godavari in the south. At present, it is grown in almost all parts of the country. It is a fast-growing cash crop for poor and marginal farmers with little acreage of their own. Currently, the total area under watermelon cultivation in India is about 30,000 hectares and the produce harvested is about 350,000 metric tons.

1.1 Objectives of the study
1. To analyze per hectare costs, returns and profitability of watermelon production in the study area.
2. To evaluate the cost of production per quintal of watermelon fruits on different size farm groups.

2. Material and Methods
The present study was conducted in Allahabad district of Uttar Pradesh during 2016-2017.
Four stages stratified sampling procedure was adopted to select the samples.



Out of the total 20 blocks of district Allahabad, Soraon block was selected purposively for the study, as this block accounted for the maximum production of watermelon as well as this block was easily accessible to the researcher. This block has 57 panchayats and 106 villages in total. In the third stage, a complete list of all the watermelon cultivating villages of Soraon block was obtained from block development office. Out of the total 106 villages, 14 villages were selected randomly by simple random sampling technique. In the fourth stage, a list of all the watermelon growers of the selected villages was obtained from the village's revenue office and the respective village heads. The watermelon growers were categorized into three groups on the basis of their size of land holding.

1. Small size group, which is having below one hectare of land.
2. Medium size group, which is having from one to two hectare land.
3. Large size group, which is having above two hectare land.

3. Results and Discussion

3.1 Cost and Return Analysis of Watermelon Production

3.1.1 Input use for cultivation of watermelon in sample farms

Input use in physical term for producing the watermelon is presented in Table and Fig 1. It has been observed from the Table that overall seeds of watermelon was used 2.77 kg/ha with application of 6.33 tons of manure. Application of fertilizers in nutrient form applied to the crop was 120 kg N and 113.33 kg DAP. Soil of the block and district as whole are rich in K_2O so, none of the farmers applied the potash. It is observed that farmers applied required amount of fertilizer to the crop as recommended in the package of practices. Leaf blight, aphids, thrips, leaf cutting caterpillar are the most common diseases and pests to damage the crop of watermelon. To control of these pests and diseases, farmers applied the chemicals in liquid mostly and found to be 319.67 ml/ha. Human labour days employed (Both family and hired human labours) for cultivation of watermelon was 159 man days and share of family labour days and hired labour was 49.34 man days and 109.66 man days. Most of the field operation was performed by bullock pair days, which was noticed in small and medium farmers while it was absent in large farms. It was interesting to note that despite use of bullock pairs, tractor hours was most common for land preparation and almost all categories of farmers use the hired tractor hours for field preparation and noticed to be maximum among large farmers 12.4 hours followed by medium 6.77 and small 4.37 hours, respectively. Thus it could be drawn the inferences that use of tractors hours was increasing with farm size and promoting the mechanization in farming.

Table 1: Input use for cultivation of watermelon in sample farms (in Ha)

S. No.	Particulars	Farm Size			Average
		Small	Medium	Large	
1	Seed (Kg)	3	2.8	2.5	2.77
2	Manure (Tons)	5.5	6	7.5	6.33
3	**Fertilizer (Kg)**				
a.	Urea	110	120	130	120.00
b.	DAP	100	115	125	113.33
4	Plant Protection				
a.	Liquid Chemical (ml.)	281	311	367	319.67
b.	W. P. (Kg)				
5	**Human Labour (in days)**				
a.	Family human labour	46.3	48.21	53.5	49.34
b.	Hired human labour	114.7	110.79	103.5	109.66
6	Bullock pair (pair day)	8.24	4.45		6.35
7	Tractor hour (hours)	4.37	6.77	12.4	7.85

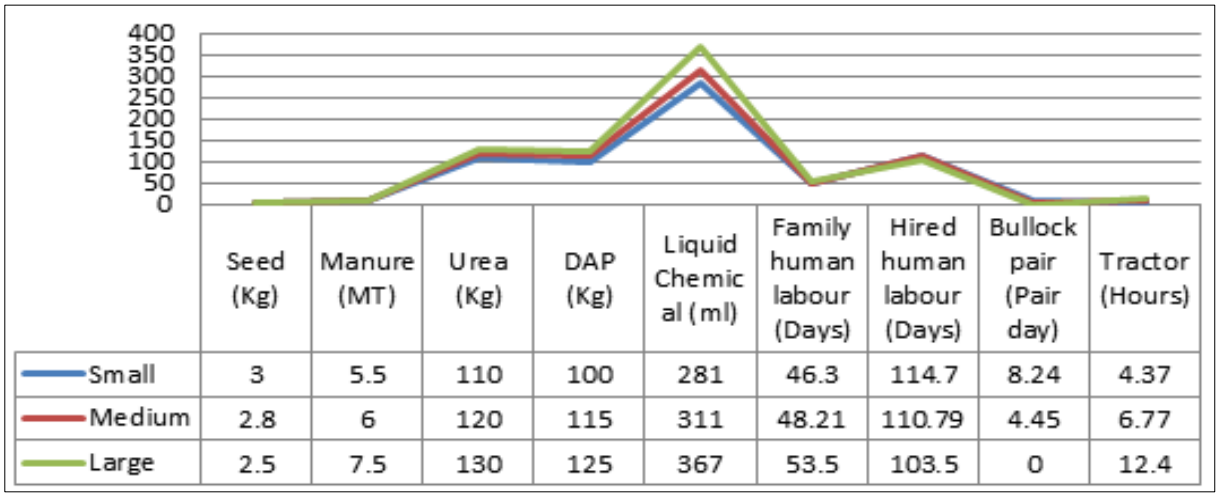


Fig 1: Input Use for Cultivation of Watermelon

3.1.2 Cost of Cultivation for Watermelon in Sample Farms

The cost of cultivation indicates the investment on the variable inputs used in the cultivation and the services rendered by fixed assets. The cost input used by cultivators in the cultivation of watermelon was calculated for contribution of each input in total costs in all the three different size farm groups. The cost of cultivation of watermelon of sample farms is worked out in Rs/ha and presented in Table and Fig 2. It reveals that overall cost of cultivation of watermelon crop was Rs/ha 44851.98 and share of materials input cost was found to be Rs. 10268.10, which shared to 22.89 percent to the total cost. The large contribution have been observed in human labour use with Rs 16959 and shared of 37.81 percent to the total cost. The power use in the form of bullock pairs and tractor hour was contributed the minimum share to the total cost of cultivation of watermelon, which shared 4.24 and 10.50 percent. Among the materials input cost manure and fertilizer shared the maximum (13.27%) followed by seeds (3.45%), irrigation (3.34%) and minimum in plant protection which shared nearly, 2.83 percent. The input value of family labour use was noticed to be Rs./ha 4933.67. The cost of cultivation of watermelon per hectare in small, medium and large farm groups is Rs. 42840.87, Rs 44393.88 and Rs. 47321.19 respectively and the average cost of cultivation per hectare is 44851.98. The table clearly indicates that, the cost of cultivation of watermelon per hectare in large size group is higher than small and medium farm groups followed by medium size group. Major cost on labour use involved in watermelon in small, medium and large groups is found to be Rs. 16100, Rs. 17007 and Rs. 17770 respectively. The materials input cost have been next to the labour use cost, which was ranging from Rs. /ha 9429.87 to Rs. /ha 10791.47.

Table 2: Cost of cultivation of watermelon on different sample farms (Rs/ha)

Particulars	Small	Medium	Large	Average
Inputs (Variable and Fixed)				
a) Hired human labour	11470 (26.77)	12186 (27.45)	12420 (26.25)	12025.33 (26.81)
b) Family labour	4630 (10.81)	4821 (10.86)	5350 (11.31)	4933.67 (11.00)
c) Tractor power	2622 (6.12)	4062 (9.15)	7440 (15.72)	4708.00 (10.50)
d) Bullock pair	2472 (5.77)	1335 (3.01)	0.00	1903.50 (4.24)
e) Cost of seed	1566 (3.66)	1780.21 (4.01)	1302.67 (2.75)	1549.63 (3.45)
f) Manures and fertilizers	5216 (12.18)	5832 (13.14)	6808 (14.39)	5952.00 (13.27)
g) Irrigation	1267.53 (2.96)	1668.3 (3.76)	1556.65 (3.29)	1497.49 (3.34)
h) Plant protection	1380.34 (3.22)	1302.45 (2.93)	1124.15 (2.38)	1268.98 (2.83)
i) Interest in working capital	722.44 (1.69)	654.13 (1.47)	569.01 (1.20)	648.53 (1.45)
j) Depreciation on fixed capital	1991.65 (4.65)	1197.72 (2.70)	734.5 (1.55)	1307.96 (2.92)
k) Rental value of owned land	4650.68 (10.86)	4743.6 (10.69)	5694.39 (12.03)	5029.56 (11.21)
l) Interest on fixed capital	4852.23 (11.33)	4811.47 (10.84)	4321.82 (9.13)	4661.84 (10.39)
Total input cost	42840.87 (100.00)	44393.88 (100.00)	47321.19 (100.00)	44851.98 (100.00)

Note: Figures in the parenthesis are percentage to total cost of cultivation of watermelon

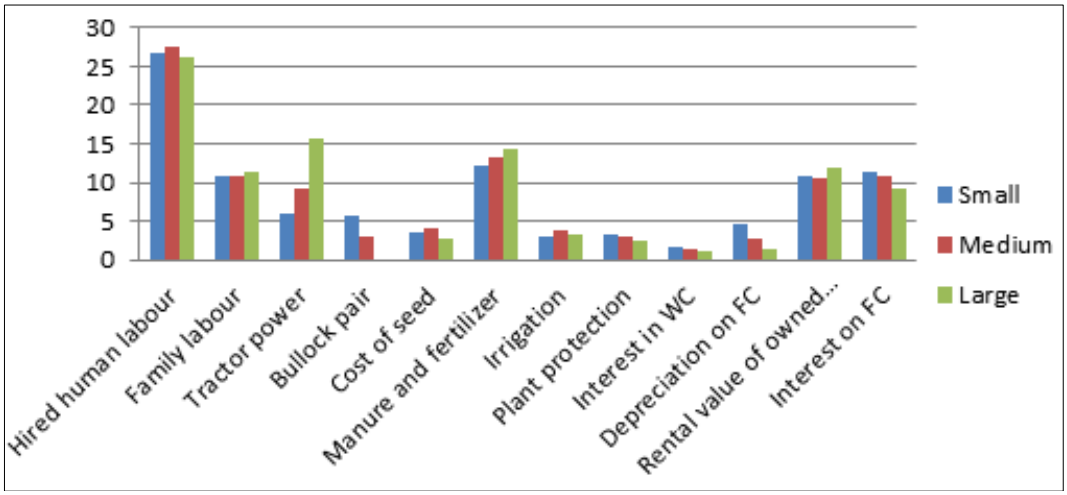


Fig 2: Cost of Cultivation of Watermelon (%)

3.1.3 Profitability in cultivation of Watermelon

A brief summary of the costs and return of watermelon by farm size is represented on gross return received; net returns obtained after subtracting the total cost of cultivation of watermelon, yield per quintal of watermelon production and benefit received on per rupee investment in watermelon cultivation (Table 3). Overall, estimated gross return of watermelon was Rs/ha 79329.83 and obtained net return was Rs/ha 34477.85. The benefit received on per rupee investment was 0.77. Across the farm size of holdings, the gross return of watermelon was varied from Rs/ha 78512 to Rs/ha 82017 of small to large farms. The obtained net return was ranging from Rs/ha 35671.13 of small farms to Rs/ha 34695.81 of large farms. The benefit cost ratio of small, medium and large farm size is Rs. 0.83, Rs. 0.74 and Rs. 0.73 respectively. However, the production of watermelon per

quintal in small, medium and large farm size is 224, 221 and 234 respectively with average of 226.33 quintal per hectare. The average of net return is found to be Rs. 34477.85 per hectare which implies that watermelon production in the study area is highly profitable. It is conforms from the findings that small farms were more efficient than that of medium and large farms because of good management and supervision in cultivation of watermelon.

Table 3: Gross return and benefit cost ratio of Watermelon

S. No.	Particular	Farm size			Average
		Small	Medium	Large	
1.00	Production of watermelon (qt/ha)	224.00	221.00	234.00	226.33
2.00	Gross return (Rs/ha)	78512.00	77460.50	82017.00	79329.83
3.00	Total cost (Rs/ha)	42840.87	44393.88	47321.19	44851.98
4.00	Net return (Rs/ha)	35671.13	33066.62	34695.81	34477.85
5.00	B: C ratio	0.83	0.74	0.73	0.77

3.2 Cost of production of watermelon per quintal

The cost of production per quintal of watermelon on the sample farms have been worked out in table 4 and Fig 3. It reveals that, the average yield per hectare of watermelon came to 226.33 quintals of on the sample farms. The cost of production per quintal, on an average, was worked out to 198.17 Rs/qt. It decreased with the increase in the size of farms due the higher yields. The Table also indicates that the total yield in large size group is 234 quintal per hectare which is higher as compared to small and medium size groups followed by small size group, 224 qt/ha. The cost of production per quintal in large size group is higher from other two groups. The cost of production per hectare in small, medium and large size group is Rs. 191.25, Rs. 200.87 and Rs. 202.22 quintals respectively.

Table 4: Cost of production of watermelon per quintal in different size groups (Rs. /ha)

Size groups	Total yield per hectare (qt.)	Total cost of cultivation (ha)	Cost of production (qt.)
I	224.00	42840.87	191.25
II	221.00	44393.88	200.87
III	234.00	47321.19	202.22
Average	226.33	44851.98	198.17

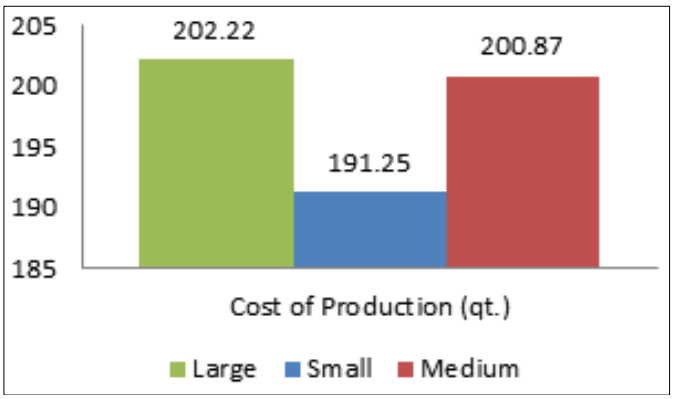


Fig 3: Cost of Cultivation of Watermelon per quintal

4. Conclusion

From the findings of the study following conclusion has been derived.

1. It is observed from the study that, still some farmers use to grow local watermelon varieties as this variety is susceptible to diseases and low in productivity, whereas most of the respondents have changed their mind and adopted hybrids varieties of water melon, as they observed that, growing of these seeds are profitable, resistant to disease and transport, yield is higher and early maturity in comparison to local variety of watermelon.
2. The highest cropping intensity was found in Saraigopal village which is 158.89 and the lowest cropping intensity was observed in Gaddopur village that's 108.03. On an average cropping intensity of Soraon Block is 139.91.
3. Watermelon is highly labour depended crops and requires more labour than that cereals and pulses. It reveals that overall, 159 labour days were used for cultivation of watermelon and share of family and hired labour was 31.03 and 68.97 per cent. Overall, labour use in cultivation of watermelon in small, medium and large size group is 161, 159 and 157 labour days per hectare respectively.
4. The cost of cultivation is maximum in large size groups, followed by medium and small size groups.
5. The cost and return analysis revealed that watermelon production in the study area was profitable with the net farm income of Rs. 34477.85 per hectare. The benefit received on per rupee investment was 0.77.
6. It is conformed from the findings that small farms were more efficient than that of medium and large farms because of good management practices, supervision and availability of sufficient capital in cultivation of watermelon.
7. The average yield per hectare of watermelon came to 226.33 quintals of on the sample farms. The cost of production per quintal, on an average, was worked out to Rs. 198.17. It decreased with the increase in the size of farms due the higher yields.

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