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Impact assessment of farm ponds on beneficiaries and non-beneficiary farmers for gram cultivation

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Abstract
The present study entitled, 'Comparative economics of farm pond beneficiary and non-beneficiary farmers of Malegaon tahasil of Washim district. The study was undertaken to examine the impact of farm ponds on production of major crops. For the present study, 50 beneficiary farmers having farm ponds and 50 non-beneficiary farmers without farm ponds on their field were selected from Malegaon tahasil of Washim district. 10 villages from Malegaon tahasil were selected purposively and, from each village sufficient samples of beneficiary and non-beneficiary farmers were taken randomly for comparison. The selected farmers were classified into three categories *viz*., small, medium, large according to their land holding. The primary data was collected from the farmers by survey method and cost concept *i.e*., cost 'A', cost 'B' and cost 'C' was used for the analysis of data. It is observed from the study that in case of beneficiary farmers at overall level the Output-input ratio at cost 'C' was 1:65, while in case of non-beneficiary farmers it was 1:40. It shows that the beneficiary farmers were more profitable than non-beneficiary farmers.

Keywords: Profitability, output-input ratio, productivity, cost and returns, input

Introduction
The challenges before Indian agriculture is to transform rainfed farming into more sustainable and productive system by giving social, economical and technological backup to the people who depend upon it. Moreover, the economy is mainly dependent on stability of crop production in rainfed areas. Construction of farm ponds is one of the beneficial programmes for harvesting excess rain water during rainy season; which is implemented by the State Agricultural Development under National Agricultural Development Programme (Rashtriya Krishi Vikas Yojana) etc.

Water is an essential and precious resource upon which our ecosystems and agricultural production depend. However, water a natural resource of the world constitutes, 1,384 million cubic kilometers of which around 97.39 per cent (i.e. 1,348 million cubic kilometers) of water is in the oceans, which is salty in nature. Another 2.61 per cent (i.e. 36 million km^3) is fresh water of this 77.23 per cent (27.82 million km^3) is in the polar ice caps, icebergs and glaciers. Only small fraction of water resources (0.59 per cent or 8.2 million km^3) of the earth present on the ground, lakes, rivers and atmosphere and is useful to mankind. Whereas, more than 99 per cent of water present on the earth is not useful to mankind.

Farm ponds are created in various states of India along with Maharashtra. The main aim of constructing farm pond is to make the availability of protective irrigation at critical growth stages of crop. In Maharashtra through various scheme of government the farm ponds are allotted to farmers namely, National Horticultural Mission, Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and Mahatma Phule Jal Abhiyan etc. The farm pond has a great impact on changing the crop productivity as well as cropping intensity. It also helps in changing the economic situation of farmers. The irrigated area also increases due to the construction of farm pond. (Deshmukh, J. M., V. D. Hyalij, 2017) [6] The rainfall amount and its distribution during monsoon period are mostly erratic and uncertain coupled with occurrence of frequent droughts of several days to weeks affecting rainfed productivity drastically.

A farm pond is a large hole dug out in the earth, usually square or rectangular in shape, which harvest rainwater and stores it for future use. It has inlet to regulate inflow and an outlet to discharge excess water. The pond is surrounded by a small bund, which prevents erosion on the banks of pond. The size and depth depend on the amount of land available, the type of soil, the farmers water requirements, the cost of excavation, and the possible uses of the excavated earth. Water from the pond is conveyed to the fields manually, by pumping or by both methods. Farm pond size adopted by the farmers ranges 15×15×3 meter, 20×20×3 meter, 25×25×3 meter, and 30×30×3 meter according to size of land holding of a farmer. (Mane N. P., S. S. Thakre, 2015) [7].

Materials and Methods

The present study was undertaken with main object of determining inputs used, cost, returns, profitability and resource use efficiency from gram production.

Cost 'A'

It is actual paid out cost by the cultivators. This cost approximates the expenditure incurred by the farmers in cash and kind in the cultivation of crop and include the following items.

1. Hired human labour
2. Bullock labour
3. Machinery hours
4. Seed
5. Irrigation charges
6. Land revenue and other cases
7. Depreciation
8. Interest on working capital

Cost 'B'

Cost 'B' was estimated by adding interest on fixed capital and rental value of land to Cost 'A' i.e.

Cost 'B' = Cost 'A' + Rental value of owned land + Interest on owned fixed capital (excluding land) @ 10%

Cost 'C'

It is obtained by adding imputed value of family labour to cost **'**B'

Cost 'C' = Cost 'B' + Imputed value of family labour

Gross income: It is calculated as under,

Gross value of output = value of main produce + value of by-produce

Net Income:

Gross value of output-Cost 'C'

Input-Output Ratio: it is ratio between the value of gross output and the cost of cultivation at different cost concept

Results and Discussion

The findings of the present study as well as relevant discussion have been presented under following heads:

Per hectare input utilization of gram

The degree of management of the resources can be judged for the utilization of resources, the choice and the decision making. Beside this, it is also indicates the level of technology adopted by the farmers. The farmers require to spend on various inputs like seed, manure, fertilizers, human labour and bullock labour, machinery labour etc. therefore, it is necessary to know the pattern of expenditure on various inputs on per hectare basis. It is observed from table 1 that at overall level family labour, fertilizers and manures was used more in beneficiary farmers as compared to the non-beneficiary farmers. Bullock labour, machinery and seed used more in non-beneficiary farmers. It showed that more used of input used in non-beneficiary farmers for the production of gram crop.

Table 1: Per hectare input utilization of gram

Sr. No.	Particulars	Unit	Size of Group							
			Small		Medium		Large		Overall	
			B	NB	B	NB	B	NB	B	NB
1	**Hired human labour**									
	Male	(Days)	22.32	15.83	15.10	12.39	17.98	13.59	18.26	13.68
	Female	(Days)	15.12	14.00	14.68	11.55	17.00	10.91	16.77	11.80
	Total	(Days)	37.44	29.83	29.78	23.94	34.98	24.50	35.07	25.48
2	Bullock labour	(Days)	1.10	2.19	2.36	1.35	1.15	1.46	1.51	1.37
3	Machinery	(Hrs.)	6.89	3.22	6.94	1.88	7.42	3.32	7.25	2.88
4	Seed	(Kg)	73.87	76.50	69.80	70.80	76.02	73.41	73.84	72.40
5	Manure	(Qtl.)	22.50	21.50	23.57	22.00	23.91	22.64	23.49	21.99
6	**Fertilizer**									
	N	(Kg.)	24.08	23.10	22.88	22.61	24.02	23.87	23.67	25.24
	P	(Kg.)	61.41	50.58	53.60	37.68	61.25	49.27	59.14	46.06
	Total	(Kg.)	85.49	73.68	76.48	60.29	85.27	73.14	82.81	71.30
7	**Family labour**									
	Male	(Days)	24.50	16.50	23.68	17.78	19.22	16.20	21.87	16.73
	Female	(Days)	8.62	9.51	12.9	9.47	5.94	6.67	8.45	8.08
	Total	(Days)	33.12	26.01	36.58	27.25	25.16	22.87	30.32	24.81

Per hectare cost of cultivation of gram for beneficiary farmers

The share each items the total cost provides necessary due to economizing costs. The cost has determined on the basis of standard cost concepts i.e., cost 'A', cost 'B', cost 'C', the different cost concepts have different utility in research. The per hectare of cost of cultivation of gram grown by the selected farmers is presented in table 1 It is revealed that, the per hectare cost of cultivation of gram for beneficiary farmers at overall level as a whole was 89555.54

Amongst the different item expenditure human labour accounted 12.43 per cent share to the total cost while the share of rental value of land is highest in all items which included in cost of cultivation. The share of rental value land is 23.82 per cent to the total cost. The proportion other items of expenditure were bullock labour 1.53 per cent, machinery

charge 8.83 per cent seed 15.00 per cent, and irrigation charge 2.31 per cent, and share of fertilizer was 5.23 per cent, also share of interest on fixed capital was 0.61 per cent. The per ha. Total cost cultivation i.e. cost c range from ₹.48376.02 in large size group to ₹. 49974.86 In medium size group. The per ha. Cost of cultivation for small farmers was ₹.50247.07. Higher total cost on small size farm was obviously due to higher use of input.

Table 2: Per hectare cost of cultivation of gram for beneficiary farmers

Sr. No.	Particulars		Size of group			
		Unit	Small	Medium	Large	Overall
1	Hired Human labour					
A	Male	(Days)	4558.33(9.07)	3335.55(6.47)	3596.95(7.44)	3710.81 (7.53)
B	Female	(Days)	2368.7(7.14)	23687.50(7.14)	2489.79(5.15)	2412.64(4.9)
2	Bullock labour	(Days)	604.17(1.20)	1163.88 (2.32)	575.95(1.19)	757.98(1.53)
3	Machinery	(Hrs.)	4675.00(9.30)	3960(7.92)	4783.05 (9.89)	4350.29 (8.83)
4	Seed	(Kg)	7387.50(14.70)	7020.00(14.04)	7602.29 (15.71)	7384.64(15.00)
5	Manures	(Qtl)	4508.33(8.97)	4686.66(9.37)	4783.05 (9.89)	4699.19(9.54)
6	Fertilizers					
A	N	(Kg)	314.05 (0.63)	297.74 (0.59)	313.28(0.65)	308.77(0.62)
B	P	(Kg)	2360.24(4.70)	2079.91.(4.16)	2353.89 (4.87)	2272.97 (4.61)
7	Irrigation charge	₹	1333.33.(2.65)	1108.33(2.21)	1084.29 (2.24)	1141.31(2.31)
8	Plant protection	₹	750.00 (1.49)	2050.00(4.10)	2090.14(4.32)	1990.07 (4.04)
9	Depreciation	₹	199.32 (0.40)	593.89 (1.18)	169.45 (0.35)	302.75 (0.61)
10	Incidental		441.25(0.88)	353.33(0.70)	373.80(0.77)	381.15(0.77)
11	Land revenue	₹	140(0.28)	140.00 (0.28)	140.00 (0.29)	140.00 (0.28)
12	Cost A	₹	32280.73(64.24)	30746.69 (61.52)	31753.87(65.64)	31557.09 (64.10)
13	Interest. on fixed capital @10% annum	₹	199.32.(0.40)	593.90(1.18)	169.44 (0.35)	302.76 (0.61)
14	Rental value of land	₹	11573.26(23.03)	11847.87(23.70)	11716.53(24.22)	11727.28 (23.82)
15	Cost B	₹	44053.32(87.67)	43188.47(86.42)	43639.85(90.21)	43587.13 (88.53)
16	Family labour					
A	Male	(Days)	4900.00 (9.75)	4905.56(9.81)	3844.66 (7.95)	4374.00(8.88)
B	Female	(Days)	114750(228.37)	189000 (378.19)	106200 (219.53)	132750(269.65)
17	Cost C	₹	50247.07(100.00)	49974.86 (100.00)	48376.02 (100.00)	49229.88 (100.00)

Per hectare cost of cultivation of gram for Non-beneficiary farmers

It is revealed from the table 2 that, per hectare cost of cultivation of gram for non-beneficiary farmers at overall level as a whole was ₹ 43348.81. Amongst the different item expenditure human labour accounted 10.38 per cent share to the total cost while the share of rental value of land is highest in all items which included in cost of cultivation. The share of rental value land is 22.33 per cent to the total cost. The proportion other items of expenditure were bullock labour 1.71 per cent, machinery charge 3.99 per cent seed 18.54 per cent, and irrigation charge 2.19 per cent, and share of fertilizer was 4.67 per cent, also share of interest on fixed capital was 0.47 per cent.

The per hectare total cost of cultivation i.e. cost c range from ₹.43098.33 in large size group to ₹.41819.23 in medium size group. The per ha. Cost of cultivation for small farmers were 46269.37. Total cost of cultivation in beneficiary farmers was less than the non-beneficiary farmers. It means that non-beneficiary farmers used more inputs in cultivation gram crop.

Table 3: Per hectare cost of cultivation of gram for non-beneficiary farmers

Sr. No.	Particulars		Size of group			
		Unit	Small	Medium	Large	Overall
1	Hired Human labour					
A	Male	(Days)	3166.67 (6.64)	2479.52 (5.93)	3468.25 (6.71)	2736.56 (6.31)
B	Female	(Days)	2187.50 (4.73)	1716.31 (4.10)	1636.81 (4.62)	1770.80 (4.07)
2	Bullock labour	(Days)	875.00 (1.89)	678.37 (1.62)	787.01 (1.70)	745.51(1.71)
3	Machinery	(Hrs.)	1975.00 (4.27)	1130.95 (2.70)	1996.19 (4.63)	1732.38 (3.99)
4	Seed	(Kg)	7679.17 (16.60)	8188.89 (19.58)	8096.27 (18.79)	8040.63 (18.54)
5	Manures	(Qtl)	7900.00 (17.07)	6833.33 (16.34)	6576.48 (15.26)	6918.24 (15.95)
6	Fertilizers					
A	N	(Kg)	494.43 (1.07)	294.94 (0.71)	350.50 (0.81)	362.61(0.83)
B	P	(Kg)	1943.92 (4.20)	1201.62 (2.87)	1838.54 (4.27)	1668.54 (3.84)
7	Irrigation charge	₹	1562.50 (3.38)	698.02 (1.67)	856.43 (1.99)	950.12 (2.19)
8	Plant protection	₹	1256.25 (2.72)	1646.07 (3.94)	1993.89 (4.63)	1742.02 (4.01)
9	Depreciation	₹	124.13 (0.27)	373.07 (0.89)	139.98 (0.32)	206.73 (0.47)
10	Land revenue	₹	140.00 (0.30)	140.00 (0.33)	140.00 (0.32)	140.00 (0.32)
11	Incidental		457.08(0.99)	246.93(0.59)	259.62(0.60)	295.30(0.68)
12	Cost A	₹	31446.15 (67.96)	27101.45 (64.81)	28952.91(67.18)	28896.12(66.65)
13	Interest. on fixed capital @10 % annum	₹	124.13 (0.27)	373.07 (0.89)	139.98 (0.32)	206.74 (0.47)
14	Rental value of land	₹	9942.85 (21.49)	9366.06 (22.40)	9763.65 (22.65)	9680.21(22.33)

15	Cost B	₹	41513.12(89.72)	36840.59 (88.09)	38856.53 (90.16)	38783.07 (89.46)
16	Family					
A	Male	(Days)	3300.00 (7.13)	3557.22 (8.51)	3240.40 (7.52)	3347.36(7.72)
B	Female	(Days)	112500.00 (2.43)	190500 (455.53)	172800 (400.94)	166050 (383.05)
17	Cost C	₹	46269.37 (100.00)	41819.24 (100.00)	43098.33 (100.00)	43348.81 (100.00)

Figures in parentheses indicate the per cent to total cost 'C'

Per hectare cost and returns of gram

It is revealed from the table 4 that in case of beneficiary farmers at overall level average gross return was ₹73490.59 The net returns obtain at various cost were ₹31557.09at cost 'A', ₹43587.13 at cost 'B', and ₹ 49229.88at cost 'C'. The highest Output-input ratio at cost 'C' was recorded in large size group i.e. 1.52 and lowest Output-input ratio at cost 'C' was recorded in small size group i.e.1.45. At overall level the Output-input ratio at cost 'C' was 1.49 and medium size group was 1.41

In case of non-beneficiary farmers overall level average gross returns worked out to ₹60693.10. The net returns obtain at various costs were ₹28896.10at cost 'A', ₹38783.07at cost 'B', and ₹43348.81at cost 'C'. The highest Output-input ratio at cost 'C' was recorded in large size group i.e. 1.41 and lowest Output-input ratio at cost 'C' was recorded in small size group i.e.1.37. At overall level the Output-input ratio at cost 'C' was 1.40 and medium size group 1.41, respectively.

Table 4: Per hectare cost and returns of Gram

Sr. No	Particulars	Small		Medium		Large		Overall	
		B	**NB**	**B**	**NB**	**B**	**NB**	**B**	**NB**
1	Total cost (₹)								
	Cost A	32280.70	31446.10	30746.69	27101.40	31753.00	28952.90	31557.09	28896.10
	Cost B	44053.30	41513.10	43188.47	36840.59	43639.85	38856.53	43587.13	38783.07
	Cost C	50247.07	46269.37	49974.86	41819.24	48376.02	43098.33	49229.88	43348.81
2	Net return over (₹)								
	Cost A	40646.38	31793.44	43300.53	31416.51	41628.15	32026.68	41933.5	31796.98
	Cost B	28847.08	21726.46	30858.75	21677.37	29742.17	22123.06	29903.46	21910.03
	Cost C	22680.01	16970.21	24072.36	16698.72	25006.00	17881.26	24260.71	17344.29
3	Yield of main produce gram (Qtl**)**	14.41	12.45	14.63	11.56	14.50	12.09	8.08	12.00
4	Yield of by-produce of gram (Qtl)	3.37	3.79	3.52	2.80	3.45	2.03	1.91	2.62
5	Value of main produce (₹)	72083.33	62291.67	73166.67	57815.48	72521.43	60469.84	72627.38	60037.90
6	value of by produce (₹)	843.75	947.91	880.55	702.48	860.59	509.75	479.52	655.20
7	Gross return (₹)	72927.08	63239.58	74047.22	58517.96	73382.02	60979.59	73490.59	60693.10
8	Output-input ratio								
	Cost A	2.25	2.01	2.40	2.16	2.31	2.11	2.32	2.10
	Cost B	1.65	1.52	1.71	1.59	1.68	1.57	1.68	1.56
	Cost C	1.45	1.37	1.41	1.40	1.52	1.41	1.49	1.40

It shown that the beneficiary farmers were more profitable than non-beneficiary farmers. The impact of gross return was observed in case of beneficiary farmers due to the construction of farm ponds in their field. Nikam *et al.* (2011) and Desai *et al.* (2007) reported that the output input ratio, which is an indicator of economic efficiency in crop production for gram and other discussion indicated, that registered a good output-input ratio means this is profitable.

Conclusions

At overall level family labour, fertilizers and manures was used more in case of beneficiary farmers as compared to non-beneficiary farmers. While bullock labour, seed, machinery was more in case non-beneficiary farmers as compared to beneficiary farmers.

The per hectare cost of cultivation of gram for beneficiary farmers at overall level as a whole was ₹ 49229.88 while in case of non-beneficiary it was ₹43348.81. It means beneficiary farmers used less input in gram production as compared to non-beneficiary farmers.

In case of beneficiary farmers at overall level average gross return was ₹73490.59While in case of non-beneficiary farmers it was ₹60693.10. It means production was more in case of beneficiary farmers as compared to non-beneficiary farmers.

In case of beneficiary farmers at overall level the Output-input ratio at cost 'C' was 1.49, while in case of non-beneficiary farmers it was 1:40. It shows that the beneficiary farmers were more profitable than non-beneficiary farmers.

The impact of farm pond construction on their field increase water level of well and also for their field to provide water during crop season whenever necessary to increase a crop production. Higher regression coefficient and consequently higher factor productivity for beneficiary farms were obviously due to farm pond availability on these farms.

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