



Rural development program in tribal region: A protocol for adaptation and addressing climate change vulnerability



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ABSTRACT

Tribal peoples globally are among the most vulnerable groups to climate change and variability. This is due to a combination of their relative poverty and their dependence on agriculture and natural support systems (NSS). Hence programmes that simultaneously help to reduce poverty and vulnerability to climate change are needed. The Indian Government has launched the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), an incentive-based programme addressing vulnerability to poverty, climate change and NSS by integrating natural systems (water, land, soil) and human systems (employment opportunities). Here we show that the vulnerability related to climate variability, agriculture, water and household economic conditions has decreased significantly due to MGNREGA interventions. Specifically, water availability, diversification of agriculture, crop yield and income have all increased. Besides the decreased vulnerability to climate change due to better access to water, the intervention has also increased employment opportunities and daily wage levels have almost doubled, thus improving the economic status of tribal peoples. These changes have led to improved living conditions, facilitating better adaptation to both natural and economic stresses. This case study illustrates the potential of well-designed government programmes to contribute to sustainable development through improving adaptive capacity and by combating poverty and vulnerability to climate change among marginalised people.

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1. Introduction

Roughly 5% of the world's population (370 million) are indigenous (tribal) peoples, who occupy about 25% of global land and make up around 15% of the extremely poor (The World Bank, 2016). These indigenous populations are heavily dependent on the natural resources for their survival. The impact on tribal communities is likely to be further accelerated by their relatively higher reliance on natural support systems (NSS) that are sensitive to climate variation (Gautam et al., 2013; INCCA, 2010), making them among the most vulnerable groups to climate change and variability (Tsosie, 2007; Vermeulen et al., 2012). Climate change will alter the frequency and intensity of environmental events such as heat events, heavy rainfall, floods, and drought (IPCC, 2007) and is predicted to

affect agriculture severely, influencing patterns and productivity of crop, livestock and fisheries (Lobell et al., 2008; Vermeulen et al., 2012). Food insecure populations in South Asia and Southern Africa are at large risk on crop production reduction unless adaptation measures are taken (Lobell et al., 2008). This will jeopardise development prospects, especially in developing countries (Porsché et al., 2011), where marginalised tribal communities already facing social and economic challenges. Thus, it is important to strengthen the resilience and adaptive capacity of tribal communities and the natural systems on which they depend across the globe. Increasing resilience requires appropriate and effective adaptation options for a more equitable public policy approach that can address poverty and vulnerability simultaneously (Eriksen and O'Brien, 2007; Hedger et al., 2008). However, at present there is a gap in interdisciplinary studies that include social factors that can facilitate or constrain changes in agriculture to adapt to climate change (Davidson, 2016).

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There are a number of ways possible for mitigating climate vulnerability of small holders that rely on rain feed farming systems such as diversification of agricultural livelihood systems (Sallu et al., 2010; Thornton et al., 2011; Vermeulen et al., 2012), prior information about seasonal climate forecasts for farmers (Hansen et al., 2011), index insurance where payouts are based on meteorological indexes correlated with agricultural losses (has worked well for small holders in India and Mexico) (Hazell et al., 2010; Hess and Syroka, 2005), water resource management (Hedger et al., 2008; Sallu et al., 2010). Social protection could be another option and include providing off-farm income, cash transfers, and transformation of societal relations to address underlying social and political vulnerability (Davies and Leavy, 2007). Asset transfer to rural poor that have been affected by climate stresses is a common coping strategy and can be managed either by cash, credits or livestock and poultry (Davies et al., 2008). Building assets can help vulnerable to increase their resilience and contribute to social protection (Blaikie et al., 2014; Sallu et al., 2010; Tanner and Mitchell, 2008). Ethiopia's productivity Safety Net Programme (PSNP) has provided seasonal employment in public sector in exchange for food and cash, this have reduced the seasonal vulnerability of rural poor for food insecurity and protected the household assets (Davies et al., 2008).

In India, tribal peoples make up 8.6%, or 104 million, of the total population (Ministry of Tribal affairs, 2013). The relative level of vulnerability in India differs between states, geographical locations and social groups within the same region. The differences in vulnerability are attributable to substantial variations in orography, climate conditions and ecosystems, as well as differences in the social structures, economic status and requirements of different communities. Various adaptation actions have been implemented to strengthen the adaptive capacity of vulnerable communities. The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is one such incentive-based programme that creates employment by constructing productive durable assets at village level (Ministry of Rural Development, 2016). The Act was initially introduced in 2006 in the 200 least developed districts in India and has been since been expanded to all 619 districts in the country (Ministry of Rural Development, 2016). MGNREGA aims to enhance livelihood opportunities in rural areas by guaranteeing at least 100 days' employment within a financial year to an adult member of a rural household who is willing to volunteer to do unskilled manual work. MGNREGA provides an opportunity for the most vulnerable group in society, i.e. poor and marginalised people, to gain employment in a legal framework, which helps them achieve social empowerment (CSE, 2008; Ministry of Rural Development, 2016; Sudarshan and others, 2010). Since its inception, MGNREGA has contributed to agricultural production, especially in semi-arid regions of rural India (Ministry of Rural Development, 2016). This has been accomplished through creation and rejuvenation of assets related to water harvesting and conservation, which have led to increased access to irrigation for marginal farmers who would otherwise be dependent on rain for agriculture (Ganeriwala, 2010). The increase in agricultural production and water availability has enhanced the livelihood opportunities and standard of living of rural populations across India (Emad, 2013; Kedia, 2012; Krishnan and Balakrishnan, 2014). Improved rural infrastructure (road and sanitation measures) and an enhanced natural resource base have reduced the vulnerability of poor and marginalised people (Holmes et al., 2010; Sharma, 2015).

The programme has led to creation of durable assets that improve land and water resources and generate ecosystem services that strengthen the livelihood resource base of rural communities. Building assets for rural poor have been pointed in other studies to be important for increasing resilience and contribute to social

protection (Blaikie et al., 2014; Sallu et al., 2010; Tanner and Mitchell, 2008). The activities focus largely on climate-sensitive NSS, i.e. water, land and soil (Tiwari et al., 2009). NSS are the main source of livelihood for large sections of rural people in the India. Specifically, access to water is crucial for rural people in semi-arid areas who depend on agriculture for their livelihood. Improved storage facilities and prevention of run-off can significantly reduce the vulnerability of these people to increased climate variability due to climate change. Furthermore, ecological regeneration or rejuvenation of NSS generates a number of tangible and intangible benefits to the community in a sustainable way. Apart from NSS stability, it also enhances livelihood security by reducing distress migration, strengthening local democracy and facilitating a decentralised development process (Hirway et al., 2008).

There is an urgent need to implement adaptation measure to support resilience to climate change for food-insecure small holders in South Asia and Southern Africa as they will be impacted negatively by climate change, (Lobell et al., 2008). MGNREGA, a government supported programme aims to counter the poverty by enhancing livelihood opportunities and therefore facilitate to achieve resilience to the smallholders. Therefore, the aim of the present study was to assess the potential of MGNREGA in reducing livelihood vulnerability and building resilience to increased climate variability due to climate change in a tribal-dominated district in India, where more than 60% of the population is below the poverty line. In particular, the impacts on access to water, agricultural production and subsequent household economic status after implementation were measured, with a view to assessing the potential to decrease vulnerability to climate change in the sample villages in the Dhar district of Madhya Pradesh, India.

2. Methods

2.1. Study area

The study was conducted in Dhar district of Madhya Pradesh state, India, which lies between 22°00' and 22°49' N and 75°06' to 75°42' E. The district covers 8153 km² and is divided into four subdivisions, 13 blocks, 669 *panchayats* and 1479 villages. The population of the district is 2,184,672, with a population density of 268 inhabitants per km² and a population growth rate of 25.53% (2001–2011). Moreover, as per reports, Madhya Pradesh has implemented various programmes for socio-economic development, however, the household status is still unsatisfactory at socio-economic development (Mishra, 2011).

The climate in the region is tropical to sub-tropical, with well-marked seasons. The winter season is from December to February. The temperature during the summer can reach up to 48 °C. The average annual precipitation in the region is 834 mm and about 93.2% of the rainfall falls from June to September. The region is characterised by medium black fertile soil, undulating terrain, low vegetation cover (9%) and a large proportion of wasteland (12.51%). Agriculture is the main source of livelihood and the district is an important soybean and cotton belt. 61.25% of the total area is net-sown and 47.30% is double-cropped.

The district is tribe-dominated (54%). The main tribes residing in the district are Bhils, Bhilalas, Patlyas and Bareliyas. More than 60% of the population lives below the poverty line. These poverty levels, together with limited livelihood opportunities, lower literacy, agricultural dependency, degraded natural resources, water scarcity (surface and ground), lack of special government programmes and absence of strong civil organisations, strain the livelihoods in the region.

The potential of MGNREGA in vulnerability reduction was assessed by comparing the status of agriculture, water accessibility

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