

DETERMINATION SOIL MOISTURE IN THE AREA OF MONGOLIA

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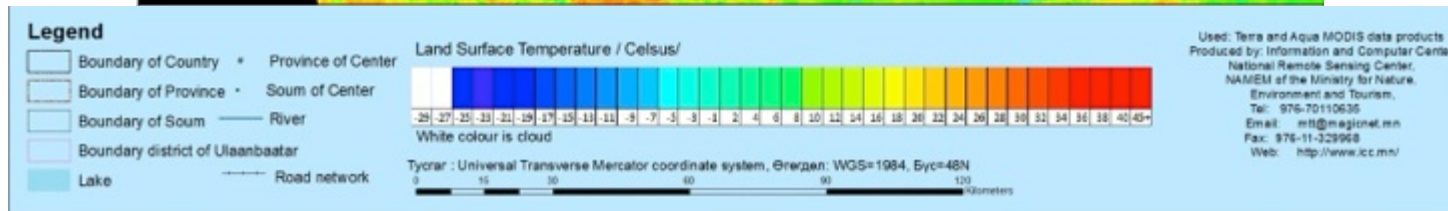
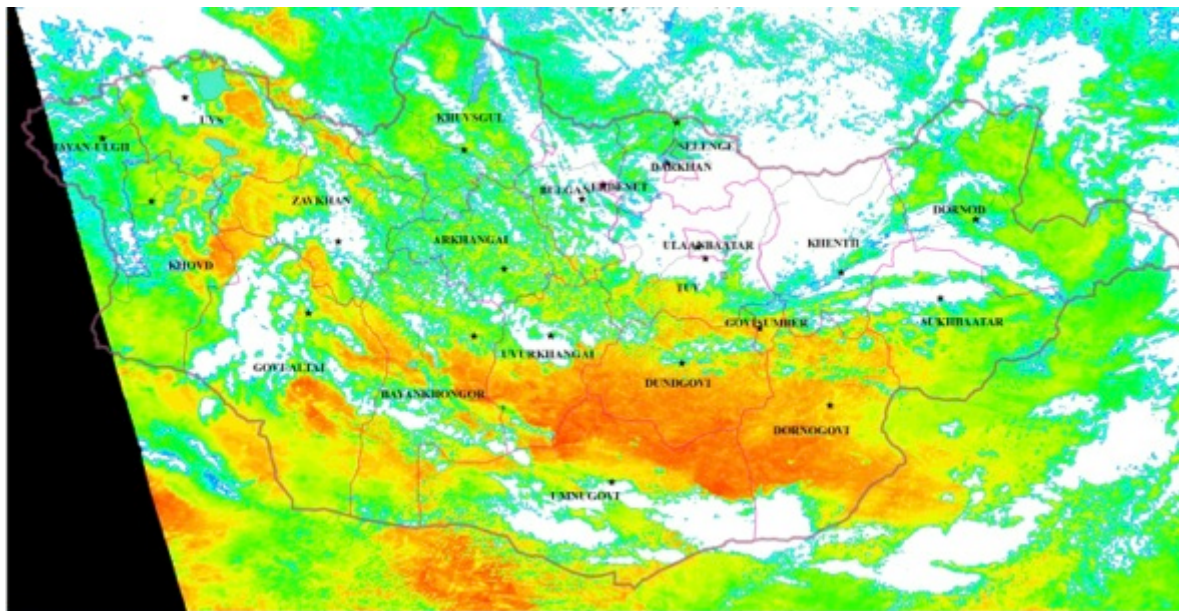
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INTRODUCTION

- The main management basis for developing the agriculture field, especially the cultivation field, of Mongolia sustainably and properly is to pay attention to permanent control on soil moisture, amount of the cultivation area and harvest process thus there is full possibility to implement this control using the modern special remote sensing.



OBJECTIVES AND DATA

The modified soil adjusted vegetation indexes (MSAVI) which depends on the normalized different vegetation index (NDVI) and soil in the arable land of the target survey region in Bornuur soum of Tuv province were estimated using the data taken by the LANDSAT satellite and the plant mapping was drawn.

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graph LR; A[To determine NDVI and MSAVI using Spectroradiometer] --> D[Correlation]; B[To determine NDVI and MSAVI using LANDSAT data] --> D; C[To determine soil moisture using traditional method] --> D;
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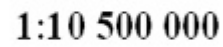
To determine NDVI and MSAVI using Spectroradiometer

To determine NDVI and MSAVI using LANDSAT data

To determine soil moisture using traditional method

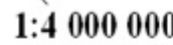
Correlation





elevation

- 644 - 855
 855,0000001 - 1 000
 1 000,0000001 - 1 132
 1 132,0000001 - 1 258
 1 258,0000001 - 1 375
 1 375,0000001 - 1 489
 1 489,0000001 - 1 626
 1 626,0000001 - 1 825
 1 825,0000001 - 2 358
 pathrow



METHODOLOGY

- “Normalized Different Vegetation Index” is formulated by using the data of LANDSAT TM satellite measured at similar colors evoked by light consisting predominantly of the longest spectral wavelengths

$$NDVI = (NIR - Red) / (NIR + Red)$$

- Developed the advanced version which is possible to be used for the image data by having determined the correlation of the factor in vegetation density and soil, “Modified Soil Adjusted Vegetation Index” or MSAVI was formulated as shown below:

$$MSAVI = \left[2NIR + 1 - \sqrt{(2NIR + 1)^2 - 8(NIR - Red) / 2} \right]$$

- Soil moisture sample was taken from the 0-60 sm depth soil surface layer, three splits then conserved into preliminarily numbered box against evaporation, delivered to laboratory and determined the soil moisture by the standard methodology.

$$W = \frac{a \cdot 100}{b}$$

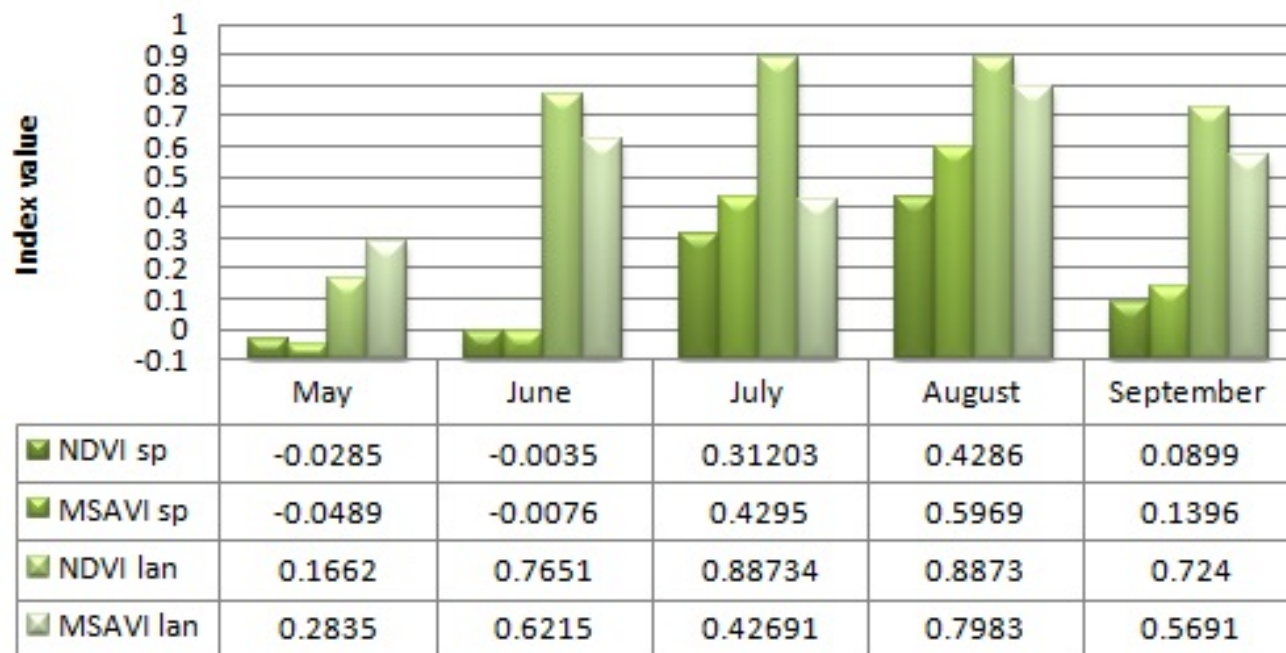
W - soil moisture of the crop land /
a - weight of evaporated water /gr/
B - absolute dry soil weight /gr/



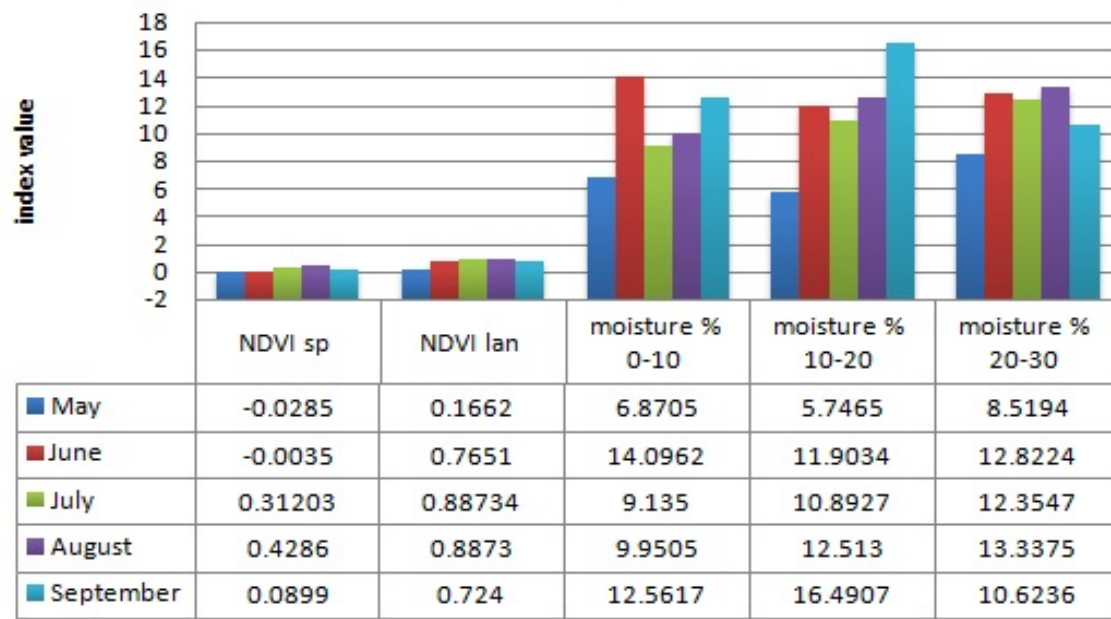
Analyzes

Oat								
No	Field name	NDVI sp	MSAVI sp	NDVI lan	MSAVI lan	moisture % 0-10	moisture % 10-20	moisture % 20-30
1	May	-0.029	-0.0489	0.1662	0.2835	6.8705	5.7465	8.5194
2	June	-0.004	-0.0076	0.7651	0.6215	14.0962	11.9034	12.8224
3	July	0.312	0.4295	0.88734	0.42691	9.135	10.8927	12.3547
4	August	0.4286	0.5969	0.8873	0.7983	9.9505	12.513	13.3375
5	September	0.0899	0.1396	0.724	0.5691	12.5617	16.4907	10.6236

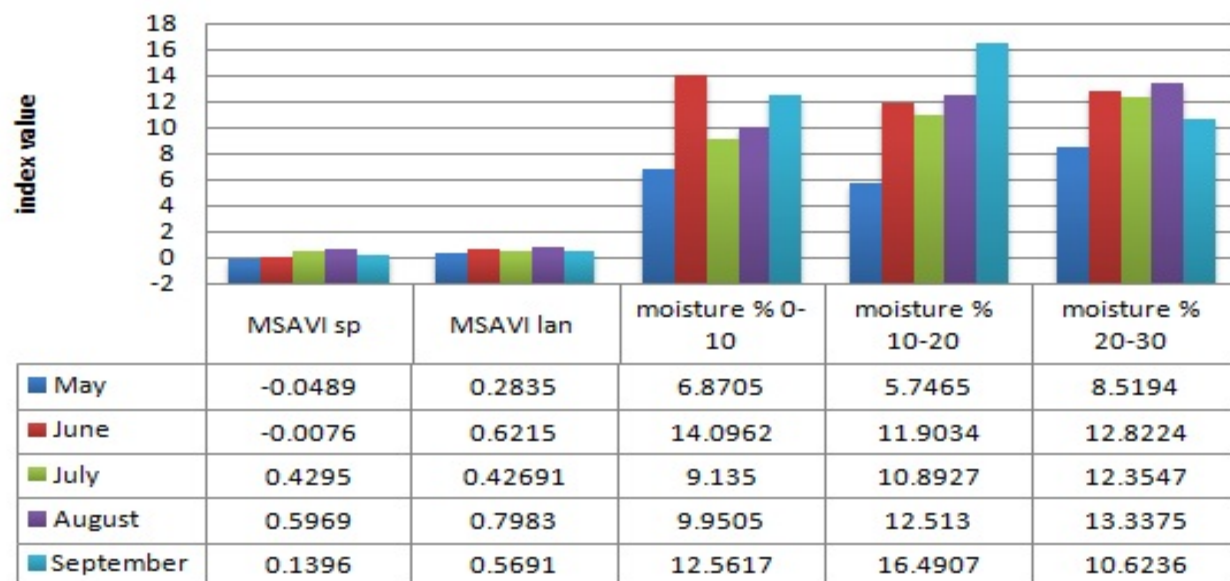
Oat area



Oat



Oat



- The index in May is lower or 0.1 so the vegetation plant is in sprouting stage after having cultivated only. It proves that there is not vegetation cover. But the index transfers to 0.798 in August, green vegetation mass cover the whole site.
- In September it decreased to 0.5691, this indicates that the vegetation maturity is fully grown, vegetation mass begins turning to yellow so the index value is down. The soil moisture reaches its maximum amount in September; the plants accumulated the reserve moisture during their growth



RESULTS AND DISCUSSION

- August, which has high correlation to the normalized different vegetation index (NDVI), is the most effective period for vegetation growth and can give more reflection.
 - Vegetation and moisture results in August indicate that the vegetation development stage is more dependable on moisture since plant growing period.
 - It is possible to carry out survey of the crops of Mongolia and to do mapping using the vegetation index.
 - In future to determine the factors which might influence to crops of the arable land using the data of the satellites which have high identifying capability.
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**Thank you for APN
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