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RESEARCH PAPER

An Economic Analysis of Costs and Returns of Major Farming Systems in Jaipur District of Rajasthan

Lal Chand Yadav, P.S. Shekhawat, Sonu Jain*, Narendra Yadav and Madhu Choudhary

Department of Agricultural Economics, SKNCOA (SKNAU), Jobner, Jaipur, Rajasthan, India

*Corresponding author: sonujain.ageco@sknau.ac.in (**ORCID ID:** 0000-0002-1590-6711)

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ABSTRACT

The present investigation was carried out to study costs and returns of major farming systems in Jaipur District of Rajasthan. A multistage purposive and random sampling procedure was used to select district, tehsils, villages and farmers from the district. A sample of 60 households i.e. 30 each from irrigated and rainfed area. Information regarding cost items like labour, irrigation, depreciation was collected through primary data collection. Results revealed that the total costs per households under rainfed situation was the highest under FS-IV and it were lowest under FS-II. While, in case of irrigated situation, it was highest in FS-II and lowest in FS-III. Under rainfed situation, FS-IV was the most profitable farming system on net return basis (₹ 158942.26) and return per rupee investment *i.e.* ₹ 1.61. While, on the basis of net return per household, the most profitable farming system adopted under the irrigated situation was FS-II (₹ 489534.25) and on the basis of returns per rupee investment most profitable farming systems were same as FS-I and FS-II *i.e.* ₹ 1.89.

HIGHLIGHTS

- Under rainfed condition, farming system-IV was profitable as it has maximum net returns.
- Under different farming systems in rainfed condition, the maximum returns per rupee as a whole was for FS-IV as it was 1.61 and minimum was towards FS-I which was 1.45.
- Under irrigated system, farming system-II was profitable as it has maximum net returns.
- Under different farming systems in irrigated condition, the maximum returns per rupee as a whole was for FS-I and FS-II as it was 1.89 and minimum was towards FS-IV which was 1.78.

Keywords: Cost, returns, rainfed, irrigated, farming system

Rajasthan state comprise of 33 districts. During the year 2020-21, 1116.4 mm actual highest rainfall was recorded in Pratapgarh district. During the same period Jaipur district has 681.10 mm actual rainfall and 324.50 mm annual rainfall. During the year 2019-2020, Rajasthan state has 117.88 lakh hectare gross irrigated area with 134 per cent irrigation intensity while, it was 130 per cent in 2018-19 (Rajasthan Agriculture Statistics at a glance 2020-21). The study was based on pattern of farming system in rainfed and irrigated situation in Jaipur district. Indian agriculture has been shouldering the responsibility of providing food and nutrition to its teeming millions. Widespread occurrence of ill-effects of green revolution, technologies in all intensively cultivated areas like Punjab and Haryana, they are threatening the sustainability of agricultural production systems and national food security (Khan *et al.* 2015). A vast majority of available land is under dry land agriculture whose potential is not yet fully exploited. For a sustained agricultural development, the minimization of risk in agricultural production is essential. Diversification

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of agriculture is the best alternative to realize this end objective (Reddy 2010). The adoption of various farming system approaches fits well into the funnel of diversified agriculture. Farming system is a resource management strategy to achieve economic gains and sustained production to meet diverse requirements for farm households while presenting resource base and maintaining a high level of environment quality (Lal and Miller 1990). Farming system approach introduces a change in farming techniques for higher production from the farm as a whole with the integration of all the enterprises. The farm products other than the economic products, for which the crops are grown, can be better utilized for productive purposes in the farming systems approach (Wilkins 2008). A judicious mix of cropping system with allied enterprises like dairy, poultry, piggery, fishery, sericulture, etc. suited to the given agro climatic conditions and socio-economic status of farmers would bring prosperity to the farmers. The costs and returns play an important role in portraying economic viability of different enterprises. Generally, a producer farmer can increase his income in two ways either by increasing the production or by reducing the cost of production. Therefore, an attempt has been made in present study to estimate cost and returns from different farming systems. The study will also be useful for research scientists who are engaged in farming system research to observe the costs and returns in farming system and to suggest the farmers for improvement on the basis of research and evaluate them critically.

MATERIALS AND METHODS

Selection of the Study Area

The present study was conducted purposively in Jaipur district of Rajasthan due to presence of rainfed as well as irrigated situation in study area. Out of sixteen tehsils of Jaipur district, two tehsils namely Chomu and Phulera were purposively selected for the study. In all, 60 farmers i.e. thirty each from rainfed and irrigated farming situations were selected for detailed study. The selected households were categorized into crops practiced and allied enterprises followed by them in respective situations of irrigated and rainfed farming systems. Households were into different farming systems (FS) like FS-I : Crops + Dairy (C+D), FS-II : Crops + Dairy + Vegetable (C+D+V), FS-III : Crops + Dairy + Goat (C+D+G), FS-IV : Crops + Poultry (C+P).

Primary data were collected from the selected farmers by using personal interview method with the help of pre-structured schedules and secondary data were collected from Collectorate, tehsil offices, department of agriculture, Panchayat samities and gram panchayat etc. government of Rajasthan. For achieving the stated costs and returns, following analytical procedures were followed.

Operational or Variable Costs: Operational costs were the actual costs incurred by the farmer along with incidental charges incurred towards labour and material costs.

Interest on working capital: Interest on working capital was charged at 7 per cent per annum.

Fixed Cost: The various items of fixed costs were land revenue, rental value of owned land, interest on fixed capital and depreciation.

Depreciation: Depreciation was computed for the items of fixed capital like farm buildings, wells and various agricultural implements and machinery like electric motors, thresher etc. The depreciation was calculated using the straight line method as shown below:

$$\text{Depreciation} = \frac{\text{Purchase value of the assets} - \text{Junk value}}{\text{Number of useful year of life}}$$

After calculating total annual depreciation of the farm, the depreciation for a particular crop was worked out. This was done as follows:

$$\text{Depreciation for crop '}X\text{'} = \frac{\text{Total annual depreciation}}{\text{Total cropped area}} \times \text{Area under crop}$$

Interest on fixed capital: Interest on fixed capital was charged at the rate of 12 per cent per annum.

Rental value of owned land: It was calculated on the basis of prevailing rates of leased in/out land in the selected villages or on selected sample farms in the study area.

Estimation of the costs of crop cultivation: The cost of cultivation and returns per household/hectare for

crops for different farming systems were studied through the cost concepts, Cost A1 to Cost C2 was also calculated:

Operational cost / variable cost: Cost A1- land revenue – depreciation

Overhead cost / fixed cost: Cost C2 – operational cost

Total costs (TC): Total Variable Cost (TVC) + Total Fixed Cost (TFC)

Estimation of the costs of Allied Enterprises: Costs of livestock and poultry enterprises were worked out for different farming systems like livestock enterprises and poultry enterprises.

(A) Costs of rearing for livestock enterprises (in ₹) were calculated with the help of following items:

(a) *Variable costs:* Variable cost items like Feed and fodder costs (dry & green fodder, concentrate, pala, tree leaves, oil etc.), labour costs, veterinary expenditures and miscellaneous expenditures (grazers charges, hiring of breeding male, etc.).

(b) *Fixed costs:* Fixed costs items like depreciation costs and interest on fixed assets @ 12 per cent.

(B) Costs for poultry enterprises (in ₹) were calculated with the help of following items:

(a) *Variable costs:* Items like feed and fodder costs, labour costs *i.e.* permanent & causal labour, veterinary expenditures and miscellaneous expenditures.

(b) *Fixed costs:* Items like depreciation costs (equipment's like waterers, brooders, cages) and interest on fixed assets @ 12 per cent (Poultry shed).

Estimation of milk yield: The milk yield was estimated by taking into account the quantity of milk produced by milking animals for the reference period of one year. The average daily milk yield was calculated taking into consideration the length of the lactation period of the animal.

Cost of milk production

Gross Cost of milk production (GC) = *TFC + TVC*

Cost of milk production per litre =

$$\frac{\text{Average gross cost of rearing/milch animal/ day}}{\text{Average milk yield /milch animal /day}}$$

Cost of milk production (in ₹/animal/year) was worked out for cows and buffaloes together.

Gross Returns

Gross Return = (Quantity of produce × Prevailing price of produce + Quantity of by-produce × Price of by-produce

Net Returns: Net Returns = Gross Returns – Total Costs

Returns per rupee (RPR)

$$\text{RPR} = \frac{\text{Gross Returns (GR) / ha}}{\text{Total Costs (Cost C}_2\text{)/ ha}}$$

RESULTS AND DISCUSSION

Costs and Returns structure of different enterprises in different farming systems for rainfed and irrigated situation

Table 1 reveals that the total costs under Farming System-I (Crops and dairy) in rainfed condition as a whole were estimated at ₹ 232078.37 per household. Out of which, total variable costs were ₹ 175176.38 (75.48 %), and total fixed costs were ₹ 56901.89 (24.52%). In FS-I, the total costs of crop enterprise were more (54.39 per cent) as compared to dairy enterprise (45.61 per cent). The gross returns as a whole was ₹ 337430.47. Out of which, crops contributed more (60.85 per cent) compared to dairy (39.15 per cent). The net return obtained from the FS-I was ₹ 105352.10. Net returns were higher in crop enterprise as of dairy enterprise. The returns per rupee was observed more (₹ 1.62) from crops as compared to dairy enterprises (₹ 1.24) and as a whole, it was found to be ₹ 1.45. Similar results were found by Girdhar *et al.* (2012).

Table 1 reveals that the total costs under Farming System-I (Crops and dairy) in irrigated condition as a whole were estimated at ₹ 332409.59 per household. Out of which, the total variable costs and total fixed costs were ₹ 205605.34 and ₹ 126804.25, respectively. Among the enterprises, the share of total cost was higher (55.58 percent) in crops than in dairy enterprises (44.42 per cent). The gross returns of the whole system were ₹ 629017.10, out of which, crops contributed higher share i.e. ₹ 337991.54 (53.73 per cent) as compare to dairy enterprise i.e. ₹ 291025.56 (46.27 per cent). The net return of the

Table 1: Costs and Returns structure of different enterprises in farming system-I under rainfed and irrigated situation (₹/household)

Items	Particulars	Under Rainfed Condition			Under Irrigated Condition		
		Enterprises		Farming system as a whole Crops	Enterprises		Farming system as a whole
		Crops	Dairy		Crops	Dairy cattle	
Costs	TVC	85592.24	89584.14	175176.38	110751.14	94854.20	205605.34
		(48.86)	(51.14)	(100)	(53.86)	(46.14)	(100)
	TFC	40656.89	16245.00	56901.89	74020.66	52783.59	126804.25
		(71.46)	(28.54)	(100)	(58.38)	(41.62)	(100)
	TC	126249.13	105829.24	232078.37	184771.80	147637.79	332409.59
		(54.39)	(45.61)	(100)	(55.58)	(44.42)	(100)
	GR	205371.96	132058.51	337430.47	337991.54	291025.56	629017.10
		(60.85)	(39.15)	(100)	(53.73)	(46.27)	(100)
	NR	79121.87	26229.27	105352.10	153219.74	143387.77	296607.51
		(75.11)	(24.89)	(100)	(51.66)	(48.34)	(100)
	Returns per rupee	1.62	1.24	1.45	1.82	1.97	1.89

Figures in the parentheses are percentages of respective costs and returns to farming system as a whole.

whole system was ₹ 296607.51 in which, return from the crops was higher i.e. ₹ 153219.74 (51.66 percent) than from dairy enterprise i.e. ₹ 143387.77 (48.34 percent). The return per rupee investment was more (₹ 1.97) in dairy cattle because of lowest cost incurred in rearing the cattle than crops (₹ 1.82). The return per rupee investment of the whole system was estimated to be ₹ 1.89.

FS-II (Crop + Vegetable + Dairy)

Table 2 reveals that the total costs under Farming System-II (Crops, Dairy and Vegetables) in rainfed condition as a whole were estimated ₹ 168330.93. Out of which, 64.22 per cent (₹ 108107.76) and 35.78 per cent (₹ 60222.66) were total variable and total fixed costs, respectively. 56.02 per cent, 27.04 percent and 16.94 per cent costs were incurred towards crops, dairy and vegetables, respectively. The gross returns of the systems as a whole were ₹ 258469.10. Among the enterprises, the gross returns contributed by crops were maximum (58.25 percent), followed by dairy enterprises (21.19 percent), and vegetables (20.56 percent). Among enterprises, the contribution of net returns was highest towards crops enterprise (62.46 percent) and least was for dairy enterprise (10.23 percent). The net returns obtained in FS-II as a whole was ₹ 90138.17. The returns per rupee were maximum from vegetables i.e. 1.86, followed by crops i.e. 1.59, and dairy enterprises i.e. 1.20 while, for the system as a whole, it was 1.53. Results were in consonance with the results of Kiresur *et al.* (2010), Maji C.C. (1991).

Table 2 reveals that the total costs under Farming System-II (Crops, Dairy and Vegetables) in irrigated condition as a whole were estimated at ₹ 545747.07, out of which ₹ 329783.93 was incurred as total variable costs and ₹ 215963.14 was incurred as total fixed costs. In total costs, among the enterprises, the share of total costs incurred in vegetable was highest (37.10 percent) followed by crops (36.28 percent) and dairy cattle (26.62 per cent). The gross returns of the whole system were ₹ 1035281.32, out of which, vegetables contributed highest share i.e. ₹ 418795.78 (40.46 percent) followed by crops ₹ 360034.44 (34.76 per cent) and dairy enterprise ₹ 256451.10 (24.78 per cent). The net return of the whole system was ₹ 489534.25 in which, returns from the vegetable was highest i.e. ₹ 216292.13 (44.19 per cent) followed by crops ₹ 162051.41 (33.09 percent) and dairy enterprise i.e. ₹ 111190.71 (22.72 percent). Among the enterprises, the returns per rupee investment were highest (₹ 2.06) in vegetable followed by crops (₹ 1.81) and dairy enterprises (₹ 1.76). The returns per rupee investment of the whole system were ₹ 1.89. Similarly results were found by Singh (2004).

FS-III (Crop + Dairy + Goat)

Table 3 reveals that the total costs under Farming

Table 2: Costs and Returns structure of different enterprises in farming system-II under rainfed and irrigated situation (₹/household)

Items	Particulars	Under Rainfed Condition				Under Irrigated Condition			
		Enterprises			Farming system as whole	Enterprises			Farming system as whole
		Crops	Dairy Cattle	Vegetables		Crops	Dairy Cattle	Vegetables	
Costs	TVC	58475.36 (54.09)	29175.17 (26.98)	20457.23 (18.93)	108107.76 (100)	116263.45 (35.25)	81475.25 (24.71)	132045.23 (40.04)	329783.93 (100)
	TFC	35821.49 (59.47)	16352.57 (27.16)	8048.60 (13.37)	60222.66 (100)	81719.58 (37.38)	63785.14 (29.54)	70458.42 (32.63)	215963.14 (100)
	TC	94297.36 (56.02)	45527.74 (27.04)	28505.83 (16.94)	168330.93 (100)	197983.03 (36.28)	145260.39 (26.62)	202503.65 (37.10)	545747.07 (100)
	GR	150587.72 (58.25)	54756.10 (21.19)	53125.28 (20.56)	258469.10 (100)	360034.44 (34.76)	256451.10 (24.78)	418795.78 (40.46)	1035281.32 (100)
	NR	56290.36 (62.46)	9228.36 (10.23)	24619.45 (27.31)	90138.17 (100)	162051.41 (33.09)	111190.71 (22.72)	216292.13 (44.19)	489534.25 (100)
	Returns per rupee	1.59	1.20	1.86	1.53	1.81	1.76	2.06	1.89

Figures in the parentheses are percentages of respective costs and returns to farming system as a whole.

Table 3: Costs and Returns structure of different enterprises in farming system-III under rainfed and irrigated situation (₹/household)

Items	Particulars	Under Rainfed Condition				Under Irrigated Condition			
		Enterprises			Farming system as a whole	Enterprises			Farming system as a whole
		Crops	Dairy cattle	Goat		Crops	Dairy cattle	Goat	
Costs	TVC	64090.41 (43.74)	43047.75 (29.38)	39365.68 (26.88)	146503.84 (100)	89093.41 (49.69)	54721.23 (30.53)	35478.19 (19.78)	179292.83 (100)
	TFC	34306.45 (39.04)	28124.69 (32.02)	25428.10 (28.94)	87859.24 (100)	58202.37 (47.65)	42483.01 (34.78)	21473.21 (17.57)	122158.59 (100)
	TC	98396.86 (41.97)	71172.44 (30.39)	64793.78 (27.64)	234363.08 (100)	147295.78 (48.86)	97204.24 (32.25)	56951.40 (18.89)	301451.42 (100)
	GR	150976.47 (42.42)	105424.23 (29.62)	99542.00 (27.96)	355942.70 (100)	281128.24 (51.17)	191756.81 (34.90)	76485.57 (13.93)	549370.62 (100)
Returns	NR	52579.61 (43.24)	34251.79 (28.18)	34748.22 (28.58)	121579.62 (100)	133832.46 (53.98)	94552.57 (38.14)	19534.17 (7.88)	247919.20 (100)
	Returns per rupee	1.53	1.48	1.53	1.51	1.90	1.97	1.34	1.82

Figures in the parentheses are percentages of respective costs and returns to farming system as a whole.

System--III (Crops, Dairy and Goat) in rainfed condition as a whole were estimated ₹ 234363.08. From which, the contribution of total variable costs was ₹ 146503.84 (62.51 per cent) and total fixed costs were ₹ 87859.24 (37.49 per cent). Among the enterprises, highest share in total costs was of crops (41.97 per cent) followed by dairy cattle (30.39 per cent) and goat enterprises (27.64 per cent). The gross return from the system as a whole was ₹ 355942.70, in which, it was highest from crops (42.42 per cent), followed by dairy cattle(29.62 per cent) and goat rearing (27.96 per cent). The net returns obtained from the FS-III as a whole was ₹ 121579.62. Among enterprises, the contribution of net returns was maximum for crops i.e. 43.24 per cent due to sale of product and by-product with remunerative prices and least was from dairy enterprises i.e. 28.18 percent. The returns per rupee were observed highest for crops and goat as 1.53 followed by dairy enterprises 1.48. The overall return per rupee of

investment for the whole system was 1.51. Similarly, this result finding was earlier by Singh (2014).

Table 3 reveals that the total costs under Farming System-III (Crops, Dairy and Goat) in irrigated condition as a whole were estimated ₹ 301451.42, out of which ₹ 179292.83 and ₹ 122158.59 were total variable and total fixed costs, respectively. Among the enterprises, 48.86 percent, 32.25 per cent and 18.89 per cent of the total costs of whole systems per household was incurred in crops, dairy cattle and goat rearing, respectively. The total gross returns of the whole system were ₹ 549370.62, in which, crops contributed highest share (51.17 percent), followed by dairy enterprises (34.90 per cent) and goat rearing (13.93 per cent). Among enterprises,the contribution of net returns to total returns was highest for crops that contributed 53.98 per cent, followed by dairy cattle (38.14 per cent), and goat rearing (7.88 per cent). The net returns obtained from the FS-III as a whole were ₹ 247919.20. (Nearby result was found by Gill *et al.* 2009). The returns per rupee were ₹ 1.97 in dairy cattle, followed by crops ₹ 1.90 and goat rearing was ₹ 1.34. The returns per rupee investment of the whole system were ₹ 1.82.

FS-IV (crop + poultry)

Table 4 reveals that the total costs under Farming System-IV (Crops and Poultry) in rainfed condition as a whole were estimated ₹ 257016.75, in which, the contribution of total variable costs and total fixed costs were ₹ 156477.61 and ₹ 100539.14, respectively. Among the total costs, the percentage of costs incurred was more (65.37 per cent) in poultry than crops (34.63 per cent). The total gross return of the system was ₹ 415959.01, in which poultry and crops shared 61.67 per cent and 38.33 per cent, respectively. The total net return of the system was ₹ 158942.26, in which the contribution of poultry was more (55.67 percent) than crops (44.33 percent). The return per rupee investment was high in crops i.e. ₹ 1.79 and low in poultry ₹ 1.52. The overall return per rupee of investment for this system was ₹ 1.61. Thus, in this system, crops on the basis of per rupee invested and poultry on the basis of net return per farm were found profitable. Results were inconsonance with the results of Ganesh Kumar and Rai (2006).

Table 4 reveals that the total costs under Farming System-IV (Crops and poultry) in irrigated condition as a whole were estimated ₹ 403714.76 in which, the contribution of total variable costs were ₹ 249774.43 and total fixed costs were ₹ 153940.33. Among the total costs the percentage of costs incurred were the higher in poultry (78.34 percent) than crop enterprises (21.66 per cent). The total gross returns of the system as a whole were estimated to be ₹ 721591.29 in which, poultry contributed ₹ 540127.91 (74.85 percent) and crops were ₹ 181463.38

Table 4: Costs and Returns structure of different enterprises in farming system-IV under rainfed and irrigated situation (₹/household)

Items	Particulars	Under Rainfed Condition			Under Irrigated Condition		
		Enterprises		Farming system as a whole	Enterprises		Farming system as a whole
		Crops	Poultry		Crops	Poultry	
Costs	TVC	58934.83	97542.78	156477.61	54935.72	194838.71	249774.43
		(37.66)	(62.34)	(100)	(21.99)	(78.01)	(100)
	TFC	30081.14	70458.00	100539.14	32471.52	121468.81	153940.33
		(29.91)	(70.09)	(100)	(21.09)	(78.91)	(100)
	TC	89015.97	168000.78	257016.75	87407.24	316307.52	403714.76
		(34.63)	(65.37)	(100)	(21.66)	(78.34)	(100)
Returns	GR	159486.61	256472.40	415959.01	181463.38	540127.91	721591.29
		(38.33)	(61.67)	(100)	(25.14)	(74.85)	(100)
	NR	70470.64	88471.62	158942.26	94056.14	223820.39	317876.53
		(44.33)	(55.67)	(100)	(29.58)	(70.42)	(100)
	Returns per rupee	1.79	1.52	1.61	2.07	1.70	1.78

Figures in the parentheses are percentages of respective costs and returns to farming system as a whole.

(25.14 per cent). The total net returns of the system were ₹ 317876.53 in which, the contribution of poultry were more i.e. ₹ 223820.39 (70.42 per cent), than crops i.e., ₹ 94056.14 (29.58 percent) (nearby result was found by Gill *et al.* 2009). The returns per rupee investment were more (₹ 2.07) in crop enterprise, than in poultry enterprise (₹ 1.70). Thus, in this system crops on the basis of per rupee invested and poultry on the basis of net return per household were found profitable.

CONCLUSION

Under rainfed situation, the total costs per household per annum was highest (*i.e.* ₹ 257016.75) in FS-IV (C+P) and it was lowest (*i.e*. ₹ 168330.93) in FS-II (C + D + G). In case of irrigated situation, the total costs per house hold per annum under FS-II (C+D+V) was highest (*i.e*. ₹ 545747.07) and it was lowest (*i.e*. ₹ 301451.42) under FS-III (C + D + G). Under rain fed situation, the total gross returns per household per annum from FS-IV (C + P) were highest (₹ 415959.01) and it were lowest (₹ 258469.10) from FS-II (C + D + V). While, in irrigated situation, the total gross returns per household per annum from FS-II (C + D + V) were maximum (₹ 1035281.32) and it were minimum (₹ 549370.62) from FS-III (C + D + G). In rainfed situation, return per rupee investment was highest (₹ 1.61) under FS-IV (C + P) and it was lowest (₹ 1.45) under FS-I (C + D). While, in irrigated situation, return per rupee investment was found maximum (₹ 1.89) under FS-I (C + D) as well as FS-II (C + D + V) and it was minimum (₹ 1.78) under FS-IV (C + P).

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