relative variable importance provided by the machine learning approaches, data from the planting season (typically in May for paddy rice) had the largest contribution to the cropland classification. In addition, NDWI, SAR backscattering, and NDVI appeared more contributing than the other variables for cropland classification (Figure 2).

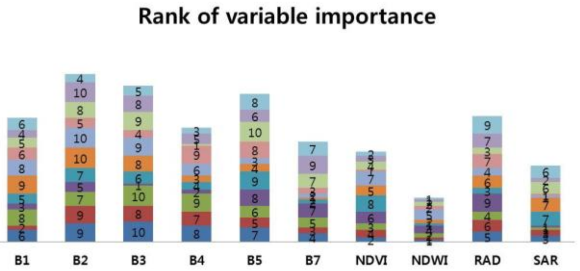

Figure 2 Rank of variable importance. The number means the rank of importance for each classification model.

NDWI, SAR backscattering, and NDVI also showed unique temporal characteristics in transplanting season (Figure 3). The growing season of vegetation (May to September) for both sites are generally between April and October. The rice paddy class shows the dramatic increase of NDVI and NDWI between the transplanting season and harvesting season when compared to the other vegetation related classes (e.g., field and grass). This is because rice paddy is planted after May when is transplanting season. SAR backscattering of the rice paddy class also shows a different pattern in the transplanting season (doy= 152) because rice paddy is full of water in that season.

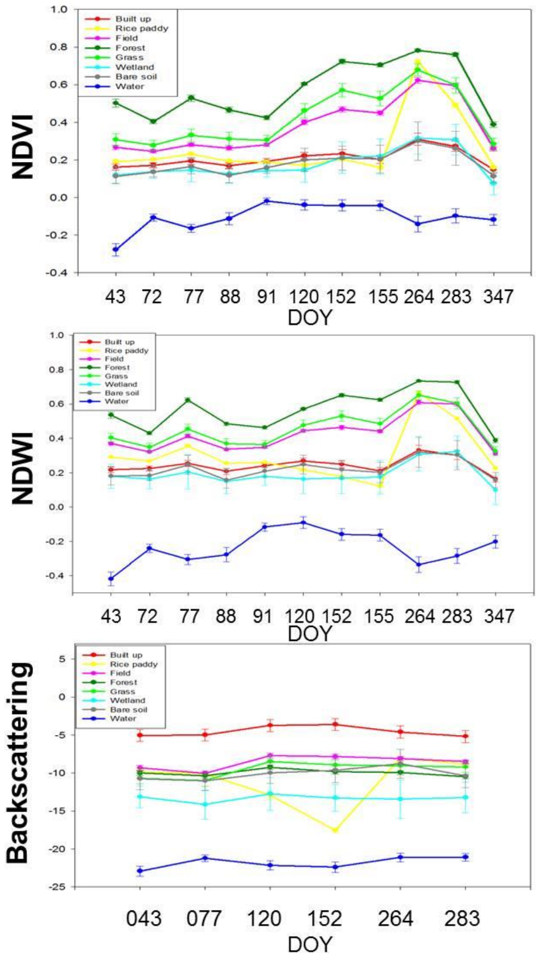

Figure 3 Time series of NDVI, NDWI and backscattering

5. CONCLUSION

In this study, croplands were classified through fusing optical and SAR multi-temporal images based on machine leaning approaches. Seven classification scenarios were tested and the one that uses all temporal and spectral data as input variables with SVM showed the best performance (overall accuracy ~ 93.87%).

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