



ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; SP-10(3): 158-162
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www.thepharmajournal.com
Received: 04-12-2020
Accepted: 23-01-2021

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Comparative study on cost of cultivation and economic returns from rice-wheat and sugarcane-wheat cropping pattern in western region (Meerut) of Uttar Pradesh

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DOI: <https://doi.org/10.22271/tpi.2021.v10.i3Sc.5863>

Abstract

The share of agriculture in gross domestic product has registered a steady decline from 36.4 per cent in 1982-83 to 20 per cent in March 2020-2021. Yet this sector continues to more than half a billion people providing employment to 52 per cent of the workforce. In the western Uttar Pradesh two cropping systems mainly Rice-wheat and sugarcane-wheat covers a larger area under production system. In Combined, both these cropping systems add up around to 12 million hectare area but the major part falls under North-West India. A sample of 80 famers who have livestock were selected for sample collection. For analysis the data Average weighted mean and CACP cost concept were used for calculation of economics of farming systems. There for the net return per hectare in small, medium and large category was Rs. 174390.40, 161003.60 and 152396.80 respectively. It was also observed the net return was higher in Sugarcane-Wheat cropping system than the Rice-Wheat cropping system.

Keywords: Cropping pattern, net return, cost of cultivation and BCR

Introduction

Agriculture is the mainstay of India economy because of its high share in employment and livelihood not withstanding its reduced contribution to the nation's gross domestic product. The share of agriculture in gross domestic product has registered a steady decline from 36.4 per cent in 1982-83 to 20 per cent in March 2020-2021. Yet this sector continues to more than half a billion people providing employment to 52 per cent of the workforce (Government of India, 2018a) [3]. The country support 16.87 per cent of the world's population on its meager 2.4 percent world surface area of 135.79 million square Kilometers. Rice and Wheat being the first and second most important staple food of the country, after rice deserves the due attention for it production. Nearly 95 million tonnes of wheat is produced in India every year. The wheat production in India contributes to about 16 per cent of the global wheat production about 60 per cent of wheat output is contributed by North-West India comprising the states of Punjab, Haryana, Rajasthan and western Uttar Pradesh .In the western Uttar Pradesh two cropping systems mainly Rice-wheat and sugarcane-wheat covers a larger area under production system. In Combined, both these cropping systems add up around to 12 million hectare area but the major part falls under North-West India. (Annual Progress Report, 2002-03, Resource Management, Vol.-II, DWR, Karnal) [1].

Rice-wheat and Sugarcane-Wheat are the most major cropping system of western Uttar Pradesh which has witnessed phenomenal growth in terms of both production and productivity during post green revolution period. Due to technological break-through under green revolution, Rice production has increased from 21 million tonnes (1950-51) to nearly 110 million tonnes in 2016-17, Wheat increased from 6.5 million tonnes to 98.38 million tonnes, and sugarcane increase from about 57.65 Million tonnes to 362 million tonnes during the reported period, similar trend was also observed for other crops. The growth in production was not due to area expansion but it was due to yield improvement in the major crops grown. The factor responsible for increase in yield growth was irrigation facilities, high yield variety, use of chemical fertilizers, insecticide, and the application of modern package of practices changed. The input utilization pattern of the farmers among the various crops have also change and depends upon its price and availability, which directly or indirectly affect the cost of production and profit margin of the farmers. Therefore, it is an important aspect to know the input utilization among the various crops along with change in cost of production of these crops.

Sugarcane is an important cash crop in the western Uttar Pradesh. It has dominated the farming system in this region for a long time. Therefore, to explore the possibilities of raising farm production and farm income in this region, there is a need to understand sugarcane-based cropping systems and their economics (S.P. Singh, B. Gangwar and M.P. Singh 2006) [8, 11, 22, 25, 29, 30, 41-51, 55-61].

Materials and Method

Multi stage random sampling technique was used for the selection of district, block, villages, and sample of livestock owners for study. The Meerut district of Uttar Pradesh was selected purposively, two blocks namely; Hastinapur and Saradhana blocks of Meerut district selected randomly., 12 villages selected randomly from Hastinapur and Saradhana blocks. From the selected villages a sample of 80 respondents was selected following the proportionate random sampling technique. The tabular analysis was used to compare the different parameters among the marginal, small and medium-size group of the farmer. In this computation weighted average is used.

$$\text{Weighted mean} = \frac{\sum W_i X_i}{\sum W_i}$$

Where

X_i = value of an item
 W_i = weight of item

Cost concept and other concept used

A number of cost concepts such as Cost A, A2, B and C were used in the analysis. The input items included under each category of cost are given below:

Cost A1 = All actual expenses in cash and kind incurred in production by the producer. i) Hired human labour, ii) Hired bullock labour, iii) Owned bullock labour, iv) Home produced/purchased seed, v) Plant protection chemicals, vi) Home produced/purchased manure, vii) Fertilizers, viii) Depreciation on farm machinery, equipment, and farm building, ix) Irrigation, x) Land revenue, land development tax and other taxes, xi) Interest on working capital, xii) Interest on crop loan and xiii) Miscellaneous expenses.

Cost A2 = Cost A + rent paid for leased land

Cost B = Cost A2 + Imputed rental value of owned land (less land revenue) + imputed interest on owned fixed capital (excluding land)

Cost C = Cost B + Imputed value of family labour

Result and Discussion

A detailed break up the cost of cultivation has been presented in above Table 1. In case of Rice-Wheat cropping system, the cost of cultivation was worked out for two agriculture years. On an average the cost of cultivation for this period was Rs. 181841.10 per hectare. Item wise and category wise cost of expenditure on hired human labour was Rs. 23694 (13.03 Percent).

Table 1: Cost of cultivation of rice-wheat and sugarcane-wheat cropping system

SI. No.	Particulars	Rice-wheat				Sugarcane-wheat			
		Small	Medium	Large	Overall average	Small	Medium	Large	Overall average
1.	Hired human labour	16272.60 (9.32)	23697.48 (13.10)	29691.3 (15.74)	23697.50 (13.03)	28588.87 (14.15)	42883.32 (19.33)	50030.54 (20.87)	40500.90 (18.32)
2.	Bullock/Machine power	15820.92 (9.06)	17036.60 (9.42)	18254.91 (9.68)	17037.92 (9.37)	11149.06 (5.52)	13378.87 (6.03)	16444.86 (6.86)	13657.68 (6.18)
3.	Manuring and Fertilizer	19024.00 (10.89)	24098.09 (13.32)	26634.73 (14.12)	23252.54 (12.79)	12241.73 (6.06)	13771.95 (6.20)	16220.29 (6.77)	14077.99 (6.37)
4.	Seed	7550.00 (4.32)	7820.00 (4.32)	8039.00 (4.26)	7803.00 (4.29)	10450.20 (5.17)	10530.32 (4.75)	10603.5 (4.42)	10528.38 (4.76)
5.	Irrigation	8905.14 (5.10)	9414.00 (5.20)	9922.87 (5.26)	9414.00 (5.17)	4625.20 (2.29)	5133.75 (2.31)	5688.75 (2.37)	4995.00 (2.26)
6.	Plant Protection	6219.35 (3.56)	6578.15 (3.64)	7116.37 (3.77)	6637.95 (3.65)	4381.87 (2.17)	4673.94 (2.11)	5112.18 (2.13)	4722.68 (2.14)
7.	Interest on working capital	3321.13 (1.90)	3943.43 (2.18)	4423.26 (2.35)	3857.50 (2.12)	4098.01 (2.03)	5054.86 (2.29)	5761.92 (2.40)	4901.19 (2.22)
8.	Land revenue and Depreciation	1350.25 (0.77)	1425.00 (0.79)	1546.52 (0.82)	1440.59 (0.79)	1550.00 (0.77)	1625 (0.73)	1645 (0.68)	1620.00 (0.73)
9.	Harvesting/Threshing	7891.41 (4.52)	8516.46 (4.71)	9375.92 (4.97)	8594.60 (4.73)	29463.80 (14.58)	34374.43 (15.49)	38302.94 (15.98)	34047.06 (15.40)
	Cost A	86354.64 (49.44)	102529.21 (56.66)	115004.88 (60.98)	101735.60 (55.95)	106548.20 (52.72)	131426.20 (59.24)	149810.00 (62.49)	129050.88 (58.39)
10.	Rental Value	64000.00 (36.64)	61500.00 (33.99)	60500.00 (32.08)	62000.00 (34.10)	74500.00 (36.86)	75600.00 (34.08)	77900.00 (32.49)	76000.00 (34.39)
11.	Interest on Fixed Capital	6152.00 (3.52)	6019.50 (3.33)	5826.50 (3.09)	6000.00 (3.30)	6928.50 (3.43)	7030.80 (3.17)	7091.49 (2.96)	7016.93 (3.17)
	Cost B	156506.64 (89.60)	170048.71 (93.98)	181331.38 (96.15)	169735.60 (93.34)	187976.70 (93.01)	214057.30 (96.49)	234801.50 (97.94)	212066.93 (95.95)
12.	Imputed value of family labour	18158.26 (10.40)	10894.96 (6.02)	7263.30 (3.85)	12105.50 (6.66)	14126.06 (6.99)	7769.33 (3.50)	4944.12 (2.06)	8946.50 (4.05)
	Cost C	174664.90 (100.00)	180943.13 (100.00)	188594.68 (100.00)	181841.10 (100.00)	202102.80 (100.00)	221826.60 (100.00)	239745.60 (100.00)	221013.43 (100.00)

Figures in parentheses indicate percentage of the total

The table 2. show cost of cultivation of the Sugarcane-Wheat on an average per hectare cost of cultivation of Sugarcane-

Wheat was Rs. 221013 and Rs. 202103, 221827 and 239746 for the small, medium, and large farmers respectively. The

share of cost A and B was about 58 per cent and 38 per cent to the total cost. The rental value of land and imputed value family labour was 34.39, and 4.05 per cent respectively to the total cost. The imputed value of family labour found more in small (Rs. 14126.06) followed by medium (Rs. 7769.33) and large (Rs. 4944.12) which was accounted 6.99 per cent, 3.50 per cent and 2.06 per cent of total cost respectively.

In comparison of both the cropping system on an average cost of cultivation per hectare was higher in Sugarcane-Wheat cropping system (Rs. 221013.43) than the case of Rice-Wheat cropping system (Rs. 181841.10). Tomar *et al.* 2020b^[31-33, 53-60]; Rajput *et al.* 2020a^[31-33]; Rajput *et al.* 2020b and Rajput *et al.* 2020c^[31-33].

Productivity and cost of production

Per hectare production of main and by product as well as cost of production per quintal of the product under Rice-Wheat and Sugarcane-Wheat cropping systems have been presented in table 2. In this table productivity of both the cropping system, yield of all the crops have been converted into Wheat equivalent yield by multiplying the yield of crops by their

price and dividing by Wheat price.

The on an average gross return per hectare in Rice-Wheat cropping system was Rs. 281087.85, it was highest in small category farms Rs. 287855.06 followed by medium Rs. 279415.50 and large Rs. 275502.60, but the per hectare total expenses was found just adverse of the gross return. On an average net return per hectare was Rs. 99246.75. Category wise net return was highest in case of small farmers Rs. 113190.20 than medium Rs. 98472.37 and large category Rs. 86908.47. In the Sugarcane-Wheat cropping system on an average gross return per hectare was Rs. 385869.51 and category wise it was highest in large farmer Rs. 392142.43 followed by medium Rs. 382830.16 and small Rs. 376493.18 and the total cost was also more in case of large farmers Rs. 239745.60, medium Rs. 221826.60 and small size of farms Rs. 202102.80. There for the net return per hectare in small, medium and large category was Rs. 174390.40, 161003.60 and 152396.80 respectively. It was also observed the net return was higher in Sugarcane-Wheat cropping system than the Rice-Wheat cropping system.

Table 2: Cost of production in rice-wheat and sugarcane-wheat cropping system

Sl. No.	Farmers size group	Cost of cultivation	Per hectare Production of main product (in qtl.)		Yield equivalent to wheat (in qtl.)	Value of Main product (Rs.)	By product (in qtl.)		Total by prod. In qtl.	1 Qtl. wheat = 4 Qtl straw	Value of By prod (In Rs)	Total prod. (In Rs.)	Cost of prod./qt. (In Rs.)
			Rice	Wheat			Rice	Wheat					
Rice-Wheat cropping system													
1.	Small	174664.90	81.88	83.12	-	247.08	2.60	83.38	85.97	21.49	21197.26	287855.06	650.35
2.	Medium	180943.13	79.38	82.70	-	237.90	2.45	82.43	83.88	20.91	22228.65	279415.50	699.14
3.	Large	188594.13	76.24	79.34	-	234.76	2.55	81.20	82.75	20.68	21423.84	275502.60	738.31
	Average	181841.10	79.60	81.68	-	239.91	2.53	82.30	84.83	21.21	21685.16	281087.85	696.39
Sugarcane-wheat cropping system													
1.	Small	202102.80	514.84	1012.5	41.13	331.27	-	42.81	-	10.70	10555.23	376493.18	0
2.	Medium	221826.60	556.93	999.00	42.05	337.24	-	43.86	-	10.91	11763.69	382830.16	637.16
3.	Large	239745.60	623.20	993.60	42.40	348.17	-	45.10	-	11.28	1138.75	392142.43	653.07
	Average	221013.43	556.66	1003.05	42.44	338.26	-	43.75	-	10.92	11183.81	385869.51	632.95

It is evident from the table that on an average per hectare farm business income from Sugarcane-Wheat cropping system was higher Rs. 256818.60 than Rice-Wheat cropping system Rs. 179352.30. The comparatively higher per hectare farm business income in Sugarcane-Wheat cropping system was due to higher rental value of land on which particular cropping system was followed. Tomar S. 2020^[31-33, 53-60]; Tomar *et al.* 2017^[31-33, 53-60]; Tomar *et al.* 2019^[31-33, 53-60]; Tomar *et al.* 2020a^[31-33, 53-60]; Tomar *et al.* 2018a^[31-33, 53-60]; Tomar *et al.* 2018b and Tomar *et al.* 2015^[31-33, 53-60]. The familylabour on Sugarcane-Wheat cropping system Rs. 173803.60 and Rice-Wheat cropping system Rs. 111752.30. Per hectare family labour income in case of Sugarcane-Wheat cropping system was higher due to the higher net return than Rice-Wheat cropping system.

Conclusion and summary

It may be concluded that the Sugarcane- Wheat cropping system was the most popular cropping system in study area which has covered more than 50 per cent of the total cultivated area and adopted by each and every sample farmers, and Rice-Wheat cropping system covered more than 30 per cent area. The Sugarcane-Wheat cropping system found more profitable, provides more employment, highly insect-pest resistant and per unit return over various cost concepts was also higher than the other cropping system. On

the other side Rice-Wheat is comparatively lesser beneficial but equally important in food security concerns.

Hence, keeping in view it is suggested to develop and implement modern package of practice in the cultivation of Sugarcane-Wheat and Rice-Wheat cropping system to increase the profit share of the grower further suggested to make the land favorable for Sugarcane, Rice and Wheat cultivation by application of organic farming.

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