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RESEARCH ARTICLE

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Crop diversification with vegetable crops for rural employment in dry hillocks ecology with rain water management

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ABSTRACT

The watershed area of 2216.83 ha was treated with peripheral bund / marginal bund, submergence bund, check dam, water storage structure and masonry structure from 1997-98 to 2000-01 and, thereafter, the holistic management approach diffused in the operational area. The innovative adaptive trials on vegetable crops were laid out during 2000-01 to 2003-04 for diversification in cropping system. Pilot site is located at hill and valley area between Pahuj river and Dongari dam in Babina block of Jhansi district. The vegetable crops grown under vegetative hedge of *Ishaemum pilosum* in conjunstion with small bund of loose stones gave higher yields by 137.00 q/ha of turmeric, 185.50 q/ha of ginger, 260.00 q/ha of colocasia and 395.50 q/ha of rataloo during rainy season. Similarly, onion, carrot, radish, tomato, potato and coriander yielded by 307.00 q/ha, 155.50 q/ha, 187.00 q/ha, 288.50 q/ha, 314.00 q/ha and 18.00 q/ha (green leaves), respectively, under small bund of loose stone + hedge of *Ishaemum pilosum* during winter season with protective irrigations. The yield obtained from different vegetables under other vegetative hedge was also higher over the conventional system. The area under different vegetable crops increased from nil to 73 ha, which provided the opportunity for rural employment generation. The rural employment generation increased from nil to 14600 human labour mandays per year due to raising of vegetable in dry hillocks area.

KEY WORDS : Innovative, Hillocks, Vegetative hedge, Employment generation, Water harvesting

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INTRODUCTION

Water is one of the most valuable physical natural resource for hillocks and valleys area. It plays a vital role for meeting out the demands of farm families. But when soil of such area gets eroded and water runs off, life of the poor farm households becomes miserable. Farm families of Amarpur-Bendaura-Chamraua pilot area of Jhansi district, situated between hillocks and valleys of Bundelkhand zone of U.P. faced this misery. This area was plagued by low productivity, deep water table, stony coarse *rakar* soil, high rate of erosion, deficit in food, fuel, fodder and water availability. Some families of the pilot area of rain water management site could not even afford the meals. With the objective to restore the ecosystem of degraded hillock area, the diversification in cropping system was launched.

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MATERIALS AND METHODS

The site of the operational area of Rain Water Management Project is located in Babina block of Jhansi district of U.P. between the catchments area of Pahuj river and Dongari dam. The operational area of rain water management typically represents soil, climate and socio-economics condition of Bundelkhand region. Water surplus is 168.11 mm mostly available from July to September. Water deficit in operational area is 766.15 mm. It measured by the amount of which the actual evapotranspiration (AET) falls short of the potential evapotranspiration (PET) and expressed as WD = (PET-AET) from the average monthly data of 20 years of operational area. Water surplus is the amount of water supply (Rainfall) that exceeded the water needs (PET). The excess water either drained off as surface run off or lost by deep percolation after satisfying the field capacity of soil. The computation of annual water deficit and annual water surplus was done as per procedure introduced by Thronthwaite (1948) and Thornthwaite and Mathur (1955). The moisture available period for the crop growth in the pilot area is 122 days. The soils of operational area developed over alluvial and occur hillocks and valleys. Watershed land belongs to class II, III and IV of the land capability class and were suitable

for cultivation. The watershed area is composed of highly eroded rakar soil, having pH 8.0, organic carbon 0.21%, available phosphorus 9.5 kg/ha and available potash 255 kg/ha. The depth varied from few inches to about two feet with parent rock lying at bottom. The whole watershed area was treated with different soil and water conservation measures. In the different treatments (Table 1) of soil and water conservation practices, the local and easily available material was used. The different vegetable crops were raised with recommended package of practices under double cropping system. The winter season vegetables were grown after harvesting of short duration groundnut while after harvesting of rainy season vegetables, the wheat crop was sown. The protective irrigations were given to winter season vegetables as and when required. Adaptive trails were laidout on four farmers fields and each farmer field was treated as one replication.

RESULTS AND DISCUSSION

The results obtained from the present investigation are presented in Table 1:

Yield of different vegetable crops :

The combination of vegetable hedge of *Ishaemum pilosum* grass and small bund of loose stones registered higher yields by 137.00 q/ha of turmeric, 185.50 q/ha of ginger, 260.00 q/ha of colocasia and 395.50 q/ha of rataloo during rainy season. Likewise, the winter season vegetable *viz.*, onion, carrot, radish, tomato, potato and coriander (green leaved) yielded by 307.00 q/ha, 155.50 q/ha, 187.00 q/ha, 288.50 q/ha, 314.00 q/ha and 18.00 q/ha, respectively, under small bund of loose stones + hedge of *Ischaemum pilosum* closely followed by small bund of loose stone+ hedge of *Themeda quadrivalvis*. Vegetative hedge of *Ichaemum pilosum* grass alone also gave higher yield of all vegetable crops grown during rainy and winter seasons as compared to other grasses used in vegetative bunding. The yield of different vegetable crops was found lowest under conventional system. The *Ischaemum pilosum* grass rose for vegetative hedge harvested, stored and used as dry fodder during lean months.

Maximum yield of different vegetables under vegetative hedge of *Ischaemum pilosum* alone and in combination with small loose stones bunds was due to its quick and compact growth in coarse rakar soil. Deep rooting system and binding ability of roots of grasses with small loose stones resulted in, more *in situ* rain water retention. These results are in line with those of Singh (2004).

Table 1 : Yield of vegetables crops under different soil and water conservation measures (Average of 7 years data)

Treatments	Rainy season vegetables				Winter season vegetables				Coriander (green leaves)
	Turmeric	Ginger	Colocasia	Rataloo	Onion	Carrot	Radish	Tomato	Potato	
Conventional system	121.3	175.2	250.0	386.2	297.3	145.9	176.1	278.3	300.1	16.8
Vegetative hedge of *Ischaemum pilosum* grass	135.0	183.0	258.0	394.2	305.0	153.5	185.0	285.5	311.8	16.0
Vegetative hedge of *Setaria glauca* grass	129.1	171.6	252.5	388.6	299.0	146.1	178.3	280.5	303.1	15.3
Vegetative hedge of *Themeda quadrivalvis* grass	131.1	179.6	254.3	390.5	301.9	149.2	181.5	282.9	307.0	13.0
Small bund of loose stones + hedge of *Ischaemum pilosum* grass	137.0	185.5	260.0	395.5	307.0	155.5	187.0	288.5	314.0	18.0
Small bund of loose stones + hedge of *Setaria glauca* grass	133.5	181.3	256.1	392.3	303.1	151.6	183.1	284.7	309.2	17.5
Small bund of loose stones + hedge of *Themeda quadrivalvis* grass	135.1	183.6	258.5	394.1	305.3	153.8	185.2	286.8	312.2	16.3
Small bund of loose stones	131.1	179.3	254.0	390.9	301.0	148.8	180.8	282.1	305.0	12.1

Employment generation :

The employment generation in term of human labour (mandays) and bullock labour (days) was calculated. Cultivation of one hectare vegetable crop gave about 200 mandays employment to human labour/year and around 14 days to bullock labour/year. Thus, the 73 hectare cultivated area under different vegetable crops provided 14600 mandays employment to human labour and 1022 days employment to bullock labour to the farm families of watershed.

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