

Crop monitoring using ESVI (Enhanced Sar Vegetation Index) from Cropix

Introduction

Crop monitoring based on satellite images is very useful to oversee the entire field, since doing walking through the field is a cumbersome task and human beings cannot oversee the crop from a ground based perspective.

The use of optical images has spread in recent years, but in many regions we find it difficult to make permanent corrections to the indices obtained due to the influence of clouds, smoke and all the atmospheric interferences that occur during the cultivation period. Even with a high frequency of image acquisition, the growing season of summer crops tends to coincide with periods of rain that generate frequent cloud cover.

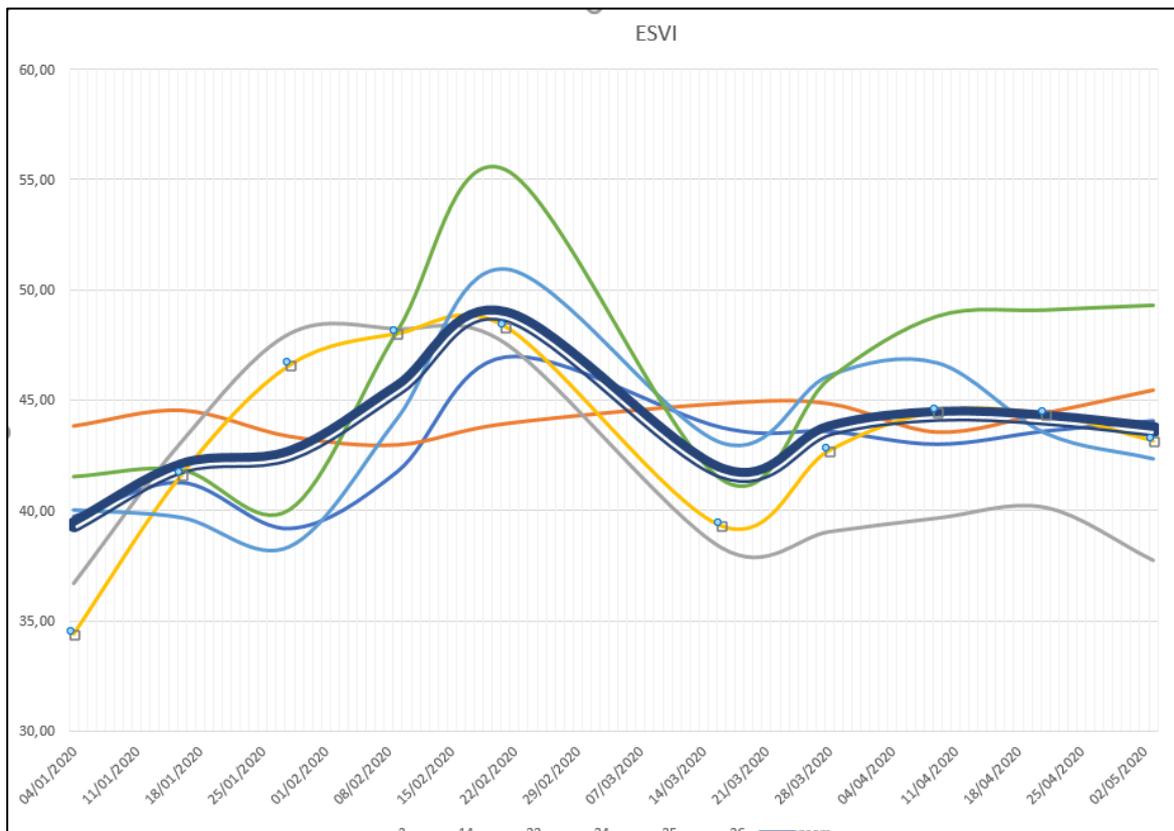
The development of vegetation indices from radar images allows to have a series of high quality data since the characteristic of the sensor (active) means that there is no relevant atmospheric interference observed.

ESVI is a vegetation index that has a high correlation with fresh biomass and it has already been validated for numerous environments. The values of this index range from 1 - 100.

Crop monitoring

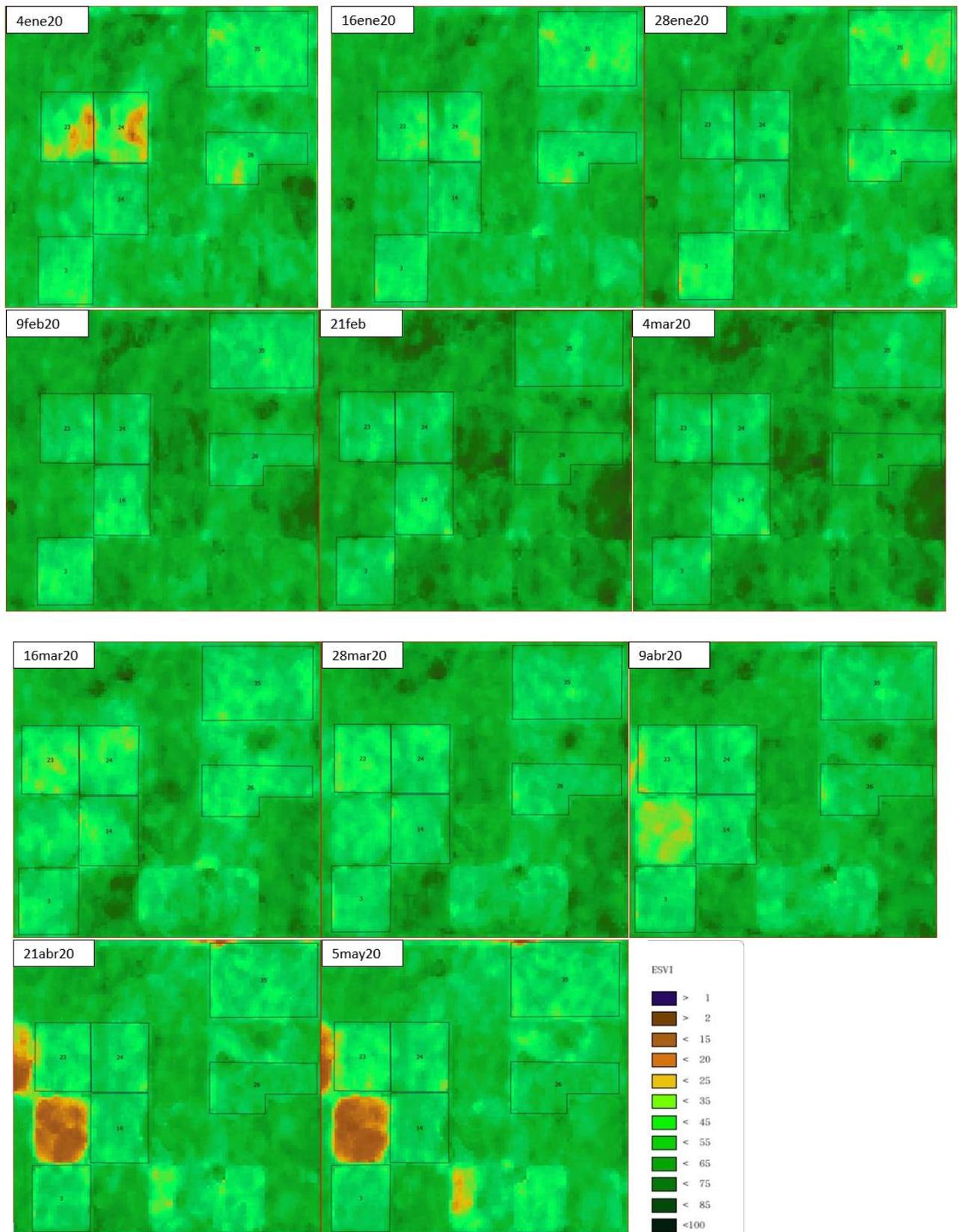
1) Campaign 2019-2020

ESVI values were calculated for 6 sorghum plots sown in November 2019 in the Logroño district, prov. of Santa Fe, Argentina, from the beginning of 2020 to the end of April of the same year.



In the graph you can see the evolution of the different plots and in the thick black line the average of all the plots.

Time-series ESVI

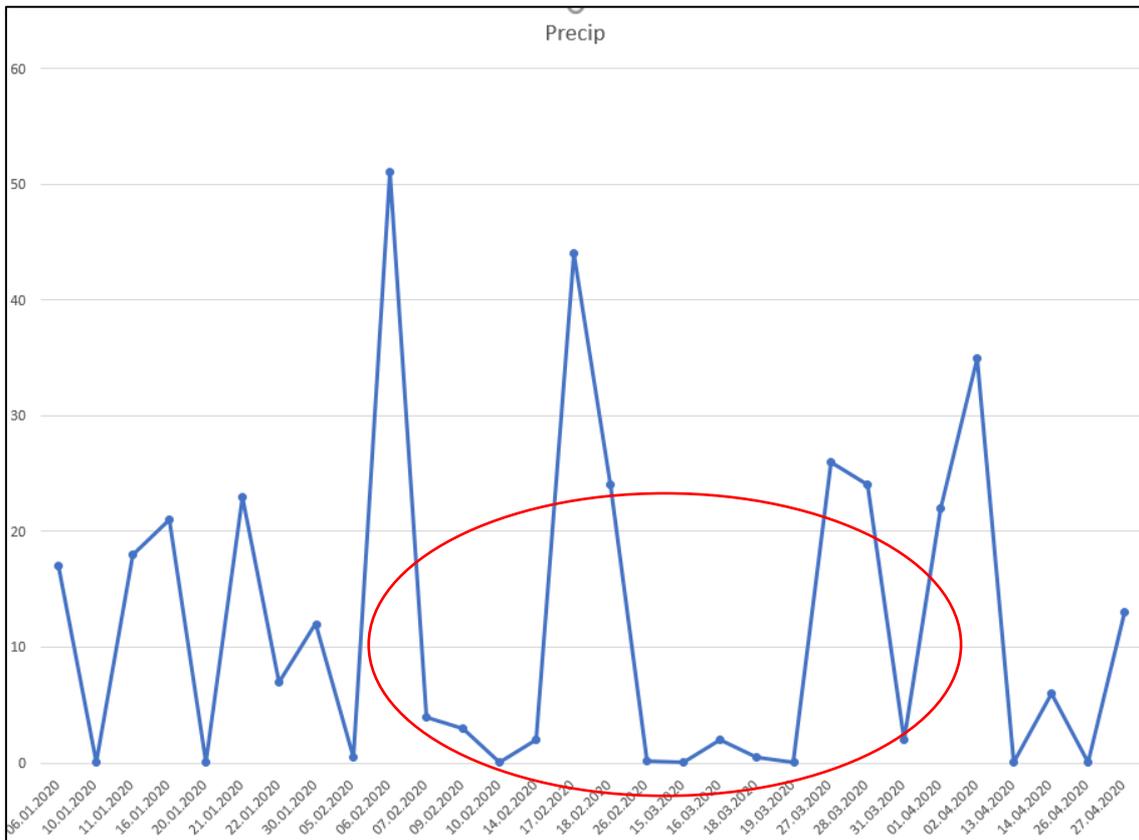


The temporal sequence allows to appreciate the growth of the different plots, as seen on the scale. Throughout the crop cycle, the differences between plots and within the plots can be seen.

It can be seen that after a significant growth until mid-February, there is a significant decline towards the end of March. That is coincident with the rains registered:

Precipitation:

To analyze the development of the crop, it is important to know the moment in which the rainfall occurred. The 2019/2020 campaign was characterized by presenting periods of interruptions in precipitation at times of high water demand, as occurred in the months of February and March.



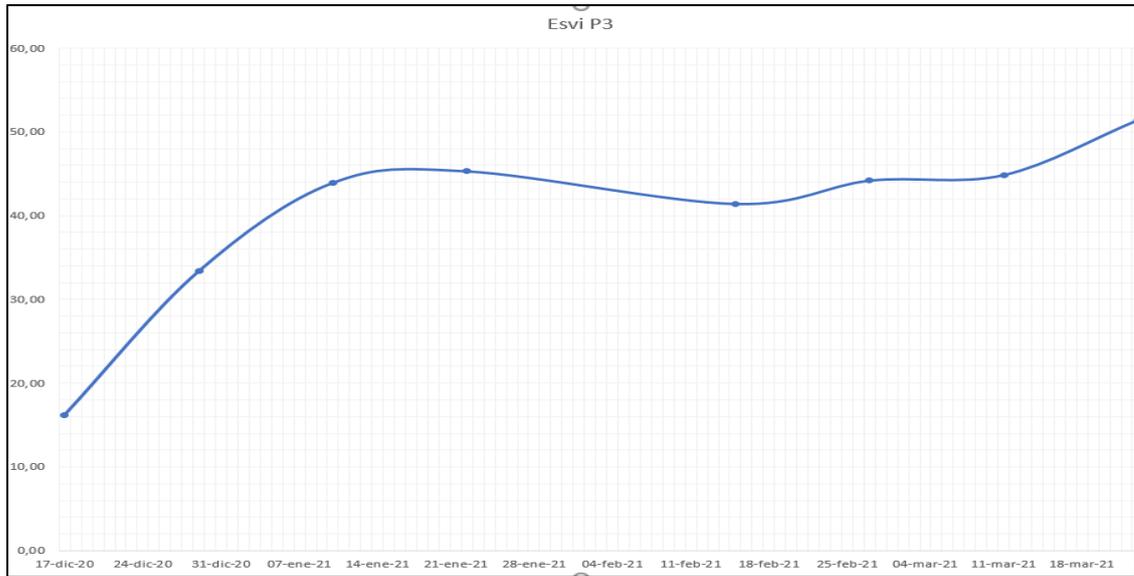
The ESVI curves show how the growth that is very high at the beginning of the crop was affected in February and then in the month of March the drop in the index due to the effects of the drought can be observed. ESVI measures **fresh** biomass.

SAR measures the structure and humidity of cropland.

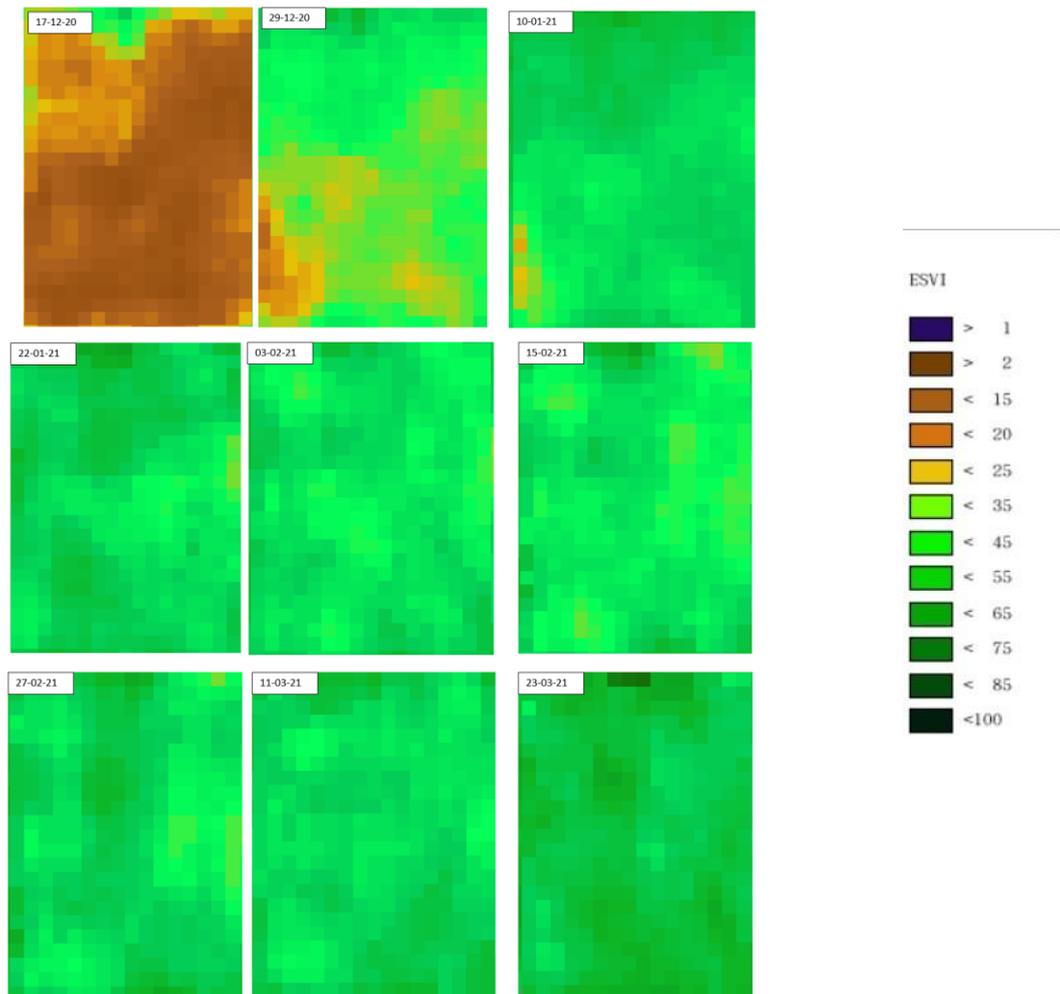
Under drought condition or in the maturity phase the backscatter value will drop.

2) Campaign 2020

ESVI values were calculated for a plot from the same area: P3 - Sorghum- Sowing 3 Dec20

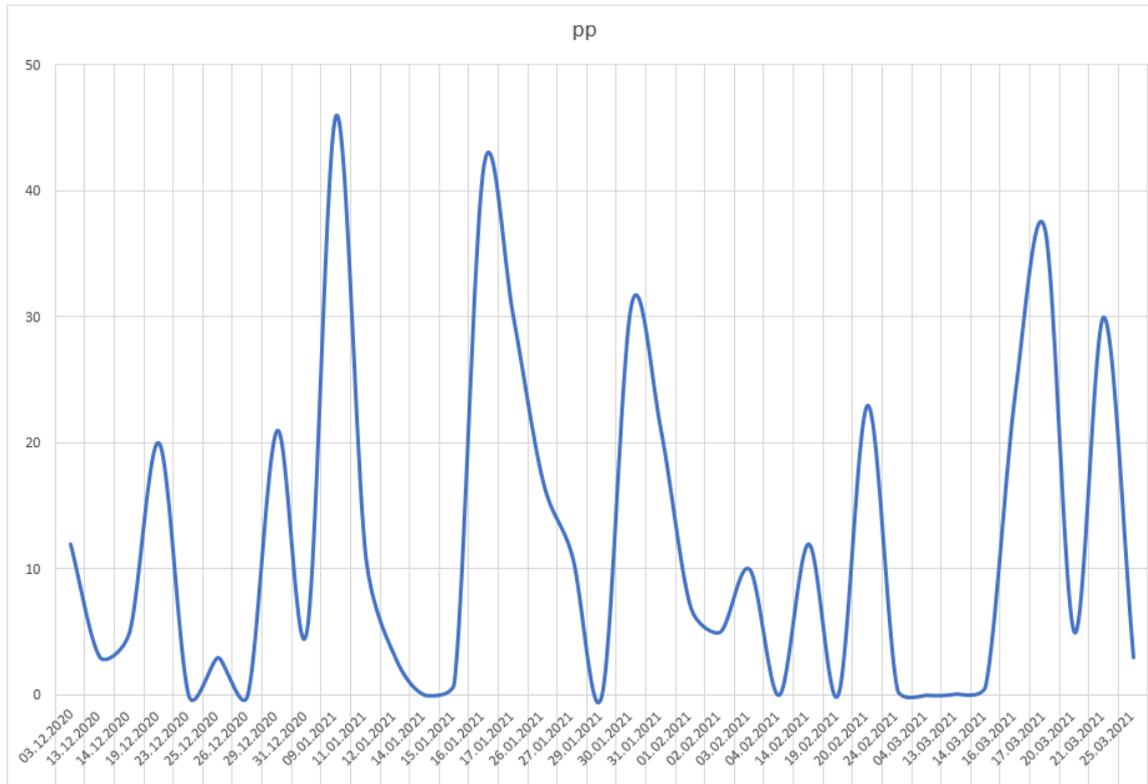


Time-series ESVI:



ESVI allows us to have an uninterrupted temporal sequence of images over the entire crop cycle.

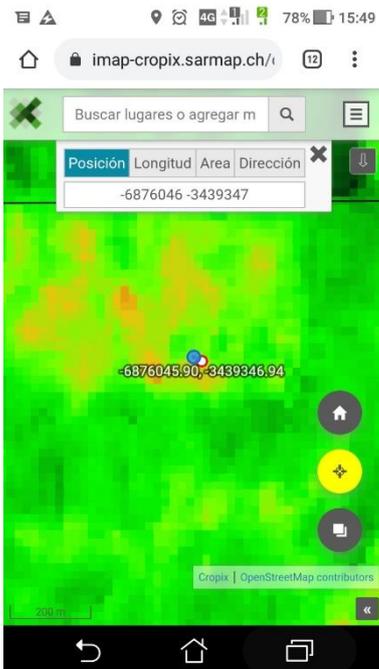
The precipitation over this period:



Stunting is also seen after mid-February due to lack of rains

Tracking using ESVI within iMAP¹

Imap, from Cropix, is the mobile application that allows field observations using the ESVI image or other map products with GPS tracking as a guide:



On the left, you see a screenshot of iMap running on a smartphone.

There you can see a spot with a lower ESVI values.

On the right, the photo of the place that shows the area with low crop development.



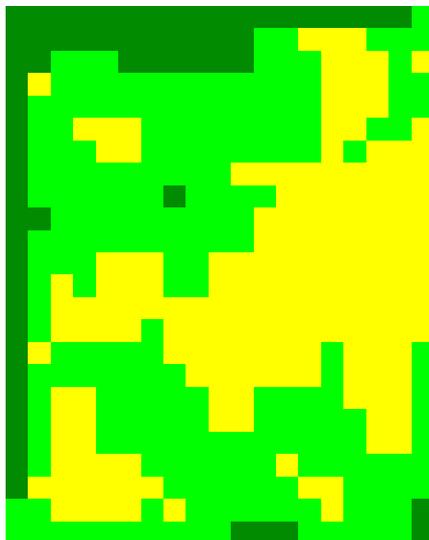
¹ Visit <https://cropix.ch/imap-en/>

Identification of zones

Variability within a plot can be quantified by identifying areas that have homogeneous behavior. This can be determined using temporal image sequences that show the evolution of crops over one or several years.

It is necessary to clarify that these settings must then be validated with field work that allows a better knowledge of those environments, for which the application of agronomic knowledge is essential. This tool is a very important aid but does not replace the professional analysis required for prescriptions.

Thus, using images from two campaigns from the same plot (in this case P_3), we can aggregate values for homogeneous areas since we have high-quality time series of the ESVI vegetation index.



	Zona	Sup	
B	1	7,23	40%
M	2	7,55	41%
A	3	3,44	19%
		18,22	

Ref:

B: low production

M: medium production

A: high production

Zones Plot. 3 – Average images of two campaigns.

Comments

For years the monitoring of crops has been carried out with the use of satellite images, due to the possibility of achieving a better knowledge of what is happening by supporting field trips. The use of products derived from radar images, such as ESVI, SWI, CC, from cropix adds the certainty of having complete time series since their generation is not affected by clouds, smoke, aerosols or other atmospheric interference.

In these years, cropix has validated these products in a number of environments, generating a new generation of high quality indices which are already available for use.

Ing.Agr. Roberto Gagliardi

www.cropix.ch

gagliardi@cropix.ch