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Oil palm expansion on the health of its associated vegetation; A case study in Nagoda administrative division using GIS and remote sensing.

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ABSTRACT

Oil palm (*Elaeis guineensis*) cultivation in Sri Lanka began several decades ago in the Galle district. Oil palm cultivation expanded to the other regions of the Low country wet zone to reach the national edible oil requirement. However, some communities in these regions claim that there are socio-environmentally detrimental consequences of this expansion, of which the depletion groundwater table is one of the most critical. Increase of the depth to groundwater table limit the water availability to plant uptake. This study focuses on evaluating the impact of oil palm expansion on the health of the associated vegetation using GIS and remote sensing. Nagoda administrative division in Galle district was selected as the study area (17448 ha in extent), where oil palm is the prominent plantation crop. Normalized difference vegetation index (NDVI) was used to estimate vegetation health. Cloud-free Landsat images from 1992 to 2021 were used to quantify the expansion of oil palm and to derive NDVI maps. Global navigation satellite system (GNSS) data and Google earth pro software were used for the ground verification process. Arc map 10.7 software was used in all spatial data analysis processes. The oil palm cultivation showed an area of up to 4224 ha, acquiring 24% of the total land cover in the Nagoda administrative division. Oil palm cultivation increased by 23% during the period of 2001–2010 and by 27% during the period of 2010–2021. In 2001, the entire land cover under the plantation sector was around 3000 ha, where both rubber and oil palm cultivations were dominant. Oil palm plantations expanded extensively during the period of 2001–2021 as a replacement crop in the rubber fields. Irrespective of this expansion in oil palm, the NDVI, which represents the health of the vegetation, increased from 0.48 in 1992 to 0.60 in 2021, and more than 74% of randomly selected locations showed higher NDVI compared with the previous year. This increase in NDVI represents both newly introduced Oil palm plantations and the other conventional vegetation types. Considering this spatial evidence of NDVI and Oil palm cultivations, it can be concluded that there is no significant detrimental impact of oil palm expansion on the health of the associated vegetation.

Keywords: *Oil palm, Low country wet zone, GIS and remote sensin, Normalized difference vegetation index, Global navigation satellite system*