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## Economics of muskmelon (*Cucumis melo*): A special reference of Rajasthan

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#### Abstract

Muskmelon (*Cucumis melo* L.) is also known as Kharbooja, one of the important crops of the Cucurbitaceae family, it is native to Tropical Africa. Muskmelon is cultivated in all tropical and subtropical areas of the world. The present investigation has been undertaken in Jaipur district of Rajasthan with a view to study about cost of production, cost of cultivation, returns and profitability from muskmelon, 80 muskmelon cultivators were randomly selected in proportion to their total number in each size group for the detailed investigation. Personal interview with use of pre-structured interview schedule were used to collect data from Muskmelon cultivator. The study of cost structure of muskmelon indicated that, on an average, total cost of cultivation of muskmelon was Rs 72370.97 per hectare. It was highest (Rs 75833.22 per hectare) on medium farms and lowest (Rs 68383.02 per hectare) on small farms. Overall gross returns, net returns, farm business income and family labour income were Rs 235834.48, Rs 159849.63, Rs 186295.56 and Rs 167607.82 per hectare, respectively. Cost of production was highest (Rs 740.18 per quintal) for small farmers and lowest (Rs 715.94 per quintal) for medium farmers with an overall average of Rs 726.50 per quintal. On an average, returns per rupee were 3.10 respectively.

**Keywords:** Labour input management muskmelon, cost of cultivation, returns and profitability

#### Introduction

Horticulture also becomes a key drive of economic development in many states in the country. Total Horticulture production was estimated to be a record 333.25 million tonnes in 2021-22. The production decrease was 1.35 million tonnes (0.4%) over the previous year 2020-21 (Ministry of Agriculture & Farmers Welfare). Total Horticulture production in 2020-21 is estimated to be a record 334.60 million tonnes (Ministry of Agriculture & Farmers Welfare). An increase in the production of Fruits while the decrease in Vegetables, Spices, Flowers, Aromatics Medicinal Plants and Plantation Crops over the previous year, is envisaged in the year 2021 (The Ministry of Agriculture and Farmer Welfare PIB India 2022). In the world India is one of the important fruit and vegetable producing country. India ranks second after China in the case of both fruits and vegetables. India is considered the fruit and vegetable basket of the world. In India, the area under fruit cultivation was 6967 thousand hectares with a production of 102924 thousand MT and the area under vegetable cultivation was 11065 thousand hectares with a production of 199882 thousand MT in the year 2021-22 (Handbook on Horticulture Statistics, Horticulture Division, Ministry of Agriculture, GOI, 2021-22). Major muskmelon producing countries in world are China, Turkey, India, Kazakhstan, Iran, Egypt, United States, etc. China ranked first in muskmelon production as the biggest producer of muskmelon in the world (FAO). In India, the area under muskmelon cultivation was estimated at 70 thousand hectares with a production of 1509.73 thousand tonnes in the year 2021-22 (National Horticulture Board). It is basically cultivated as a vegetable predominately in Uttar Pradesh, Andhra Pradesh, Punjab, Madhya Pradesh, Haryana, Tamil Nadu, Maharashtra, and Rajasthan etc. 2021-22 (Directorate of Horticulture). In Rajasthan, an area under muskmelon cultivation was estimated at 2074 hectares with a production of 10,027 metric tonnes in the year 2020-21 (Directorate of Economics and Statistics, GOI). It is sown during January to February in Rajasthan state. In this state, a large area was put under muskmelon crop in Jaipur and Alwar districts and thereafter in the remaining districts. Jaipur district occupied the first position in an area under muskmelon cultivation of 315 hectares and production 998 metric tonnes during the year 2020-21 (Directorate of Economics and Statistics, GOI).

**Objective:** To compute the cost structure of muskmelon in the study area.

### Methodology

The study was based on the input and output data obtained from the respondents in chomu and phulera block of Jaipur district. 80 muskmelon cultivators were randomly selected in proportion to their total number in each size group for the detailed investigation. Jaipur district occupies first rank in the area under muskmelon cultivation. Therefore, the Jaipur district has been selected purposively for the study.

**Nature of Data:** The primary data were collected from the selected muskmelon cultivators through the personal interview method with the help of pre-structured schedules. Information about the farm inventories cost of cultivation in respect of inputs used (like human labour, machine labour, seed, irrigation charges, plant protection chemicals etc.) and output of muskmelon in both physical and monetary terms were collected. The data so collected pertained to the Zaid season of the agricultural year 2021.

### Analytical Approach

**Estimation of Costs and Returns:** In the farm management, cost concept approach is widely used in India for evaluating crop profitability in production.

The costs of cultivation of crop per hectare were computed on the basis of the following cost items.

1. Value of hired human (man days/ha)
2. Value of owned bullock labour (hrs./ha)
3. Value of hired bullock labour (hrs./ha)
4. Value of owned machine labour (hrs./ha)
5. Value of hired machine labour (hrs./ha)
6. Value of owned seed (gm/ha)
7. Value of purchased seed (gm/ha)
8. Value of owned farm yard manure (q/ha)
9. Value of purchased farm yard manure (q/ha)
10. Value of fertilizers and pesticides (in kg/ha)
11. Irrigation charges (per/ha)
12. Land revenue (per/ha)
13. Interest on working capital (per/ha)
14. Depreciation (per/ha)
15. Miscellaneous expenses (per/ha)
16. Rent paid for leased in land (per/ha)
17. Interest on fixed capital (excluding land) (per/ha)
18. Rental value of owned land (per/ha)
19. Imputed value of family labour (per/ha)

**These cost items were categorized into following cost groups**

**Cost A<sub>1</sub>:** 1 to 15 Cost items.

**Cost A<sub>2</sub>:** Cost A<sub>1</sub> + Rent paid for leased in-land (16).

**Cost B<sub>1</sub>:** Cost A<sub>1</sub> + Interest on fixed capital assets excluding land (17).

**Cost B<sub>2</sub>:** Cost B<sub>1</sub> + Rental value of owned land (18) + Rent paid for leased-in land (16).

**Cost C<sub>1</sub>:** Cost B<sub>1</sub> + Imputed value of family labour (19).

**Cost C<sub>2</sub>:** Cost B<sub>2</sub> + Imputed value of family labour (19).

**Cost C<sub>3</sub>:** Cost C<sub>2</sub> + 10 percent of cost C<sub>2</sub> as managerial cost.

### Cost of production

$$\text{Cost of production per quintal} = \frac{\text{Total cost of cultivation per hectare}}{\text{Quantity of main product}}$$

### Rates of Returns over Different Cost Concepts

**Gross income:** It is the total value of main product.

$$GI = Q_m \times P_m$$

Where,

GI = Gross Income in Rupees

Q<sub>m</sub> = Quantity of main product in quintal

P<sub>m</sub> = Price of main product in rupees per quintal

**Farm business income:** Gross income - Cost A<sub>2</sub>

**Family labour income:** Gross income - Cost B<sub>2</sub>

**Net income:** Gross income (G.I.) - Total Cost (cost C<sub>2</sub>)

$$\text{Return per rupee of investment} = \frac{\text{Gross Income (G.I.)}}{\text{Total cost (cost C}_2\text{)}}$$

### Result and Discussion

Different types of farm input are utilized by different farm size groups of farmers in the muskmelon cultivation are presented in table-1. This table reveals that overall utilization of human labour was estimated as 37.05 man day/ha. Among the farm size groups, total human labour utilized in muskmelon cultivation per hectare was 35.07, 37.10 and 38.99 man-days on small, semi-medium and medium farms, respectively. It was observed that utilization of total human labour had a positive relationship with the size of farm holding. In case of family labour, it was found that 22.97, 21.82 and 20.97 man days/ha for small, semi-medium, and medium farms, respectively, with the overall utilization of hired human labour in the cultivation of muskmelon was 15.13 man days/ha. Hired human labour utilized in muskmelon cultivation per hectare was 12.10 man days on small, 15.28 man days on semi-medium, and 18.02 man days/ha on medium farms with the increase in farm size holding, family labour involvement decreased, while hired labour participation increased. Overall machine labour utilization in muskmelon cultivation was estimated at 10.84 hrs./ha and it was estimated at 10.04, 11.02 and 11.44 hrs./ha on small, semi-medium and medium farms, respectively. Use of machine labour was lowest on small farms and highest on medium farms. Among the categories of sample farms, used quantity of muskmelon seed was highest for medium farms (420 gm./ha) and lowest for small farms (400 gm./ha). On an average, seed rate of muskmelon was calculated as 410 gm./ha. The overall utilization of farm yard manure in cultivation of muskmelon was found 89.19 quintal per hectare. The quantity of farm yard manure per hectare was estimated to be 94.25, 91.27 and 82.06 quintals on small, semi-medium and medium farms, respectively. Thus, utilization of farm yard manure was decrease with increase in the size of farm holdings. In case of the fertilizer utilization, on an average, total consumption of fertilizer in cultivation of muskmelon was found to be 112.57 kg. The utilization of fertilizers was observed as highest (123.18 kg/ha) on medium farm and lowest (101.34 kg/ha) on small farm. Among the fertilizers, the overall utilization of urea was 59.29 kg/ha. On different farm size groups, quantity of urea utilization was varied form 55.74, 59.35 and 62.79 kg/ha for small, semi-medium and medium farms, respectively. The quantity of (DAP) was estimated as 33.60 kg/ha on small, 39.52 kg/ha on semi-medium and 45.28 kg/ha on medium farms with the

overall phosphorus utilization of 39.46 kg/ha. Application of potassium fertilizer (Muriate of potash) was varied from 12.00, 14.37 and 15.11 kg/ha for small, semi-medium and medium farms, respectively.

On an average, the used quantity of potassium fertilizer was 13.82 kg/ha. In cultivation of muskmelon, quantity of plant protection chemicals (Malathion, etharel etc.) was utilized as 0.52, 0.56 and 0.62 lit/ha on small, semi-medium and medium

farms, respectively, with an overall plant protection chemicals application of 0.56 lit/ha. Utilization of plant protection chemicals was increase with increase in the farm size holdings. Finally the overall number of applied irrigation was 21 during the entire life of muskmelon cultivation. Among the categories of sample farms, the total number of applied irrigation was estimated as 20, 21 and 22 per hectare for small, semi-medium and medium farms, respectively

**Table 1:** Utilization of inputs in muskmelon cultivation on different farm size group

S. No.	Farm size / Farm Inputs	Small	Semi-medium	Medium	Overall
1.	<b>Human labour (man days/ha)</b>				
A.	Family labour	22.97	21.82	20.97	21.92
B.	Hired labour	12.10	15.28	18.02	15.13
	Total human labour (A+B)	35.07	37.10	38.99	37.05
2.	Hired machine labour (hrs./ha)	10.04	11.02	11.44	10.84
3.	Seed (gm/ha)	400	410	420	410
4.	Manures (FYM) (q/ha)	94.25	91.27	82.06	89.19
5.	<b>Fertilizers (in Kg/ha)</b>				
A.	Nitrogen (Urea)	55.74	59.35	62.79	59.29
B.	Phosphorus (DAP)	33.60	39.52	45.28	39.46
C.	Potassium (MOP)	12.00	14.37	15.11	13.82
	Total Fertilizers (A+B+C)	101.34	113.24	123.18	112.57
6.	Plant protection chemicals (Lit/ha)	0.52	0.56	0.62	0.56
7.	Number of Irrigations (Per hectare)	20	21	22	21

### Component wise costs in muskmelon cultivation

The different cost items incurred in the cultivation of muskmelon on different farm size groups are shown in table-2. The table-2 depicts that, on an average, per hectare total cost of cultivation was estimated Rs 72370.97. Out of which, operational cost was Rs 51669.04 per hectare (71.39 percent of total costs) and fixed cost was Rs 20701.93 per hectare (28.61 percent of total costs). The total cost of cultivation was varied from small farm to medium farm, which was Rs 68383.02, Rs 72896.68 and Rs 75833.22 per hectare for small, semi-medium, and medium farms, respectively. Among the total costs, per hectare total operational costs were estimated as Rs 49970.74 on small, Rs 51975.85 on semi-medium and Rs 53060.52 on medium farms. Whereas, total fixed costs were Rs 18412.29, Rs 20920.83 and Rs 22772.70 per hectare on small, semi-medium and medium farms, respectively.

Component-wise, the overall per hectare machine labour charges in muskmelon cultivation were Rs 5419.80 which accounted for the 7.49 percent of total costs. Among the different size group of farms, the per hectare machine labour costs were estimated at Rs 5023.81 in small farm, Rs 5512.50 in semi-medium farm and Rs 5723.08 in medium farm groups. Thus it was observed that, machine labour charges were highest on medium farms and lowest on small farms. In case of human labour cost, the total costs of human labour were estimated at Rs 12278.57, Rs 12989.92 and Rs 13650.46 on small, semi-medium and medium farms, respectively. On an average, per hectare total human labour cost of muskmelon cultivation was found to be Rs 12972.98 (17.93 percent of total cost). Among the human labour, family labour cost was highest on small farms, which was (11.76 percent of total cost) and it was lowest on medium farms which was Rs 7342.77 per hectare (9.68 percent). On an average, family labour cost was Rs 7674.78 per hectare (10.60 percent of total cost). The total cost of hired human labour estimated at Rs 4235.71, Rs 5351.21 and Rs 6307.69 on small, semi-medium and medium farms, respectively. On an average Rs 5298.20

per hectare, which accounted for 7.32 percent of total cost? It was also observed that family labour charges decrease with increase in the farm size of farm holdings, while hired human labour charges increased with the increase in the farm size holdings.

Overall expenses on muskmelon seed were Rs 13803.15 per ha which accounted for 19.47 percent of total cost. Cost of seed was varied from Rs 12921.67 per hectare on small farms to Rs 14657.69 per hectare on medium farms. The per hectare cost of fertilizer was found highest (Rs 1709.74 per hectare) on medium farms. This accounted for the 2.25 percent of total costs and it was lowest (Rs 1330.65 per hectare) on small farms which accounted for the 1.95 percent of total costs. With an overall cost of fertilizer of Rs 1526.17 per hectare which accounted for 2.11 percent was of total cost. The per hectare overall cost of farm yard manure (FYM) was estimated at Rs 7581.70 per hectare (10.48 percent of total cost), cost of farm yard manure (FYM) was varied from small farms (Rs 8011.43 per hectare) to medium farms (Rs 6975.46 per hectare). The cost of FYM was decrease with the increase in the size of farms holdings. The per hectare cost of plant protection chemicals was estimated to be Rs 3926.67 on small, Rs 4272.92 on semi-medium and Rs 4699.92 on medium farms. Overall cost of plant protection chemicals was Rs 4299.84 per hectare. This accounted the 5.94 percent to the total cost.

The next important cost item in operation cost was irrigation charges, on an average, cost of irrigations was estimated at Rs 5049.45 per hectare which accounted for the 6.98 percent of total costs. Per hectare irrigation charges varied from Rs 5515.38, Rs 5054.67 and Rs 4578.31 on small, semi-medium and medium farms. On an average, interest on working capital was calculated as Rs 504.48/ha, It varied from Rs 480.79/ha on small farms to Rs 524.24/ha on the medium farms. Among the different farm size categories, the value of depreciation of assets was calculated as Rs 1652.50, Rs 1816.00 and Rs 2323.85 per hectare on small, semi-medium and medium farms, respectively. The overall value of depreciation was

estimated to be Rs 1930.78 per hectare which accounted for the 2.67 percent of total costs. The rental value of owned land was highest for medium farms Rs 19768.62 per hectare and lowest for small farms Rs 16129.81 per hectare. The overall

rental value of owned land of was estimated to be Rs 18112.72 per hectare which accounted for the 25.03 percent of total costs. On an average, interest on fixed capital was Rs 658.43 per hectare (0.91 percent of total cost).

**Table 2:** Component wise costs of muskmelon cultivation on different farm size groups (in Rs /ha)

S. No.	Farms / Size Inputs	Small	Semi –medium	Medium	Overall
<b>(A) Operational costs</b>					
1.	Hired machine labour	5023.81 (7.35)	5512.50 (7.56)	5723.08 (7.55)	5419.80 (7.49)
2.	<b>Human labour</b>				
	(i) Hired labour	4235.71 (6.19)	5351.21 (7.34)	6307.69 (8.32)	5298.20 (7.32)
	(ii) Family labour	8042.86 (11.76)	7638.71 (10.48)	7342.77 (9.68)	7674.78 (10.60)
	Total human labour (i+ii)	12278.57 (17.96)	12989.92 (17.82)	13650.46 (18.00)	12972.98 (17.93)
3.	Seed	12921.67 (18.90)	13830.08 (18.97)	14657.69 (19.33)	13803.15 (19.47)
<b>Fertilizers</b>					
4.	(i) Urea	302.55 (0.44)	322.13 (0.44)	340.77 (0.45)	321.81 (0.44)
	(ii) DAP	838.31 (1.23)	986.25 (1.35)	1129.94 (1.49)	984.83 (1.36)
	(iii) MOP	189.79 (0.28)	229.75 (0.32)	239.03 (0.32)	219.52 (0.30)
	Total fertilizers(i+ii+iii)	1330.65 (1.95)	1538.13 (2.11)	1709.74 (2.25)	1526.17(2.11)
5.	Manures	8011.43 (11.72)	7758.22 (10.64)	6975.46 (9.20)	7581.70 (10.48)
6.	Plant protection chemicals	3926.67 (5.74)	4272.92 (5.86)	4699.92 (6.20)	4299.84 (5.94)
7.	Irrigation charge	5515.38 (8.07)	5054.67 (6.93)	4578.31 (6.04)	5049.45 (6.98)
8.	Interest on working capital	480.79 (0.70)	508.41 (0.70)	524.24 (0.69)	504.48 (0.70)
9.	Miscellaneous charges	481.77 (0.70)	511.00 (0.70)	541.62 (0.71)	511.47 (0.71)
	Total operational costs (A)	49970.74 (73.07)	51975.85 (71.30)	53060.52 (69.97)	51669.04 (71.39)
<b>(A) Fixed costs</b>					
11.	Rental value of owned land	16129.81 (23.59)	18439.75 (25.30)	19768.62 (26.07)	18112.72 (25.03)
12.	Depreciation	1652.50 (2.42)	1816.00 (2.49)	2323.85 (3.06)	1930.78 (2.67)
13.	Interest on fixed capital	629.98 (0.92)	665.08 (0.91)	680.23 (0.90)	658.43 (0.91)
14.	Total fixed costs (B)	18412.29 (26.93)	20920.83 (28.70)	22772.70 (30.03)	20701.93 (28.61)
15.	Total costs (A+B)	68383.02 (100.00)	72896.68 (100.00)	75833.22 (100.00)	72370.97 (100.00)

Figures in the parentheses are percentages of total costs

### Cost groups in muskmelon cultivation

In this sub-section, all cost items incurred in cultivation of muskmelon have been categorized under different cost groups like: costA<sub>1</sub>, costA<sub>2</sub>, costB<sub>1</sub>, costB<sub>2</sub>, costC<sub>1</sub>, costC<sub>2</sub>, and costC<sub>3</sub>. These cost groups in muskmelon cultivation on different farm size groups are given in Table 3. This table indicates that, on an average, cost A<sub>1</sub> in cultivation of muskmelon was estimated Rs 49538.91 per hectare in the study area. Among the farm size groups, cost A<sub>1</sub> was estimated to be Rs 43580.38, Rs 51975.84 and Rs 53060.52 per hectare on small, semi-medium and medium farms, respectively. Cost A<sub>2</sub> was equal to cost A<sub>1</sub> because of no one farmer take land on rent for muskmelon cultivation. The per hectare cost B<sub>1</sub> was found to be Rs 44210.36 for small farm Rs 52640.93 for semi-medium and Rs 53740.75 for medium farms. The overall cost B<sub>1</sub> was calculated as Rs 50197.34 per hectare. The cost B<sub>2</sub> was observed as Rs 60340.17, Rs 71080.68 and Rs 73509.36 for small, semi-medium and medium farms, respectively. On an average cost B<sub>2</sub> was estimated at Rs 68310.07 per hectare in cultivation of muskmelon.

Among different size group of farms, cost C<sub>1</sub> on small, semi-medium and medium farms was estimated at Rs 52253.21, Rs 60279.63 and Rs 61083.52 per hectare, respectively, with an overall average of Rs 57872.12 per hectare. Cost C<sub>2</sub> (Total cost) Rs 68383.02 for small Rs 78719.38 for semi-medium and Rs 80852.13 for medium farms. It was observed that cost C<sub>2</sub> was lowest (Rs 68383.02 per hectare) for small farms and highest (Rs 80852.13 per hectare) for medium farms. The overall cost C<sub>2</sub> was found Rs 75984.85 per hectare. Cost C<sub>3</sub> equals cost C<sub>2</sub> and 10 percent of cost C<sub>2</sub> on account of the

management functions performed by the farmers. The overall C<sub>3</sub> was estimated at Rs 83473.72 per hectare. Among the farm size groups, it was found to be Rs 75221.33 on small farm, Rs 86262.49 on semi-medium farm and Rs 88937.34 on medium farms per hectare, respectively.

**Table 3.** Cost groups in cultivation of muskmelon different farm size groups (Rs /ha)

Cost groups	Small	Semi-medium	Medium	Overall
Cost A <sub>1</sub>	43580.38	51975.84	53060.52	49538.91
Cost A <sub>2</sub>	43580.38	51975.84	53060.52	49538.91
Cost B <sub>1</sub>	44210.36	52640.93	53740.75	50197.34
Cost B <sub>2</sub>	60340.17	71080.68	73509.36	68310.07
Cost C <sub>1</sub>	52253.21	60279.63	61083.52	57872.12
Cost C <sub>2</sub>	68383.02	78719.38	80852.13	75984.85
Cost C <sub>3</sub>	75221.33	86262.49	88937.34	83473.72

**Source:** Data collection on farmer field visit

### Policy Implication:

1. The study on components of operational costs indicated that the seed cost was one of major components of operational costs in cultivation of muskmelon. Therefore, it may be develop improved varieties of muskmelon on commercial scale and provide to farmers at subsidies rate.
2. Grading and standardization facilities should be created so that farmers can realize the maximum profits through quality muskmelon produced

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