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NATURAL RESOURCE CONSERVATION AND VARIETAL REPLACEMENT ON CROP PRODUCTIVITY IN LOHARI WATERSHED OF FATEHPUR DISTRICT IN UTTAR PRADESH—A CASE STUDY

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ABSTRACT

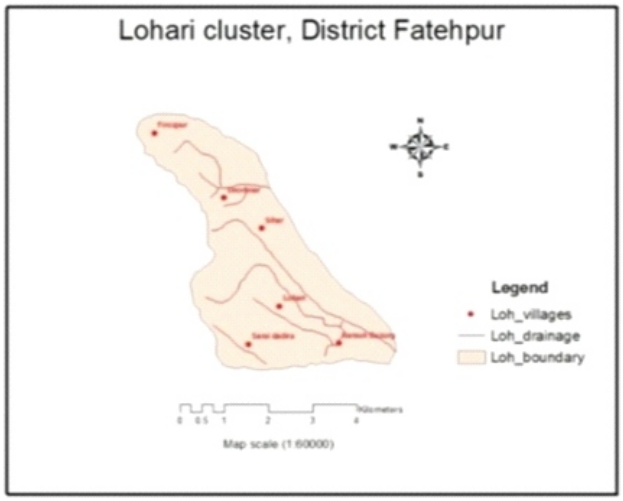
A study was conducted in six villages of *Lohari* watershed in Fatehpur district to assess the livelihood security of rural people living in disadvantaged areas through natural resource conservation and seed multiplication cum seed exchange programme from Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. Various interventions viz., seed multiplication-cum-seed exchange, animal health improvement, soil and water conservation, horticultural plantations, promotion of microenterprises and service providers were introduced in the cluster areas. Out of these, seed multiplication-cum-seed exchange was one of the best programme enhanced the productivity of crops. The average productivity of crops and seed replacement was increased by 35.12 and 63.49 per cent, respectively due to adopting natural resource conservation, recommended crop cultivation practices and introduction of good inputs of agriculture.

Key words : *Resource conservation, crop productivity, livelihood security, seed replacement*

Agriculture is the backbone of Indian economy. The rapid growth of agriculture is essential not only for self-reliance but also for meeting the food and nutritional security of the people, to bring about equitable distribution of income and wealth in rural areas as well as to reduce poverty and improve the quality of life. Agriculture is an important sector of Indian economy as it contributes about 17 per cent to the total GDP and provides employment to over 60 per cent of the population. Starting with a food grain production of about 51 million tons in1950-51, Indian agriculture achieved an all time record harvest of 231 million tons in 2007-08. This highly impressive fourfold increase in the production has been achieved from almost same net sown area, which has remained practically static around 142 million hectares since last 40 years. India is a home of more than 1.2 billion people and shares only 2.4 per cent of the world's geographical area, but supports around 16.7 per cent of the world's population and over 17.2 per cent of the world's livestock. The availability of land per capita has decreased sharply from 0.48 hectare in 1951 to 0.15 hectare in 2001 and to be further decreased 0.12 hectare by 2025. The declining availability of land is further exacerbated by degradation. At the same time decline in area of common land resources affected the livelihood system of marginal farmers, landless and livestock dependant people of whom women constitute a substantial portion. Efforts must be made towards integrated approach to enhance better utilization of rainfed areas which account for about 63 per cent of the cultivated land and can play a key role in meeting future food needs (1). Growing a range of crops suited to different sowing and harvesting times, assists in achieving sustainable productivity by allowing farmers to employ biological cycles to minimize inputs, maximize yields, conserve the resource base and reduce risk from both environmental and economic factors. To reverse the downward trend of sustainable productivity, a sustainable change in the current system is required, including reducing tillage and improving organic matter status (2). Hence, under such scenario where soil and vegetation are already overstressed and there are chances of further degradation, the present study was planned to know the status of the resources for its judicious and sustainable planning and management.

MATERIALS AND METHODS

The present study was conducted in six villages of *Lohari* watershed in Uttar Pradesh selected under World Bank funded National Agricultural Innovation Project during November 2008 to March, 2012 at Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. *Lohari* watershed is classified as semi-arid as per standard climatic characterization and



situated 33 km away from Fatehpur city. It is located 26.03N and79.23S and mean sea level-108 m.

A baseline survey was conducted at household level with the prime objective of understanding and documenting the present agricultural and socio-economic status of the target groups. The survey report formed the basis of comparison between pre- and post-project status, evaluation and monitoring of the project. The change due to project was measured using the baseline information. The reported area is 2103.8 ha of which the net sown area is 1139.8 (54.2 per cent) ha. Barren and uncultivated area is 57.50 ha (2.7 per cent). Net irrigated area is 365.7 ha. Cropping intensity is 116. About 28 to 40 per cent of the net sown area is irrigated. The average land holding was 0.75 ha. The major crops in the watershed are wheat, maize, rice, gram, pigeonpea, mustard and lentil. Baseline productivity of cereals, pulses and oilseeds were 22.00, 12.40 and 10.83 qha^{-1}, respectively.

Table-1: Promising varieties of different crops distributed in cluster areas**.**

Cereal crops	Pulses crops	Oil seed crops			
Wheat	PBW- 343, Satabdi (K-307), Halna (K-7903), Unnat Halna (K-9423), Mandakini (K-9351), Atal (9444), Raj-3765	Greengram	PDM- 139, Samrat, Meha	Mustad	Rai-Kanti, Urvashi,Ashirwad Toria-Bhawani, T-9
Paddy	Pant- 12, PB-1121, Sarju-52, NDR-359, PB-1	Blackgram	Azad-3, Shekhar-2, JPU-94-1	Sesame	T-78, Tarun
Maize	Azad Uttam	Gram	K4D-1168,Udai, Avarodhi, Radhe	Ground nut	Amber (T-37)
Barley	K-560, K-508, K-551	Pea	KPMR-522	-	-
		Pigeonpea	Narendra, Bahar	-	-

Table-2: Quantity of seed supplied, area, number of beneficiaries covered and production under seed multiplication programme

Crops	Quantity distributed (q)	Area covered (ha)	Number of beneficiaries	Production (q)
Cereal crops				
Wheat	13.00	13.00	52	431.60
Paddy	50.50	126.25	505	4368.25
Maize	4.83	24.15	97	736.58
Barley	4.13	5.51	22	156.48
Pulses crops				
Greengram	1.25	10.42	42	84.40
Blackgram	2.41	16.07	65	148.65
Gram	3.75	4.69	19	113.22
Pea	1.00	1.00	4	23.50
Pigeonpea	2.50	16.67	67	241.72
Oil seed crops				
Mustard	0.80	16.00	64	156.80
Sesame	1.50	37.50	150	183.75
Groundnut	1.25	1.67	07	47.01

Table-3 : Impact of promising varieties on crop productivities and income of the beneficiaries

Crops	Productivity (q/ha)	Baseline Productivity (1/ha)	Productivity increased (%)	Enhanced income (Rs/ha)
Cereal crops				
Wheat	33.20	21.50	54.42	11692
Paddy	34.60	23.50	47.23	11097
Maize	30.50	23.00	32.61	7495
Barley	28.40	20.00	42.00	8348
Pulses crops				
Greengram	8.10	6.00	35.00	8445
Blackgram	9.25	7.00	32.14	9023
Gram	24.14	19.00	27.05	20469
Pea	23.50	18.00	30.56	22000
Pigeonpea	14.50	12.00	20.83	10018
Oil seed crops				
Mustard	9.80	8.00	22.50	5375
Sesame	4.90	3.50	40.00	4213
Ground nut	28.15	21.00	34.05	21557

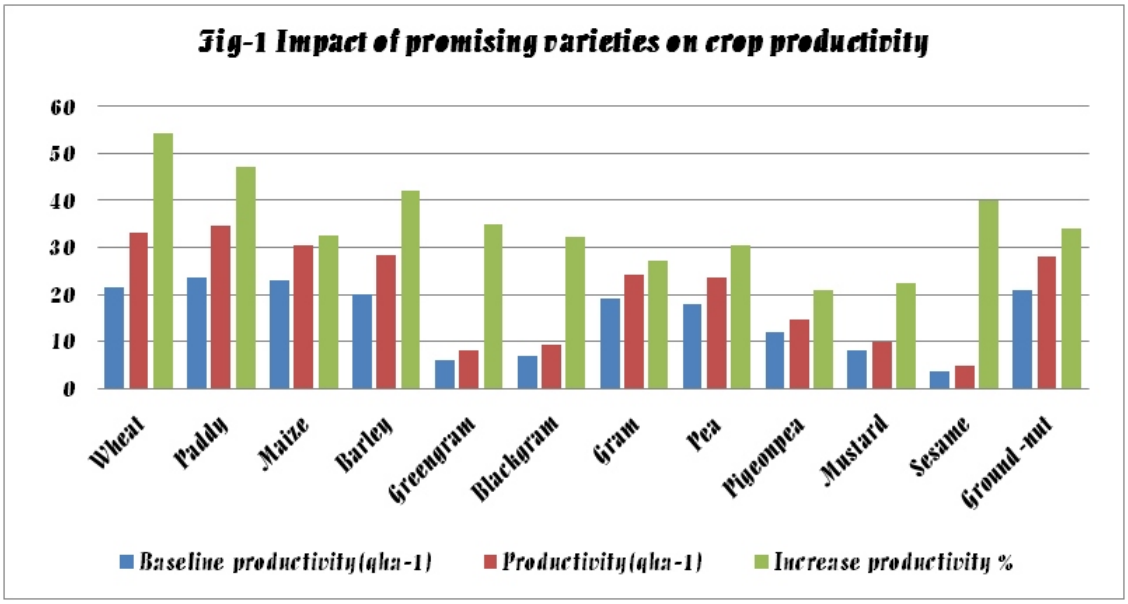
Table-4 : Impact of promising varieties on seed exchange programme

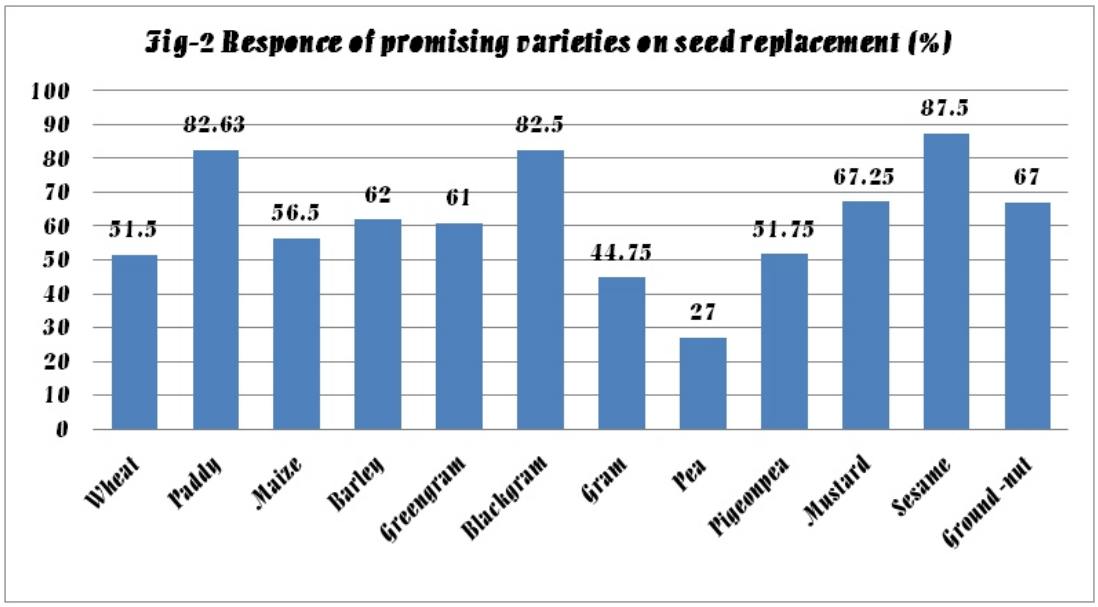
Crops	No. of beneficiaries	No. of beneficiaries among seed exchanged	No. of farmers cultivated crops	Seed replacement (%)
Cereal crops				
Wheat	52	360	800	51.50
Paddy	505	156	800	82.63
Maize	97	16	200	56.50
Barley	22	40	100	62.00
Pulses crops				
Greengram	42	80	200	61.00
Blackgram	65	100	200	82.50
Gram	19	160	400	44.75
Pea	04	50	200	27.00
Pigeonpea	67	140	400	51.75
Oil seed crops				
Mustard	64	205	400	67.25
Sesame	150	25	200	87.50
Groundnut	07	60	100	67.00

Ground water table is varying from 100 to 110 ft. The total population of six villages in the watershed area was 9605**,** of which males constituted 4515 (47.0 per cent), females 3675 (38.3 per cent) and children 1415 (14.73 per cent). The female: male ratio ranged from 814:1000. The average literacy level of the selected villages was 41.7 per cent. Migration from the village was a common phenomenon in search of employment. About 81 per cent of population is dependent on agriculture and more than 75 per cent of the farmers are small and marginal. The cropping practices are mostly traditional and the yields were very low as compared to the potential for most of the crops. Farmers usually sow previous year's seeds, with little knowledge about their quality. Replacement rates of quality seeds are very poor in almost all the crops. Due to the blue bull and monkey nuisance in the watershed areas, farmers were not growing leguminous and vegetable crops.The major problems in the watershed are poor natural resource management, land degradation, and low productivity of cereals, pulses, oilseeds and animals. Therefore, more emphasis was given to resource conservation, and on-farm seed production with the improved package of practices.

Eight hundred beneficiaries in the watershed were selected on the basis of poorest of the poor. Eight

hundred soil samples were analyzed and fertilizer applications were given accordingly. Field bunding in 40 ha, staggered contour trenching in 15 ha, 10 km long trench and small gunny bag crate check dams were constructed in nala bed under soil and water conservation programme**.** Twenty five thousand bamboo seedlings was planted in 10 km distance along both sides of *nalas* at the spacing of 1m for stabilizing the natural nalas and at a spacing of 2 m in 11 ha wasteland for bamboo based entrepreneurship. Six thousand fruit plants were planted in the farmer's field for enhancing the income of the farmers. Six visual points, each of 0.4 ha, with a floor area of 400 m^2 and a water storage capacity of 800 m^3 pond were constructed in each target village on a participatory mode with arrangement of cost effective seepage control measures for demonstration of multiple use of water including fish culture and irrigation. Each visual area was also fenced for protection of cattle. Minor leveling was done in 20 ha area. Application of vermicompost @ 2 t/ha and zinc sulphate @ 25 kg/ha along with recommended dose of fertilizers was applied in selected field for on-farm seed production. Various agricultural implements viz., zero tillage machines, sprayers, ferti-seed-drill were introduced. Three turbine pumps were installed for irrigation purposes. Twenty one trainings, five workshops and eleven exposure visits were conducted and improved





crop cultivation practices were advocated in these programmes. Breeder and foundation seeds of site specific and latest varieties were distributed to the selected farmers under mini-seed multiplication cum seed exchange programme. Recommended package of crop cultivation practices were followed. Farmers were advised to grow leguminous crops in compact blocks under a participatory protection mode to protect these crops against the damage of blue bull and monkey. The production of each crop was calculated on the basis of randomly selected crop field and yield of selected field was multiplied by the total area for getting the total seed production of the respective crop.

RESULTS AND DISCUSSION

A considerable soil and water losses were checked due to adaptation of various soil and water conservation measures. Planting of bamboo seedlings stabilized the nalabed. Adaptation of soil and water conservation measures in cluster areas increased the ground water table 0.50 to 0.60 m. Sixty hectare area was covered under horticultural plants. Seventy hectare area was covered under irrigation facility by installation of turbine pumps. Fifty hectare area was sown under wheat by ferti-seed-drill in cluster areas. Site specific and promising varieties of cereals, pulses and oil seed crops were distributed in the cluster area for seed multiplication programme (Table-1).The total quantity of seed supplied, area covered and number of farmers benefitted were 86.92q, 272.93 ha and 1094, respectively. The total seed yield of cereals, pulses and oilseed crops were 5692.91, 611.49 and 387.56q respectively. Cultivation of pulses crops in compact blocks under a participatory protection mode was resulted in good response and the area under which was almost nil, now increased in significant proportion (48.85 ha) (Table-2). Application of vermicompost @ 2 t/ha and zinc sulphate @ 25 kg/ha supplemented with recommended dose of fertilizers, adopting of soil and water conservation measures, recommended crop cultivation practices and introduction of site specific latest varieties was found to increase the average productivity of cereals, pulses and oilseed crops were 31.68, 15.90 and 14.28 q/ha, respectively as compared to baseline productivity level of 22.00, 12.40 and 10.83 q/ha, respectively. The increase in productivity of cereals, pulses and oilseed crops were 44.07, 29.12 and 32.18 per cent, respectively. Average enhanced income Rs.9658, 13991and10382/ha was obtained from cereals, pulses and oil seed crops, respectively (Table-3 and Fig-1). The increase in productivity of crops and income of the beneficiaries might be due to most landholders make rational decisions and organize their resources efficiently within limit of their own knowledge and of their environment. The innovations with low cost technologies supported by soil and water conservation measures and introduction of site specific latest varieties contributed to increased household income. Similar findings were also recorded by. It is evident from Table-4 and Figure-2 that the maximum seed replacement 87.50, 82.63 and 82.50 per cent were found in sesame, paddy and blackgram, respectively. Total number of farmers among seed exchanged was1392. The seed replacement through seed exchange programme was obtained 63.16, 53.40 and 73.92 per cent in cereals, pulses and oilseeds crops, respectively.

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