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Impact of Watershed on Cost and Returns Structure of Soyabean Cultivation in Nek Region

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Land is a scarce resource and basic unit for any material production. It can support the needs of the growing population, provided they use land in a rational and judicious manner. The biggest crisis that the world is facing in the 21st century is the crisis of water. Looming water scarcity over large parts of the world and increased withdrawal by agriculture from 2500 km^3 in 2000 to 3200 km^3 by 2025 has attracted the attention of policy makers and researchers for achieving food and water security. Soybean *(Glycine max)* was one of the major *Kharif* crop cultivated in watershed (71.50 acres) and non-watershed areas (80.35 acres). Hence, an attempt was made to study the impact of watershed on the cost and returns structure in soybean cultivation in selected four districts of NEK region with the sample size of 240. It was observed inputs utilized for the cultivation in watershed areas was higher than non-watershed areas. Due to higher input utilization the total cost in watershed (Rs. 17080.90/ha.) was higher than non-watershed (Rs. 14257.62/ha.). The returns were also higher in watershed area (Rs. 27941.76/ha.). The returns per rupee of investment realized in watershed areas was 1.64 which is slightly higher than (1.56) non-watershed areas. The higher returns per rupee of investment indicating soyabean cultivation in the watershed area was financially feasible.

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Keywords: Financial feasible; input utilization; non-watershed; returns per rupee of investment and watershed.

1. INTRODUCTION

Land is a scarce resource and basic unit for any material production. It can support the needs of the growing population, provided they use land in a rational and judicious manner. The biggest crisis that the world is facing in the 21st century is the crisis of water. Looming water scarcity over large parts of the world and increased withdrawal by agriculture from 2500 km^3 in 2000 to 3200 km^3 by 2025 "Shiklomanov, 1999" [1] has attracted the attention of policy makers and researchers for achieving food and water security. It is estimated that by 2025, one third of the world's population (especially in the developing countries) would face severe water scarcity. A hydrological watershed is a delineated area from which the runoff drains through a particular point in the drainage system [2,3]. Watershed is the unit for planning and management of land, where water and other resources and all inter-related factors such as physical, biological, technological, economic, socio-cultural, managerial, *etc*., are considered in a systems framework [4]. In Karnataka agriculture plays a key role in the state's economy, and 70 percent of dry land is arable. The state depends on dry land for more than half of its food production [5]. Recognizing the importance of improving the drylands on a watershed basis, the Government of Karnataka launched an innovative and participatory watershed development programme called Sujala-I from 2002 to 2007 in collaboration with an NGO called Myrada, with a holistic and integrated approach to address not only land-based activities but also livelihoods, with an emphasis on equity, gender, and sustainability. Sujala-II was a projected project, sponsored and funded by NABARD, that began in the year 2008 in six districts of Karnataka: Belagavi, Shivamogga, Chikkamagaluru, Hassan, Chitradurga, and Kodagu, spanning an area of 4.12 lakh hectares. The project was successful in increasing the socio-economic, ecological and institutional condition. With the success of the Sujala-I and Sujala-II watershed projects, the Government of Karnataka intends to establish a new project model in order to effectively converge the unique Sujala watershed strategy in the future [6,7]. As a result, the Government of Karnataka launched the Karnataka Watershed Development Project II (Sujala-III) in May 2013 with financial assistance from the World Bank. The project is being carried out in 2531 micro watersheds in 11 project districts: Bidar, Kalaburagi, Yadgir, Raichur, Koppal, Vijayapura, Gadag, Davangere, Tumkur and Chamarajanagara. Soybean (*Glycine max*) was a focus Kharif crop grown in both watershed (71.50 acres) and non-watershed regions (80.35 acres). As a result, an attempt was made to investigate the effect of watershed on the cost and return structure of soybean production in the NEK region.

2. METHODOLOGY

The study was conducted in North Eastern region of Karnataka (NEK), which constituted six districts namely Bidar, Kalburgi, Yadgir, Raichur, Bellary and Koppal. The entire area of NEK falls under the jurisdiction of University of Agricultural Sciences, Raichur (UASR) (Fig. 1).

2.1 Sampling Design

Four districts of NEK region was selected for the study based on highest watershed intervention areas, the four districts namely Bidar, Kalaburagi, Raichur, Yadgir from each district one taluka was selected. From each taluka 4 villages of watershed and 4 villages of non-watershed areas were selected and from each village 10 respondents were selected. Hence, total sample size were 240 comprises of 120 watershed areas farmers and 120 non-watershed areas farmers. The farmers' selection was done with simple random sampling technique (Table 1).

2.2 Nature and Source of Data

2.2.1 Primary data

The primary data were collected from both watershed and non-watershed farmers regarding all aspects of social change related to general characteristics, cropping pattern, crop yield,landutilization, sources of income of farm households, returns from the crops and livestock, farming systems adopted and input utilization on major crops cultivated *etc.,*by using pre-tested, well structured schedule through survey method.

2.3 Analytical Tools and Techniques

The data collected from the primary source were subjected to rigorous statistical analysis for

arriving comparable results between watershed and non-watershed areas. The tabular, production function technique, budgeting technique were adopted for the above purpose and to draw meaningful conclusions on the results obtained.

2.4 Tabular Analysis

The data collected from the primary sources were presented in tabular form to facilitate easy and effective comparison. The tabular presentation with the help of percentages and averages were employed for estimating cost and returns and asset creation under watershed and non-watershed areas.

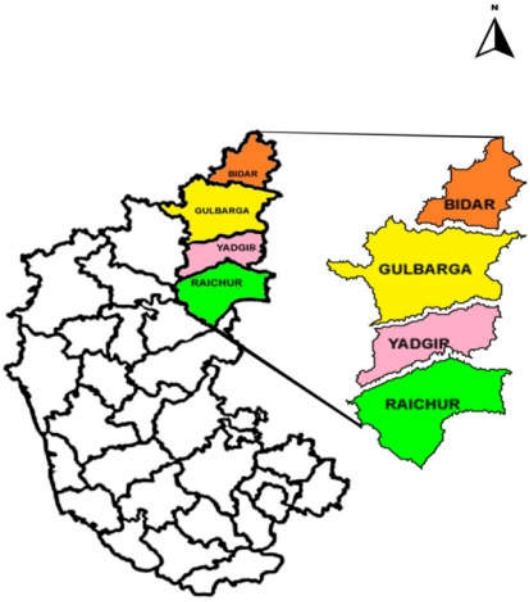

Fig. 1. Map showing study area in Karnataka

3. RESULTS AND DISCUSSION

The findings of the study are presented here.

3.1 Input Utilization Pattern in Soybean Cultivation

The inputs used for the cultivation of soybean was illustrated in the Table 2, and study reveals that per acre use of seed (32.50 kg), manure (3.59 q), chemical fertilizer (56.25 kg), human labour (17.58 man days), machine labour (1.60 hrs), plant protection chemicals (Rs 498.08) and bullock pair (3.20 pair days) were the inputs utilized at higher level by watershed respondents than non-watershed, inputs like seed (30.75 kg), manure (2.67 q), chemical fertilizer (52.75 kgs), human labour (13.92 man days), machine labour (1.20 hr), plant protection chemicals (Rs 449.58) and bullock pair (2.50 pair days). The data presented in Table 2. The results are in line with the result obtained from the results of Kannan K et al. [8], Dwivedi S et al. [9] and R H Patel et al. [10].

From the above results it was concluded that input utilization among watershed respondents were relatively higher than non-watershed respondents. Thus with the improvement in soil condition prevailing in the watershed area, crops responded well to fertilizer and farmers also realised the favorable impact of watershed interventions on soil and water resources there by mooted them to apply inputs in larger quantities.

3.2 Cost and Returns Structure of Soybean Cultivation

Table 3 reveals that, the per acre total cost incurred in soybean cultivation was Rs 17,080.90 among watershed area and Rs 14,257.62 in non-watershed area. The fixed cost incurred in non-watershed area (Rs 4588.92 / acre) was relatively lower than that of watershed area (Rs 3742.66 / acre). Out of the total cost, the cost incurred on bullock labour constituted the major component (19.67%) followed by cost on human labour (18.01%), seed cost (9.41%), machine labour (7.49%), chemical fertilizer (6.85%), organic manure (6.31%), plant protection chemicals (2.92%) and interest on working capital (2.47 %) which together constituted 73.13 per cent of total cost. The rental value of land (26.87%), interest on fixed capital (1.10%), depreciation (0.64%) and land revenue (0.10%), constituted about 26.87 per cent of total cost. More or less similar pattern of expenditure was observed among non - watershed respondents.

The return structure in soybean production clearly revealed that the gross returns obtained by watershed respondents was relatively higher (Rs 27,941.76 /acre) than that of non-watershed respondents (Rs 22,244.55 / acre) as a result of higher yield among watershed respondents (7.92 q) than (6.15q) among non-watershed respondents. The returns per rupee of investment realized in watershed areas was 1.64 which is slightly higher than (1.56) non-watershed areas. The results are in line with the result obtained from Arunkumar Y S [11] and Nirunkusha [12].

Table 1. Sampling design of the study area

Districts	Talukas	Watershed Village	No. of watershed respondents	Non-Watershed Village	No. of non watershed respondent	Total
Bidar	Aurad	Chikli	10	KheraThanda	10	60
		Handikera	10	Hunsnal	10	
		Chandori	10	Balad	10	
Kalaburagi	Kalaburagi	Pattana	10	Suntanur	10	60
		Dongaragaon	10	Shiroli	10	
		Sawalagi	10	Nilur	10	
Raichur	Lingasagur	Chatra	10	Janathapur	10	60
		Medinapur	10	Muddalgundi	10	
		Hachihal	10	Kanasawi	10	
Yadagir	Yadagir	Ginkera	10	Koilur	10	60
		Kollur	10	Bolari	10	
		Mustur	10	M.Hosalli	10	
	Total					240

Table 2. Input utilisation pattern in soybean cultivation (Per acre)

Sl. No.	Particulars	Unit	Watershed		Non-watershed	
			Quantity	Value	Quantity	Value
1	Seed	Kg	32.50	1607.75	30.75	1521.20
2	Manure	Q	3.59	1077.20	2.67	801.00
3	Chemical fertilizer	Kg	56.25	1170.00	52.75	1055.00
4	Human labour	Man days	17.58	3076.50	13.92	2436.00
5	Machine labour	Hrs	1.60	1280.00	1.20	960.00
6	PPC	Rs.	498.08	498.08	442.58	442.58
7	Bullock pair	Pairdays	3.20	3360.00	2.50	2625.00
8	Yield	Q	7.92		6.15	

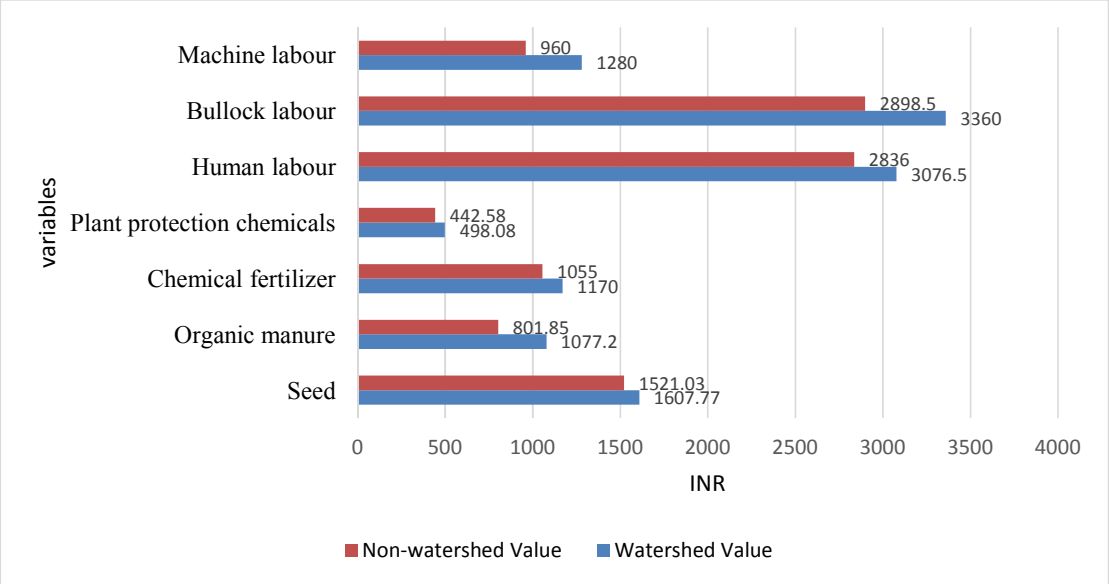

Fig. 2. Input use pattern in soyabean cultivation under watershed and non-watershed area

Table 3. Cost and returns structure of soybean cultivation (Rupee /acre)

Sl. No	Particulars	Watershed		Non-watershed	
		Value	Per cent	Value	Per cent
1	Seed	1607.77	9.41	1521.03	10.67
2	Organic manure	1077.20	6.31	801.85	5.62
3	Chemical fertilizer	1170.00	6.85	1055.00	7.40
4	Plant protection chemicals	498.08	2.92	442.58	3.10
5	Human labour	3076.50	18.01	2836.00	19.89
6	Bullock labour	3360.00	19.67	2898.50	20.33
7	Machine labour	1280.00	7.49	960.00	6.73
8	Interest on working capital @ 7 %	422.43	2.47	368..02	2.62
	Total variable cost	**12491.98**	**73.13**	**10514.96**	**73.75**
9	Land revenue	16.50	0.10	15.00	0.11
10	Rental value of land	4275.85	25.03	3482.52	24.43
11	Depreciation	109.50	0.64	92.57	0.65
12	Interest on fixed capital @ 8.5 %	187.07	1.10	152.57	1.07
	Total fixed cost	**4588.92**	**26.87**	**3742.66**	**26.25**
	Total cost of cultivation	**17080.90**	**100.00**	**14257.62**	**100.00**
	Yield	7.92		6.15	
	Market price	3528		3617	
	Total returns	**27941.76**		**22244.55**	
	Net returns	**10860.86**		**7986.93**	
	Returns per rupee of investment	1.64		1.56	

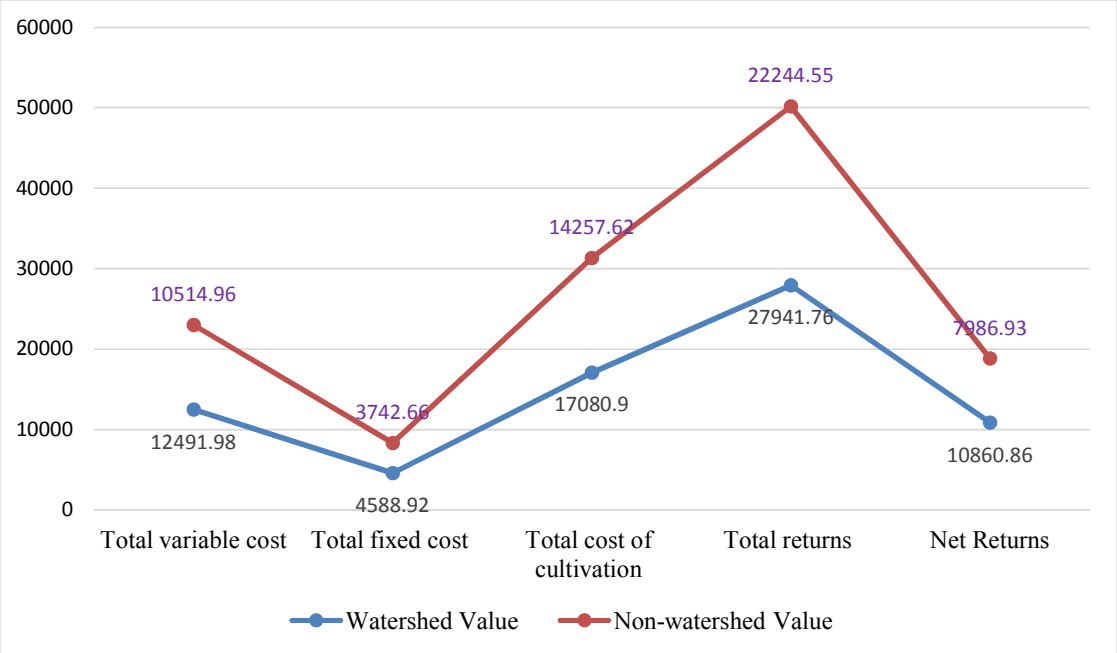

Fig. 3. Cost difference of soyabean cultivation under watershed and non-watershed area

4. CONCLUSIONS

From the result obtained from analysis, it can be concluded that the variable cost registered was substantial higher in watershed area when compared to non-watershed area because of high productive potential soil due to technological interventions. It could be also seen that rental value of land was found to be more in the watershed area with increased productive potentiality of soil after watershed interventions than in non-watershed area. Therefore the

general tendency of increased input utilization was observed and in turn leads to higher cost of cultivation in watershed areas.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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