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RESEARCH ARTICLE

Impact of upper Wardha canal irrigation project on economy of farmers

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ABSTRACT : The present study entitled, "Impact of Upper Wardha canal irrigation project on the economy of farmers." The study has been undertaken in Amravati district of Vidarbha region. Primary data was collected from Tiwsa tahsil and ten villages are selected purposely, from each village of 40 beneficiary farmers were selected for present study. The selected farmers were classified into three category *viz.*, small, medium and large according to their land holding. The average marketing cost for small, medium and large sized groups was Rs. 77.00, Rs. 73.00 and Rs.69.00 per quintal. The maximum cost required in marketing was for packaging which accounts for Rs. 22.00, Rs.21.00 and Rs.20.00 per quintal for small, medium and large size groups, respectively. The value addition in processing of dal mills showed that per quintal Rs.1132.68, Rs.1245.90 and Rs.1250.89 for small, medium and large size groups of dal mills, respectively. The standard cost concept fixed cost, variable cost, total cost, marketing cost, net returns and value addition was used for the analysis of data.

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Irrigation is an artificial application of water to land to assist growth of crops. The additional supply of water through irrigation makes possible production of two or three crop in year or cultivation of crop requiring perennial water supply. Vidarbha is mainly rainfed farming region subjected to vagaries of monsoon with instability of yields and income. The ultimate irrigation potential of Vidarbha is 28.95lakh hectares. In Vidarbha 14.30 lakh hectare of irrigation potential has been created. Chief Engineer of water resource department at Amravati having 1 major, 4 medium, 65, minor project. The Upper Wardha irrigation project was located in Simbhora village of Morshi tahsil in Amravati District. It is completed in the year 1995. The watershed area is 4302 Sq.Km. It covers 5 tahsils of which three comes under Amravati district and two Wardha district. The irrigation potential is 80250 ha. At present irrigated area is 75000 hectare. Canal irrigation was beneficiary to the farmer to provide adequate water to crops in *Rabi* season and recharging water table of land and also increase the water level of farm well.

EXPERIMENTAL METHODOLOGY

Estimation of resource use efficiency :
Cost A (Total variable cost) :

The cost A includes expenses on all variable items is analogous to cost of cultivation. Following variables have been considered to estimate cost A)

- Hired human labour
- Bullock labour

- Seeds
- Manures
- Fertilizers
- Plant protection measures.
- Irrigation charges
- Land revenue
- a) Depreciation cost
  b) Repairing and hiring of implements.
- Interest on working capital

Cost B :

The cost B is estimated as under -

Cost B = Cost A + Interest on fixed capital @10 per cent per annum + Rental value of land (1/6 of gross value of produce - land revenue).

Cost C :

The Cost C is calculated as under.

Cost C = Cost B + Imputed value of family labour

Production :

It includes main produce and by produce.

Production = Main produce + by produce

Measurement of income :

The measurement of income, such as gross income farm business incomes and family labour income net income were calculated as under.

Gross income :

This is the value of main product and by product.

Input-output ratio :

The output-input ratio was calculated by dividing the value of total output by the value of total input of the farm.

EXPERIMENTAL FINDINGS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Per hectare input for gram :

To accomplish the objective of economics of wheat crop Table 1 revealed that, at overall level in case of beneficiary farmers at overall level the seed requirement was found to be 83.29 kg per hectare whereas in case of non-beneficiary farmers it was found to be 84.58 kg per hectare. Manure was used by small, medium and large size group in case of beneficiary farmers was observed to be 2.08 qt, 1.06 qt and 1.73 qt per hectare, respectively. Whereas in case of non beneficiary farmers manure used to be 2.50 qt, 1.04 qt and 1.43 qt per hectare, respectively. Which was more as compared to beneficiary farmers. At overall level fertilizer used in case of beneficiary farmers was observed to be Nitrogen *i.e.*, 100.11 kg and Phosphorus *i.e.*, 103.67 kg per hectare. While in case of non-beneficiary farmers N and P used to be 97.74 kg and 101.99 kg per hectare, respectively. At overall level hired human labour accounts to 33.30 days in case of beneficiary farmers whereas in case of non-beneficiary it accounts to 30.83 days per hectare.

Table 1 : Per hectare input for gram

Sr. No.	Input	Unit	Physical quantity							
			Small		Medium		Large		Overall	
			B	NB	B	NB	B	NB	B	NB
1.	Hired human labour									
	Male	Days	26.62	26.15	15.49	18.29	14.27	21.63	20.75	19.95
	Female	Days	20.34	22.43	18.23	17.44	21.50	25.86	20.10	20.47
2.	Bullock labour		4.53	4.35	3.13	3.51	2.71	3.47	3.72	4.78
3.	Machinery	Hrs.	3.54	3.91	3.77	3.72	4.93	4.56	3.94	4.45
4.	Seed	kg	79.04	87.30	76.47	81.17	77.22	84.78	77.94	84.43
5.	Manure	qtl	1.91	2.50	2.20	3.40	2.65	4.02	2.16	3.03
6.	Fertilizers									
	N	kg	73.13	87.17	82.84	87.76	77.40	99.45	76.62	79.52
	P		106.39	108.46	115.68	116.48	114.75	125.54	110.80	113.41
7.	Family labour									
	Male	Days	10	11.02	7.64	8.40	6.68	10.43	8.58	9.64
	Female	Days	10.58	11.28	7.84	8.08	7.04	9.78	9.01	8.60

Family labour (male + female) accounted at overall level was observed to be 20.18 days in case of beneficiary farmers while in case of non-beneficiary farmers it was 24.77 days per hectare. This was found to be more as compared to beneficiary farmers.

Per hectare cost of cultivation for gram :

It is revealed from the Table 2 that, per hectare cost of cultivation of gram crop for the beneficiary in case of small, medium, large size group and at overall level hired human labour (male + female) accounted to Rs. 6029.06, Rs. 4147.06, Rs. 4292.27 and Rs. 5124.34, respectively this was observed to be less than the non beneficiary farmers. This human labour used in various farm operations like ploughing, harrowing, sowing, hoeing, weeding, harvesting etc. The next input like Bullock labour accounted in case of small, medium, large size group and at overall level was found to be Rs.1360.46, Rs.941.17, Rs.813.25 and Rs.1118.84, respectively it was found to be more in small group of farmers. Input like Machinery cost at overall level was found to be Rs.1975.91.The next input having more cost incurred *i.e.*, Seed was used in case of small, medium, large size group and at overall level was found to be Rs.3162.79, Rs.3058.82, Rs.3402.41 and Rs.3196.70, respectively. Input like Manure was used in case of small, medium, large and at overall level was observed to be Rs.1981.60, Rs.2205.88, Rs.2650.7 and Rs. 2173.42, respectively were more manure was used in large group than other groups of farmers. Fertilizer used likes D.A.P. or mixed fertilizer (N+P) it's accounted worth to Rs.2992.31, Rs.3276.52, Rs.3139.76 and Rs.3162.87 in case of small, medium, large size group and at overall level, respectively. An irrigation charge amount paid to irrigation department in case of small, medium large size group and at overall its worth to be Rs.381.39, Rs.375.00, Rs.385.54 and

Table 2 : Per hectare cost of cultivation of gram for beneficiary farmers (Rs./ha)

Sr. No.	Particulars	Unit	Small	Medium	Large	Overall
1.	Hired human labour	Male (Days)	3994.18 (9.68)	2323.53 (6.92)	2141.57 (5.43)	3113.37 (9.15)
		Female (Days)	2034.88 (4.98)	1823.53 (5.43)	2150.7 (5.46)	2010.97 (5.91)
2.	Bullock labour	(Days)	1360.46 (3.30)	941.17 (2.80)	813.25 (2.06)	1118.84 (3.19)
3.	Machinery	(Hrs)	1773.25 (4.30)	1887.25 (5.62)	2469.88 (6.27)	1975.91 (5.91)
4.	Seed	(kg)	3162.79 (7.67)	3058.821 (9.11)	3402.41 (8.63)	3196.70 (9.41)
5.	Manure	(qtl)	1918.60 (4.65)	2205.88 (6.57)	2650.7 (6.73)	2173.42 (6.39)
6.	Fertilizer	N (kg)	438.83 (1.06)	497.05 (1.48)	636.14(1.61)	502.71 (1.48)
		P (kg)	2553.48 (6.19)	2779.47 (8.28)	2754 .22 (6.99)	2660.16 (7.82)
7.	Irrigation	(Rs)	381.39 (0.92)	375 (1.12)	385.54 (0.98)	380.83 (1.12)
8.	Incidental	(Rs.)	453.48 (1.10)	430.39 (1.280	367.47 (0.93)	426.21 (1.25)
9.	Plant protection	(Rs.)	1708.13 (4.14)	1204.90 (3.59)	1568 (3.98)	1547.29 (4.55)
10.	Depreciation@ 10 per cent per annum	(Rs.)	1808.13 (4.38)	1872.55 (5.58)	1846.37 (4.68)	1833.05 (5.39)
11.	Threshing	(Rs.)	1360.46 (3.30)	2779.41 (8.28)	2665.66 (6.76)	2041.50 (6.00)
12.	Transportation	(Rs.)	203.37 (0.49)	277.94 (0.83)	213.25 (0.54)	224.48 (0.66)
13.	Land revenue	(Rs.)	232.55 (0.56)	157.35 (0.47)	176.50 (0.45)	199.74 (0.59)
14.	Int. on working capital@6 per cent per annum	(Rs.)	1227.58 (2.98)	1096 (3.26)	1188.58 (3.02)	1184.94 (3.48)
15.	COST "A"	(Rs.)	24611.56 (59.66)	19386.71 (57.74)	25427.04 (64.53)	18672.79 (54.86)
16.	Rental value of land 1/6 gross produce	(Rs.)	9637.30 (23.36)	8796.90 (26.20)	9422.19 (23.91)	9373.42 (27.54)
17.	Int. on fixed capital@ 10 per cent per annum	(Rs.)	4447.67 (10.78)	3460.78 (10.31)	2889.40 (7.23)	3801.38 (11.17)
18.	COST "B"	(Rs.)	38696.53 (93.80)	31644.39 (94.25)	37698.63 (95.67)	31847.59 (93.57)
19.	Family labour charges	Male (Days)	1500 (03.64)	1147.07 (3.42)	1003.01 (2.5)	1287.52 (3.78)
		Female (Days)	1058.13 (2.56)	784.31 (2.34)	704.81 (1.79)	901.35 (2.65)
20.	COST"C"	(Rs.)	41254.66 (100)	33575.77 (100)	39406.45 (100)	34036.46 (100)

Figure in parenthesis indicate the percentages to cost 'C'

Rs.380.83, respectively. Major input like plant protection cost incurred at overall level was found to be Rs. Input Rs.1547.29 was observed to be less as compared to non beneficiary farmers. Depreciation cost @ 10 per cent per annum included in small, medium, large size group and at overall level it was found to be Rs.1808.13, Rs.1872.55, Rs.1846.37 and Rs.1833.05, respectively, higher depreciation cost observed in medium size group. The next input like Threshing at overall level was observed to be Rs.2041.50 was observed to be slightly less than non beneficiary farmers.

It is revealed from the Table 3 that, of per hectare cost of cultivation of gram crop in case of non beneficiary farmers the expenditure incurred on major items likes hired human labour (male + female) in case of small, medium, large size group and at overall level accounted to Rs.6166.67, Rs.4489.36, Rs.5831.55 and Rs.5663.56, respectively which was higher as compared to beneficiary farmers The next input like Bullock labour in case of small, medium, large size group and at overall level was found to be Rs.1307.69, Rs.1053.19, Rs.1043.48 and Rs.1178.01, respectively was observed to be slightly more at overall level than beneficiary farmers. Item like Machinery cost at overall level was observed to be Rs.2013.64 it was more as compared to beneficiary farmers at overall level. The next input having more cost incurred *i.e.*, Seed was used at overall level was found to be Rs.3405.70 it was observed to be more than beneficiary farmers at overall level. Input like Manure used in case of small, medium, large and at overall level was Rs.2500, Rs.3404.26, Rs.4031.74 and Rs. 3106.50, respectively were more manure used in large size group of farmers than other groups. The next input was Fertilizer used like N and P (N+P) it accounted worth to Rs.3126.14, Rs.3438.82, Rs.3609.77 and Rs.3325.23 in case of small, medium, large size group and at overall

Table 3 : Per hectare cost of cultivation of gram for non-beneficiary farmers (Rs./ha)

Sr. No.	Particulars	Unit	Small	Medium	Large	Overall
1.	Hired human labour	Male (Days)	3923.08 (9.46)	2744.68 (7.12)	3244.57 (7.32)	3458.85 (8.4)
		Female (Days)	2243.59 (5.41)	1744.68 (4.52)	2586.96 (5.84)	2204.71 (5.35)
2.	Bullock labour	(Days)	1307.69 (3.15)	1053.19 (2.73)	1043.48 (2.26)	1178.01 (2.86)
3.	Machinery	(Hrs)	1955.13 (4.72)	1861.70 (4.83)	2282.61 (5.15)	2013.64 (4.89)
4.	Seed	(kg)	3492.31 (8.42)	3246.88 (8.42)	3391.20 (7.66)	3405.70 (8.27)
5.	Manure	(qtl)	2500 (6.03)	3404.26 (8.83)	4031.74 (9.08)	3106.50 (7.54)
6.	Fertilizer	N (kg)	523.06 (1.26)	526.59 (1.37)	596.73 (1.35)	542.37 (1.32)
		P (kg)	2603.08 (6.28)	2912.23 (7.55)	3013.04 (6.80)	2782.86 (6.76)
7.	Irrigation	(Rs)	500 (1.21)	750 (1.94)	820.20 (1.85)	642.55 (1.56)
8.	Incidental	(Rs.)	550 (1.33)	431.91 (1.12)	467.39 (1.06)	499.83 (1.21)
9.	Plant protection	(Rs.)	1548.3.74 (3.74)	1363.82 (3.54)	2086.95 (4.71)	1637.05 (3.97)
10.	Depreciation@ 10 per cent per annum	(Rs.)	2211.54 (5.33)	1893.62 (4.91)	2157.61 (4.87)	2118.58 (5.14)
11.	Threshing	(Rs.)	2057.69 (4.96)	2106.38 (5.46)	2233.70 (5.04)	2113.87 (5.13)
12.	Transportation	(Rs.)	205.76 (0.50)	168.51 (0.44)	148.91 (0.34)	182.24 (0.44)
13.	Land Revenue	(Rs.)	231.15 (0.56)	175 (0.45)	241.84 (0.55)	219.79 (0.53)
14.	Int. on working capital@ 6 per cent per annum	(Rs.)	1079.16 (2.60)	1174.66 (3.05)	1358.54 (3.07)	1172.88 (2.85)
15.	COST "A"	(Rs.)	26931.96 (64.96)	25558.11 (66.28)	29695.57 (67.03)	27024.95 (65.61)
16.	Rental value of land 1/6 of gross produce	(Rs.)	7299.42 (17.61)	7358.69 (19.08)	7739.49 (17.47)	7423.26 (18.02)
17.	Int. on fixed capital@10 per cent per annum	(Rs.)	4448.72 (10.73)	3574.47 (9.27)	3652.17 (8.24)	4031.02 (9.79)
18.	COST "B"	(Rs.)	38680.10 (93.49)	36491.27 (94.63)	41087.23 (92.75)	38480.22 (93.42)
19.	Family labour charges	Male (Days)	1653.85 (3.99)	1260.64 (3.27)	2233.70 (5.04)	1700.51 (4.13)
		Female (Days)	1128.21 (2.72)	808.51 (2.10)	978.26 (2.21)	1010.80 (2.45)
20.	COST"C"	(Rs.)	41462.16 (100.00)	38560.42 (100.00)	44299.19 (100.00)	41191.53 (100.00)

Figure in parenthesis indicate the percentages to cost 'C'

level, respectively. An irrigation charge includes in case of small, medium, large size group and at overall its worth to Rs.500, Rs.750, Rs.820.20 and Rs.642.55, respectively. Major input like plant protection cost incurred at overall level was found to be Rs.1637.05 was observed to be more as compared to non beneficiary farmers. The next input like Threshing charges in case of small, medium, large and at overall level was found to be Rs.2057.69, Rs.2106.38, Rs.2233.70 and Rs.2113.87, respectively were threshing charge was observed to be more in case of beneficiary farmers. The next input like Rental value of land 1/6 gross produce *i.e.*, expenditure at overall level was found to be Rs.7423.26 were having less cost incurred as compared to beneficiary farmers.

Economics of gram :

The Table 4 shows that Economics of Gram on beneficiary farmers at overall level total returns per hectare were found to be Rs.57439.02. Whereas cost 'A', cost 'B' and cost 'C'. worked out to be Rs.18672.79, Rs.31847.59 and Rs.34036.46, respectively. Net returns over cost 'A', cost 'B' and cost 'C'. were found to be Rs.38766.23, Rs. 25591.43 and Rs.23402.56, respectively. Input-output ratios at different cost 'A', cost 'B' and cost 'C'. were noticed to be 3.08, 1.80 and 1.69, respectively. The total income ranges from Rs.59219.18 on small size farmers, Rs.53725.46 on medium size farmers and Rs.57592.22 on large size farmers.

In case of beneficiary farmers at small, medium, large group and at overall level per hectare yield of main produce obtained from gram 18.13 qtl., 15.52 qtl., 17.77 qtl. and 18.14 qtl., respectively it was more as compared to non beneficiary farmers which has seen in Table 4 Yield increases 3.00 to 4.00 qtl. more than the non-beneficiary farmers here impact of canal irrigation shown by providing irrigation to crop.

In case of non-beneficiary farmers at overall level total returns per hectare worked out to be Rs.45864.27. Inter group comparison revealed that total incomes ranges from Rs.45183.47 on small size farmers, Rs.45202.11 on medium size farmers and Rs.47888.01 on large size farm. Whereas cost 'A', cost 'B' and cost 'C'. were observed to be Rs.27024.95, Rs.38480.22 and Rs.41191.53, respectively. Net returns over different cost 'A', cost 'B' and cost 'C'. worked out to be Rs.18839.32, Rs.7384.05 and Rs.4672.74, respectively. Input-output ratios at different cost 'A', cost 'B' and cost 'C'. were noticed to be 1.70, 1.19 and 1.11, respectively. Net returns and profitability ratio on beneficiary farmers founds more as compared non beneficiary farmers.

Table 4 : Economics of gram (Rs./ha)

Sr. No.	Particulars	Size group							
		Small		Medium		Large		Overall	
		B	NB	B	NB	B	NB	B	NB
1.	Yield of main produce of gram (qtl.)	18.13	13.71	18.52	14.04	17.77	14.89	18.14	14.11
2.	Yield of by-produce of gram (qtl.)	5.00	3.71	4.11	3.82	5.12	4.89	4.81	4.07
3.	Value of main produce (Rs.)	53,579.65	40,996.80	49,318.60	41,005.30	52,188.00	42,730.40	52,166.48	41,432.33
4.	Value of by- produce (Rs.)	5,639.53	4,186.67	4,406.86	4,196.81	5,404.22	5,157.61	5,272.54	4,431.94
5.	Total produce (Rs.)	59,219.18	45,183.47	53,725.46	45,202.11	57,592.22	47,888.01	57,439.02	45,864.27
6.	Prices of main produce of gram (Rs.)	2955.30	2990.48	2662.99	2920.61	2936.86	2869.74	2876.17	2935.86
7.	Total cost								
	Cost 'A'	24,611.56	26,931.96	19,386.71	25,073.55	25,427.04	29,162.32	18,672.79	27,024.95
	Cost 'B'	38,696.53	38,680.10	31,644.39	36,006.71	37,698.63	40,553.98	31,847.59	38,480.22
	Cost 'C'	41,254.66	41,462.16	33,575.77	38,075.86	39,406.45	43,765.94	34,036.46	41,191.53
8.	Net return over								
	Cost 'A'	34,607.62	18,251.51	34,338.75	20,128.56	32,165.18	18,725.69	38,766.23	18,839.32
	Cost 'B'	20,522.65	6,503.37	22,081.07	9,195.40	19,893.59	7,334.03	25,591.43	7,384.05
	Cost 'C'	17,964.52	3,721.31	20,149.69	7,126.25	18,185.77	4,122.07	23,402.56	4,672.74
9.	Input-Output ratio at								
	Cost 'A'	2.41	1.68	2.77	1.80	2.26	1.64	3.08	1.70
	Cost 'B'	1.53	1.17	1.70	1.26	1.53	1.18	1.80	1.19
	Cost 'C'	1.44	1.09	1.60	1.19	1.46	1.09	1.69	1.11

Conclusion :

At overall level, seed requirement in gram it was observed to be 77.94 kg in case of beneficiary farmers whereas 84.43 kg per hectare in case of non-beneficiary farmers. Manure used by small, medium and large size group of beneficiary farmers it was found to be 1.91 qt, 2.20 qt and 2.65 qt/hectare, respectively. While in case of non beneficiary farmers manure used to be 2.50 qt, 3.40 qt and 4.02 qt/hectare, respectively. Per hectare cost of cultivation of gram crop in case of beneficiary farmers at overall level cost 'C' it was observed to be Rs.34036.46 which was lower than beneficiary farmers. While in case of non-beneficiary farmer at overall level was found to be Rs.41191.53. Economics of gram crop at overall level total income worked out to Rs. 57439.02 and the net returns obtain at various costs were Rs.38766.23 at cost 'A', Rs. 25591.43 at cost 'B' and Rs.23402.56 at cost 'C', respectively, in case of beneficiary farmers. Whereas in case of non beneficiary farmers at overall level total income worked out to be Rs. 45864.27. The net returns obtain at various cost were Rs.18839.32 at cost 'A', Rs.7384.05 at cost 'B' and Rs.4672.74 at cost 'C', respectively. Input-output ratio of beneficiary farmers at overall level at cost 'C' it was found to be 1.69 whereas 1.11 in case of non-beneficiary farmers.

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