

Livelihood improvement through watershed development in the ecologically fragile Bundelkhand region

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The Bundelkhand region frequently remains in the media spotlight because of water scarcity and large-scale migration issues. Agriculture is the primary source of income in the region. However, farming in the region is very unstable due to climate fluctuations and scarcity of water, which has led to a shortage of food, fodder, and fuel, as well as the large-scale migration of the inhabitants to other places to secure their livelihood. This article presents a study which evaluated the impacts of the watershed development programme on the livelihood of the farmers during 2021-22. The results indicated that watershed interventions positively impacted the livelihood of farmers in the watershed area.

Keywords: Anna pratha, Crop productivity, Watershed interventions, Water scarcity

THE Bundelkhand region, comprising fourteen districts, seven districts each from Uttar Pradesh and Madhya Pradesh, frequently remains in the media for water scarcity and large-scale migration. This region has undulating topography, insufficient vegetation cover and a myriad of soil constraints. The region is also affected by frequent droughts, natural resource degradation, high erosion, poor irrigation facilities, heavy biotic pressure on forests. As per the Indian Meteorological Department (IMD), the normal number of rainy days in Bundelkhand is 52, but during recent years, it has been restricted to 24 days. The region witnesses an average annual precipitation of between 800–900 mm, but its occurrence and distribution have no definite pattern. About 61% of the population (15.62 million) of the region lives in rural areas, which primarily depend on agriculture and allied enterprises for their livelihood. These agriculture and allied enterprises are frequently disturbed

due to climate conditions and water scarcity, which led to a shortage of food, fodder and fuel. It results on large-scale migration of inhabitants to other places to secure their livelihoods. In view of the above, the then ICAR-National Research Centre for Agroforestry (NRCAF), now renamed as the Central Agroforestry Research Institute (CAFRI), Jhansi developed the Garhkundar-Dabar watershed, which truly represents the geological, physiographical and ecological conditions of the Bundelkhand region, in 2005 by implementing various soil and water conservation measures in conjunction with agroforestry techniques. The Garhkundar-Dabar watershed, which covers an area of 850 ha and represents three village panchayats, is situated in the worst-affected Niwari District of Madhya Pradesh.

Intervention

To understand the impact of Garhkundar-Dabar watershed development on the livelihood of the inhabitants, a detailed survey of

the Garhkundar-Dabar watershed area was conducted in 2021-22 and data were recorded using a standard questionnaire. Demographic details, types of interventions, land and soil characteristics, sources of irrigation and drinking water, land holding size, availability of water in ponds or dug wells, migration patterns, cropping systems, input use, crop productivity, market access and livestock information were obtained using participatory rural appraisal (PRA) techniques, and also through key informants, formal and informal surveys and case studies. Household surveys and focused discussions were also conducted.

Impact on livelihood

Watershed development has enhanced the availability of drinking and irrigation water, which has further influenced agriculture and allied enterprises in the watershed area. The availability of irrigation water, which was restricted to the *rabi* season only, has now been extended throughout the year. Likewise, the period of drinking water availability

Table 1. Respondents' details as per socio-economic characteristics (n=152)

Particular	Number
Age	
Upto 40 year	40
Above 40 year	112
Education	
Literate > five year schooling	71
Illiterate	81
Major source of income	
Farming	121
Business	6
Labour	21
Service	4
Land holding	
< 1 ha	117
1–2 ha	23
2–4 ha	12
>4 ha	-

also improved in the area. The number of dry wells, which were prominent and very common in the watershed area, especially during the lean period (May-June), drastically decreased and was rarely observed. The cropping patterns in the watershed area have changed noticeably. Earlier, farmers kept their fields fallow in the *kharif* season to conserve soil moisture for the post-rainy *rabi* crops. Currently, *kharif* and *rabi* crops are regularly cultivated in addition to summer vegetable crops, which has resulted in an increase in the gross cropped area, cropping intensity, and crop rotation intensity in the watershed area. The changed cropping pattern due to increased irrigation water availability renewed farmers interest in farming, which led to the increased use of farm inputs like fertilisers and pesticides, which was a distant dream for the farmers due to poor economic conditions and the risks associated otherwise with farming.

The changed mindset of the farmers in their farming activities discouraged traditional practices such as the use of higher seed rates and previous season crop

seed for next season sowing. For instance, earlier farmers used a wheat seed rate of 250 kg/ha in the watershed area, which might be due to constraints related to soil and climate. Moreover, seed replacement for cultivated crops was negligible. Currently, recommended packages practices for the cultivation of different season crops are in vogue in the area. Altogether, interventions in the watershed area improved agriculture by enhancing the productivity of all types of crops in the range of 20–50%, increasing the availability of quality fodder, reducing migration patterns, and helping to reduce *Anna Pratha* practice.

Table 2. List of interventions implemented in the Garhkundar-Dabar watershed

Name of interventions	Unit
Check dam	9
Gabions	150
Drainage structures	15
Water spreaders	3
Field bunding	40 ha
Aonla, guava and citrus based agroforestry system	4 ha
Live fencing of Karonda	100 m
Teak plantation	0.23 ha
Plantation of tree saplings along the <i>nallah</i>	6,000

The *Anna Pratha* practice is very common in the Bundelkhand region, wherein farmer abandon animals after harvesting the *rabi* season crops until before the onset of the sowing for the next *rabi* season (April to September). It has been reported that Bundelkhand, part of Uttar Pradesh, incurs a tentative annual loss of ₹1,619 crore due to the *Anna Pratha* practice. Among the interventions, agroforestry systems proved to be drought-proofing mechanisms during drought periods and additional sources of income during normal periods. Additionally, agroforestry interventions lower the risk of crop failure and ensure efficient resource utilisation. It is opined that agroforestry not only ensures food security but also reduces income variability among farmers

in the Bundelkhand region. Overall, agroforestry-based watershed interventions had positive impacts on the livelihood of farmers in general and the Garhkundar-Dabar watershed, in particular.

Table 3. Pre and post scenario of the Garhkundar-Dabar watershed

Particulars	Before watershed development	After watershed development
Cropping pattern	One crop in a year	Usually two crops; sometimes summer vegetable cultivation in pockets
Inputs use (fertiliser and pesticides)	Very rare	Common
Seed rate (kg/ha)	Very high	Normal
Seed replacement	Negligible	Common
Crop productivity	Very low	Increased (20–50%)
Cropping intensity (%)	Low (61.4)	Increased (150)
Crop rotation intensity (%)	Low	Increased
Gross cropped area	Equal net area	Increased (75%)
Source of drinking water	Dug well and hand pump	Dug well and hand pump
Availability of drinking water	8–10 months only	Throughout year
Source of irrigation water	Dug well and bore well	Dug well, bore well and dugout pond
Availability of irrigation water	Limited to <i>rabi</i> season only	Available throughout year
Status of dry wells	Very common	Occasional/very rare
Migration pattern	Large out migration	Seasonal/specific only
<i>Anna paratha</i>	Very common	Reduced

SUMMARY

The Bundelkhand region frequently remains in the media for water scarcity and large-scale migration, and has undulating topography, insufficient vegetation

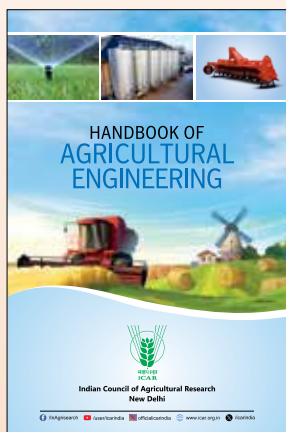
cover, and a myriad of soil constraints. Droughts, natural resource degradation, erosion, poor irrigation facilities, and heavy biotic pressure on forests also affect the region. Approximately 61% of the population lives in rural areas and relies on agriculture and allied enterprises for their livelihood. Climate fluctuations and water scarcity cause food, fodder, and fuel shortages, leading to large-scale migration to secure livelihoods. To address the aforementioned uncertainties, the Garhkundar-Dabar watershed was developed using soil and water conservation measures and agroforestry

techniques. In 2021-22, we conducted a survey to assess the impact of Garhkundar-Dabar watershed development on the livelihoods of its inhabitants. The data indicated that watershed development has significantly improved the availability of drinking and irrigation water, which subsequently affects agriculture and allied enterprises in the area. The regular cultivation of *kharif* and *rabi* crops in the watershed area has changed the cropping pattern, resulting in an increase in gross cropped area, cropping intensity, and crop rotation intensity. This change has renewed farmers interest in farming,

leading to an increased use of farm inputs. Moreover, interventions in the watershed area have improved farming by enhancing the productivity of all types of crops by 20–50%, increased the availability of quality fodder, reduced migration patterns, and *Anna Pratha*. Overall, the interventions not only ensured food security but also reduced income variability among farmers in the Bundelkhand region, particularly in the Garhkundar-Dabar watershed.

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