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COMPARATIVE STUDY FOR MAJOR CROPS IN RAJASTHAN, INDIA

Supriya^{1*}, H.L. Singh², Prateek Kumar³, Ishita Omar¹, N. Manaswini¹, Catherine Mueni Peter¹ and Unmesha Dhar⁴

¹Department of Agricultural Economics, ANDUA&T, Kumarganj, Ayodhya, U.P., India.

²Department of Agricultural Economics, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut, U.P., India.

³Department of Extension Education, ANDUA&T, Kumarganj, Ayodhya, U.P., India.

⁴Department of Agribusiness Management, ANDUA&T, Kumarganj, Ayodhya, U.P., India.

*Correspondence author E-mail : drsupriya@nduat.org / drsupriya.anduat2019@gmail.com

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ABSTRACT

The western region of India is characterized by a scorching desert, commonly referred to as the Thar Desert. The desert's vast expanse is primarily located in the state of Rajasthan. The Indira Gandhi Canal Project (IGCP) was implemented to enhance the agricultural capacity of arid soil. The implementation of the IGCP project has resulted in alterations to the land use pattern, specifically an expansion in the agricultural area. The expansion of agricultural land and the growth of irrigation infrastructure have led to oscillations in the groundwater level. The fluctuation in groundwater level is caused by the infiltration of water due to excessive irrigation and seepage from the canal network. Thus study delves into the agricultural dynamics of three canal divisions, namely Rawatsar, Bijaynagar and Suratgarh, within the Hanumangarh district of Rajasthan, India. The research revolves around the cultivation of three major crops: moong, groundnut, and cotton, and seeks to analyze the economic performance of these crops across different landholding sizes. The findings reveal that moong consistently emerges as the most economically promising crop in all three divisions, with positive net returns for small, medium, and large-sized landholdings. Groundnut also demonstrates profitability, albeit slightly lower than moong. Cotton showcases competitive returns, particularly in specific landholding size categories. Data-driven insights from this study shed light on the economic challenges faced by farmers in these canal-irrigated regions. It emphasizes the significance of tailored agricultural policies and support mechanisms to address the unique challenges faced by farmers in each division, focusing on cost management, irrigation practices, and crop selection. These insights provide valuable guidance for farmers, policymakers, researchers, and stakeholders in the agricultural sector, aiming to enhance the economic prosperity of farmers in these canal areas.

Key words : B:C Ratio, Costs and Returns, CACP, Cotton, Groundnut, Moong.

Introduction

The tapestry of global agriculture is intricately woven with threads of diverse climatic conditions, cultural practices and economic factors. Within this vibrant fabric, India stands as a leading producer of agricultural products, showcasing remarkable resilience and adaptability in the face of varied geographies (John *et al.*, 2023; Rai and Maharjan, 2023). Yet, amidst this abundance, lies a stark reality: Rajasthan, the quintessential desert state, grapples with aridity, posing significant challenges to its agricultural prospects.

Most of Rajasthan's landscape bears the unmistakable imprint of the Thar Desert, where successful crop cultivation hinges precariously upon irrigation. In this context, canals emerge as a lifeblood, accounting for nearly 27.6% of net irrigated area of the state (Swain, 2004). The majestic Indira Gandhi Canal, snaking its way through 204 kilometers, symbolizes this dependence, carrying the promise of prosperity within its 18,500 cusec embrace. In the Hanumangarh district, where the waters of the Rajasthan feeder power agricultural ambitions, this study investigates the main

area of this region that is irrigated by canals (Singh, 2005; Brar, 2016).

The implementation of the Indira Gandhi Canal Project (IGCP) has fundamentally reshaped the land use patterns of Hanumangarh. Arid expanses have yielded verdant fields, echoing the transformative power of irrigation (Bainda and Malhotra, 2021; Dular, 2023; Kaur and Bala, 2020). However, this expansion has not been without consequences. Groundwater levels, once a silent reservoir, now experience dramatic fluctuations, responding to the infiltration of excess irrigation and seepage from the canal network (Kumar, 2019). This complex interplay of water, land, and agriculture forms the backdrop for our investigation.

This study probes the agricultural dynamics of three distinct canal divisions within Hanumangarh: Rawatsar, Bijaynagar, and Suratgarh. Each division presents a unique microcosm, shaped by specific soil characteristics, topography, and access to irrigation water (Kumar *et al.*, 2023). Within these landscapes, we focus our lens on three major crops: moong, groundnut and cotton. These hardy cultivars represent the economic mainstay of many farmers in the region, their fortunes intricately linked to the vagaries of weather, market forces and crucially, irrigation practices (Prasad, 2023).

The main objective of this study is to analyse the economic performance of these three crops across different landholding sizes within each canal division. By meticulously dissecting costs and profitability measures, the main aim is to shed light on the financial realities faced by farmers in these regions. This data-driven approach will enable us to identify the most economically viable crop choices for landholdings of varying scales, providing crucial insights for farmers seeking to optimize their returns (Mishra *et al.*, 2023a; Mishra *et al.*, 2023b).

This study transcends mere economic analysis. Discuss deeper, seeking to identify the specific challenges faced by farmers in each canal division. Issues of cost management, efficient irrigation practices and the connection between crop selection and landholding size will be brought under the microscope (Mishra *et al.*, 2023c). By unraveling these intricate threads, we hope to inform the development of tailored agricultural policies and support mechanisms, ensuring that farmers are equipped to navigate the unique hurdles of their respective environments (Chauhan and Thakur, 2022).

Ultimately, this study aspires to be a beacon of hope, guiding farmers, policymakers, researchers, and stakeholders towards a future of sustainable agricultural prosperity in the canal-irrigated regions of Hanumangarh.

By illuminating the economic realities of crop cultivation and unveiling the challenges and opportunities within each canal division, we aim to empower farmers to make informed decisions, optimize their returns, and contribute to the overall agricultural vibrancy of Rajasthan (Kumar and Singh, 2022; Rathore *et al.*, 2017).

It is important to acknowledge that some of our hypotheses may generate debate and diverge from existing perspectives. For instance, our findings may challenge the widely held belief that cotton cultivation offers the highest returns across all landholding sizes. Conversely, we may uncover unexpected economic viability in seemingly marginal crops like moong, particularly for smaller landholdings (Kumar *et al.*, 2022). By embracing these potential disagreements, we pave the way for a more nuanced understanding of the economic dynamics of canal-irrigated agriculture in Rajasthan, laying the groundwork for future research and informed policy interventions (Shrivatsava *et al.*, 2023 and Jangid, 2022).

Materials and Methods

First, a separate list of major crop growers of selected villages was prepared along-with their size of holding and further it was group into three categories *i.e.*

1. Marginal farmers (less than 1 ha)
2. Small farmer (1-2 ha)
3. Medium farmer (2-4 ha)
4. Large (4 ha & above)

Table 1 shows the no. of moong, groundnut and cotton growers and their landholdings as small landholding size is (1-2 ha) medium is in between (2-4ha) and the large category is above (4ha & above). In this Rawatsar Canal consist no. of farmers in small, medium and large is 56,31,19 in moong; 31,18,12 in groundnut and 107, 98 and 84 in cotton. Similarly, Bijayanagar and Suratgarh have the number of farmers in small, medium and large is 26, 18, 6 and 14, 10, 5 in moong; 16,11,8 and 10,8,6 in groundnut and 33,27,8 and 19,13,7 in cotton.

Both primary and secondary data were utilized in present study. The primary data on different aspects were collected through pre-tested interview schedule. Each of the selected growers was approached personally for recording relevant data. The secondary data was collected from published record of district head quarter.

Period of Enquiry

The data pertained to agriculture year 2020-2021 estimation of costs and returns

Table 1 : Division wise numbers of farmers.

Crops →	Moong ↓			Groundnut			Cotton			Total		
Division →	R	B	S	R	B	S	R	B	S	R	B	S
Land Size of holding												
Small (1-2 ha.)	56	26	14	31	16	10	107	33	19	194	75	43
Medium (2-4 ha.)	31	18	10	18	11	8	98	27	13	147	56	31
Large (4 ha. and above)	19	6	5	12	8	6	84	8	7	115	22	18
Total	106	50	29	61	35	24	289	68	39	456	153	92

R=Rawatsar, B = Bijaynagar and S=Suratgarh

Estimation of costs in the cultivation of major crops grown in the selected study area

The estimation of costs and profitability of major crops mainly moong, groundnut and Cotton cultivation were based on different costs and profitability measures as recommended by “Special expert committee on cost estimates. GOI new Delhi” was used in this study.

A. Cost concepts

The cost of cultivation classified as recommended by, “Special Expert Committee on Cost Estimates, GOI, New Delhi”, was used in this study. The cost concepts are given below:

Cost A₁ : It includes costs and kind expenses actually incurred by cultivators which are as follows:

- (i) Value of hired human labour
- (ii) Value of hired and owned bullock labour
- (iii) Value of owned and purchased seed
- (iv) Value of fertilizers, manures and chemicals
- (v) Value of hired and owned machinery charges
- (vi) Land revenue and taxes
- (vii) Expenditure on irrigation
- (viii) Interest paid on crop loans (if taken)
- (ix) Depreciation on farm assets
- (x) Interest on working capital, and
- (xi) Miscellaneous expenses.

Cost A₂: Cost A₁ + Rent paid for leased in land.

Cost B₁: Cost A₂ + Interest on owned fixed capital assets.

Cost B₂: Cost B₁ + Rental value of owned land.

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 (managerial cost)

Gross Income = Value of total output.

Net Income = It is computed by deducting cost C₃ from gross income.

B. Evaluation of farm inputs

Methods followed in evaluating different farm input for the present study are described in the following paragraphs.

Hired human labour : The farmers normally engage permanent farm labour on the basis of yearly wages and casual labour on daily wages basis, for performing farm operations. The casual labour was evaluated on the basis of actual wages that prevailed in the locality. The wages of male and female labour included payment given both in cash or kind. The value of kind components given to the labour was calculated at their prevailing market prices.

Family labour : The family labour cost was evaluated at the rate of prevailing wages in the locality for casual hired labour at various stages of operations.

Bullock and machinery labour : Estimation of bullock and machine labour charges on actual wage that prevailed in the locality was considered.

For estimation of depreciation, interest on working capital, interest on fixed capital and rental value of owned land, following standard norms were used.

B:C ratio

B:C ratio= Net return /Cost C₃ or total cost

Cultivators are becoming more and more conscious about the costs and returns from agriculture in general and enterprises on one farm in particular. Cultivator relates the price, which he receives for the produce in the market with his cost of production. Government takes into account the cost of production in deciding the price policy and for declaring the minimum support prices for selected important crops. The commission, which recommends the minimum support prices to government, is aptly named as the Commission for Agricultural Costs and Prices. Hence, the B:C ratio formula is the ratio of its Net return with its total cost.

Results and Discussion

The first canal study has a survey of 456 farmers in Rawatsar distributaries canal about 153 farmers in the second canal Bijaynagar division and 92 growers were selected and surveyed in Suratgarh canal division of Hanumangarh district of Rajasthan. The present study is undertaken in the state of Rajasthan to study the problems of farmers in the production of major crops in the canal area. The selected moong, groundnut and cotton growers were thus enquired about the operations of crop cultivation and their cost was estimated based on the information collected.

A. First Canal (Rawatsar division)

Table 2 depicted that the percentage of the total human labour of the all three crop of Rawatsar division in the small, medium, and large category sized sample and found to be as for Moong 33.76%, 33.40%, 32.93%. For Groundnut 34.69%, 33.50%, 33.30% and for Cotton 40.31%, 38.86%, 41.07%. The ploughing charges for all three crop in small, medium, large landholding was 4830.22 (Rs./ha), 5025.30(Rs./ha), 5615.20(Rs/ha); 4280.25(Rs/ha), 4700.21(Rs/ha), 48890.78(Rs/ha) and 3286.25(Rs/ha), 3413.45(Rs/ha), 3549.07(Rs/ha), respectively.

On the other hand, irrigation charges for the moong, groundnut & cotton in small, medium, large size per unit area was 569.31 (Rs/ha), 621.25 (Rs/ha), 688.45 (Rs/ha); 680.06 (Rs/ha), 703.67 (Rs/ha), 725.61 (Rs/ha) & 695.46 (Rs/ha), 712.20 (Rs/ha), 779.38 (Rs/ha) respectively for the division Rawatsar. The land revenue charge for all the three crops were observed was 50.00(Rs/ha) in all the small, medium and large sized category wise. There is interest on Fixed capital @12% in all the category wise farmers/growers of the three crops of Hanumangarh district of Rajasthan (Rawatsar) and calculated as 6.23%, 6.18%, 6.99%; 4.91%, 5.08%, 5.22%, & 6.26%, 7.76%, 8.26% respectively in case of moong, groundnut and cotton cultivation.

Bar graph (Fig. 1) shows the overall average of all the three crops of rawatsar division of Hanumangarh district of Rajasthan for the crops of moong groundnut and cotton. This bar graph having the particulars of family labour, hired labour, total human labour, ploughing charge, seed, manure & fertilizer, irrigation charges and insecticides etc. The number of total human labour of all the three-crops overall average were found Rs. 11637.67, Rs. 18981.83, Rs. 21600.80 per hectare. All the three crops has ploughing charges which are as 5027.98(Rs/ha), 4524.28(Rs/ha), 3405.77(Rs/ha). The seed charge per hectare of all the three crops are as 1466.82(Rs/ha),

10492.32(Rs/ha), 3230.30(Rs/ha). The charges for manure & fertilizers application charge are as 4172.37(Rs/ha), 3912.65(Rs/ha), 5363.65 (Rs/ha). The overall irrigation charges of the all the three crops are 605.86(Rs/ha), 695.99(Rs/ha) & 725.53(Rs/ha). Similarly the overall insecticides charge of all the three crops are given as 1291.53(Rs/ha), 1201.44(Rs/ha) & 1507.93(Rs/ha).

Cost and returns based on CACP of Rawatsar division

Table 3 depicted the Computation of Costs and Returns based on CACP of Rawatsar division with its small, medium and large sized categories of farmers/growers for the crops of moong, groundnut and cotton, the net returns were calculated and found to be as 2907.12 (Rs/ha), 3007.26 (Rs/ha), 2887.89 (Rs/ha); 2063.37 (Rs/ha), 2303.21 (Rs/ha), 2246.52 (Rs/ha) & 2601.72 (Rs/ha), 2457.30 (Rs/ha), 2315.17 (Rs/ha), respectively. The ratio of Benefit-Cost (B:C ratio) was calculated as 1:0.88, 1:0.94, 1:0.87; 1:0.85, 1:0.92, 1:0.88 and 1:0.95, 1:0.85, 1:1.76 respectively in their small, medium and large size.

CACP shows the overall average of the cost of all the three crops of rawatsar district. There are seven cost A_1/A_2 , B_1 , B_2 , C_1 , C_2 , C_3 . The cost A_1/A_2 of overall average the three crops was found to be as 23705.38(Rs/ha), 36912.97 (Rs/ha) & 33106.45(Rs/ha) as there is no land on lease that's why cost A_1 and cost A_2 were found to be similar. The cost B_1 and B_2 was calculated and found to be as (25916.55, 28916.55 (Rs/ha)) in moong, (39712.43, 42712.43 (Rs/ha) in groundnut & (37093.13, 43093.13(Rs/ha) in Cotton. Similarly trend of there are cost C_1 , C_2 & C_3 and the Cost C_3 is given as 28586.78, 31586.78 & 34745.46 Rs./ha. in moong, 47675.63, 50675.63 & 55743.20 Rs./ha. in groundnut and 43032.65, 49032.65 & 53935.91 in cotton respectively for Rawatsar division respectively. The overall average of Gross Income for moong, groundnut and cotton growers of rawatsar division of Hanumangarh district were 65968 (Rs./ha), 108000 (Rs./ha) & 100098.50 (Rs./ha). The overall average of yield is given in quintal per hectare and found to be as 10.64, 22.50 & 18.71. Similarly the overall net return average of all the three crops are computed and found to be as 2934.45(Rs/ha), 2322.52(Rs/ha) & 2467.27(Rs/ha).

B. Second Canal (Bijaynagar Division)

Table 4 depicted that the percentage of the total human labour of the all three crop of Bijaynagar division in the small, medium, and large category sized sample and found to be as for Moong 34.35%, 34.92%, 33.97%. For Groundnut 35.19%, 34.41%, 25.00% and for Cotton 43.06%, 43.36%, 40.85%. The ploughing charges for all

Table 2 : Cost of Cultivation in Rawatsar division of Hanumangarh district.

Particulars	Crops	Small	Medium	Large	Overall average
Family Labour	Moong	2964.31(8.82)	2638.49(7.54)	1855.25(4.93)	2670.23(7.69)
	Groundnut	8560.20(15.73)	7910.50(13.98)	6500.00(11.24)	7963.20(14.29)
	Cotton	6137.80(12.16)	5938.31(10.87)	5688.37(9.89)	5939.52(11.01)
Hired Labour	Moong	8386.12(24.94)	9050.35(25.86)	10545.55(28.00)	8967.44(25.81)
	Groundnut	10325.55(18.97)	11050.80(19.52)	12760.85(22.06)	11018.63(19.77)
	Cotton	14199.74(28.14)	15298.63(28.00)	17946.09(31.19)	15661.28(29.04)
Total Human Labour	Moong	11350.43(33.76)	11688.84(33.40)	12400.80(32.93)	11637.67(33.49)
	Groundnut	18885.75(34.69)	18961.30(33.50)	19260.85(33.30)	18981.83(34.05)
	Cotton	20337.54(40.31)	21236.94(38.86)	23634.46(41.07)	21600.80(40.05)
Ploughing Charge	Moong	4830.22(14.37)	5025.30(14.36)	5615.20(14.91)	5027.98(14.47)
	Groundnut	4280.25(7.86)	4700.21(8.30)	4890.78(8.46)	4524.28(8.12)
	Cotton	3286.25(6.51)	3413.45(6.25)	3549.07(6.17)	3405.77(6.31)
Seed	Moong	1450.24(4.31)	1476.33(4.22)	1500.17(3.98)	1466.82(4.22)
	Groundnut	10000.25(18.37)	10950.49(19.35)	11076.25(19.15)	10492.32(18.82)
	Cotton	3185.47(6.31)	3793.81(6.94)	2629.97(4.57)	3230.30(5.99)
Manure & Fertilizer	Moong	4012.33(11.93)	4260.18(12.17)	4500.80(11.95)	4172.37(12.01)
	Groundnut	3830.10(7.04)	3981.28(7.03)	4022.95(6.96)	3912.65(7.02)
	Cotton	4841.89(9.60)	5576.13(10.20)	5780.37(10.05)	5363.65(9.94)
Irrigation Charge	Moong	569.31(1.69)	621.25(1.78)	688.45(1.83)	605.86(1.74)
	Groundnut	680.06(1.25)	703.67(1.24)	725.61(1.25)	695.99(1.25)
	Cotton	695.46(1.38)	712.20(1.30)	779.38(1.35)	725.53(1.35)
Insecticides	Moong	1250.46(3.72)	1280.34(3.66)	1430.82(3.80)	1291.53(3.72)
	Groundnut	1176.38(2.16)	1200.30(2.12)	1267.90(2.19)	1201.44(2.16)
	Cotton	1368.09(2.71)	1441.59(2.64)	1763.46(3.06)	1507.93(2.80)
Total working Capital	Moong	23462.99(69.79)	24352.24(69.59)	26136.24(69.40)	24202.22(69.66)
	Groundnut	38852.79(71.38)	40497.25(71.55)	41244.34(71.31)	39808.51(71.41)
	Cotton	33714.70(66.82)	36174.12(66.20)	38136.71(66.28)	35833.98(66.44)
Interest on Working Capital@7%	Moong	1642.41(4.89)	1704.66(4.87)	1829.54(4.86)	1694.16(4.88)
	Groundnut	2719.70(5.00)	2834.81(5.01)	2887.10(4.99)	2786.60(5.00)
	Cotton	2360.03(4.68)	2532.19(4.63)	2669.57(4.64)	2508.38(4.65)
Land Revenue	Moong	50.00(0.15)	50.00(0.14)	50.00(0.13)	50.00(0.14)
	Groundnut	50.00(0.09)	50.00(0.09)	50.00(0.09)	50.00(0.09)
	Cotton	50.00(0.01)	50.00(0.09)	50.00(0.09)	50.00(0.09)
Depreciation	Moong	313.91(0.93)	540.12(1.54)	588.19(1.56)	429.23(1.24)
	Groundnut	2192.35(4.03)	2198.35(3.88)	2380.16(4.12)	2231.07(4.00)
	Cotton	590.37(1.17)	680.36(1.25)	702.98(1.22)	653.62(1.21)
Rental Value of land	Moong	3000.00(8.92)	3000.00(8.57)	3000.00(7.97)	3000.00(8.63)
	Groundnut	3000.00(5.51)	3000.00(5.30)	3000.00(5.19)	3000.00(5.38)
	Cotton	6000.00(11.89)	6000.00(11.98)	6000.00(10.43)	6000.00(11.12)

Table 2 continued...

Table 2 continued...

Interest on Fixed Capital @12%	Moong	2094.61(6.23)	2164.28(6.18)	2631.25(6.99)	2211.18(6.36)
	Groundnut	2670.81(4.91)	2876.07(5.08)	3016.90(5.22)	2799.46(5.02)
	Cotton	3156.21(6.26)	4238.96(7.76)	4750.19(8.26)	3986.67(7.39)
Sub Total	Moong	30563.92(90.91)	31811.30(90.91)	34235.22(90.91)	31586.78(90.91)
	Groundnut	49485.65(90.91)	51456.48(90.91)	52578.50(90.91)	50675.63(90.91)
	Cotton	45871.31(90.91)	49675.63(90.91)	52309.45(90.91)	49032.65(90.91)
Miscellaneous cost @ 10% of Sub total cost	Moong	3056.39(9.09)	3181.13(9.09)	3423.52(9.09)	3158.68(9.09)
	Groundnut	4948.56(9.09)	5145.65(9.09)	5257.85(9.09)	5067.56(9.09)
	Cotton	4587.13(9.09)	4967.56(9.09)	5230.94(9.09)	4903.26(9.09)
Total Cost C₃	Moong	33620.31(100)	34992.43(100)	37658.74(100)	34745.46(100)
	Groundnut	54434.21(100)	56602.13(100)	57836.35(100)	55743.20(100)
	Cotton	50458.44(100)	54643.19(100)	57540.39(100)	53935.91(100)

Table 3 : Computation of costs and returns based on CACP in Rawatsar division of Hanumangarh district:

Particulars	Crops	Small	Medium	Large	Overall average
Cost A₁/A₂	Moong	22505.00	24008.53	26748.72	23705.38
	Groundnut	35254.64	37669.91	40061.60	36912.97
	Cotton	30577.3	33498.36	35870.89	33106.45
Cost B₁	Moong	24599.61	26172.81	29379.97	25916.55
	Groundnut	37925.45	40545.98	43078.50	39712.43
	Cotton	33733.51	37737.32	40621.08	37093.13
Cost B₂	Moong	27599.61	29172.81	32379.97	28916.55
	Groundnut	40925.45	43545.98	46078.50	42712.43
	Cotton	39733.51	43737.32	46621.08	43093.13
Cost C₁	Moong	27563.92	28811.30	31235.22	28586.78
	Groundnut	46485.65	48456.48	49578.50	47675.63
	Cotton	39871.31	43675.63	46309.45	43032.65
Cost C₂	Moong	30563.92	31811.30	34235.22	31586.78
	Groundnut	49485.65	51456.48	52578.50	50675.63
	Cotton	45871.31	49675.63	52309.45	49032.65
Cost C₃	Moong	33620.31	34992.43	37658.74	34745.46
	Groundnut	54434.21	56602.13	57836.35	55743.20
	Cotton	50458.44	54643.19	57540.39	53935.91
Cost of production (Rs./qtl.)	Moong	3292.88	3192.74	3312.11	3265.55
	Groundnut	2436.63	2496.79	2553.48	2477.48
	Cotton	2748.28	2892.70	3034.83	2882.73
Yield(qtl./ha)	Moong	10.21	10.96	11.37	10.64
	Groundnut	22.34	22.67	22.65	22.50
	Cotton	18.36	18.89	18.96	18.71

Table 3 continued...

Table 3 continued...

Sale price(Rs. qtl.)	Moong	6200.00	6200.00	6200.00	6200.00
	Groundnut	4500.00	4800.00	4800.00	4800.00
	Cotton	5350	5350	5350	5350
Total Gross income	Moong	63302.00	67952.00	70494.00	65968.00
	Groundnut	100530.00	108816.00	108720.00	108000.00
	Cotton	98226	101061.5	101436	100098.5
Net return(Rs./qtl.)	Moong	2907.12	3007.26	2887.89	2934.45
	Groundnut	2063.37	2303.21	2246.52	2322.52
	Cotton	2601.72	2457.30	2315.17	2467.27
Total Net Returns	Moong	29681.69	32959.57	32835.26	31222.54
	Groundnut	46095.79	52213.87	50883.65	52256.80
	Cotton	47767.56	46418.31	43895.61	46162.59
Input-Output ratio	Moong	1.88	1.94	1.87	1.90
	Groundnut	1.85	1.92	1.88	1.94
	Cotton	1.95	1.85	1.76	1.86
B:C ratio	Moong	0.88	0.94	0.87	0.90
	Groundnut	0.85	0.92	0.88	0.94
	Cotton	0.95	0.85	0.76	0.86

three crop in small, medium, large landholding was 4980.75 (Rs./ha), 5080.81(Rs./ha), 5420.94(Rs/ha); 4288.21(Rs/ha), 4476.35(Rs/ha), 4600.00(Rs/ha) and 3197.26(Rs/ha), 3494.81(Rs/ha), 4150.05(Rs/ha) respectively.

On the other hand, irrigation charges for the moong, groundnut & cotton in small, medium, large size per unit area was 520.35 (Rs/ha), 588.44 (Rs/ha), 600.00 (Rs/ha); 667.90 (Rs/ha), 680.32 (Rs/ha), 690.38 (Rs/ha) & 647.47 (Rs/ha), 680.94 (Rs/ha), 779.48 (Rs/ha) respectively for the division Bijaynagar. The land revenue charge for all the three crops were observed was 50.00(Rs/ha) in all the small, medium and large sized category wise. There is interest on Fixed capital @12% in all the category wise farmers/growers of the three crops of Hanumangarh district of Rajasthan (Bijaynagar) and calculated as 6.25%, 6.21%, 7.65%; 4.53%, 5.06%, 4.99%, & 7.29%, 7.18%, 8.21% respectively in case of moong, groundnut and cotton cultivation.

Bar graph (Fig. 2) shows the overall average of all the three crops of Bijaynagar division of Hanumangarh district of Rajasthan for the crops of moong groundnut and cotton. This bar graph having the particulars of family labour, hired labour, total human labour, ploughing charge, seed, manure & fertilizer, irrigation charges and

insecticides etc. The number of total human labour of all the three-crops overall average were found Rs. 12282.28, Rs. 19540.22, Rs. 24054.49 per hectare. All the three crops has ploughing charges which are as 5069.59(Rs./ha), 4418.61(Rs/ ha), 3575.09(Rs./ ha). The seed charge per hectare of all the three crops are as 1483.16(Rs./ha), 10659.86(Rs./ ha), 2617.42(Rs./ ha). The charges for manure & fertilizers application charge are as 4208.27(Rs/ha), 4048.93(Rs/ha), 5444.38 (Rs./ha). The overall irrigation charges of the all the three crops are 554.42(Rs./ha), 676.94(Rs./ha) & 697.19 (Rs./ha). Similarly the overall insecticides charge of all the three crops are given as 1320.05(Rs/ha), 1216.56 (Rs./ha) & 1649.48 (Rs./ha).

Cost and returns based on CACP of Bijaynagar division

Table 5 depicted the Computation of Costs and Returns based on CACP of Bijaynagar division with its small, medium and large sized categories of farmers/growers for the crops of moong, groundnut and cotton, the net returns were calculated and found to be as 2885.99 (Rs./ha), 2943.34(Rs./ha), 2890.49 (Rs./ha); 2361.69 (Rs./ha), 2298.27 (Rs./ha), 2266.86 (Rs./ha) & 2449.18 (Rs./ha), 2283.61 (Rs/ha), 2283.45 (Rs/ha) respectively. The ratio of Benefit-Cost (B:C ratio) was calculated as

Table 4 : Cost of cultivation in Bijaynagar Division in Hanumangarh district.

Particulars	Crops	Small	Medium	Large	Overall average
Family Labour	Moong	3175.80(9.21)	2850.50(7.83)	2200.00(5.82)	2941.60(8.27)
	Groundnut	8865.30(16.33)	8175.25(14.45)	7630.15(13.05)	8366.11(14.95)
	Cotton	6346.10(11.79)	6947.50(12.10)	5949.56(10.05)	6434.78(11.37)
Hired Labour	Moong	8675.30(25.15)	9865.25(27.10)	10650.35(28.15)	9340.69(26.25)
	Groundnut	10240.80(18.86)	11290.75(19.96)	12880.35(22.03)	11174.10(19.97)
	Cotton	16836.95(31.27)	17955.39(31.26)	18225.17(30.79)	17619.71(31.12)
Total Human Labour	Moong	11851.10(34.35)	12715.75(34.92)	12850.35(33.97)	12282.28(34.51)
	Groundnut	19106.10(35.19)	19466.00(34.41)	20510.50(25.00)	19540.22(34.92)
	Cotton	23183.05(43.06)	24902.89(43.36)	24174.73(40.85)	24054.49(42.49)
Ploughing Charge	Moong	4980.75(14.44)	5080.81(13.95)	5420.94(14.33)	5069.59(14.25)
	Groundnut	4288.21(7.90)	4476.35(7.91)	4600.00(7.87)	4418.61(7.90)
	Cotton	3197.26(5.94)	3494.81(6.08)	4150.05(7.01)	3575.09(6.32)
Seed	Moong	1462.58(4.24)	1500.55(4.12)	1520.15(4.02)	1483.16(4.17)
	Groundnut	10450.37(19.25)	10760.58(19.02)	10940.34(18.71)	10659.86(19.05)
	Cotton	2337.08(4.34)	2674.40(4.66)	2908.03(4.91)	2617.42(4.62)
Manure & Fertilizer	Moong	4135.20(11.99)	4286.49(11.77)	4290.24(11.34)	4208.27(11.83)
	Groundnut	3971.31(7.31)	4088.15(7.23)	4150.25(7.10)	4048.93(7.23)
	Cotton	5378.67(9.99)	5424.05(9.44)	5551.79(9.38)	5444.38(9.62)
Irrigation Charge	Moong	520.35(1.51)	588.44(1.62)	600.00(1.59)	554.42(1.56)
	Groundnut	667.90(1.23)	680.32(1.20)	690.38(1.18)	676.94(1.21)
	Cotton	647.47(1.20)	680.94(1.19)	779.48(1.32)	697.19(1.23)
Insecticides	Moong	1290.74(3.74)	1340.15(3.68)	1386.74(3.67)	1320.05(3.71)
	Groundnut	1185.60(2.18)	1218.15(2.15)	1276.30(2.18)	1216.56(2.17)
	Cotton	1435.28(2.67)	1682.63(2.93)	1883.64(3.18)	1649.48(2.91)
Total working Capital	Moong	24240.72(70.27)	25512.19(70.07)	26068.42(68.91)	24917.77(70.02)
	Groundnut	39669.49(73.05)	40689.55(71.94)	42167.77(72.12)	40561.12(72.48)
	Cotton	36178.81(67.20)	38859.72(67.66)	39447.72(66.65)	38038.04(67.19)
Interest on Working Capital@7%	Moong	1696.85(4.92)	1785.85(4.90)	1824.79(4.82)	1744.24(4.90)
	Groundnut	2776.86(5.11)	2848.27(5.04)	2951.74(5.05)	2839.28(5.07)
	Cotton	2532.52(4.70)	2720.18(4.74)	2761.34(4.67)	2662.66(4.70)
Land Revenue	Moong	50.00(0.14)	50.00(0.14)	50.00(0.13)	50.00(0.14)
	Groundnut	50.00(0.09)	50.00(0.09)	50.00(0.09)	50.00(0.09)
	Cotton	50.00(0.09)	50.00(0.09)	50.00(0.08)	50.00(0.09)
Depreciation	Moong	220.54(0.64)	490.21(1.35)	550.16(1.45)	357.18(1.00)
	Groundnut	1408.06(2.59)	1973.01(3.49)	2064.09(3.53)	1735.57(3.10)
	Cotton	260.32(0.48)	456.32(0.79)	683.21(1.15)	449.70(0.79)

Table 4 continued...

Table 4 continued...

Rental Value of land	Moong	3000.00(8.70)	3000.00(8.24)	3000.00(7.93)	3000.00(8.43)
	Groundnut	3000.00(5.52)	3000.00(5.30)	3000.00(5.13)	3000.00(5.36)
	Cotton	6000.00(11.14)	6000.00(10.45)	6000.00(10.14)	6000.00(10.60)
Interest on Fixed Capital @12%	Moong	2154.50(6.25)	2261.28(6.21)	2895.46(7.65)	2281.86(6.41)
	Groundnut	2460.38(4.53)	2861.18(5.06)	2916.27(4.99)	2690.55(4.81)
	Cotton	3923.12(7.29)	4125.99(7.18)	4861.72(8.21)	4264.72(7.53)
Sub Total	Moong	31362.61(90.91)	33099.53(90.91)	34388.83(90.91)	32351.05(90.91)
	Groundnut	49364.79(90.91)	51422.01(90.91)	53149.87(90.91)	50876.51(90.91)
	Cotton	48944.77(90.91)	52212.21(90.91)	53803.99(90.91)	51465.13(90.91)
Miscellaneous cost @ 10% of Sub total cost	Moong	3136.26(9.09)	3309.95(9.09)	3438.88(9.09)	3235.10(9.09)
	Groundnut	4936.48(9.09)	5142.20(9.09)	5314.99(9.09)	5087.65(9.09)
	Cotton	4894.48(9.09)	5221.22(9.09)	5380.40(9.09)	5146.51(9.09)
Total Cost C₃	Moong	34498.87(100)	36409.49(100)	37827.71(100)	35586.15(100)
	Groundnut	54301.27(100)	56564.21(100)	58464.86(100)	55964.16(100)
	Cotton	53839.24(100)	57433.43(100)	59184.39(100)	56611.64(100)

Table 5 : Computation of costs and returns based on CACP in Bijaynagar division of Hanumangarh district.

Particulars	Crops	Small	Medium	Large	Overall average
Cost A₁/A₂	Moong	23032.31	24987.75	26293.37	24127.60
	Groundnut	35039.11	37385.58	39603.45	36819.85
	Cotton	32675.55	35138.72	36992.71	34765.63
Cost B₁	Moong	25186.81	27249.03	29188.83	26409.45
	Groundnut	37499.49	40246.76	42519.72	39510.40
	Cotton	36598.67	39264.71	41854.43	39030.35
Cost B₂	Moong	28186.81	30249.03	32188.83	29409.45
	Groundnut	40499.49	43246.76	45519.72	42510.40
	Cotton	42598.67	45264.71	47854.43	45030.35
Cost C₁	Moong	28362.61	30099.53	31388.83	29351.05
	Groundnut	46364.79	48422.01	50149.87	47876.51
	Cotton	42944.77	46212.21	47803.99	45465.13
Cost C₂	Moong	31362.61	33099.53	34388.83	32351.05
	Groundnut	49364.79	51422.01	53149.87	50876.51
	Cotton	48944.77	52212.21	53803.99	51465.13
Cost C₃	Moong	34498.87	36409.49	37827.71	35586.15
	Groundnut	54301.27	56564.21	58464.86	55964.16
	Cotton	53839.24	57433.43	59184.39	56611.64
Cost of production (Rs./qtl.)	Moong	3314.01	3256.66	3309.51	3291.97
	Groundnut	2438.31	2501.73	2533.14	2480.68
	Cotton	2900.82	3066.39	3066.55	3025.74

Table 5 continued...

Table 5 continued...

Yield(qtl./ha)	Moong	10.41	11.18	11.43	10.81
	Groundnut	22.27	22.61	23.08	22.56
	Cotton	18.56	18.73	19.3	18.71
Sale price(Rs. qtl.)	Moong	6200.00	6200.00	6200.00	6200.00
	Groundnut	4800.00	4800.00	4800.00	4800.00
	Cotton	5350	5350	5350	5350
Total Gross income	Moong	64542.00	69316.00	70866.00	67022.00
	Groundnut	106896.00	108528.00	110784.00	108288.00
	Cotton	99296	100205.5	103255	100098.5
Net return(Rs./qtl.)	Moong	2885.99	2943.34	2890.49	2908.03
	Groundnut	2361.69	2298.27	2266.86	2319.32
	Cotton	2449.18	2283.61	2283.45	2324.26
Total Net Returns	Moong	30043.13	32906.51	33038.29	31435.85
	Groundnut	52594.73	51963.79	52319.14	52323.84
	Cotton	45456.76	42772.07	44070.61	43486.86
Input-Output ratio	Moong	1.87	1.90	1.87	1.88
	Groundnut	1.97	1.92	1.89	1.93
	Cotton	1.84	1.74	1.74	1.77
B:C ratio	Moong	0.87	0.90	0.87	0.88
	Groundnut	0.97	0.92	0.89	0.93
	Cotton	0.84	0.74	0.74	0.77

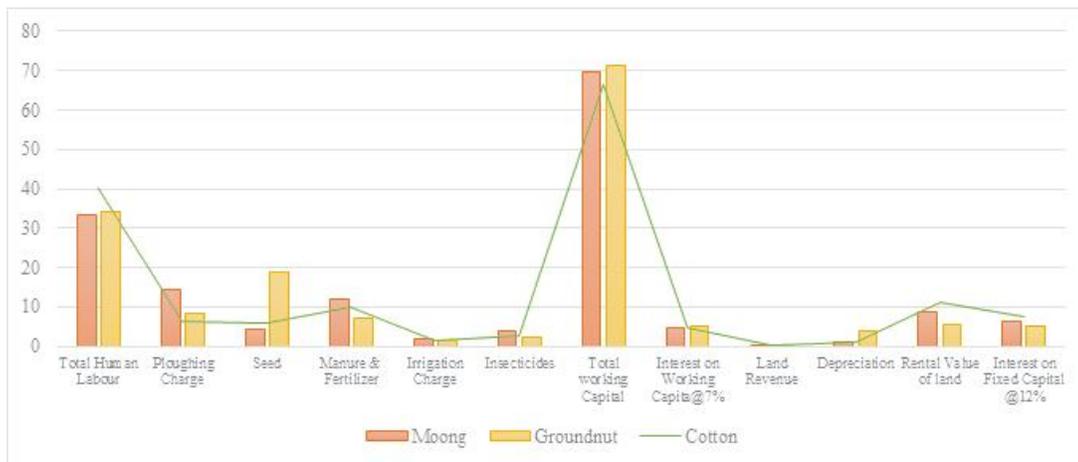


Fig. 1 : Cost of cultivation of first canal (%).

1:0.87, 1:0.90, 1:0.87; 1:0.97, 1:0.92, 1:0.89 and 1:0.84, 1:0.74, 1:1.74 respectively in their small, medium and large size.

CACP shows the overall average of the cost of all the three division of Hanumangarh district. There are seven cost A_1/A_2 , B_1 , B_2 , C_1 , C_2 , C_3 . The cost A_1/A_2 of overall average the three crops was found to be as 24127.60 (Rs/ha), 36819.85 (Rs/ha) & 34765.63(Rs/ha)

as there is no land on lease that's why cost A_1 and cost A_2 were found to be similar. The cost B_1 and B_2 was calculated and found to be as (26409.45, 29409.45 (Rs/ha) in moong), (39510.40, 42510.40 (Rs/ha) in groundnut & (39030.35, 45030.35 (Rs/ha) in cotton. Similarly trend of there are cost C_1 , C_2 & C_3 and the Cost C_3 is given as 35586.15, 55964.16 & 56611.64 respectively for Rawatsar division, respectively. The overall average of Gross

Table 6 : Cost of cultivation in Suratgarh Division in Hanumangarh district.

Particulars	Crops	Small	Medium	Large	Overall average
Family Labour	Moong	3945.35(11.48)	3060.75(8.35)	2370.25(6.18)	3368.75(9.40)
	Groundnut	8230.65(15.40)	7640.50(13.71)	6540.25(11.52)	7611.33(13.83)
	Cotton	6402.63(12.17)	5295.53(9.63)	5502.29(9.32)	5765.52(10.43)
Hired Labour	Moong	7860.20(22.87)	9840.15(26.84)	10645.50(27.77)	9023.17(25.17)
	Groundnut	10570.15(19.78)	11795.75(21.17)	12845.95(22.63)	11547.63(20.98)
	Cotton	16146.17(30.68)	17977.09(32.70)	18634.29(31.55)	17490.23(31.63)
Total Human Labour	Moong	11805.55(34.34)	12900.90(35.19)	13015.75(33.96)	12391.91(34.57)
	Groundnut	18800.80(35.18)	19436.25(34.89)	19386.20(34.15)	19158.97(34.81)
	Cotton	22548.80(42.84)	23272.62(42.33)	24136.58(40.87)	23255.75(42.06)
Ploughing Charge	Moong	5120.77(14.90)	5240.43(14.30)	5620.74(14.66)	5248.23(14.64)
	Groundnut	4379.61(8.19)	4483.27(8.05)	4680.16(8.24)	4489.30(8.16)
	Cotton	3295.84(6.26)	3490.15(6.35)	3525.75(5.97)	3428.56(6.20)
Seed	Moong	1380.35(4.02)	1468.50(4.01)	1490.88(3.89)	1429.80(3.99)
	Groundnut	10790.28(20.19)	11060.48(19.85)	11128.30(19.60)	10964.85(19.92)
	Cotton	2333.48(4.43)	2518.33(4.58)	2716.57(4.60)	2507.51(4.53)
Manure & Fertilizer	Moong	4216.51(12.27)	4280.12(11.68)	4405.21(11.49)	4270.98(11.92)
	Groundnut	3230.50(6.04)	3789.02(6.80)	3940.08(6.94)	3594.07(6.53)
	Cotton	5087.09(9.67)	5158.08(9.38)	6156.57(10.42)	5422.02(9.81)
Irrigation Charge	Moong	535.00(1.56)	645.30(1.76)	750.80(1.96)	610.24(1.70)
	Groundnut	608.64(1.14)	712.25(1.28)	791.25(1.39)	688.83(1.25)
	Cotton	620.57(1.18)	698.28(1.27)	780.00(1.32)	693.26(1.25)
Insecticides	Moong	1210.75(3.52)	1370.58(3.74)	1405.11(3.67)	1299.37(3.63)
	Groundnut	1137.18(2.13)	1208.15(2.17)	1290.18(2.27)	1199.09(2.18)
	Cotton	1432.39(2.72)	1603.21(2.92)	1986.86(3.36)	1651.48(2.99)
Total working Capital Capita@7%	Moong	24268.93(70.60)	25905.83(70.67)	26688.49(69.63)	25250.54(70.45)
	Groundnut	38947.01(72.87)	40689.42(73.03)	41216.17(72.60)	40095.10(72.86)
	Cotton	35318.17(67.11)	36740.67(66.83)	39302.33(66.55)	36958.57(66.84)
Interest on Working	Moong	1698.83(4.94)	1813.41(4.95)	1868.19(4.87)	1767.54(4.93)
	Groundnut	2726.29(5.10)	2848.26(5.11)	2885.13(5.08)	2806.66(5.10)
	Cotton	2472.27(4.70)	2571.85(4.68)	2751.16(4.66)	2587.10(4.68)
Land Revenue	Moong	50.00(0.15)	50.00(0.14)	50.00(0.13)	50.00(0.14)
	Groundnut	50.00(0.09)	50.00(0.09)	50.00(0.09)	50.00(0.09)
	Cotton	50.00(0.01)	50.00(0.09)	50.00(0.08)	50.00(0.09)
Depreciation	Moong	368.16(1.07)	410.31(1.12)	468.76(1.22)	400.04(1.12)
	Groundnut	1680.25(3.14)	1794.82(3.22)	2084.67(3.67)	1819.55(3.31)
	Cotton	320.63(0.61)	490.24(0.89)	562.14(0.95)	448.34(0.81)
Rental Value of land	Moong	3000.00(8.73)	3000.00(8.18)	3000.00(7.83)	3000.00(8.37)

Table 6 continued...

Table 6 continued...

	Groundnut	3000.00(5.61)	3000.00(5.38)	3000.00(5.28)	3000.00(5.45)
	Cotton	6000.00(11.40)	6000.00(10.91)	6000.00(10.16)	6000.00(10.85)
Interest on Fixed Capital @12%	Moong	1862.90(5.42)	2143.99(5.85)	2768.12(7.22)	2115.90(5.90)
	Groundnut	2183.24(4.08)	2265.20(4.07)	2376.18(4.19)	2258.80(4.10)
	Cotton	3685.12(7.00)	4128.96(7.51)	5021.76(8.50)	4224.13(7.64)
Sub Total	Moong	31248.82(90.91)	33323.54(90.91)	34843.56(90.91)	32584.02(90.91)
	Groundnut	48586.79(90.91)	50647.70(90.91)	51612.15(90.91)	50030.10(90.91)
	Cotton	47846.19(90.91)	49981.72(90.91)	53687.39(90.91)	50268.14(90.91)
Miscellaneous cost @10% of Sub total cost	Moong	3124.88(9.09)	3332.35(9.09)	3484.36(9.09)	3258.40(9.09)
	Groundnut	4858.68(9.09)	5064.77(9.09)	5161.22(9.09)	5003.01(9.09)
	Cotton	4784.62(9.09)	4998.17(9.09)	5368.74(9.09)	5026.81(9.09)
Total Cost C₃	Moong	34373.70(100)	36655.89(100)	38327.92(100)	35842.42(100)
	Groundnut	53445.47(100)	55712.47(100)	56773.37(100)	55033.11(100)
	Cotton	52630.81(100)	54979.89(100)	59056.13(100)	55294.95(100)

Income for moong, groundnut and cotton growers of rawatsar division of Hanumangarh district. The overall average of yield is given in quintal per hectare and found to be as 10.81 in moong, 22.56 in groundnut & 18.71 in cotton. The overall average gross income of all the three crops are given as 67022.00(Rs/ha), 108288.00(Rs/ha) & 100098.50 (Rs/ha). Similarly the overall net return average of all the three crops are computed and found to be as 2908.03(Rs/ha), 2319.32 (Rs/ha) & 2324.26 (Rs/ha) respectively.

C. Third canal (Suratgarh Division)

Table 6 depicted that the percentage of the total human labour of the all three crop of Suratgarh division in the small, medium, and large category sized sample and found to be as for Moong 34.34%, 35.19%, 33.96%. For Groundnut 35.18%, 34.89%, 34.15% and for Cotton 42.84%, 42.33%, 40.87%. The ploughing charges for all three crop in small, medium, large landholding was 5120.77 (Rs./ha), 5240.43(Rs./ha), 5620.74(Rs/ha); 4379.61(Rs/ha), 4483.27(Rs/ha), 4680.16(Rs/ha) and 3295.84(Rs/ha), 3490.15(Rs/ha), 3525.75(Rs/ha), respectively.

On the other hand irrigation charges for the moong, groundnut & cotton in small, medium, large size per unit area was 535.00 (Rs/ha), 645.30 (Rs/ha), 750.80 (Rs/ha); 608.64 (Rs/ha), 712.25 (Rs/ha), 791.25 (Rs/ha) & 620.57 (Rs/ha), 698.28 (Rs/ha), 780.00 (Rs/ha) respectively for the division Suratgarh. The land revenue charge for all the three crops were observed was 50.00 (Rs/ha) in all the small, medium and large sized category

wise. There is interest on Fixed capital @12% in all the category wise farmers/growers of the three crops of Hanumangarh district of Rajasthan (Suratgarh) and calculated as 5.42%, 5.85%, 7.22%; 4.08%, 4.07%, 4.19%, & 7.00%, 7.51%, 8.50% respectively in case of moong, groundnut and cotton cultivation.

Bar graph (Fig. 3) shows the overall average of all the three crops of suratgarh division of Hanumangarh district of Rajasthan for the crops of moong groundnut and cotton. This bar graph having the particulars of family labour, hired labour, total human labour, ploughing charge, seed, manure & fertilizer, irrigation charges and insecticides etc. The number of total human labour of all the three-crops overall average were found Rs. 12391.91, Rs. 19158.97, Rs. 23255.75 per hectare. All the three crops has ploughing charges which are as 5248.23(Rs/ha), 4489.30(Rs/ha), 3428.56(Rs/ha). The seed charge per hectare of all the three crops are as 1429.80(Rs/ha), 10964.85(Rs/ha), 2507.51(Rs/ha). The charges for manure & fertilizers application charge are as 4270.98(Rs/ha), 3594.07(Rs/ha), 5422.02 (Rs/ha). The overall irrigation charges of the all the three crops are 610.24(Rs/ha), 688.83(Rs/ha) & 693.26(Rs/ha). Similarly the overall insecticides charge of all the three crops are given as 1299.37(Rs/ha), 1199.09(Rs/ha) & 1651.48 (Rs/ha).

Cost and returns based on CACP of Suratgarh division

Table 7 depicted the Computation of Costs and Returns based on CACP of suratgarh division with its small, medium and large sized categories of farmers/

Table 7 : Computation of costs and returns based on CACP in suratgarh division of Hanumangarh district

Particulars	Crops	Small	Medium	Large	Overall average
Cost A ₁ /A ₂	Moong	22440.57	25118.80	26705.19	24099.37
	Groundnut	35172.90	37742.00	39695.72	37159.97
	Cotton	31758.44	34557.23	37163.34	34278.49
Cost B ₁	Moong	24303.47	27262.79	29473.31	26215.27
	Groundnut	37356.14	40007.20	42071.90	39418.77
	Cotton	35443.56	38686.19	42185.1	38502.62
Cost B ₂	Moong	27303.47	30262.79	32473.31	29215.27
	Groundnut	40356.14	43007.20	45071.90	42418.77
	Cotton	41443.56	44686.19	48185.1	44502.62
Cost C ₁	Moong	28248.82	30323.54	31843.56	29584.02
	Groundnut	45586.79	47647.70	48612.15	47030.10
	Cotton	41846.19	43981.72	47687.39	44268.14
Cost C ₂	Moong	31248.82	33323.54	34843.56	32584.02
	Groundnut	48586.79	50647.70	51612.15	50030.10
	Cotton	47846.19	49981.72	53687.39	50268.14
Cost C ₃	Moong	34373.70	36655.89	38327.92	35842.42
	Groundnut	53445.47	55712.47	56773.37	55033.11
	Cotton	52630.81	54979.89	59056.13	55294.95
Cost of production (Rs./qtl.)	Moong	3308.34	3272.85	3324.19	3297.37
	Groundnut	2406.37	2424.39	2455.60	2425.43
	Cotton	2828.09	2896.73	3030.07	2927.21
Yield(qtl./ha)	Moong	10.39	11.20	11.53	10.87
	Groundnut	22.21	22.98	23.12	22.69
	Cotton	18.61	18.98	19.49	18.89
Sale price(Rs. qtl.)	Moong	6200.00	6200.00	6200.00	6200.00
	Groundnut	4800.00	4800.00	4800.00	4800.00
	Cotton	5350	5350	5350	5350
Total Gross income	Moong	64418.00	69440.00	71486.00	67394.00
	Groundnut	106608.00	110304.00	110976.00	108912.00
	Cotton	99563.5	101543	104271.5	101061.5
Net return(Rs./qtl.)	Moong	2891.66	2927.15	2875.81	2902.63
	Groundnut	2393.63	2375.61	2344.40	2374.57
	Cotton	2521.91	2453.27	2319.93	2422.79
Total Net Returns	Moong	30044.30	32784.11	33158.08	31551.58
	Groundnut	53162.53	54591.53	54202.63	53878.89
	Cotton	46932.69	46563.11	45215.37	45766.55
Input-Output ratio	Moong	1.87	1.89	1.87	1.88
	Groundnut	1.99	1.98	1.95	1.98

Table 7 continued...

Table 7 continued...

	Cotton	1.89	1.85	1.77	1.83
B:C ratio	Moong	0.87	0.89	0.87	0.88
	Groundnut	0.99	0.98	0.95	0.98
	Cotton	0.89	0.85	0.77	0.83

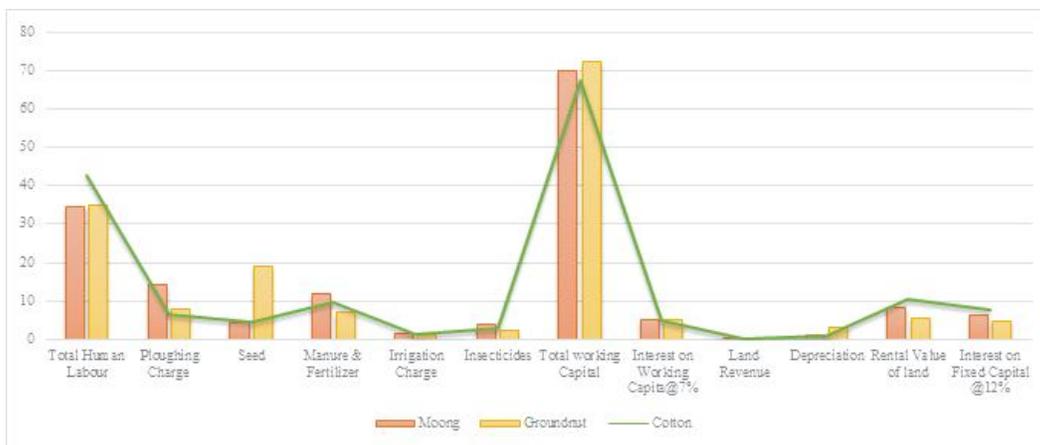


Fig. 2 : Cost of cultivation of second canal (%).

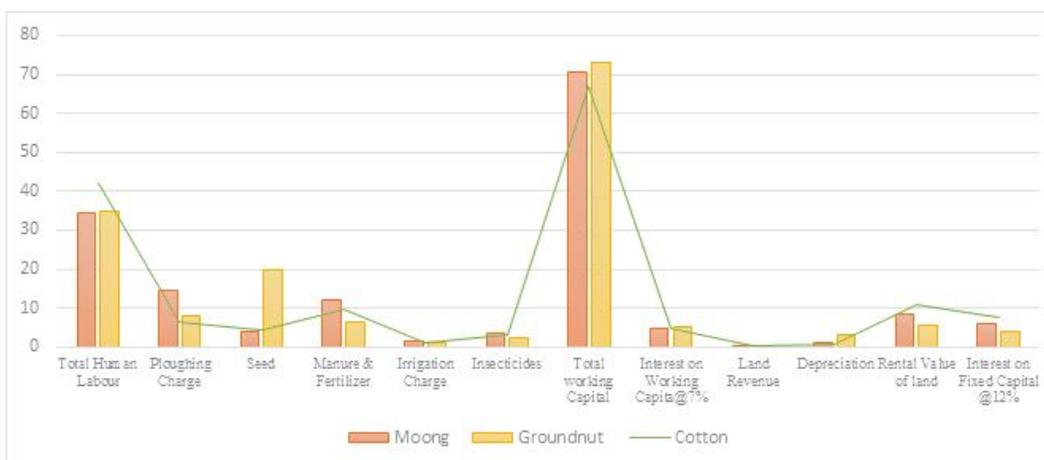


Fig. 3 : Cost of cultivation of third canal (%).

growers for the crops of moong, groundnut and cotton, the net returns were calculated and found to be as 2891.66 (Rs/ha), 2927.15 (Rs/ha), 2875.81 (Rs/ha); 2393.63 (Rs/ha), 2375.61 (Rs/ha), 2344.40 (Rs/ha) & 2521.91 (Rs/ha), 2453.27 (Rs/ha), 2319.93 (Rs/ha) respectively. The ratio of Benefit-Cost (B:C ratio) was calculated as 1:0.87, 1:0.89, 1:0.87; 1:0.99, 1:0.98, 1:0.95 and 1:0.89, 1:0.85, 1:1.77 respectively in their small, medium and large size.

CACP shows the overall average of the cost of all the three division of Hanumangarh district. There are seven cost A₁/A₂, B₁, B₂, C₁, C₂, C₃. The cost A₁/A₂ of overall average the three division was found to be as 24099.37(Rs/ha), 37159.97 (Rs/ha) & 34278.49(Rs/ha) as there is no land on lease that's why cost A₁ and cost A₂ were found to be similar. The cost B₁ and B₂ was calculated and found to be as (26215.27, 29215.27 (Rs/

ha) in moong), (39418.77, 42418.77 (Rs/ha) in groundnut & (38502.62, 44502.62 (Rs/ha). Similarly trend of there are cost C₁, C₂ & C₃ and the Cost C₃ is given as 35842.42, 55033.11 & 55294.95 respectively for Rawatsar division respectively. The overall average of yield is given in quintal per hectare and found to be as 10.87 in moong, 22.69 in groundnut & 18.89 in cotton. The overall average gross income of all the three crops are given as 67394.00(Rs/ha), 108912.00 (Rs/ha) & 101061.50 (Rs/ha). Similarly the overall net return average of all the three crops are computed and found to be as 2902.63 (Rs/ha), 2374.57(Rs/ha) & 2422.79(Rs/ha), respectively.

Conclusion

From the above facts highlighted that the study conducted in the Rawatsar, Bijaynagar, and Suratgarh canal divisions of Hanumangarh district, Rajasthan,

provided valuable insights into the challenges and economics of crop cultivation in these regions. The data collected and analyzed offer a comprehensive understanding of the dynamics of agricultural practices in the canal areas.

The study assessed the performance of three main crops in the Rawatsar division: cotton, groundnuts and moong. Data analysis revealed that moong showed the most promising results, with net returns per hectare of 2907.12 (Rs/ha), 3007.26 (Rs/ha) and 2887.89 (Rs/ha) for small, medium and large landholding sizes, respectively. Groundnut also demonstrated positive net returns, albeit slightly lower than moong. Cotton, on the other hand, exhibited comparatively lower returns in this division. The Benefit-Cost (B:C) ratios varied across landholding sizes but consistently indicated moong as the most economically advantageous choice.

Similarly the study evaluated the performance of cotton, groundnuts and moong in the Bijaynagar division. The data suggested that moong was the standout crop in this division, with net returns of 2885.99 (Rs/ha), 2943.34 (Rs/ha), and 2890.49 (Rs/ha) for small, medium, and large-sized farmers, respectively. Groundnut, while still profitable, demonstrated slightly lower returns than moong. Cotton exhibited competitive returns, especially for medium-sized landholdings. The B:C ratios reinforced the economic advantage of moong cultivation in this division.

In Suratgarh division, the study assessed the performance of moong, groundnut, and cotton. The data analysis indicated that moong continued to be the most economically viable crop, with net returns per hectare of 2891.66 (Rs/ha), 2927.15 (Rs/ha), and 2875.81 (Rs/ha) for small, medium, and large landholding sizes, respectively. Groundnut also presented positive returns, albeit slightly lower than moong. Cotton, while profitable, demonstrated a comparative economic advantage for small landholding sizes. The B:C ratios highlighted moong as the crop of choice for optimal economic returns in Suratgarh division.

Overall, this data-driven analysis highlights moong as the consistently most economically promising crop across all three divisions, with groundnut also offering profitability, and cotton showing competitive returns, especially in specific landholding size categories. These insights provide valuable guidance for farmers in each division to make informed decisions regarding crop choices and agricultural practices to enhance economic outcomes.

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Conflict of interest : The authors declare no competing interests.

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