



## **Economic evaluation of Rajeev Gandhi Watershed Development Programme in Rewa district of Madhya Pradesh**

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### **ABSTRACT**

*This study conducted in Majhigavana Mili Watershed Area in Teonthar Block of Rewa district of Madhya Pradesh was selected under the watershed area. A sample of 35 cultivators consisting of 20 small (less than 2.00 ha), 10 medium (2 to 4 ha) and 5 large (above 4 ha) farmers each were selected randomly from the list of total cultivators the village of watershed area (WSA) and non watershed area (NWSA), respectively. A multi random sampling technique was adopted. The average yields per hectare of wheat and gram were 34.22 and 14.64 quintal, respectively in WSA as compared to, 16.82 and 8.06 quintals in NWSA. The average cost of production per quintal of wheat and gram worked out ` 592.18 and ` 1846.85, respectively in WSA as compared to ` 1086.37 and ` 3252.65 in NWSA. The average cost of production per quintal of wheat and gram worked out to be in Watershed Development Programme (WDP) less than Non-Watershed Development Programme (NWDP). The average cost benefit ratio was higher for wheat and gram in WDP as compared to NWDP. Overall there has been a positive impact due to adoption of WDP in raising the level of income, employment and productivity of various crops in watershed area on small, medium and large farms.*

**KEY WORD:** Watershed, Wheat, Gram, Cost, Returns, B-C ratio

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### **INTRODUCTION**

The Watershed approach aims at the promotion of overall economic development of the resource poor by treating merely degraded land with the help of technologies such as in-situ soil and moisture conservation measures, rain water harvesting, etc. The Government of India has initiated various programme within this approach. The Drought Prone Areas Programme (DPAP) and the Desert Development Programme (DDP) were also brought into the watershed mode. The Integrated Wasteland Development Programme (IWDP) aiming at the development of wastelands on watershed basis was also launched in 1989. But the major thrust to watershed approach came after 1994 when the Ministry of Rural Development, Government of India, launched its watershed development programme incorporating DPAP, DDP and IWDP. Creation of structures for soil and moisture conservation is an important activity in this programme. Watershed assets include structures like check-dams and nullah-plugs as well as village forest and pasture land (Chaturvedi 2004).

Balanced ecosystem, consisting of soil, water, plant, man, animal and environment is essential for survival and welfare of mankind. Soil erosion and land degradation have increased, water-table has gone down, forest has been depleted, severity of drought and flood has increased and ecological degradation is greater than few decades ago. The main reason of these degradations/losses is basically increase in demographic pressure on fragile ecosystem, mismanagement and over-exploitation of natural resources and inadequate investment to conserve it. Out of 329 million ha geographical area of the country, 150 million ha are threatened by water and wind erosion, 7 million ha by excessive salts, 6 million ha by water logging, 4 million ha by ravines and 3 million ha by shifting cultivation (verma et.al. 2002). The watershed programme endeavours to improve and sustain production and productivity of all categories of land at higher levels. The specific objectives of watershed management programme are (i) to design sustainable resource use in order to provide optimum production potential of the agro-eco-system, (ii) promotion of in-situ soil and water conservation, (iii) proper management of non-available lands to conserve soil, moisture and store run-off water for recharging ground water, and (iv) optimal use of land to minimize

risk in rainfed farming, increase productivity of lands and provide better returns to farmers on sustainable basis through adoption of better technology and cropping patterns and diversification of sources of income. Therefore, watershed is a holistic approach arrived at optimising the use of land, water and vegetation in area and thus, providing solution to alleviate drought, moderate floods, prevent soil erosion, improve water availability and increase fuel, fodder and agricultural production on a sustained basis.

### OBJECTIVES

1. To work out the cost and returns of different crops on different size of farms in WDP and non-WDP areas.
2. To work out the level of earnings employment on different size of farms in WDP and non-WDP areas.

### METHODOLOGY

The study was conducted in year 2013-14 and confined to Rewa district of Madhya Pradesh. In the present study, three stages purposive / random sampling techniques were used for drawing the sample. At the first stage, Theonthar block has been selected purposively out of 09 blocks in Rewa district where watershed programmes has been launched, this watershed programme having maximum area under coverage. At the second stage, The Amilia watershed area and Hathipurva Non-watershed area in Theonthar block of district Rewa was selected. Third stage of sampling, 35 cultivators was selected for the purposely, out of which 20 small (below 2 hectares), 10 medium (2 to 4 ha) and 5 large (above 4.0 ha) farmers were selected randomly from the list of total cultivators in the watershed area and non watershed areas, respectively. The sample consisting of 35 farmers from each of the categories of WDP areas and non WDP areas, therefore total respondents were 70. The information was collected with the help of pre-tested schedule. Finally, the data was collected by personal interview method.

### ANALYTICAL FRAMEWORK

The data were analysed using descriptive statistics such as percentages, mean, and average were used.

**Estimation of Costs:** Different costs concepts were used for the analysis as suggested by Commission on Agricultural Costs and Prices (CACP).

**Cost A<sub>1</sub>:** It includes costs and kind expenses actually incurred by cultivators which are as follows: Wage of hired human labour, Charges for bullock labour, Hired labour charges of implements and machinery, Cost incurred on manures and fertilizers, Seeds, Plant protection chemicals, Irrigation charges, Land revenue, Depreciation, and Repair charges on farm assets.

**Cost A<sub>2</sub>:** Cost A<sub>1</sub> + Rent paid for leased in land.

**Cost B<sub>1</sub>:** Cost A<sub>2</sub> + Interest on owned fixed capital assets.

**Cost B<sub>2</sub>:** Cost B<sub>1</sub> + Rental value of owned land.

**Cost C<sub>1</sub>:** Cost B<sub>1</sub> + Imputed value of family labour.

**Cost C<sub>2</sub>:** Cost B<sub>2</sub> + Imputed value of family labour.

**Cost C<sub>3</sub>:** Cost C<sub>2</sub> + 10 % of cost C<sub>2</sub> (managerial cost)

**Estimation of Income:** Different income measures were calculated to draw the policy implications.

**Gross Income** = Value of total output (total output x per unit price of output).

**Net Income** = It is computed by deducting cost C<sub>3</sub> from gross income.

**Family labour income** = Gross Income (G.I.) – Cost B<sub>2</sub>

**Farm Business Income** = G.I. – Cost A<sub>2</sub>

**Farm investment income** = Net income + rental value of owned land + interest on fixed capital

**Benefit-Cost Ratio:** Return per unit of investment and is presented as follows:

$$\text{B-C ratio} = \frac{\text{Value of output}}{\text{Value of input}}$$

$$\text{Cropping Intensity} = \frac{\text{Gross cropped area}}{\text{Net sown area}} \times 100$$

### RESULTS AND DISCUSSION

#### Economic characteristics of selected farmers

The economic structure of a farm provides a base of the economic activities on a land holding. It includes the size of operational land holdings, irrigated areas, man and bullock labour, investment in fixed capital, cropping pattern and intensity of cropping.

#### Size of farms

The distribution of average size of land holdings, net cultivated area and holdings under different size group of farms in Watershed Development Programme (WDP) and Non- Watershed Development Programme (NWDP) is presented in Table 1.

**Table 1: Classification of the respondent according to farm size in WDP and NWDP, Rewa district of Madhya Pradesh**

S.N.	Size group	Area	Number of households	Percentage to total	Average size of holding (ha)
1	Small (< 2 ha)	NWDP	20	57.25	1.54
		WDP	20	57.25	1.23
2	Medium (2 to 4 ha)	NWDP	10	28.5	3.24
		WDP	10	28.5	3.27
3	Large (above 4 ha)	NWDP	5	14.25	5.8
		WDP	5	14.25	7.12

Table 1 shows that the average size of land holding groups in NWDP and WDP farm workout to 5.8 and 7.12 hectares on the large size group followed by 1.54 and 1.23 hectares in small and 3.24 and 3.27 hectares on the medium size group, respectively. Total numbers of household were 70, maximum of them in small farmers. Small farmers were contributing the total number of farmer i.e.57.00 per cent. Remaining 43 farmers were distributed among other two size groups. Percentage of large size group of farmers was smaller (14.25 per cent) than medium size group having 28.5 per cent.

#### **Land utilization**

The land utilization pattern of the sample farmers is presented in Table 2. The average land holding of the respondents of different farm sizes *viz.* small, medium and large were found to be 1.54 ha, 3.24 ha and 5.70 ha per farm in NWDP and 1.23 ha, 3.27 ha and 7.12 ha per farm in WDP, respectively. The land under permanent fallow in case of medium and large farm size respondents were 3.55, 2.42 per cent in NWDP and 1.42, 0.81 per cent in WDP respectively, relation to gross cultivated area.

**Table 2: Statement showing land use pattern of WDP and NWDP respondent of Rewa district of Madhya Pradesh**

SN	Particulars	Area	Small		Medium		Large		Overall	
			Total area (ha)	Percent to total						
1	Average size of holding	NWDP	1.54	60.63	3.24	63.91	5.70	58.53	10.58	60.39
		WDP	1.23	50.41	3.27	51.42	7.12	52.58	11.62	52.01
2	Permanent fallow land	NWDP	0.00	0.00	0.18	3.55	0.24	2.42	0.42	2.40
		WDP	0.00	0.00	0.09	1.42	0.11	0.81	0.20	0.90
3	Cultivated waste land	NWDP	0.00	0.00	0.00	0.00	0.15	1.51	0.15	0.86
		WDP	0.00	0.00	0.00	0.00	0.10	0.74	0.10	0.45
4	Net cultivated area	NWDP	1.54	60.63	3.06	60.36	5.41	54.59	10.01	57.13
		WDP	1.23	50.41	3.18	50.00	6.91	51.03	11.32	50.67
5	Area sown more than ones	NWDP	1.00	39.37	2.01	39.64	4.50	45.41	7.51	42.87
		WDP	1.21	49.59	3.18	50.00	6.63	48.97	11.02	49.33
6	Gross cultivated area	NWDP	2.54	100.00	5.07	100.00	9.91	100.00	17.52	100.00
		WDP	2.44	100.00	6.36	100.00	13.54	100.00	22.34	100.00

Average cultivated waste land 1.51 per cent in NWDP and 0.74 per cent in WDP of gross cultivated area was found under large farm size only. Small farm size and medium farm size respondents had no cultivated waste land. These groups were utilized all area for cultivation.

Gross cultivated area were found to be 2.54 ha on the small, 5.07 ha on the medium and 6.63 ha on the large size of farms in NWDP as compared to 2.44 ha on the small, 6.36 ha on the medium and 13.54 ha gross cultivated land on the large size group of farms in WDP.

#### **Cropping pattern**

The existing cropping pattern is given in the Table 3, the data reveals that the gross cropped area was found to be 50.41 per cent under the Kharif season and 49.59 per cent area in Rabi season in WDP. On the other hand in NWDP, the gross cropped area was 60.63 per cent under Kharif season and 45.41 per cent area under Rabi season. Main crop of Kharif season was soybean that covers 30.44 per cent gross cropped area in WDP as compared to 30.99 per cent in NWDP. Cropped area of wheat crop was sown 7 hectares (31.33 per cent of gross cropped area) and gram was shown 3.10 hectares in cropped area (13.88 per cent of the gross cropped area) in WDP as compared to wheat and gram were shown in 9.70 per cent and 30.25 per cent of the total gross cropped area in NWDP, respectively.

**Table 3: Distribution of total cropped area under different crops in WDP and NWDP respondent of Rewa district of Madhya Pradesh**

Area	Size Groups	Kharif crops			Total Kharif crops	Rabi crops			Total Rabi crops	Gross cropped area
		Soybean	Sorghum	Arhar		Gram	Wheat	Other		
WDP	Small	1.02	0.05	0.16	1.23	0.1	1	0.11	1.21	2.44
		41.8	2.05	6.56	50.41	4.1	40.98	4.51	49.59	100
	Medium	2	0.18	1	3.18	1	2	0.18	3.18	6.36
		31.45	2.83	15.72	50	15.72	31.45	2.83	50	100
	Large	3.78	0.13	3	6.91	2	4	0.63	6.63	13.54
		27.92	0.96	22.16	51.04	14.77	29.54	4.65	48.96	100
Total	6.8	0.36	4.16	11.32	3.1	7	0.92	11.02	22.34	
NWDP	Small	0.9	0.19	0.45	1.54	0.8	0.2	0	1	2.54
		35.43	7.48	17.72	60.63	31.5	7.87	0	39.37	100
	Medium	1.53	0.95	0.58	3.06	1.5	0.5	0.01	2.01	5.07
		30.18	18.74	11.44	60.36	29.59	9.86	0.2	39.65	100
	Large	3	1.5	0.91	5.41	3	1	0.5	4.5	9.91
		30.27	15.14	9.18	54.59	30.27	10.09	5.05	45.41	100
Total	5.43	2.64	1.94	10.01	5.3	1.7	0.51	7.51	17.52	
		30.99	15.07	11.07	57.13	30.25	9.7	2.91	42.86	100

**Cropping intensity**

The existing cropping intensity is given in the table 4, the data reveals that the overall cropping intensity of the watershed area was estimated 197.35 per cent comparison to Non-watershed area which was 174.85 per cent. It can be concluded from the cropping pattern of the area that due to increasing irrigated area the cropping intensity also increased.

**Table 4: Intensity of cropping under different size group of land holding on the WDP and NWDP respondents of Rewa district of Madhya Pradesh**

Particular	Small		Medium		Large		Overall	
	NWDP	WDP	NWDP	WDP	NWDP	WDP	NWDP	WDP
Intensity of cropping percentage	164.94	198.37	165.69	200.00	183.18	195.95	174.85	197.35

**Irrigation**

Irrigation is one of the most important input factors for farm production. It not only helps in minimizing the risk and uncertainty in agriculture, but also helps in maintaining and increasing the level of production and productivity. Greater percentage area under irrigation, higher would be the productivity of that farm. It also determines the intensity of cropping on a farm to a larger extent. Higher the intensity of irrigation, higher would be the intensity of cropping on that farm. The area under irrigation and its percentage to total cultivated area under different size group of farms in WDP and NWDP have been depicted in Table 5.

**Table 5: Size wise irrigation status of respondent of WDP and NWDP of Rewa district of Madhya Pradesh**

SN	Size groups	Area	Irrigated area (ha)	Un-irrigated area (ha)	Open wells (Partially working)	Tube wells (Partially working)	Tank	Water supply sufficient	Water supply In sufficient
1	Small	NWDP	1.00	0.54	9	1	0	2	18
		Percent	64.94	35.06	0	0	0	10.00	90.00
		WDP	1.21	0.02	10	15	0	19	1
		Percent	98.37	1.63	0	0	0	95.00	5.00
2	Medium	NWDP	2.01	1.05	10	1	0	1	14
		Percent	65.69	34.31	0	0	0	6.67	93.33
		WDP	3.18	0.00	15	29	1	14	1
		Percent	100.00	0.00	0	0	0	93.33	6.67
3	Large	NWDP	4.50	0.91	12	2	0	1	4
		Percent	83.18	16.82	0	0	0	20.00	70.00
		WDP	6.63	0.28	28	30	3	4	1
		Percent	95.95	4.05	0	0	0	70.00	20.00

Table 5 shows that, the total irrigated area in NWDP was only 1.00 hectare on small size group farmers, which compared to 1.21 hectare in the WDP. It proves the significant impact of watershed work. Numbers of tube wells, which are still partially, worked only one tube well in NWDP as compared to 15 tube wells in the WDP in small size group of farmers. The number of tube wells (partially working) was one in medium group and two in large size of group of respondent farms. This compared to 29 and 30 tube wells in medium and large, respectively in the WDP. The study reveals that the number of farmers reporting sufficient water supply through their tube wells was 95 per cent in small farmer groups, 93.33 per cent in medium farmers and 70 per cent in large size group respondents of the watershed area.

#### Economics of wheat and gram production in WDP and NWDP

The per hectare yield, cost of production per quintal, gross returns net returns and input-output ratio in wheat and gram crops on farms of different sizes of WDP and NWDP given in Table 6.

The overall average yield of wheat found to be 34.22 quintals per hectare in WDP and 16.82 quintals in NWDP. In case of WDP, maximum yield found to be 35.12 q/ha in medium farms followed by 34.57 and 32.97 q/ha in small and large, respectively and in case of NWDP, maximum yield found to be 17.48q/ha in small group followed by 17.26 and 15.73q/ha in medium and large group, respectively.

The overall average gross return was calculated to ` 54752 per hectare in WDP and ` 26912 in NWDP. The group wise gross return was found to be `55313, `54438 and `52763 per ha in small, medium and large, respectively in case of WDP and ` 27975, `27625 and ` 25175 per ha in small, medium and large, respectively in case of NWDP.

The average value of net returns was calculated to ` 33906 per hectare in WDP and ` 8652.3 in NWDP. Maximum net return was found to be `35550 in small followed by `34041 and ` 32128 in medium and large, respectively in case of WDP and ` 10182, 9362.1 and ` 6412.9 in small, medium and large, respectively in case of NWDP.

The overall average cost of cultivation per hectare was calculated to be ` 20265 per hectare in WDP and ` 18273 in NWDP. The group wise gross return was found to be ` 19763, `20396 and `20635 per ha in small, medium and large, respectively in case of WDP and ` 17793, `18263 and `18762 per ha in small, medium and large, respectively in case of NWDP.

The cost of production per quintal over cost  $C_3$  on an average was calculated ` 467.61 in WDP and ` 848.32 in NWDP. In case of WDP, maximum cost of production per quintal found to be ` 446.61 in large group followed by `488.87 and ` 468.34 in medium and small, respectively and ` 931.58, ` 826.37, and `795.05 in large, medium and small, respectively in case of NWDR.

In case of WDP, input output ratio varied from 1:2.56 to 1: 2.7 per hectare. It farm size group wise was found to be 1: 2.7, 1:2.67 and 1:2.56 per hectare in small, medium and large size group, respectively. The overall average input-output ratio was worked out 1: 2.67 per hectare. In case of NWDP, overall input output ratio was found to be 1: 1.47 and farm size group wise was found to be 1: 1.57, 1:1.51 and 1:1.34 in small, medium and large group, respectively.

**Table 6: Economics of wheat and gram production per hectare on the different size of farms of WDP and NWDP of Rewa district of Madhya Pradesh**

Wheat								
Particular	Farm size group						Average	
	Small		Medium		Large			
	WDP	NWDP	WDP	NWDP	WDP	NWDP	WDP	NWDP
Total yield (q/ha)	34.57	17.48	35.12	17.26	32.97	15.73	34.22	16.82
Gross return (₹)	55313	27975	54438	27625	52763	25175	54753	26912
Cost of cultivation over cost (₹/ha)	19763	17793	20396	18263	20635	18762	20265	18273
Net returns over cost (₹)	35550	10182	34041	9362.1	32128	6412.9	33906	8652.3
Cost of production per quintal (₹)	446.61	795.05	468.34	826.37	488.87	931.58	467.61	848.32
Input-output ratio over cost	2.7	1.57	2.67	1.51	2.56	1.34	2.67	1.47
Gram								
Total yield (q/ha)	15.37	8.62	14.88	7.98	13.67	7.57	14.64	8.06
Gross return	61500	34500	59550	31950	54690	30300	58560	32240
Cost of cultivation over cost (₹)	26693	25339	28591	25642	28830	27668	27038	26216
Net returns over cost (₹)	34707	9161.5	30959	6307.9	25860	2631.6	30542	6033.7
Cost of production per quintal (₹)	1302.08	2203.35	1440.36	2407.71	1581.46	2739.45	1435.88	2438.73
Input-output ratio over cost	2.3	1.36	2.08	1.25	1.9	1.1	2.09	1.23

The overall average yield of gram found to be 14.64 q/ha in WDP and 8.06 q/ha in NWDP. In case of WDP, maximum yield found to be 15.37q/ha in small followed by 14.88 and 13.67q/ha in medium and large,

respectively and in case of NWDP, maximum yield found to be 8.62q/ha in small group followed by 7.98 and 7.57 q/ha in medium and large group, respectively.

The overall average gross return was calculated to be ` 58560 per hectare in WDP and ` 32240 in NWDP. The group wise gross return was found to be ` 61500, ` 59550 and ` 54690 per ha in small, medium and large group, respectively, in case of WDP and ` 34500, ` 31950 and ` 30300 per ha respectively, in case of NWDP.

The overall average cost of cultivation per hectare was calculated to be ` 27038 per hectare in WDP and ` 26212 in NWDP. The group wise gross return was found to be ` 26693, ` 28591 and ` 28830 per ha in small, medium and large, respectively in case of WDP and ` 25339, ` 25642 and ` 27668 per ha in small, medium and large, respectively, in case of NWDP.

The average net return was calculated to be ` 30542 per hectare in WDP and ` 6033.7 in NWDP. Maximum net return was found to be ` 34707 in small followed by ` 30959 and ` 25860 in medium and large, respectively in case of WDP and ` 9161.5, 6307.9 and ` 2631.6 in small, medium and large, respectively in case of NWDP.

The cost of production per quintal over cost C<sub>3</sub> on an average was calculated ` 1435.88 in WDP and ` 2438.73 in NWDP. In case of WDP, maximum cost of production per quintal found to be ` 1581.46 in large group followed by ` 1440.36 and ` 1302.08 in medium and small, respectively and ` 2739.45, ` 2407.71, and ` 2203.35 in large, medium and small in case of NWDR.

In case of WDP, input-output ratio varied from 1:1.9 to 1: 2.3. It farm size group wise was found to be 1: 2.3, 1:2.08 and 1:1.19 in small, medium and large size group, respectively. The overall average input-output ratio was worked out 1: 2.09 per hectare. In case of NWDP, overall input output ratio was found to be 1: 1.23 and farm size group wise was found to be 1: 1.36, 1:1.25 and 1:1.1 in small, medium and large group, respectively.

#### **Comparative economics of wheat and gram in WDP and NWDP**

A comparative economics analysis of wheat and gram in WDP and NWDP in respect of average yield, values of input, output and net income per hectare, cost of production per quintal and input-output ratio on the sample farms are given in Table 7.

The average yield of wheat per hectare was calculated to 34.22 quintals in WDP as compared to 16.82 quintals in NWDP. The average yield was substantially higher in WDP as compared to NWDP. The average cost of production per quintal in WDP was worked out at ` 592.48 as compared to ` 1086.37 in NWDP. The cost of production per quintal was lower in WDP as compared to NWDP. There was significant improvement in the yield level and cost of production per quintal of wheat in WDP. The average input output ratio of wheat in WDP was calculated at 1:2.67 as compared to 1:1.47 in NWDP. The return on per rupees on investment of wheat was higher in WDP as compared to NWDP.

The average yield of gram per hectare was calculated to 14.64 quintals in WDP as compared to 8.06 quintals in NWDP. The average yield was substantially higher in WDP as compared to NWDP. The average cost of production per quintal in WDP was worked out at ` 1846.85 as compared to ` 3252.65 in NWDP. The cost of production per quintal was lower in WDP as compared to NWDP. There was significant improvement in the yield level and cost of production per quintal of gram in WDP. The average input output ratio of gram in WDP was calculated at 1:2.09 as compared to 1:1.23 in NWDP. The return on per rupees on investment of gram was higher in WDP as compared to NWDP. The better use in the availability of water through WDP resulted in higher use of inputs like human labour, bullock labour, improved seeds, plant protection measures and chemical fertilizers resulting in increase productivity on all crops in WDP farms.

**Table 7: Comparative economics of wheat and gram per hectare of the WDP and NWDP respondents of Rewa district of Madhya Pradesh**

SN	Area	Crops	Average yield in quintal	Output (₹)	Input (₹)	Net Income (₹)	Cost of production per quintal (₹)	B:C Ratio
1	NWDP	Wheat	16.82	26912.00	18272.75	8639.25	1086.37	1.47
		Gram	8.06	32140.00	26216.36	5923.64	3252.65	1.23
2	WDP	Wheat	34.22	54520.83	20264.62	34087.38	592.18	2.67
		Gram	14.64	58560.00	27037.96	31522.04	1846.85	2.09

#### **Change in Income and Employment:-**

The main objective of Rajiv Gandhi Watershed Development Project is to raise income and employment of the beneficiaries through crops and other related allied activities suitable to the area. To assess the impact of watersheds programme on income is presented in Table 8. This table also concerned with change in income during the study period through crop production, live stock production and other

agricultural activities performed by WDP and NWDP beneficiaries. It is obvious, the impact of project on income of beneficiaries that on an average basis gross income increase from ` 126101.68 (base year) to ` 215999.43 (current year) per farm in WDP and ` 127000.49 (base year) to ` 156929.56 (current year) in NWDP, respectively through raising crops, animal husbandry and other agricultural work. These figures shows that, the increased the gross income by ` 89897.76 per farm in current year as compare to base year in WDP area. Likely, net return also increased by ` 71486.38 per farm per year through agricultural pursuit over study period. These figures shows in the NWDP area, increased on gross income by ` 29929.07 per farm in current year as compare to base year. Likely, net return also increased by ` 21346.17 per farm per year. The ultimate aim of the farmers is getting the amount as a farm business income from their farm which are sufficient for their family consumption and which is higher and higher in subsequent years. The study clearly indicated that a WDP farmer got ` 70901.31 per farm in base year and ` 93636.035 per farm in current year. This implies that the total farm business income was higher in WDP by ` 31536.70 as compared to NWDP ` 27464.40 per farm per annum from their farm. The higher generated income was due to the watershed project.

**Table 8: Change in Income of beneficiaries**

Profitability Aspects			Total cost	Gross Income	Net income	Family labour income	Farm business income	B:C Ratio
Base year (2007-08)	WDP	Crop production	40200.25	90500.45	50300.20	3000.00	3100.00	2.25
		Livestock + Other	15000.12	35601.23	20601.11	2000.00	2100.00	2.37
		<b>Total</b>	<b>55200.37</b>	<b>126101.68</b>	<b>70901.31</b>	<b>5000.00</b>	<b>5200.00</b>	<b>2.28</b>
	NWDP	Crop production	40210.12	90750.24	50540.12	3000.00	3100.00	2.26
		Livestock + Other	14500.50	36250.25	21749.75	2100.00	2200.00	2.50
		<b>Total</b>	<b>54710.62</b>	<b>127000.49</b>	<b>72289.87</b>	<b>5100.00</b>	<b>5300.00</b>	<b>2.32</b>
Current year (2012-13)	WDP	Crop production	48211.64	140517.08	92305.44	33231.18	33936.70	2.91
		Livestock + Other	25400.10	75482.35	50082.25	2500.00	2700.00	2.97
		<b>Total</b>	<b>73611.74</b>	<b>215999.43</b>	<b>142387.69</b>	<b>35731.18</b>	<b>36736.70</b>	<b>2.93</b>
	NWDP	Crop production	43143.32	101573.33	58430.00	29258.88	29964.40	2.35
		Livestock + Other	20150.20	55356.23	35206.03	2500.00	2700.00	2.75
		<b>Total</b>	<b>63293.52</b>	<b>156929.56</b>	<b>93636.03</b>	<b>31758.88</b>	<b>32764.40</b>	<b>2.48</b>
Change over time	WDP	Crop production	7011.40	50016.64	42005.24	30231.18	30836.70	0.66
		Livestock + Other	10399.98	39881.12	29481.14	500.00	700.00	0.60
		<b>Total</b>	<b>18411.38</b>	<b>89897.76</b>	<b>71486.38</b>	<b>30731.18</b>	<b>31536.70</b>	<b>0.65</b>
	NWDP	Crop production	2933.20	10823.09	7889.89	26258.88	26864.40	0.10
		Livestock + Other	5649.70	19105.98	13456.28	400.00	600.00	0.25
		<b>Total</b>	<b>8582.90</b>	<b>29929.07</b>	<b>21346.17</b>	<b>26658.88</b>	<b>27464.40</b>	<b>0.16</b>

Table 9 reveals the change in employment availability in current year over to base year of the study through agricultural pursuit. The data in table clearly indicated that the project has shown positive impact on employment of beneficiaries. The study also depicted the change in extent of employment days per farm from different crops and animal production. As evident from study, the average employment of human labour in base year was 486 man days per annum which was 272 man days in Kharif crops production followed by 99 man days in Rabi crop production and 70 man days in animal husbandry occupation in WDP area and the average employment of human labour in base year was 471 man days per annum which was 261 man days in Kharif crops production followed by 100 man days in Rabi crop production and 68 man days in animal husbandry occupation NWDP area.

In the NWDP, the average employment of human labour in current year was 537 man days per annum which was 293 man days in Kharif crops production followed by 174 man days in Rabi crop production and 70 man days in animal husbandry occupation. This came to total 66 man days more in current year over to base year.

On the other hand, as evident from WDP study, the average employment of human labour in current year was 588 man days per annum which was 324 man days in Kharif crops production followed by 184 man days in Rabi crop production and 70 man days in animal husbandry occupation. This came to total 102 man days more in current year over to base year. This additional employment of human labour over to base year was created by higher farm activities involved by additional resource application on farm which is the result of the watershed programme.

**Table 9: Change in Employment pattern of beneficiaries (Days per farm)**

S. No.	Particulars	Base year (2007-08)						Current year (2012-13)						Percentage change over time	
		WDP			NWDP			WDP			NWDP			WDP	NWDP
1	Kharif crops	Family	Hired	Total	Family	Hired	Total	Family	Hired	Total	Family	Hired	Total		
A	Soybean	66.0	16.0	82.0	65.0	15.0	70.0	75.0	21.0	96.0	69.0	19.0	88.0	14.0	8.0
B	Arhar	70.0	25.0	95.0	65.0	25.0	90.0	78.0	30.0	108.0	70.0	26.0	96.0	13.0	6.0
C	Jowar	36.0	9.0	45.0	34.0	10.0	44.0	43.0	17.0	60.0	40.0	17.0	57.0	15.0	13.0
D	Maize	37.0	13.0	50.0	35.0	12.0	47.0	39.0	21.0	60.0	37.0	15.0	52.0	10.0	5.0
	<b>Total Kharif</b>	<b>209.0</b>	<b>63.0</b>	<b>272.0</b>	<b>199.0</b>	<b>62.0</b>	<b>261.0</b>	<b>235.0</b>	<b>89.0</b>	<b>324.0</b>	<b>216.0</b>	<b>77.0</b>	<b>293.0</b>	<b>52.0</b>	<b>32.0</b>
2	<b>Rabi</b>														
A	Wheat	38.0	18.0	56.0	37.0	19.0	56.0	43.0	23.0	66.0	41.0	23.0	64.0	10.0	8.0
B	Gram	45.0	14.0	59.0	44.0	13.0	57.0	47.0	18.0	65.0	45.0	18.0	63.0	6.0	6.0
C	Mustard / Rai (other)	17.0	12.0	29.0	18.0	11.0	29.0	32.0	21.0	53.0	32.0	15.0	47.0	24.0	18.0
	<b>Total Rabi</b>	<b>100.0</b>	<b>44.0</b>	<b>144.0</b>	<b>99.0</b>	<b>43.0</b>	<b>142.0</b>	<b>100.0</b>	<b>62.0</b>	<b>184.0</b>	<b>100.0</b>	<b>62.0</b>	<b>174.0</b>	<b>40.0</b>	<b>32.0</b>
3	<b>Animal Husbandry</b>	<b>50.0</b>	<b>20.0</b>	<b>70.0</b>	<b>45.0</b>	<b>23.0</b>	<b>68.0</b>	<b>55.0</b>	<b>25.0</b>	<b>70.0</b>	<b>46.0</b>	<b>24.0</b>	<b>70.0</b>	<b>10.0</b>	<b>2.0</b>
4	<b>Total Rabi</b>	<b>359.0</b>	<b>127.0</b>	<b>486.0</b>	<b>343.0</b>	<b>128.0</b>	<b>471.0</b>	<b>390.0</b>	<b>176.0</b>	<b>588.0</b>	<b>362.0</b>	<b>163.0</b>	<b>537.0</b>	<b>102.0</b>	<b>66.0</b>

**CONCLUSIONS**

The Watershed approach aims at the promotion of overall economic development of the resource poor by treating merely degraded land with the help of technologies such as in situ soil and moisture conservation measures, rain water harvesting, etc. It involves cost in terms of structures constructed, human resource cost and administrative expenses, against which there are benefit in terms of increased area under irrigation, shift in cropping pattern, increase in crop productivity, employment generation, etc.

The average yield of wheat per hectare was calculated to 34.22 quintals in WDP as compared to 16.82 quintals in NWDP. The average yield was substantially higher in WDP as compared to NWDP. The average cost of production per quintal of wheat in WDP was worked out at `592.18 as compared to `1086.37 in NWDP. The cost of production per quintal of wheat was lower in WDP as compared to NWDP. There was significant improvement in the yield level and cost of production per quintal of wheat in WDP.

The average yield of gram per hectare was calculated to 14.64 quintals in WDP as compared to 8.06 quintals in NWDP. The average yield was substantially higher in WDP as compared to NWDP. The average cost of production per quintal of gram in WDP was worked out at `1846.85 as compared to `3252.65 in NWDP. The cost of production per quintal of gram was lower in WDP as compared to NWDP. There was significant improvement in the yield level and cost of production per quintal of gram in WDP.

The average input output ratio of wheat in WDP was calculated at 1:2.67 as compared to 1:1.47 in NWDP. The return on per rupees on investment of wheat was higher in WDP as compared to NWDP.

Input-output ratio at their respective levels had given the right indication that the impact of WDP was significantly higher on small, medium and large farms. The better use in the availability of water through WDP resulted in higher use of inputs like human labour, bullock labour, improved seeds, plant protection measures and chemical fertilizers resulting in increase productivity on all crops in WDP farms.

The impact of project on income of beneficiaries that on an average basis gross income increase from ` 126101.68 (base year) to ` 215999.43 (current year) per farm in WDP and ` 127000.49 (base year) to `156929.56 (current year) in NWDP through raising crops, animal husbandry and other agricultural work.

The average employment of human labour in base year was 486 man days per annum which was 272 man days in Kharif crops production followed by 99 man days in Rabi crop production and 70 man days in animal husbandry occupation in WDP area and the average employment of human labour in base year was 471 man days per annum which was 261 man days in Kharif crops production followed by 100 man days in Rabi crop production and 68 man days in animal husbandry occupation NWDP area.

## REFERENCES

1. Verma, A.R., Rajput, A.M. and Srivastava, R.N. (2002) Economic Analysis of Watershed Management and Development in Malwa Region of Madhya Pradesh (India), *12th ISCO Conference*, pp-568-571.
2. Chaturvedi, V. (2004) Cost Benefit Analysis of Watershed Development: An Exploratory Study in Gujarat, *Research Report of Development Support Centre, Near Government Tube Well, Bopal, Ahmedabad*, pp. 1- 42.
3. Jat, S., Jain, S.K. and Rajput, A.M. (2008) Impact of Watershed Development Programme in Madhya Pradesh, *Indian Res. J. Ext. Edu.* 8 (1), pp-66-68.
4. Verma, A.R. (2008) Impact of Watershed Development Programme in the Rainfed Area in Indore district of Madhya Pradesh, *Indian Journal of Agricultural Economics*, 63 (3):526-27.
5. Solanki, M., Jaulkar, AM, and Raghuwanshi, JS. (2013) Economic evaluation of Rajiv Gandhi watershed development programme, *Bhartiya Krishi Anusandhan Patrika* 28.1: 55-57.

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