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STUDIES ON CROPPING SYSTEM IN CHAMBAL RAVINES AFFECTED AREA ON WATERSHED BASIS IN UTTAR PRADESH

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ABSTRACT
The field study was conducted during kharif and *Rabi* seasons of 2008-09 to 2010-11 at ravines affected area of Agra, Uttar Pradesh. The pilot site was situated in catchments area of rivers chambal at *Bhopal ka pura* and *chamraua* villages of Vah block. The experiment was laidout under Farmers Participatory Action Research Programme on Water/ Rain Water Harvesting (Scheme of Ministry of Water Resources, New Delhi). The soil of experimental areas was loam to clay loam, having pH 8.0, organic carbon 0.22%, total nitrogen 0.02%, available phosphate 10.3 Kg/ha and available potash 167.0 Kg/ha, therefore, the fertility status of pilot area was low. Four cropping system *i.e*. sesamum- wheat, sesamum- field pea, sesamum- chickpea and sesamum -Indian mustard were tested on 10 farmers fields. Crop varieties *Pragati of sesamum, K* 9423 *of wheat, Sapana of field pea Udaya of chickpea and Urvashi of Indian mustard* sown in the ravines rehabilitated area. Sesamum gave yield @236Kg/ha, 240Kg/ha, 223Kg/ha and 256Kg/ha under *sesamum- wheat, sesamum- field pea, sesamum- chickpea and sesamum -Indian mustard cropping systems*, respectively. Wheat yield was recorded by 4050 Kg/ha under sesamum-wheat cropping system. Field pea raised under sesamum-field pea gave 2780 Kg/ha. Similarly chickpea kernel was harvested by 2725 Kg/ha after sesamum. Likewise, Indian mustard yielded seed by 2763 Kg/ha under sesamum- Indian mustard system. The order of performance of system productivity was sesamum- wheat (5463 Kg/ha) >sesamum- field pea (3738 Kg/ha) >sesamum- Indian mustard (3410 Kg/ha) > sesamum- chickpea (3362 Kg/ha). The highest net return of Rs. 50769/hectare obtained from sesamum- Indian mustard cropping system followed by sesamum-chickpea (Rs 45194/ha). The net return of Rs. 37104/ha from sesamum-field pea and Rs. 23663/ha from sesamum-wheat were computed.

KEYWORDS- Chambal ravines, Cropping system, Farmers participatory, Ravines rehabilitation, Watershed basis.

INTRODUCTION

As per estimation of National Commission on Agriculture, 3.67 million ha area under ravines in India. The chambal ravines are mainly situated along the bank of the river chambal and its tributaries in districts Bhind and Morena of Madhya Pradesh, Jalaun, Etawah and Agra district of U.P. and Karauli and Dholpur districts of Rajasthan. The area of chambal ravines spread in Uttar Pradesh is characterized by very low rainfall, high temperature fluctuation, light alluvial soil with poor fertility and low water holding capacity. Luck of vegetation in ravines area causes rainfall water sweeping. Farming is the main occupation of this area but condition of farmers and farming is very poor due to poor soil condition and low productivity. In Agra district of Uttar Pradesh total ravines affected area is 1,78,000 hectare out of which 79,000 hactare suffered from chambal ravines. In this ravines area of chambal river form continuous belt of 5 -10 kilometer width. The maximum depth of ravines is largely governed by the depth of chambal river from the table lands and, therefore, the ravine system along the tributataries is shallower than that along the chambal river. The ravine beds are moist, the sides dry up quickly. The general lay of this land comprises a flat table land with 3% slopes. Just above the ravines land generally becomes steep and undulating and is not cultivated. Erratic, short duration and high intensity rainfall, erodible nature of soil, week geology of alluvium, steep slopes and uneven terrain, faulty agricultural practices, illicit cutting of tree and bushes and over grazing have combined to aggravate the gullies formation. Therefore, the rehabilitation of this ravines affected area and expansion of suitable cropping systems are king point for better livelihood security, which is subject matter of this manuscript.

MATERIALS AND METHODS

The study was laidout during kharif and rabi seasons of 2008-09 to 2010-11 at ravines affected area of Agra, Uttar Pradesh. The ravines affected area 515.00 ha was selected, which is lies in the catchments of river chambal at Bhopal Ka Pura and Chamraua villages of Vah block. The subjected area selected under Farmers Participatory Action Research Programme on Water/ Rainwater Harvesting Project (Scheme of Ministry of Water Resources, New Delhi) for carrying out research programme on important technologies of water harvesting during the experimental years. The soil of experimental area was loam to clay loam having pH 8.0, organic carbon 0.22%, total nitrogen 0.02%, available phosphate 10.3 kg/hectare and available potash 167.0 kg/ha, therefore, the fertility status of pilot area was low. The pH was determined by Electrometric glass electrode method (Piper, 1950), while organic carbon

was determined by Colorimetric method (*Datta et al.* 1962). Total nitrogen was analyzed by Kjeldahls method as discussed by Piper (1950). The available phosphorus and potassium were determined by Olsen's method (*Olsen et al.*, 1954) and Flame photometric method (Singh, 1971), respectively. Four cropping systems i.e. *sesamum-wheat, sesamum- field pea, sesamum-chickpea sesamum-Indian mustard* were tasted on ten farmers fields. The sesamum was sown after onset of rainfall in the last week of July and harvested at 80 to 85 days after sowing during the experimental seasons. Wheat, field pea, chickpea and Indian mustard were seeded after pre-sowing irrigation with recharged ground water in second fortnight of November and harvested after 110 days of planting under tested cropping systems. Crop varieties *Pragati, K9423, Sapana, Udaya and Urvashi for sesamum, wheat, field pea, chickpea and Indian mustard*, respectively, were sown under double cropping system in the ravines rehabilitated area. The recommended conservation agronomical practices were followed. The life saving irrigations were given to test crops as and when required

RESULTS AND DISCUSSION

The pooled yield data of three year, system productivity and system profitability were recorded and reported in Table- 1 and discussed here under:-

During rainy season, sesamum gave average yield of 236 Kg/ha, 240 Kg/ha, 223 Kg/ha and 256 Kg/ha under sesamum –wheat, sesamum-field pea, sesamum-chickpea and sesamum-Indian mustard cropping ststems, respectively. These results displayed that there was no variation in the yield of sesamum under different cropping systems. In sesamum-wheat cropping system, wheat yield was recorded by 4050 Kg/ha. Field pea was given grain yield by 2740 Kg/ha under sesamum-field-pea cropping system. Under sesamum –chickpea cropping system chickpea yielded grain by 2725 Kg/ha. Indian mustard gave 2763 kg/ha seed yield under sesamum-Indian mustard cropping system.

The order of performance of system productivity was sesamum-wheat (5463 Kg/ha) >sesamum-field pea (3738 Kg/ha)> sesamum-Indian mustard (3410 Kg/ha)> sesamum- chickpea (3362Kg/ha). The maximum net profit of Rs 50769/ha obtained from sesamum-Indian mustard cropping system followed by sesamum – chickpea (Rs 45154/ha). The net return of Rs 37104/ha from sesamum-field pea and Rs 23663/ha from sesamum – wheat were obtained. The similar observations on yield & system productivity and system profitability were also recorded in ravaines affected watershed, Rendhar, Jalaun (U.P.), situated in Pahuj river catchments area and ravines affected watershed of Jhararghat, Lalitpur (U.P.), situated in Betawa river catchments area by Singh (2011) and Singh (2015), respectinvely.

TABLE 1: Yield, system productivity and system profitability under different cropping systems (pooled data of three years)

S.No.	Cropping System	Yield (Kg/ha)		System Productivity (Kg/ha)	System profitability (Rs/ha)
		Crop	Yield		
	Sesamum-Wheat	Sesamum Wheat	236 4050	5463.00	23663.00
	Sesamum-Field pea	Sesamum Field pea	240 2740	3738.00	37104.00
	Sesamum-Chick pea	Sesamum Chick pea	223 2725	3362.00	45194.00
	Sesamum-Indian mustard	Sesamum Indian mustard	256 2763	3410.00	50769.00

CONCLUSION AND RECOMMENDATION

The tested cropping systems proved beneficial, therefore, the farm families of pilot area, which are adopting the mono cropping of Rabi season crops may be advocated for double cropping systems of test crops to enhance the system productivity and profitability.

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