Analysis of various spectral indices and their weighted fusion techniques for the accurate extraction of forest burn scar in a tropical deciduous forest

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The present study was conducted in the tropical dry deciduous forests of Vidarbha region, Maharashtra, India. Burn scar discrimination capabilities of seven widely used spectral indices (SIs) such as burn area index (BAI), burned area index modified-LSWIR (BAIML), burned area index modified-sSWIR (BAIMs), normalized burn ratio (NBR), normalized difference vegetation index (NDVI), normalized difference moisture index (NDMI), modified soil-adjusted vegetation index (MSAVI) and their weighted fusion were examined in a multi-temporal domain. This study generated different images during fire season using individual SIs, change vector analysis and weighted fusion normalized difference image technique. Comparative analysis was performed between these approaches for burn scar discrimination with *M* statistics, burned and unburned class distribution and evaluation of confusion matrix. The study demonstrates that the weighted fusion of BAI, MSAVI and BAIMs can more accurately discriminate burn scars with good overall accuracy (86.61%).

Keywords: Burn scar extraction, change vector analysis, forest fire, spectral indices, weighted fusion.

impacts on biodiversity, structure and composition of the forest[4]. The forests in India are prone to fires and are impacted by varying intensity and extent. Based on the forest inventory records, 54.40% of forests in India are exposed to occasional fires, 7.49% to moderately frequent fires and 2.40% to high incidence levels, while 35.71% have not yet been exposed to fires of real significance[5]. Every year, 2–5% of forests are affected by fires that damage their ecological resources. Due to the severe forest fires, the forest ecosystem can be affected by irreparable damages. Escalated anthropogenic activities due to population increase and climate change are the leading causes of the increased frequency as well as intensity of forest fires[6,7]. Considering these factors, the country has to focus more on strengthening its efforts to manage forest fires efficiently to achieve the goals set for Green India[8]. A large variation exists between the exact area burnt and that reported using the ocular method by the forest staff. Most of the time, the area reported is less than the exact area burnt, or sometimes highly exaggerated as the estimation technique is ocular without surveying in detail. There is an average of 17% error between the exact and reported burnt areas[9]. In general, the burnt area has a large size with spatial variability. The ad-