



THE USE OF NDVI AND NDBI TECHNIQUES FOR MONITORING THE GROWTH OF MAIZE

A CASE STUDY OF MAE PHRIK DISTRICT, LAMPANG PROVINCE.

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Maize are very important to the animal husbandry industry, the demand for domestic maize has increased considerably, the production of maize is insufficient to meet the demand and the volume is uncertain due to the production. With the soil, the weather causes heat to heat from the very quiet and risks having to compete with other economic crops that yield better returns than usual. Mae Prik District, Lampang Province most farmers cultivate maize for animal husbandry. This study was conducted to study the classification of maize acreage areas using the Vegetation Index (NDVI) and the Building Index (NDBI) for classification and comparison. It was correct that both techniques were effective. Different or not according to the growing period, divided into 3 phases: start planting, growing, harvesting.

INTRODUCTION

Maize is considered a very important farm plants. The need of maize in the country tends to be increasing after the animal culture has been expanded since 1992. Nowadays, planting maize is not enough for internal usage. The quantity is inconstant because the production depends on the weather so that there is a risk of drought. The area for planting is in need to compete with other kinds of plants for more income in the following 4-5 years. The Government solves these problems by managing a Project of Maize Planting to be in accordance with academic principle, to reduce the area of planting maize at the inappropriate area and increase the planting area in drought season for maize planting, in order to have enough production for the market demands.



THE PURPOSE OF THIS RTUDY

- 1) apply the techniques of NDVI and ADBI to track the maize planting in 2019, Mae Phrik District, Lampang Province.
- 2) compare the efficiency values (NDVI, NDBI) of the maize planting.

TOOLS AND METHODOLOGY

Normalized Difference Vegetation Index: NDVI

$$NDVI = \frac{(NIR - RED)}{(NIR + RED)}$$

NDVI is Normalized Difference Vegetation Index
NIR is the reflection waves near infrared
RED is red visible light of the wave's reflection

In case of water surface, the reflection value near the infrared is lower than the waves seen in red color by eyes. As a result, NDVI is negative. These values are normally between 0.1 - 0.7 only, as shown in the following Equation

Normalized Difference Built - up Index: NDBI

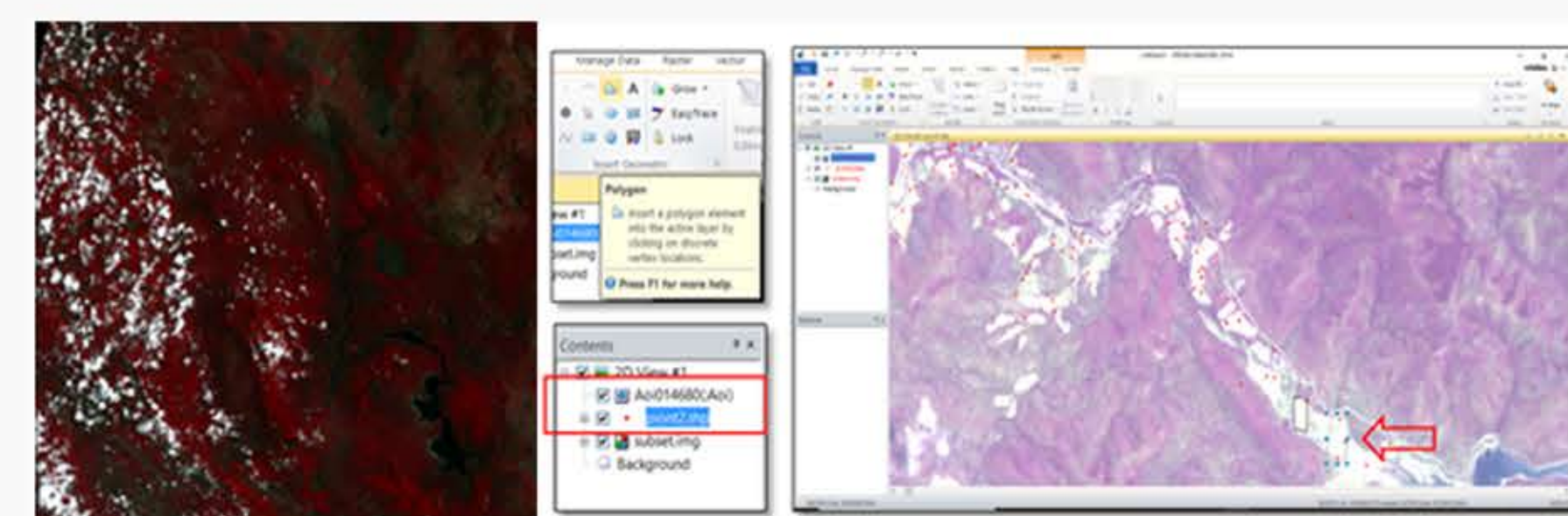
$$NDBI = \frac{(SWIR - NIR)}{(SWIR + NIR)}$$

NDBI means Normalized Difference Built - up Index
SWIR means Short-wavelength infrared
NIR means Near infrared spectroscopy

The Normalized Difference Built - up Index (NDBI) is the analysis of relationship between the surface temperature and types of soil used, or soil covers. The analysis employs the data from the satellite which reflect the built-up objects in both nighttime and daytime, and the temperature of each period.

Research methodology

The researcher employs pictures from Sentinel-2 Satellite during May 2019 - January 2020. The study is classified into 3 phrases as described below. 1) Starting to plant phrase; 2) growing phrase; and 3) harvesting phrase, these phrases employ Normalized Difference Vegetation Index and Normalized Difference Built - up Index to classify the area for planting maize in each identified period.



Pictures from Sentinel-2 satellite during May 2019 - January 2020. Data of maize planting at Mae Prik District, Lampang Province during 2019 - 2020.

RESULT

Comparison of NDVI and NDBI via T-Test of the maize

The study is conducted to classify maize planting area, which the data are from the analysis of NDVI and NDBI of the satellite pictures for three phrases: planting, growing, and harvesting, during 2019 - 2020.

| ประเภท | NDVI | NDBI | t-Test: Paired Two Sample for Means |
|----------------|-------|-------|-------------------------------------|
| ช่วงปลูก | 0.053 | 0.177 | |
| ช่วงโตเต็มตัว | 0.029 | 0.022 | |
| ช่วงเก็บ | 0.242 | 0.242 | |
| ช่วงพักฤดูหนาว | 0.289 | 0.289 | |
| | | | Mean |
| | | | 0.15325 |
| | | | Variance |
| | | | 0.01726425 |
| | | | Observations |
| | | | 4 |
| | | | Pearson Correlation |
| | | | 0.87655392 |
| | | | Hypothesized Mean Difference |
| | | | 0 |
| | | | df |
| | | | 3 |
| | | | t Stat |
| | | | -0.924860248 |
| | | | P(T<=t) one-tail |
| | | | 0.211626649 |
| | | | t Critical one-tail |
| | | | 2.353363435 |
| | | | P(T<=t) two-tail |
| | | | 0.423253298 |
| | | | t Critical two-tail |
| | | | 3.182446305 |
| | | | alpha |
| | | | 0.05 |
| | | | Significance |
| | | | UnSig |

- Major hypothesis: the area of planting maize and other purposes of soil using are not different.
- Minor hypothesis: the area of maize planting and the other purposes of soil using are different.

display the results of the analysis Statistical value at the beginning of cultivation of maize compared to Other land use in hypothesis 2

Result of the test program

The analysis results reveal that the two-tail P(T<=t) value of NDVI and NDBI of maize comparing to the other purposes of planting is 0.42. It is higher than the significant value, 0.05. Therefore, it rejects H1 but accepts H0.

| ประเภท | NDVI | NDBI | t-Test: Paired Two Sample for Means |
|----------------|-------|-------|-------------------------------------|
| ช่วงปลูก | 0.457 | 0.352 | |
| ช่วงโตเต็มตัว | 0.181 | 0.249 | |
| ช่วงเก็บ | 0.508 | 0.352 | |
| ช่วงพักฤดูหนาว | 0.452 | 0.413 | |
| | | | Mean |
| | | | 0.3995 |
| | | | Variance |
| | | | 0.021859 |
| | | | Observations |
| | | | 4 |
| | | | Pearson Correlation |
| | | | 0.851838039 |
| | | | Hypothesized Mean Difference |
| | | | 0 |
| | | | df |
| | | | 3 |
| | | | t Stat |
| | | | 1.199643441 |
| | | | P(T<=t) one-tail |
| | | | 0.1581909 |
| | | | t Critical one-tail |
| | | | 2.353363435 |
| | | | P(T<=t) two-tail |
| | | | 0.3163818 |
| | | | t Critical two-tail |
| | | | 3.182446305 |
| | | | alpha |
| | | | 0.05 |
| | | | Significance |
| | | | UnSig |

This means that NDVI and NDBI of maize are not significantly different from other kinds of planting.

DISCUSSION AND CONCLUSION

The adaptation of Sentinel-2 Satellite data to study the area of maize planting in 2020, at Mae Prik District, Lampang Province, with the techniques NDVI and NDBI. The Sentinel-2 Satellite includes the measurement tool called Multispectral Instrument (MSI), which consists of 12 bands and the analysis of NDVI and NDBI analysis from the Satellite.

$$NDVI = \frac{(NIR-Red)}{(NIR+Red)}$$

$$\text{Sentinel-2} : \frac{(Band8-Band4)}{(Band8+Band4)}$$

$$NDBI = \frac{(R1650-R830)}{(R1650+R830)}$$

$$\text{Sentinel-2} : \frac{(Band11-Band8)}{(Band11+Band8)}$$

In conclusion, the area of maize planting at Mae Prik District, Lampang Province is obviously not different from other purposes of soil using in plantation.