Zhengning County is located in the southeastern part of Qingyang City, Gansu Province, China (107°56'~108°38' E, 34°26'~35°14' N), near the western foothills of the Ziwuling mountain range, covering a total area of 1331 km². It borders Huangling County, Xunyi County, Bin County, and Changwu County of Shaanxi Province, and Ning County of Gansu Province to the north. The region is part of the Loess Plateau's gully area, with loess layer thicknesses ranging from 90 to 150 m. The terrain slopes from northeast to southwest, with an average elevation of 1460 m. The topographical features include interlaced ridges, mounds, and gullies, as well as rivers, streams, and tablelands. The overall topography is higher and broader in the east than in the west, forming a slightly triangular shape. The area has a large number of gullies, accounting for 82% of the total area, with more than 1200 gullies of various sizes. It experiences a temperate continental monsoon climate, with an average annual temperature of 10.1°C, and an annual precipitation of 567.4 mm. The frost-free period lasts for 166 days per year, with a total annual sunshine duration of 2136 hours. The multi-year average temperature is 8.5°C, with an average annual precipitation of 608.2 mm. The soil is predominantly loess, constituting 97.6% of the county's soil, with 79.3% being light loam and 20.7% medium loam. The average organic matter content in the soil is 12.6 g kg^{-1}, with an average pH of 8.1. The average total nitrogen content is 0.96 g kg^{-1}, with an average alkali-hydrolyzable nitrogen content of 93 mg kg^{-1}, available phosphorus content of 27.4 mg kg^{-1}, and readily available potassium content of 98 mg kg^{-1}. The county's broad-leaved forests are mainly composed of species such as *Robinia pseudoacacia*, *Quercus mongolica*, *Populus davidiana*, *Betula platyphylla*, and *Prunus sibirica*; while its coniferous forests consist primarily of *Pinus tabuliformis*, *Platycladus orientalis*, and *Larix gmelinii*.

Baishui County is located in the northeastern part of Shaanxi Province, China (109°16'~109°45' E,

35°4'~35°27' N), situated in the transitional zone between the Guanzhong Plain and the Northern Shaanxi Plateau. It borders Chengcheng County, Pucheng County, Tongchuan City, and Yan'an City. The total area of the county is 986 km². The central and southeastern parts of the county are characterized by loess plateau regions, with an average elevation of 834 m, accounting for 54.44% of the total area of the county. The county's terrain is complex, including ridge–mound–gully terrain and plateau–ridge–gully terrain. The average elevation is 877 m, with the lowest elevation at 464 m and the highest at 1544 m. It has a temperate monsoon climate, with an average annual temperature of 11.4°C, and annual precipitation of 577.8 mm. The soil is primarily classified as Huangmeng soil and Baimeng soil. Huangmeng soil is the predominant soil type, covering 32.72% of the soil area, mainly distributed on the gentler plateaus and sloping lands. The county's broadleaved forests are primarily composed of species such as *Robinia pseudoacacia*, *Populus davidiana*, and *Paulownia fortunei*; while its coniferous forests consist mainly of *Pinus tabuliformis* and *Platycladus orientalis*.

Random Forest Algorithm Implementation

The random forest algorithm was utilized to select the optimal combination of spectral bands. This implementation was conducted in the PyCharm integrated development environment (IDE). The following steps outline the process:

(1) Environment Setup

The environment was prepared using the conda package manager. Essential libraries, including GDAL, NumPy, and Rasterio, were installed. Additionally, the scikit-learn library was used for implementing the random forest algorithm.

(2) Data Preparation

Spectral data from coniferous and broadleaf forest images were read and processed. The images were loaded and their spectral bands extracted to form the feature set. The datasets consisted of 6000 coniferous and 8000 broadleaf samples.

(3) Parameter Selection and Optimization

The random forest classifier was configured with 100 trees (n_estimators=100) to balance between computational efficiency and model performance. The maximum depth of the trees was set to 30 to prevent overfitting. Grid search and cross-validation techniques were employed to optimize the number of features considered for splitting at each node. The gini criterion was used to measure the quality of splits, ensuring minimized impurity within nodes.

(4) Model Training and Evaluation

The feature set was divided into training and testing subsets using an 80:20 split ratio. The random forest model was trained on the training data and evaluated on the testing data. Accuracy was assessed, and feature importances were calculated to determine the significance of each spectral band in the classification task.

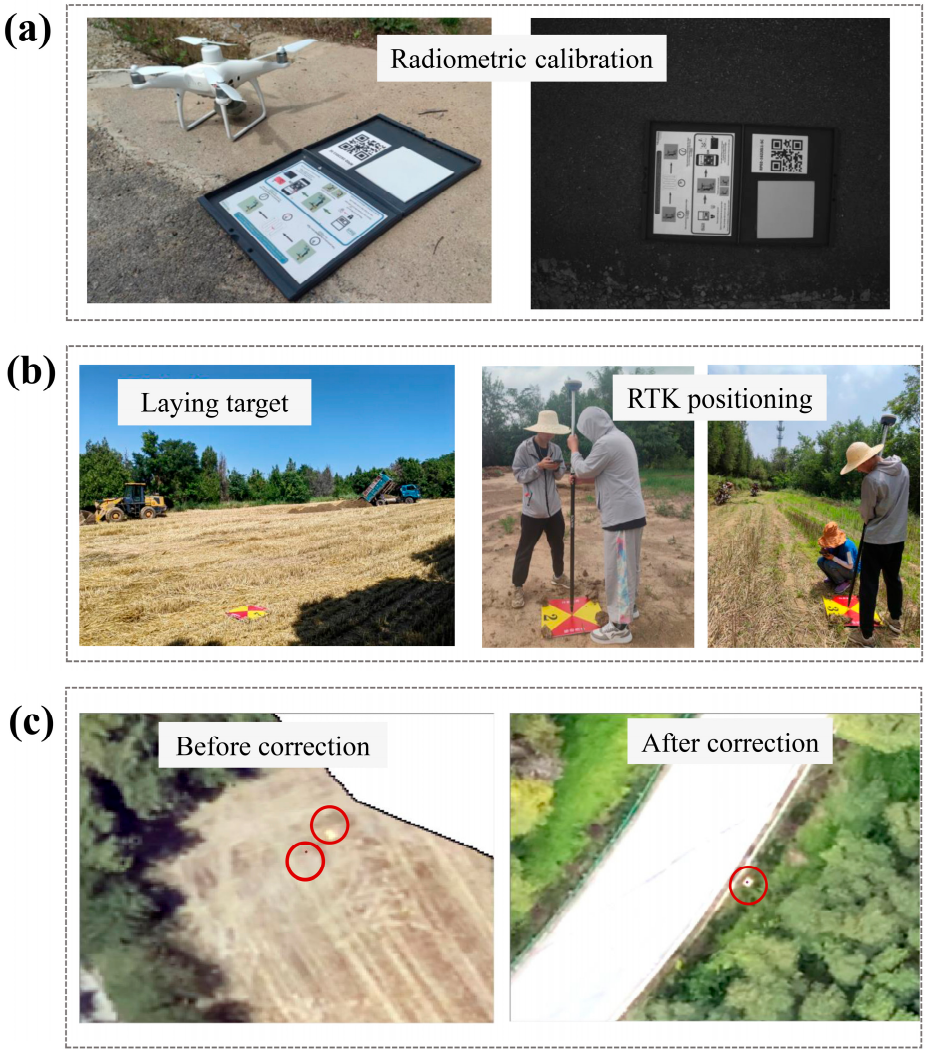


Figure S1. Calibration of UAV multispectral data: (**a**) radiometric calibration; (**b**) target-laying calibration; and (**c**) effect before and after targeting correction.

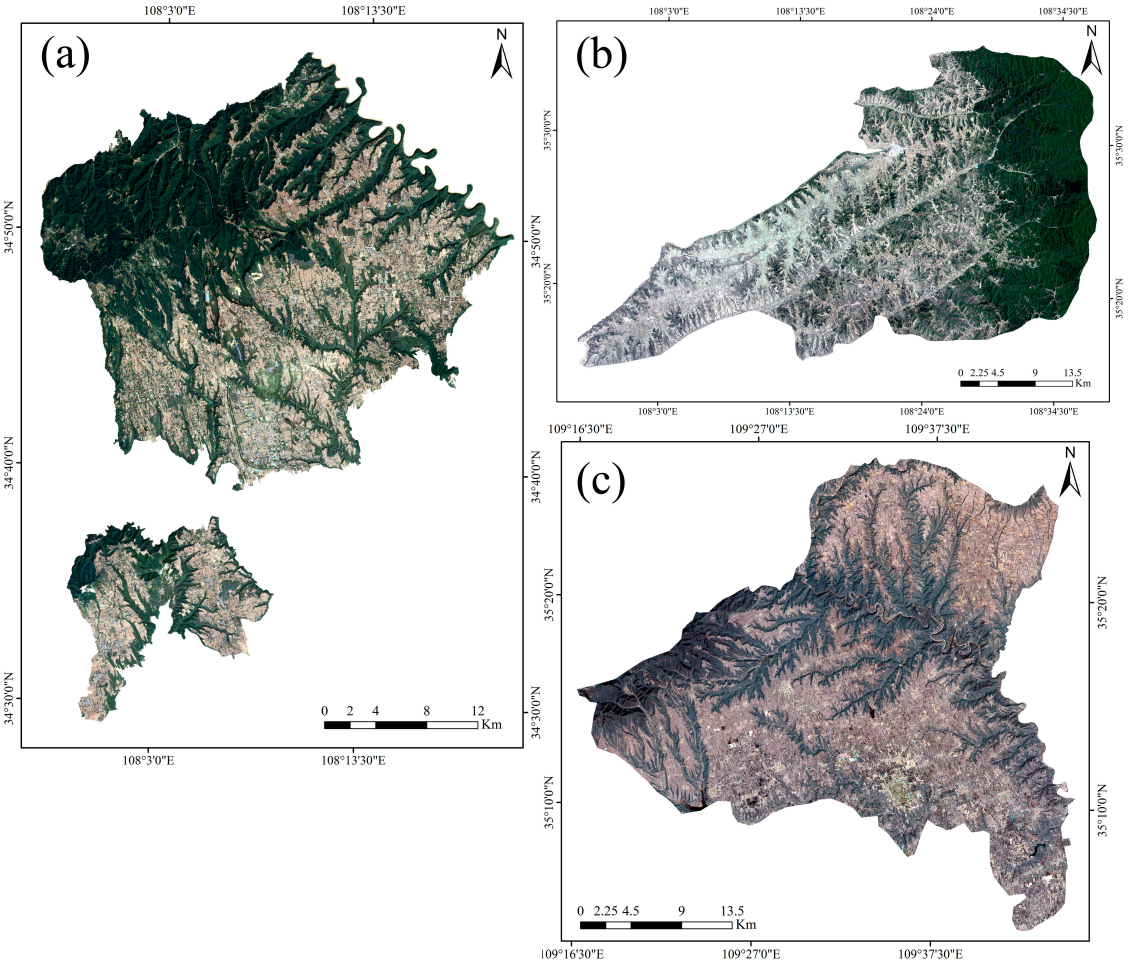


Figure S2. Landsat RGB data with less than 5% cloud cover: (**a**) YS; (**b**) ZN; and (**c**) BS.

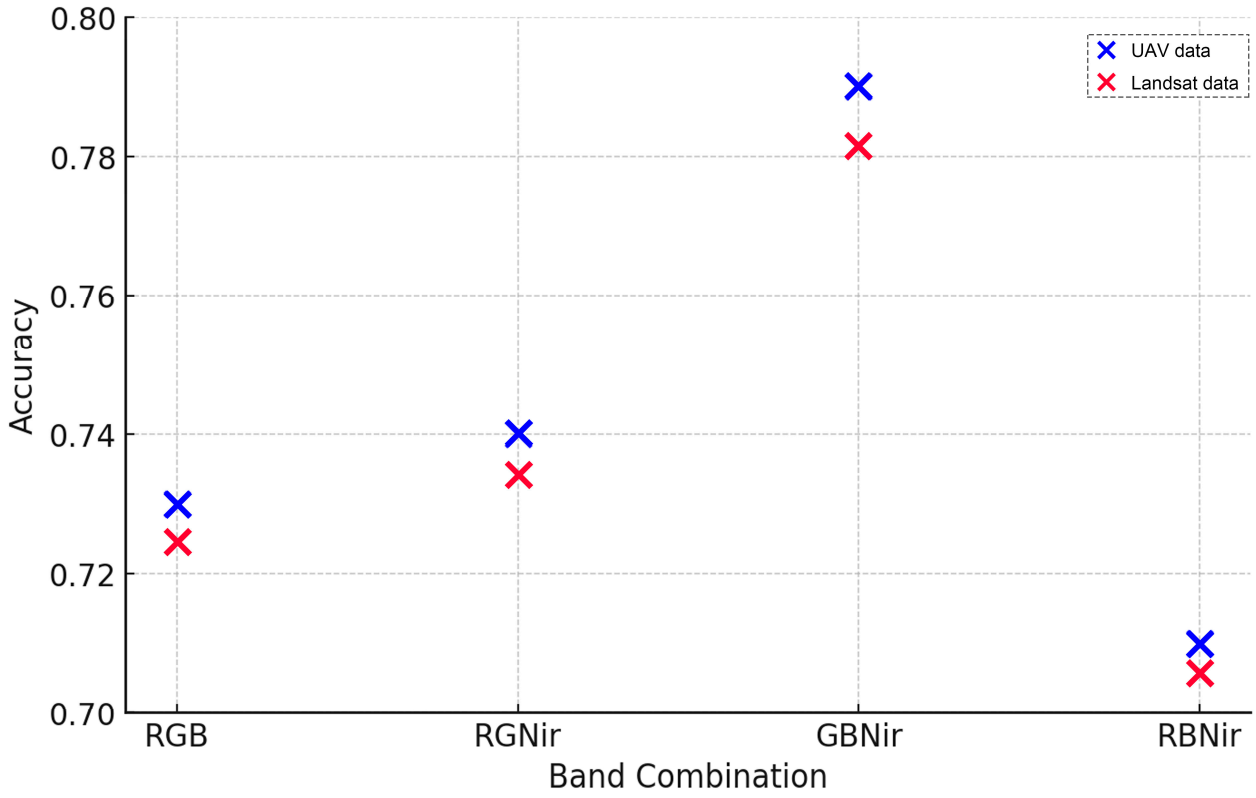


Figure S3. Classification accuracy of different band combinations of Landsat data and UAV data, based on the random forest algorithm.