
# Drone-based Smart Weed Localization from Limited Training Data and Radiometric Calibration Parameters

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## Introduction

1. Increased world population growth will demand more high-quality food production, which can only be achieved by applying a sustainable method for increasing crop yields. According to the Food and Agriculture Organization (FAO) report, weed grasses increases environmental and economic costs of pesticide use by spreading them across farm boundaries, and their competition with agricultural crops reduces quantity and quality output.

2. Small object localization from drone images have become the outstanding tool for real applications, such as weed monitoring in smart farming.

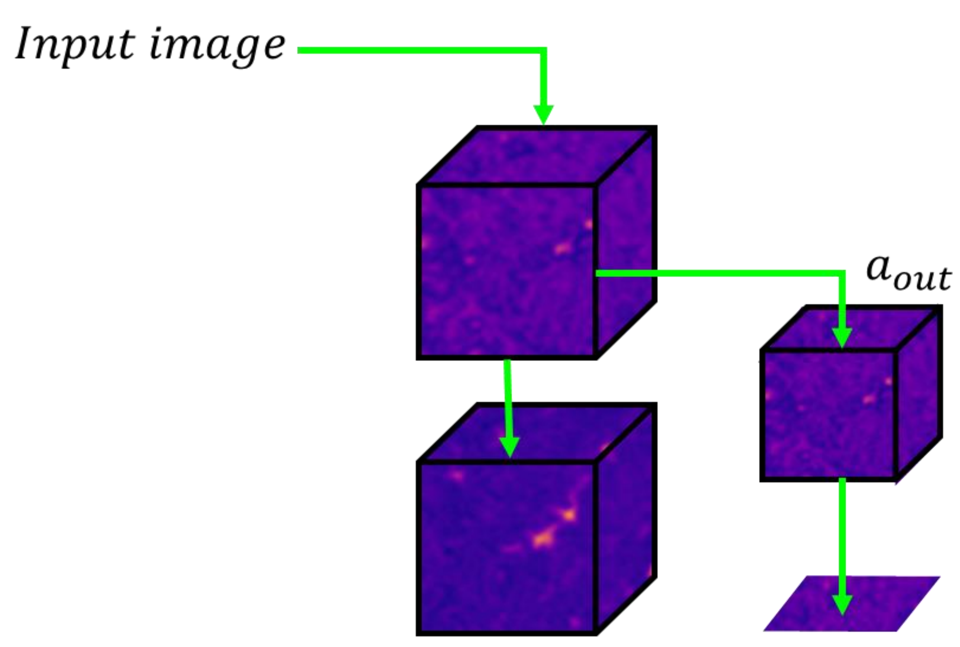
## Method

1. In this study, the purpose of weed grasses localization from drone-based multispectral images and reflectance calibration factor is to locate the weed on the large-scale imag-es by using pixel-wise classification. Weed grasses localization with the use of few-shot learning for drone-based multispectral images potentially improves multispectral scene understanding with a small training dataset, while many weed detection methods appear to understand single-time localization with a big training dataset.

2. Timely weed grass localization in the farm fields is important to obtain high-quality crop. Weed grasses occupy a large space in the farm field thus space left for growing crops is get reduced.

## Meta-feature Extraction

In the proposed method, three sets where each set contains $K$ multispectral images, consist of a training set $\boldsymbol{train} = \{l_j, m_j\}_{j=1}^{K}$ an input multispectral data, a support set $\boldsymbol{support} = \{l_j, m_j\}_{j=1}^{K_{support}}$, and a test set $\boldsymbol{test} = \{l_j\}_{j=1}^{k_{test}}$ [8]. This network is trained using a small training set that includes 80 samples of images.

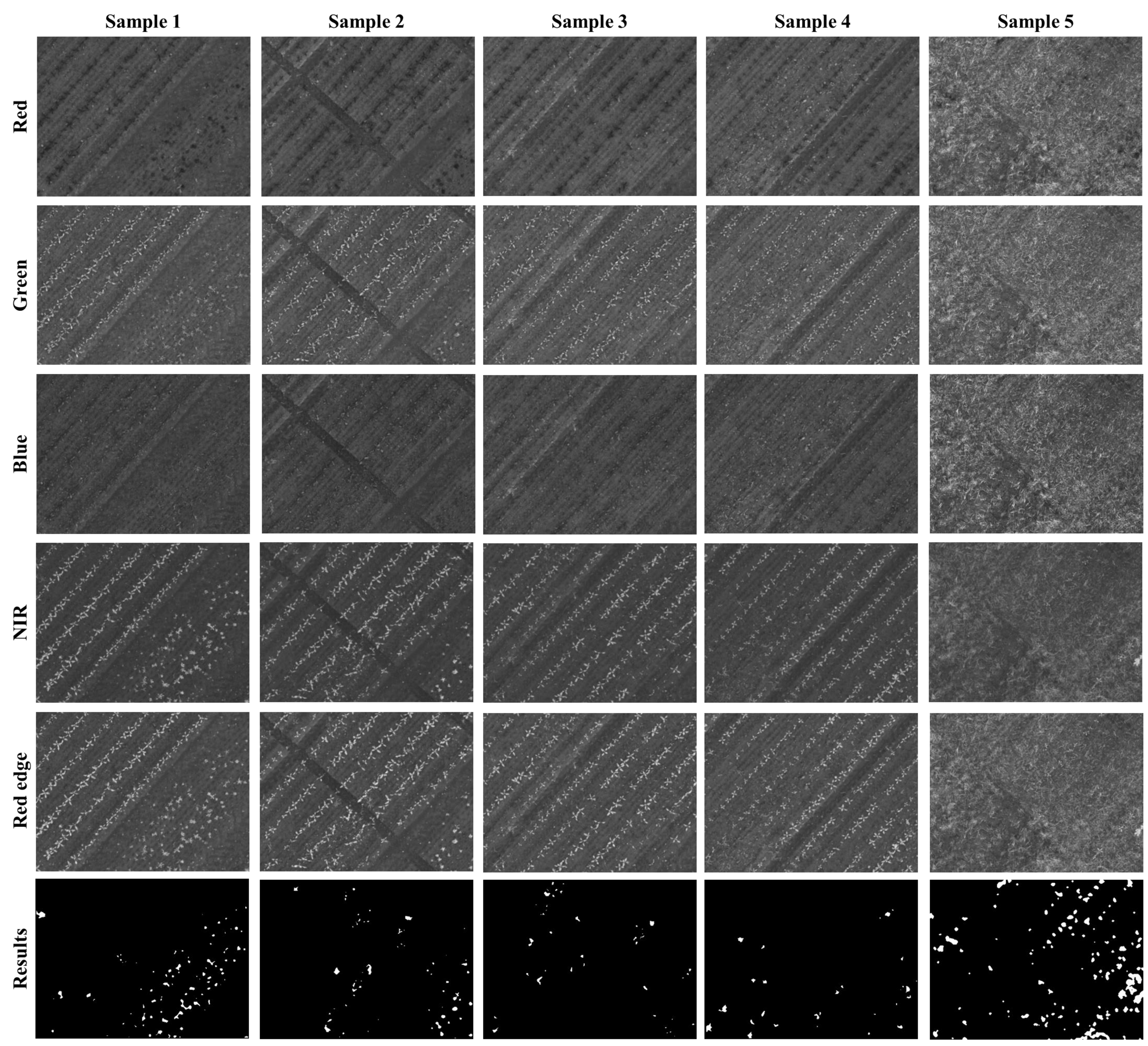



## Results and Discussion (1)

For training and assessment of the proposed network, we use the WeedMap [13] dataset. The WeedMap consists of drone-based multispectral images using RedEdge-M sensor with a size of 480×360 pixels labelled for weed detection have significant crop and weed changes from various scenes that sit in Rheinbach, Germany.

## Results and Discussion (2)

Visualization of weed grasses localization results of the test stage is shown in Figure 2. The proposed model achieves a mean IoU for the weed grasses localization of 69.7 and 73.2% for the 1-shot, and 10-shot tested images, respectively.




## Conclusion

1. In this study, we proposed a few-shot learning model for weed grasses localization from a small training dataset in multispectral images.

2. The purpose of this study is to investigate the capabilities of few-shot learning and reflectance calibration factor estimation for precision farming.

## References

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