Poster 3

Comparison of Vegetation Indices and Spectral Reflectance Observed by Two Types of UAV-mounted Multispectral Camera

Ryohei YOKOYAMA[1], Chinatsu YONEZAWA[2], Mizuhiko NISHIDA[2], Ryosuke TAJIMA[2], Muxiye[2], Koharu OKADA[1], Kouki TAKAMURA[3], Kaori AMAYA[3] and Ken ICHIKAWA[3]

[1]Faculty of Agricultural, Tohoku University, Japan
[2]Graduate School of Agricultural Science, Tohoku University, Japan
[3]Fukken Gijyutsu Consultants, Japan

Remote sensing in agriculture using multispectral cameras has increased in availability due to their advantages, such as high flexibility, ease of operation, and high spatial resolution. Several multispectral cameras with UAVs have been developed and utilized. The observed value can be converted to spectral reflectance and vegetation indices are calculated. However, the accuracy of the observed reflectance should be confirmed for vegetation monitoring. In this study, we compared images obtained by the two types of multispectral cameras mounted on UAVs, RedEdge MX-dual with Inspire-2 and P4 Multispectral (P4M) for paddy rice fields in the Kawatabi Field Science Center. We obtained spectral reflectance and calculated vegetation indices such as Normalized Difference Vegetation Index (NDVI), Green Normalized Difference Vegetation Index (GNDVI), and Red Edge Normalized Difference Vegetation Index (RENDVI). On August 5th, 2022, and September 13th, 2022, we observed target area almost simultaneously by two cameras. Because of the battery duration, the region was separated into two portions and monitored individually. Radiometric calibration was performed for the orthomosaic images by RedEdge MX-dual using a reflectance panel. P4M has a sunlight sensor, and it is possible to obtain vegetation indices without calibration, however, spectral reflectance is uncertain. Therefore, radiometric calibration was performed for the observation on September 13. For the comparison of RedEdge MX-dual and P4M, the average of vegetation indices and spectral reflectance were computed on each of the agricultural parcels for paddy rice. The results show that the spectral reflectance and RENDVI obtained by P4M without calibration were inconsistent with those of RedEdge MX-dual. The differences were clearly visible, especially in the spectral reflectance. NDVI and GNDVI obtained by P4M without calibration on September 13 corresponded to those obtained by the RedEdge MX-dual, however, RENDVI was smaller than that of the RedEdge MX-dual. After the calibration, RENDVI and spectral reflectance, except for blue and red edge, acquired by the first flight of P4M on September 13 almost corresponded to those obtained by RedEdge MX-dual. Blue was larger than that by RedEdge MX-dual and red edge was smaller than that by RedEdge MX-dual. RENDVI and spectral reflectance were discordant with those of the RedEdge MX-dual on the second flight on September 13. Blue, green, and RENDVI were larger than these by RedEdge MX-dual. Red, red edge, and near infrared were smaller than these by RedEdge MX-dual. These results show that the UAV multispectral remote sensing technology is instructive for precision agriculture; however, calibration and evaluation are necessary to obtain accurate observation results.