



VEGETATION HEALTH AND DENSITY (NDVI) SPOT-VEGETATION

1. OUTLINE

• Information of spatial data product specification			
Title	Specifications for the NDVI, also called 'Vegetation health and density' derived from SPOT-VEGETATION sensor		
Date	22/10/2008		
Implementer	ENDELEO project VITO, Dr. Else Swinnen		
Language	English		
Engineering field	Environmental monitoring		
Document data format	PDF		
• Purpose			
<p>NDVI, or Normalised Difference Vegetation Index, is the scientific name for the 'Vegetation health and density'. It is a dimensionless index that is indicative for vegetation photosynthetic activity.</p> <p>Healthy vegetation absorbs most of the incident visible light (emitted by the Sun), and reflects a large portion of the near-infrared light. Unhealthy (non-green) or sparse vegetation reflects more visible light and less near-infrared light. This difference in reflectance for different wavelengths, allows remote sensing instruments to measure the relative presence (or absence) of healthy, green vegetation, by simply measuring and comparing the reflectances. Typically, this is done by evaluating the following formula:</p> $NDVI = (NIR - RED) / (NIR + RED)$ <p>where NIR is the near-infrared reflectance and RED is the reflectance of red light.</p>			
• Spatial extent			
ULX	-113550m	LRX	834381m
ULY	10556023m	LRY	9444577m
Kenya			
• Temporal extent			
April 1998 – present; update each 10 days.			
• Reference standards			
• Terminology and definitions			
The following technical terms and definitions are used with this data product specification: Kenya profile for geographic standards (KPGIS) ver. 1			
• Abbreviations			
<p>NDVI: Normalized Difference Vegetation Index ULX: Upper left X coordinate ULY: Upper left Y coordinate LRX: lower right X coordinate LRY: lower right Y coordinate TOC: Top of Canopy NIR: Near infrared</p>			

2. DOMAIN OF VALIDITY

• Domain of validity identification
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Data product specification of the NDVI for the territory of Kenya
• Hierarchical level
Dataset

3. DATA PRODUCT IDENTIFICATION

• Name of spatial data product
NDVI from SPOT-VEGETATION
• Date
Produced each 10 days since April 1998, update still ongoing
• Contact Information
Ir. Josefien Delrue VITO Boeretang 200 B-2400 Mol Belgium e-mail: josefien.delrue@vito.be
• Geographical description
The territory of Kenya

4. DATA CONTENTS AND STRUCTURE

• Application schema class diagram
Not applicable

• Application schema class document			
Feature	Image		
Definition	NDVI		
Parent class	None		
Abstract/Concrete	Abstract		
Attributes			
Name	Definition	Collection condition	Domain
	-	-	Within geographical extent

Feature	Image		
Definition	NDVI		
Parent class	-		
Abstract/Concrete	Concrete		
Attributes			
Name	Definition	Collection condition	Domain
Data format: GeoTiff	-	-	Within Geographical extent

5. REFERENCE SYSTEM

• Spatial reference system	
Compound coordinates reference system	
Identical name	Clarke 1880, Mean sea level (Mombasa), UTM zone 37
Coordinates reference system 1 (Horizontal component)	



Identical name	Clarke 1880, UTM zone 37
Domain of validity	Nairobi
Datum	
Identical name	New (1960) Arc
Type	Geodetic
Fixed origin	500,000m Easting, 10,000,000m Northing
Ellipsoid	
Identical name	Clarke 1880, (Modified)
Semi major axis	6378249.145
Inverse flattening	1 / 293.465
Prime meridian	
Identical name	Greenwich meridian
Greenwich longitude	39deg 00min East of Greenwich
Coordinate system	
Identical name	UTM zone 37
Type	Projected
Number of dimensions	2
Coordinate axis	
Name	Northing
Direction	Positive to true north at origin
Unit identifier	Meter
Coordinate axis	
Name	Easting
Direction	Positive to true east at origin
Unit identifier	Meter

• **Temporal reference system**
 A new image is produced on the 2nd, the 12th and the 22nd of each month. Each image represents the maximum value of the NDVI within the periods 1-10, 11-20 and 21-end of the month.

6. DATA QUALITY

• Quality requirements and quality evaluation procedure		
COMPLETENESS: not applicable		
LOGICAL CONSISTENCY		
(1) Formal consistency		
Domain of validity	Data quality evaluation index	
All imagery	Name	Omission percentage
	Definition	Data can be opened by ArcGIS as GeoTiff format with no opening error
	Quality conformity level	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.		
TEMPORAL ACCURACY: not adopted		
THEMATIC ACCURACY: not applicable		

7. DATA PRODUCT DISTRIBUTION

Distribution format information
• <i>Format name</i>
GeoTiff
• <i>Encoding rules</i>
http://trac.osgeo.org/geotiff/
• <i>Language encoding method</i>
UTF-8
• <i>Language</i>
English
Distribution media information
• <i>Unit of product</i>
Image of the NDVI 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

• <i>Values</i>
Physical values of NDVI range between -1.0 and 1.0. The index is unitless.
Scaling of the values
The NDVI values are rescaled such that they only occupy a byte. The physical range -0.1 to 0.9 is rescaled to the range 0 – 250, using the following formula: $\text{Image value} = (\text{physical value} + 0.1) * 250$
To convert the image values back to physical values, the following formula is used: $\text{Physical value} = \text{image value} * 0.004 - 0.1$



- **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**

To identify the 'Vegetation health and density', the NDVI can be used.

The physical NDVI values are between -0.1 and 0.92, where higher values indicate denser and healthier (higher green density) vegetation. NDVI values of 0.1 and below, for instance, typically correspond to areas with little to no vegetation (rocks, ice, desert). Moderate values (around 0.2 and 0.3) correspond to shrub and grasslands and high values (0.5 and above) typically correspond to dense vegetation like rainforests. The NDVI of MODIS is generally slightly higher than that of VGT for the same surface conditions.

This implies that, over the course of a growing season, we first see a steady increase in the NDVI values as the young, green vegetation grow (the growth makes the surface appear more and more green, which is reflected by the NDVI). This increase reaches a maximum value just before it drops suddenly at harvest time or when the plants die naturally, which can easily be explained by the harvesting of the healthy, green plants or their senescence, which makes the surface appear less green. This simple example shows how NDVI can be a very interesting tool for monitoring of agricultural crops.

- **Example**

NDVI

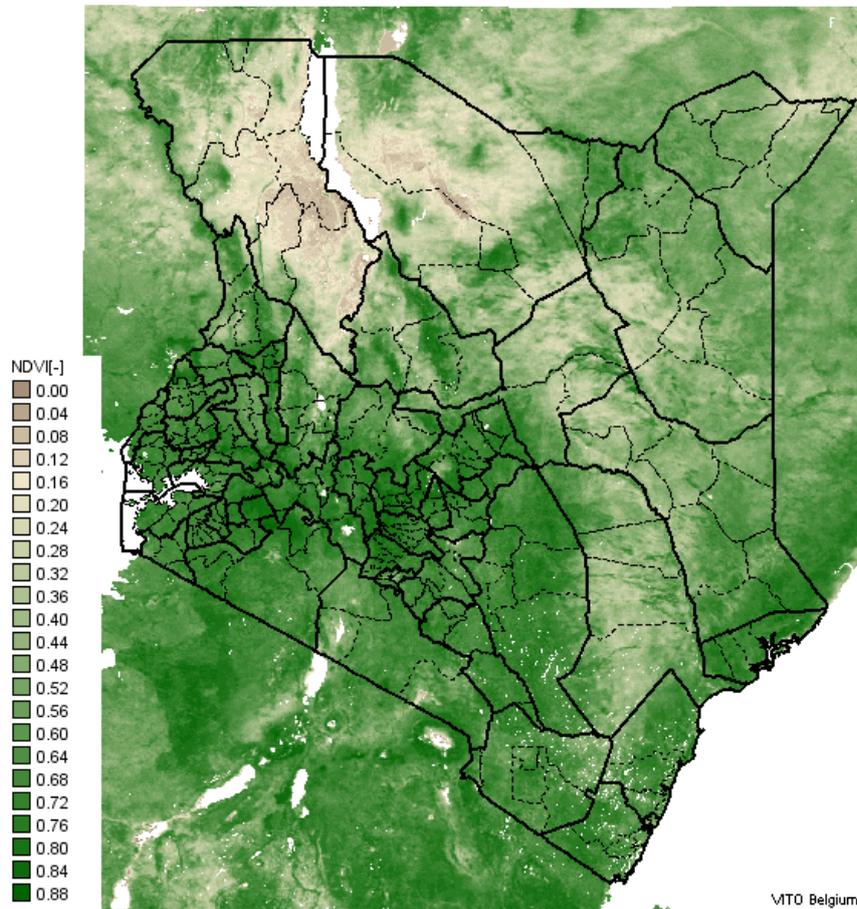
Kenya

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/>