

## **Monitoring Temporal Vegetation Changes on Ungrazed Grassland by Satellite and Paramotor Remote Sensing**

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Integrated Terrestrial Field Station affiliated with Graduate School of Agricultural Science, Tohoku University, called as Kawatabi Field Science Center (FSC) is located in a hot spot area polluted by Fukushima Daiichi nuclear disaster triggered by the 2011 Tohoku earthquake. Large grazing pastures are included in FSC and cattle were grazed before the pollution. After the pollution, the cattle grazing has been voluntary restrained.

In this study, we compared time-series of remote sensing images for the grass land area on FSC to evaluate the effect of the ungrazing by the disaster on vegetation. The images obtained from high resolution satellites, IKONOS in July, 2008, WorldView-2 in November, 2010, October, 2014 and Quickbird in July, 2012 were used. The spatial resolution of panchromatic images IKONOS, WorldView-2 and Quickbird is 0.8, 0.5 and 0.6m respectively. Pan-sharpened dataset was created by Gram-Schmidt Spectral Sharpening method. The images obtained from paramotor in October, 2013 and September, 2015 were also used for the comparison. The spatial resolution was approximately 0.1 m and 0.19 m, respectively.

Though the difference of observation season is an element of consideration for the image interpretation, temporal vegetation change is recognized. Increase in the number of grass plant or shrub blocks is estimated in all parts of the grass land. Especially, in the comparison of the images obtained from paramotor, the increase of around 1–2 m forms is recognized. These forms correspond to large grass plants such as Japanese silver grass and round-leaved dock.