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An impact analysis of farm pond's on beneficiary and non-beneficiary farmers for soybean cultivation in Akola district

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Abstract
The present study entitled, 'Comparative economics of farm pond beneficiary and non-beneficiary farmers of Telhara Tahsil of Akola 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 Telhara Tahsil of Akola district. 10 villages from Telhara Tahsil 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 category *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. The per hectare cost of cultivation of soybean for beneficiary farmers at overall level as a whole was ₹ 56348.67. While in case of non-beneficiary farmers it was ₹ 60648.88. In case of beneficiary farmers at overall level the output-input ratio at cost 'C' was 1:37, while in case of non-beneficiary farmers it was 1:28.

Keywords: Soybean, cost of cultivation, cost, net return, gross returns, output-input ratio, beneficiary, non-beneficiary

Introduction
India has been predominantly an agricultural country. Hence, it is true that progress of India is very much dependent on the development of agriculture. The increased agricultural production depends upon the number of factors of which, water play an important role. 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. 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 ranges 15×15×3 meter, 20×20×3 meter, 25×25×3 meter, and 30×30×3 meter respectively, according to size of land holding of a farmer (Mane *et al*. 2015) [7] Telhara Tahsil of Akola district was under a dry zone area whereas various watershed development activities carried out to provide supplementary irrigation to the Kharif and Rabi crops, to increase the farmer income. The activities carried on the farm which has been selected under study. Farm pond 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. The excess rain water harvested in farm ponds play a vital role in stabilizing crop production through recycling during dry spell in kharif season and for protective irrigation in rabi season. Ponds can be filled by rainfall, as is common with farm and ranch ponds that are sited at a low point and serve to collect runoff from higher reaches in the watershed. Alternatively, farm ponds can be filled with well water from irrigation, which can then be recycled. The major works of Rain Water Harvesting Structure adopted in the watershed are check dams, farm ponds, nala bunds, contour bunds, vegetative covers etc. which play major role in managing and conserving the soil and water resources. However, farm pond is perceived as best rain water harvesting structure by large majority of farmers.

Methodology
a) Sampling Technique
The total sample of 100 farmers was selected purposively of which 50 beneficiary farmers and 50 non-beneficiary farmers were selected for the present study.

Telhara Tahsil covers 94 villages. Out of these 10 villages were selected for present study namely Adsul, Dahigoan, Nimboli, Ner, Talegoan, Shirsoli, Manabda, Vangargoan, Vadgoan and Bhabheri. These villages were purposively selected taking into consideration, availability of at least five farm ponds in each village and their accessibility. List of farm pond beneficiary farmers from these villages was prepared with the help of officials of the State Department of Agriculture who are stationed at Telhara Tahsil.
Schedule was designed for data collection by keeping in view the objectives of the study. The sample farmers for present study were personally contacted and primary data was collected from them in a specially structured schedule.

b) Analytical Technique
1. Cost and Return Analysis: Gross & Net Returns**,** Output-Input Ratio,

2. Production function analysis: Following equation employed to asses the production function

$Y = ax_1^{b1} x_2^{b2} x_3^{b3} x_4^{b4} x_5^{b5} x_6^{b6} \ldots\ldots x_n^{bn} . e^n$

Where, (Y = Dependent Variable, X1, X2, X3.....= independent Variables, $b_1$to b_n= Regression coefficient of the concerned factors)

3. Estimation of MVP: $MVP = b_i \frac{Y}{Xi}$

Where, (MVP = Marginal value of products, Y= the estimated output when all the inputs (x`s) were held at their geometric mean level, b_i = the regression coefficient of the concerned input factor and X_i = the geometric mean of the i^{th} factor)

4. Cost analysis: Cost A, Cost B and Cost C,

Results and Discussions
The findings of the present study as well as relevant discussion have been presented under following head:

Per hectare input utilization of soybean
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 indicating 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.

Table 1: Per hectare input utilization pattern of beneficiary and non-beneficiary farmers for soybean

Sr. No.	Particulars	Unit	Small		Medium		Large		Overall	
			B	NB	B	NB	B	NB	B	NB
1	Hired human labour	Days								
	Male		27.74	25.84	12.87	16.75	9.76	11.54	15.19	20.04
	Female		42.01	38.55	22.20	24.81	19.58	24.17	25.91	31.53
	Total		69.75	64.39	35.07	41.56	29.34	37.45	41.10	51.57
2	Bullock labour	Days	7.52	9.26	7.95	7.32	4.36	5.08	6.41	7.75
3	Machinery	Hrs.	6.16	6.68	5.36	5.27	2.29	3.80	4.33	5.63
4	Seed	Kg.	74.87	82.19	75.12	79.39	58.38	52.41	68.36	74.32
5	Manures	Qtl.	8.55	6.31	2.46	3.83	4.18	1.86	4.61	4.60
6	Fertilizers	Kg.								
	N		55.37	61.38	60.03	66.22	47.99	42.92	54.10	58.21
	P		84.14	114.54	119.33	130.96	96.73	77.99	101.84	110.04
	Total		139.51	175.92	179.36	197.18	144.72	120.91	155.94	168.25
7	Family labour	Days								
	Male		11.39	11.72	9.38	8.56	7.12	9.23	8.96	10.30
	Female		11.26	11.07	9.53	15.18	10.70	12.04	10.41	12.37
	Total		22.65	22.79	18.91	23.74	17.82	21.27	19.37	22.67

*B-Beneficiary, NB-Non-beneficiary

It is observed from table 1 that at overall level hired human labour, machinery and seed was used more in non-beneficiary farmers as compared to the beneficiary farmers. It showed that more used of input used in non-beneficiary farmers for the production of soybean crop.

Per hectare cost of cultivation of soybean for beneficiary farmers
The share of each item to the total cost i.e., cost 'C' for soybean cultivation. 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 utilities in research. Thus, attempt has been made to estimate the cultivation costs of soybean crop of beneficiary and non-beneficiary farmers in the study area and presented in succeeding table.

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

Sr. No.	Particulars	Unit	Small	Medium	Large	Overall
1	Hired human labour	(Days)				
	Male		5547.88 (7.99)	2574.43 (4.79)	1951.03 (3.88)	3038.70 (5.39)
	Female		6302.06 (9.08)	3954.80 (7.36)	8500.77 (16.91)	6336.53 (11.25)
	Total		11849.94 (17.07)	6529.23 (12.15)	10451.80 (20.80)	9375.23 (16.64)
2	Bullock labour	(Days)	4463.83 (6.43)	4768.62 (8.87)	2618.44 (5.21)	3835.40 (6.81)
3	Machinery	(Hrs.)	1232.40 (1.78)	2679.94 (4.99)	1145.80 (2.28)	1718.87 (3.05)
4	Seeds	(Kg.)	7487.00 (10.79)	7511.54 (13.97)	5837.56 (11.62)	6836.06 (12.13)
5	Manures	(Qtl.)	12822.57 (18.47)	3687.74 (6.86)	6267.77 (12.47)	6912.11 (12.27)

6	Fertilizers	(Kg.)				
	N		885.89 (1.28)	960.54 (1.79)	767.86 (1.53)	865.55 (1.54)
	P		2019.35 (2.91)	2864.04 (5.33)	2321.42 (4.62)	2444.27 (4.34)
	Total		2905.24 (4.19)	3824.58 (7.12)	3089.28 (6.15)	3309.82 (5.87)
7	Plant Protection	(₹)	3782.13 (5.45)	2317.82 (4.31)	1465.09 (2.92)	2328.16 (4.13)
8	Depreciation cost	(₹)	2490.00 (3.59)	1624.55 (3.02)	1296.53 (2.58)	1701.05 (3.02)
9	Land revenue	(₹)	159.53 (0.23)	196.83 (0.37)	159.41 (0.32)	172.91 (0.31)
10	Int. on working capital (@6% annum)	(₹)	3041.77 (4.38)	2188.10 (4.07)	2067.09 (4.11)	2344.58 (4.16)
11	Cost 'A'	(₹)	50234.40 (72.36)	35328.96 (65.73)	34398.75 (68.44)	38534.19 (68.39)
12	Int. on fixed capital (@10% annum)	(₹)	1975.65 (2.85)	1475.52 (2.75)	1229.27 (2.45)	1497.05 (2.66)
13	Rental value of land	(₹)	13882.57 (20.00)	13355.00 (24.85)	11281.80 (22.45)	12652.34 (22.45)
14	Cost 'B'	(₹)	66092.62 (95.21)	50159.48 (93.32)	46909.82 (93.34)	52683.58 (93.50)
15	Family labour	(Days)				
	Male		1766.67 (2.54)	1875.31 (3.49)	1423.29 (2.83)	1791.06 (3.18)
	Female		1560.00 (2.25)	1715.42 (3.19)	1925.59 (3.83)	1874.03 (3.33)
	Total		3326.67 (4.79)	3590.73 (6.68)	3348.88 (6.66)	3665.09 (6.50)
16	Cost 'C'	(₹)	69419.29 (100.00)	53750.21 (100.00)	50258.70 (100.00)	56348.67 (100.00)

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

Table 3: Per hectare cost and returns of soybean:

Table 3									
Sr. No.	**Particulars**	**Size of group**							
		Small		**Medium**		**Large**		**Overall**	
		B	**NB**	**B**	**NB**	**B**	**NB**	**B**	**NB**
1	**Total Cost (₹)**								
i)	Cost 'A'	50234.40	51332.67	35328.96	39156.63	34398.75	26237.30	38534.19	42144.01
Ii)	Cost 'B'	66092.62	68567.27	50159.48	51491.25	46909.82	37315.58	52683.58	56627.10
iii)	Cost 'C'	69419.29	72784.20	53750.21	55479.23	50258.70	40967.42	56348.67	60648.88
2	**Net Return over (₹)**								
i)	Cost 'A'	34018.19	41246.52	45982.02	26466.77	34248.52	33218.19	38417.29	35476.99
Ii)	Cost 'B'	18159.97	24011.92	31151.50	14132.15	21737.45	22139.91	24267.90	20993.90
iii)	Cost 'C'	14833.30	19794.99	27560.77	10144.17	18388.57	18488.07	20602.81	16972.12
3	**Yield of soybean (Qtl)**								
i)	Main produce	24.50	24.00	20.67	23.50	24.00	20.00	25.05	24.80
ii)	By-produce	6.29	8.26	10.16	8.94	20.61	8.00	13.41	8.37
4	**Value of soybean (₹)**								
i)	Main produce	82242.22	90021.91	78857.04	63230.77	66166.04	58006.38	74593.08	75372.49
ii)	By-produce	2010.37	2557.28	2453.94	2392.63	2481.23	1449.11	2358.40	2248.51
5	**Gross Return (₹)**	84252.59	92579.19	81310.98	65623.40	68647.27	59455.49	76951.48	77621.00
6	**Output-input ratio at**								
i)	Cost 'A'	1.68	1.80	2.30	1.68	2.00	2.27	2.00	1.84
ii)	Cost 'B'	1.27	1.35	1.62	1.27	1.46	1.59	1.46	1.37
iii)	Cost 'C'	1.21	1.27	1.51	1.18	1.37	1.45	1.37	1.28
7	**Per quintal cost of production**	2751.38	2926.12	2481.68	2259.00	1990.73	1975.92	2155.30	2354.85

*B-Beneficiary, NB-Non-beneficiary

It is revealed from the table 3 that in case of beneficiary farmers at overall level average gross return was ₹ 76951.48. The net returns obtain at various cost were ₹38417.29 at cost 'A', ₹ 24267.90 at cost 'B' and ₹ 20602.81 at cost 'C'.

The highest Output-input ratio at cost 'C' was recorded in medium size group i.e. 1.51 and lowest Output-input ratio at cost 'C' was recorded in small size group i.e.1.21. At overall level the Output-input ratio at cost 'C' was 1.37 and large size group was 1.37.

In case of non-beneficiary farmers overall level average gross returns worked out to ₹77621.00. The net returns obtain at various costs were ₹ 35476.99 at cost 'A', ₹ 20993.90 at cost 'B', and ₹ 16972.12 at cost 'C'.

The highest Output-input ratio at cost 'C' was recorded in large size group i.e.1.45 and lowest Output-input ratio at cost 'C' was recorded in medium size group i.e.1.18. At overall level the Output-input ratio at cost 'C' was 1.28 and small size group 1.27, respectively.

In case of beneficiary farmers overall per quintal cost of production was ₹ 2155.30, whereas in case of non-Beneficiary farmers it was ₹ 2354.85.

It shown that the beneficiary farmers were more profitable than non-beneficiary farmers by looking the overall Output-input ratio as well as per quintal cost of cultivation. The impact of gross returns 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 soybean and other discussion indicated, that registered a good output-input ratio means this is profitable.

Conclusions

At overall level hired human labour, bullock labour, machinery, seed was used more in case of non-beneficiary farmers as compared to beneficiary farmers. Also, family labour and manures were more used in case of non-beneficiary farmers as compared to the beneficiary farmers. It shows more input used in non-beneficiary farmers for the production of soybean crop.

The per hectare cost of cultivation of soybean for beneficiary farmers at overall level as a whole was ₹ 56348.67. while in

case of non-beneficiary farmers it was ₹ 60648.88. It means non-beneficiary farmers costs more than beneficiary farmers in soybean production. In case of beneficiary farmers at medium level average gross returns was ₹ 81310.98. While in case of non-beneficiary farmers it was ₹ 65623.40. It means production was more in case of medium size beneficiary farmers as compared to non-beneficiary farmers.

In case of beneficiary farmers overall per quintal cost of production was ₹ 2155.30, whereas in case of non-Beneficiary farmers it was ₹ 2354.85.

In case of beneficiary farmers at overall level the output-input ratio at cost 'C' was 1:37, while in case of non-beneficiary farmers it was 1:38. It shows that the beneficiary farmers were more profitable than non-beneficiary farmers.

The impact of farm pond construction on their field increases 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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