



## COMPARISON OF VEGETATION INDEX WITH AVERAGE SITUATION (SPOT-VEGETATION)

### 1. OUTLINE

|   |  |            |          |
|---|--|------------|----------|
| <b>• Information of spatial data product specification</b>  |  |            |          |
| <b>Title</b>  | Specifications for the relative difference of an index, calculated between the actual image and the image of the same period but from the historical year. The difference is derived from data originating from the SPOT-VEGETATION sensor |            |          |
| <b>Date</b>   | 22/10/2008   |            |          |
| <b>Implementer</b>  | ENDELEO project<br>VITO, Dr. Else Swinnen  |            |          |
| <b>Language</b>   | English  |            |          |
| <b>Engineering field</b>  | Environmental monitoring   |            |          |
| <b>Document data format</b>   | PDF  |            |          |
| <b>• Purpose</b>  |  |            |          |
| <p>The relative difference of an index with respect to the 'historical year' or 'long term average' is used to assess the difference between the vegetation condition at a certain time and the vegetation condition at the same time in average conditions. The relative difference is calculated as the percentage difference of the actual condition relative to the mean condition for that period since 1998 up till the most recent year.</p> <p>It is calculated as :</p> $\text{relative difference} = (\text{present year} - \text{long term average}) / \text{long term average}$ $\text{historical year} = [1998 + \dots + (\text{current year} - 2) + (\text{current year} - 1)] / \text{number of years}$ <p>It can be calculated on any index.. In the frame of the ENDELEO project, the difference is calculated based on the NDVI and on the DMP.</p> <p>Based on the NDVI, it expresses the relative difference in vegetation health and density for a period in the current year compared to the average condition for that period in the previous years. Based on the DMP, it expresses the relative difference in vegetation growth for a period in the current year compared to the average condition for that period in the previous years.</p> |  |            |          |
| <b>• Spatial extent</b>   |  |            |          |
| <b>ULX</b>  | -113550m   | <b>LRX</b> | 834381m  |
| <b>ULY</b>  | 10556023m  | <b>LRV</b> | 9444577m |
| Kenya   |  |            |          |
| <b>• Temporal extent</b>  |  |            |          |
| April 1998 – present; update each 10 days.  |  |            |          |
| <b>• Reference standards</b>  |  |            |          |
|   |  |            |          |
| <b>• Terminology and definitions</b>  |  |            |          |
| The following technical terms and definitions are used with this data product specification:<br>Kenya profile for geographic standards (KPGIS) ver. 1   |  |            |          |
| <b>• Abbreviations</b>  |  |            |          |
| DMP: Dry Matter Productivity<br>NDVI: Normalized Difference Vegetation Index<br>ULX: Upper left X coordinate<br>ULY: Upper left Y coordinate  |  |            |          |



LRX: lower right X coordinate  
 LRY: lower right Y coordinate

## 2. DOMAIN OF VALIDITY

|  |
|--|
| <ul style="list-style-type: none"> <li>• <b>Domain of validity identification</b></li> </ul>                           |
| Data product specification of the relative difference to the historical year of NDVI or DMP for the territory of Kenya |
| <ul style="list-style-type: none"> <li>• <b>Hierarchical level</b></li> </ul>  |
| Dataset  |

## 3. DATA PRODUCT IDENTIFICATION

|   |
|---|
| <ul style="list-style-type: none"> <li>• <b>Name of spatial data product</b></li> </ul>   |
| The relative difference to the historical year of NDVI or DMP derived from SPOT-VEGETATION  |
| <ul style="list-style-type: none"> <li>• <b>Date</b></li> </ul>   |
| Produced each 10 days since April 1998, update still ongoing  |
| <ul style="list-style-type: none"> <li>• <b>Contact Information</b></li> </ul>  |
| Ir. Josefien Delrue<br>VITO<br>Boeretang 200<br>B-2400 Mol<br>Belgium<br>e-mail: <a href="mailto:josefien.delrue@vito.be">josefien.delrue@vito.be</a> |
| <ul style="list-style-type: none"> <li>• <b>Geographical description</b></li> </ul>   |
| The territory of Kenya  |

## 4. DATA CONTENTS AND STRUCTURE

|   |
|---|
| <ul style="list-style-type: none"> <li>• <b>Application schema class diagram</b></li> </ul> |
| Not applicable  |

|  |   |                             |                            |
|--|---|-----------------------------|----------------------------|
| <ul style="list-style-type: none"> <li>• <b>Application schema class document</b></li> </ul> |   |                             |                            |
| <b>Feature</b>   | Image   |                             |                            |
| <b>Definition</b>  | The relative difference to the historical year of NDVI or DMP |                             |                            |
| <b>Parent class</b>  | None  |                             |                            |
| <b>Abstract/Concrete</b>   | Abstract  |                             |                            |
| <b>Attributes</b>  |   |                             |                            |
| <b>Name</b>  | <b>Definition</b>   | <b>Collection condition</b> | <b>Domain</b>              |
|  | -   | -                           | Within geographical extent |

|                          |   |                             |                            |
|--------------------------|---|-----------------------------|----------------------------|
| <b>Feature</b>           | Image   |                             |                            |
| <b>Definition</b>        | The relative difference to the historical year of NDVI or DMP |                             |                            |
| <b>Parent class</b>      | -   |                             |                            |
| <b>Abstract/Concrete</b> | Concrete  |                             |                            |
| <b>Attributes</b>        |   |                             |                            |
| <b>Name</b>              | <b>Definition</b>   | <b>Collection condition</b> | <b>Domain</b>              |
| Data format: GeoTiff     | -   | -                           | Within Geographical extent |



## 5. REFERENCE SYSTEM

|  |  |
|--|--|
| <b>• Spatial reference system</b>                            |  |
| <b>Compound coordinates reference system</b>                 |  |
| <b>Identical name</b>  | Clarke 1880, Mean sea level (Mombasa), UTM zone 37 |
| <b>Coordinates reference system 1 (Horizontal component)</b> |  |
| <b>Identical name</b>  | Clarke 1880, UTM zone 37                           |
| <b>Domain of validity</b>                                    | Nairobi  |
| <b>Datum</b>   |  |
| <b>Identical name</b>  | New (1960) Arc                                     |
| <b>Type</b>  | Geodetic   |
| <b>Fixed origin</b>  | 500,000m Easting, 10,000,000m Northing             |
| <b>Ellipsoid</b>   |  |
| <b>Identical name</b>  | Clarke 1880, (Modified)                            |
| <b>Semi major axis</b>                                       | 6378249.145  |
| <b>Inverse flattening</b>                                    | 1 / 293.465  |
| <b>Prime meridian</b>  |  |
| <b>Identical name</b>  | Greenwich meridian                                 |
| <b>Greenwich longitude</b>                                   | 39deg 00min East of Greenwich                      |
| <b>Coordinate system</b>                                     |  |
| <b>Identical name</b>  | UTM zone 37  |
| <b>Type</b>  | Projected  |
| <b>Number of dimensions</b>                                  | 2  |
| <b>Coordinate axis</b>                                       |  |
| <b>Name</b>  | Northing   |
| <b>Direction</b>   | Positive to true north at origin                   |
| <b>Unit identifier</b>                                       | Meter  |
| <b>Coordinate axis</b>                                       |  |
| <b>Name</b>  | Easting  |
| <b>Direction</b>   | Positive to true east at origin                    |
| <b>Unit identifier</b>                                       | Meter  |

|  |
|--|
| <b>• Temporal reference system</b>   |
| A new image is produced on the 2 <sup>nd</sup> , the 12 <sup>th</sup> and the 22 <sup>nd</sup> of each month. Each image represents the maximum value of the relative difference to the historical year of NDVI or DMP within the periods 1-10, 11-20 and 21-end of the month. |

## 6. DATA QUALITY

|  |                                      |  |
|--|--------------------------------------|--|
| <b>• Quality requirements and quality evaluation procedure</b> |                                      |  |
| <b>COMPLETENESS: not applicable</b>                            |                                      |  |
| <b>LOGICAL CONSISTENCY</b>                                     |                                      |  |
| <b>(1) Formal consistency</b>                                  |                                      |  |
| <b>Domain of validity</b>                                      | <b>Data quality evaluation index</b> |  |
| All imagery  | <b>Name</b>                          | Omission percentage  |
|  | <b>Definition</b>                    | Data can be opened by ArcGIS as GeoTiff format with no opening error |
|  | <b>Quality conformity level</b>      | Error: 0%  |



| (2) Domain consistency   |                               |   |
|--|-------------------------------|---|
| Domain of validity   | Data quality evaluation index |   |
| All imagery  | Name                          | Geographical extent error percentage          |
|  | Definition                    | Check dataset is only inside map sheet border |
|  | Quality conformity level      | Geographical extent error: 0%                 |
| POSITIONAL ACCURACY  |                               |   |
| (1) Gridded data positional accuracy   |                               |   |
| Domain of validity   | Data quality evaluation index |   |
|  | Name                          | Gridded data positional accuracy              |
|  | Definition                    |   |
|  | Quality conformity level      | 300m  |
| Quality evaluation procedure   |                               |   |
| The SPOT-VEGETATION image quality center (QIV) ensures the data quality of the input data for the relative difference to the previous year of NDVI or DMP. |                               |   |
| <b>TEMPORAL ACCURACY: not adopted</b>  |                               |   |
| <b>THEMATIC ACCURACY: not applicable</b>   |                               |   |

## 7. DATA PRODUCT DISTRIBUTION

| Distribution format information   |
|---|
| • <i>Format name</i>  |
| GeoTiff   |
| • <i>Encoding rules</i>   |
| <a href="http://trac.osgeo.org/geotiff/">http://trac.osgeo.org/geotiff/</a>                                   |
| • <i>Language encoding method</i>   |
| UTF-8   |
| • <i>Language</i>   |
| English   |
| Distribution media information  |
| • <i>Unit of product</i>  |
| Image of the relative difference to the historical year of NDVI or DMP derived from SPOT-VEGETATION for Kenya |
| • <i>Media name</i>   |
| FTP   |

## 8. METADATA

|  |
|--|
| • <i>Direction of metadata creation</i>                          |
| Metadata must be produced together with spatial data             |
| • <i>Format of metadata</i>                                      |
| KSISO19115 metadata is adopted                                   |
| • <i>Indication of metadata elements</i>                         |
|  |
| • <i>Direction of unit of metadata creation</i>                  |
| Metadata is provided for each spatial data product dataset unit. |

## 9. OTHERS

|                             |
|-----------------------------|
| • <i>Spatial resolution</i> |
|-----------------------------|



1km x 1km

• **Values**

Physical values of the relative difference to the historical year of NDVI or DMP range between -1.0 and 1.0. The indicator is unitless; when multiplied by 100 it expresses percentages (%).

**Scaling of the values**

The relative difference to the historical year of NDVI or DMP values are rescaled such that they only occupy a byte. The physical range -1.0 to 1.0 is rescaled to the range 0 – 250, using the following formula:

$$\text{Image value} = (\text{physical value} + 1.25) * 100$$

To convert the image values back to physical values, the following formula is used:

$$\text{Physical value} = \text{image value} * 0.01 - 1.25$$

• **Flags**

The image value 255 corresponds to a flag.

This can indicate missing data, cloud observations, or water body. The status map that is delivered with the SPOT-VEGETATION data is used to identify the missing data and clouds. These pixels are then flagged directly in the VPI image.

• **Interpretation**

The relative difference to the historical year of NDVI or DMP is used to qualitatively compare the vegetation development in a certain period of the year with the average for same period in the previous year (since April 1998). The 'historical year' or 'long term average' reflects the condition that normally occurs and is considered as a reference. Calculating the difference between the current vegetation condition and the long term average can reveal anomalies.

If the relative difference is based on the NDVI, it is possibly linked to a difference in vegetation health and density between years. If the relative difference is based on the DMP, it is possibly linked to a difference in vegetation growth rate as compared to the average of the same period during the past year.

The values vary between -1.0 and 1.0. If the value 0 is obtained, then there is no difference in the NDVI or DMP compared to an average year. If a negative value is obtained, then the vegetation health and density or growth rate are better compared to a normal situation. If a positive value is obtained, then the vegetation health and density or growth rate was better during the average year in the past.

• **Example**

## NDVI relative difference to historical year

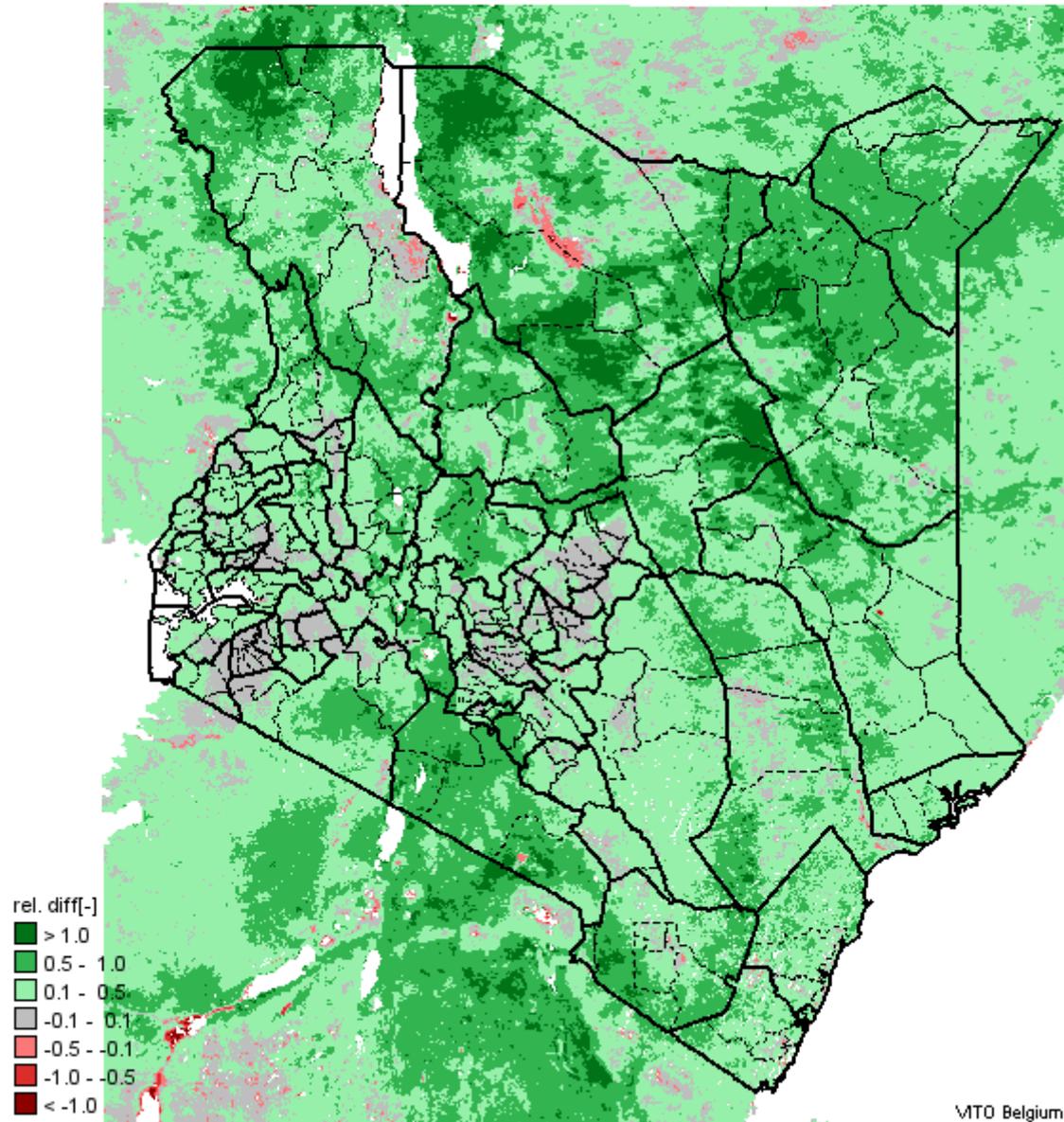
Kenya

Normalised Difference Vegetation Index (NDVI)

from: 01 January 2007

SPOT-VEGETATION

Projection: UTM 37S (Arc 1960)



VITO Belgium

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- *More information*



SPOT-VEGETATION mission

<http://www.spot-vegetation.com>

<http://www.vgt.vito.be>

SPOT-VEGETATION data for Africa

<http://www.vgt4africa.org>

ENDELEO project

<http://dfwm.ugent.be/endeleo>

<http://endeleo.vgt.vito.be>

Related projects

<http://www.gmfs.info>

<http://www.marsop.info/>