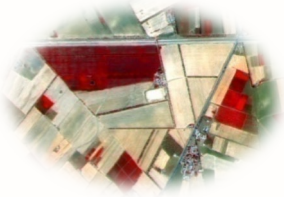
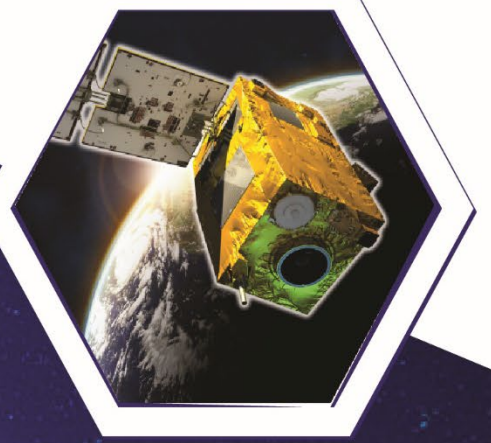


Basic information for the Algerian agricultural sector, crop phenology, and agricultural projects related to remote sensing

D. Mansour
Agence Spatiale Algérienne, Centre des Techniques Spatiales
dmansour@cts.asal.dz



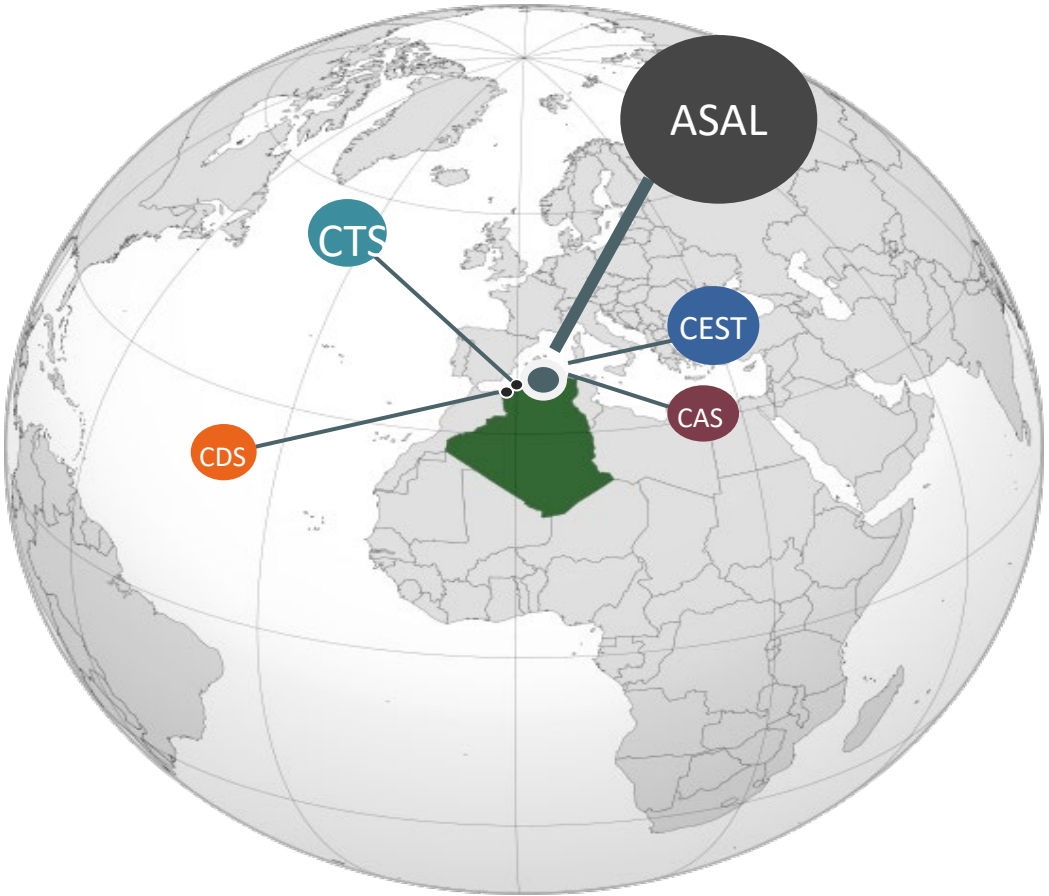
UNCTAD CropWatch Regional Workshop, Mauritius, auguest 07-10 th , 2023

1. An Overview of the Algerian Space Agency and Its Activities
2. Basic information for agriculture
3. Existed agricultural projects related to remote sensing
4. Crop phenology for main crops
5. Current problems
6. Requirements and expectation.

ASAL

Algerian Space Agency

1. An Overview of the Algerian Space Agency and Its Activities



Algerian Space Agency

Telecommunications Systems Operations Center — CEST

Spatial Application Center — CAS

Satellite Development Center — CDS

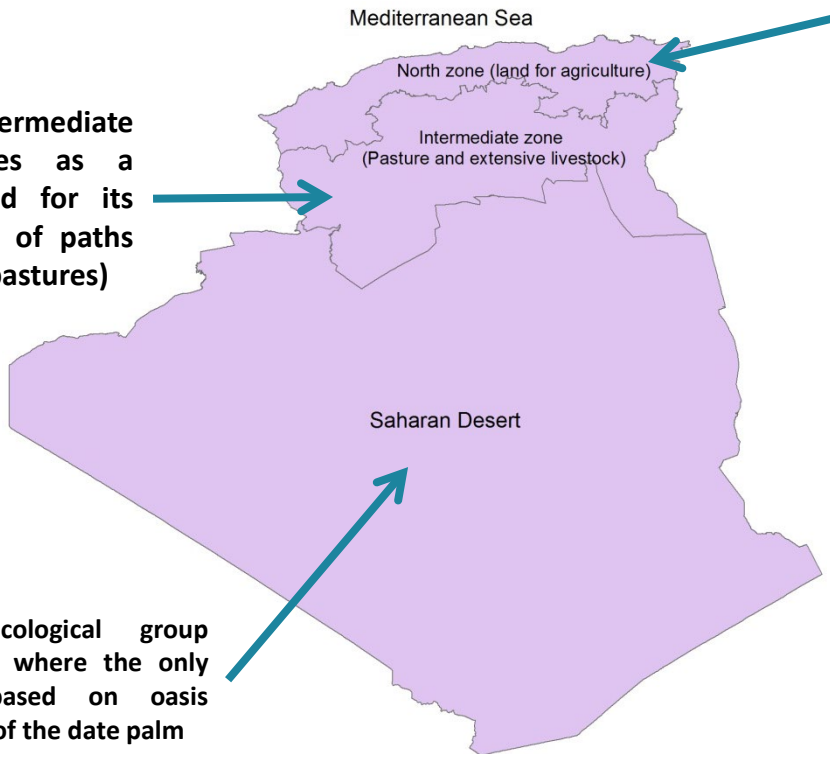
Spatial Techniques Center — CTS

01, Avenue de la Palestine BP 13
31200 – Arzew
Tél : 041.79.21.78
Fax: 041.79.21.76

2. Basic information for agriculture

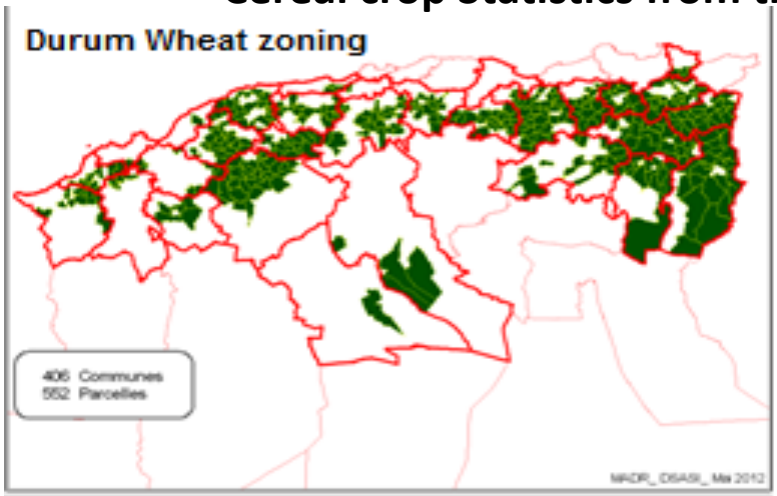
an overview of the geographical context of Algeria:

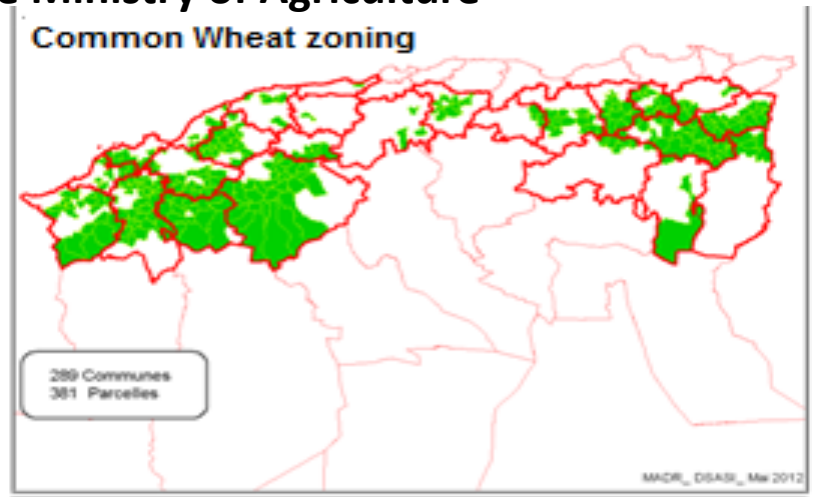
Algeria subdivided into three natural zones

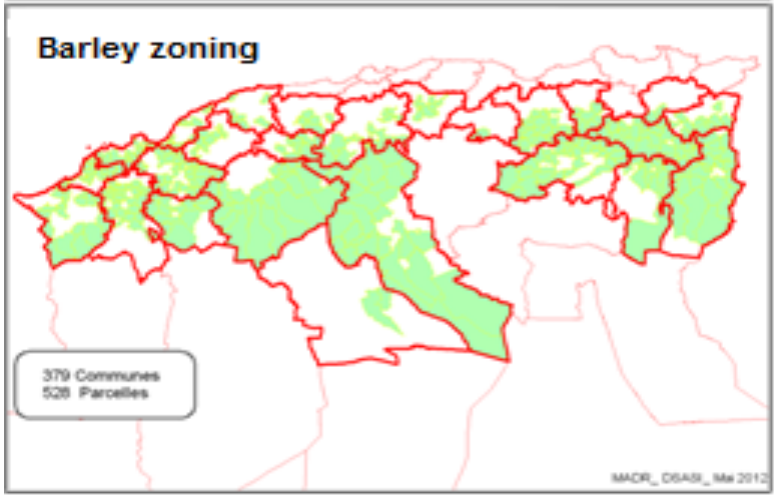


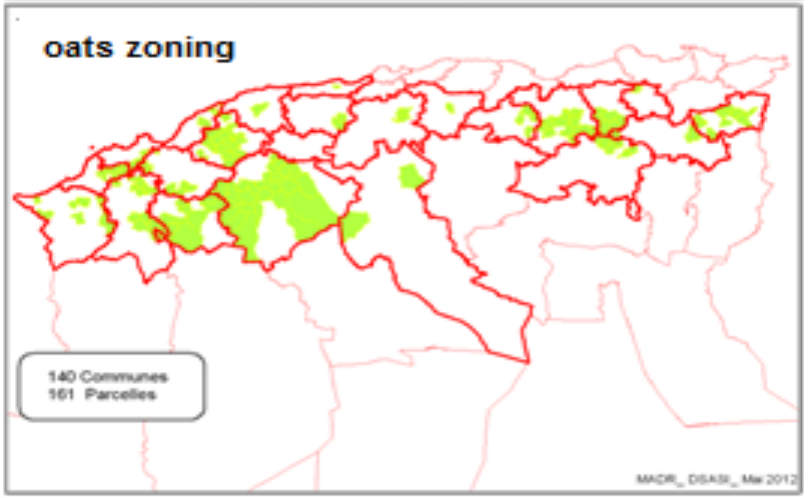
- **The rainy zone of the north remains the source of diversified agricultural products: cereals, vegetables and fruits, as well as semi-intensive livestock farming (mainly milk and meat).**
- **The intermediate zone serves as a sheep-pound for its wide range of paths (extensive pastures)**
- **The third unproductive ecological group represents the Saharan desert where the only agricultural activities are based on oasis agriculture and the exploitation of the date palm**

Cereal crop Statistics from the Ministry of Agriculture

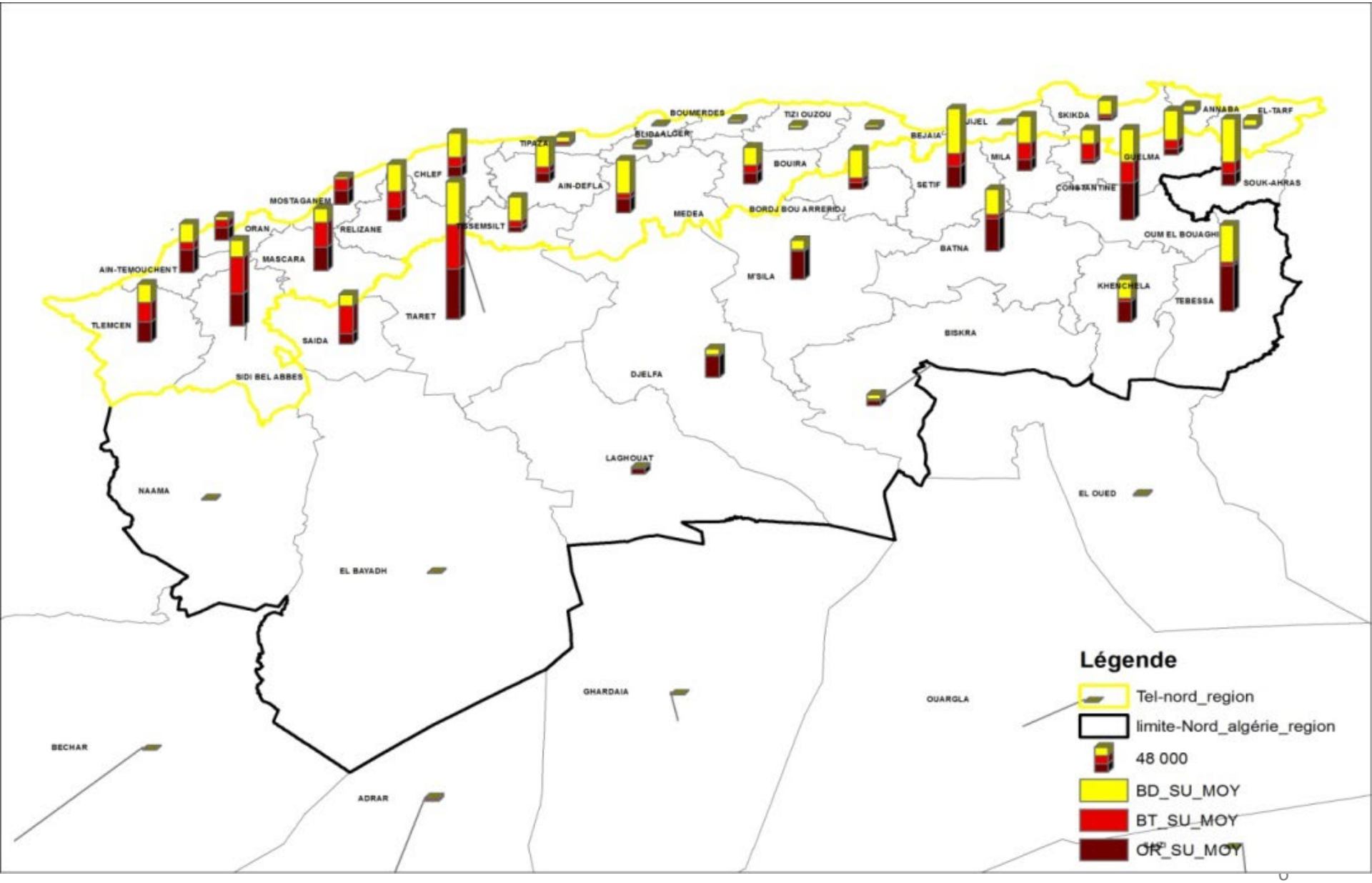




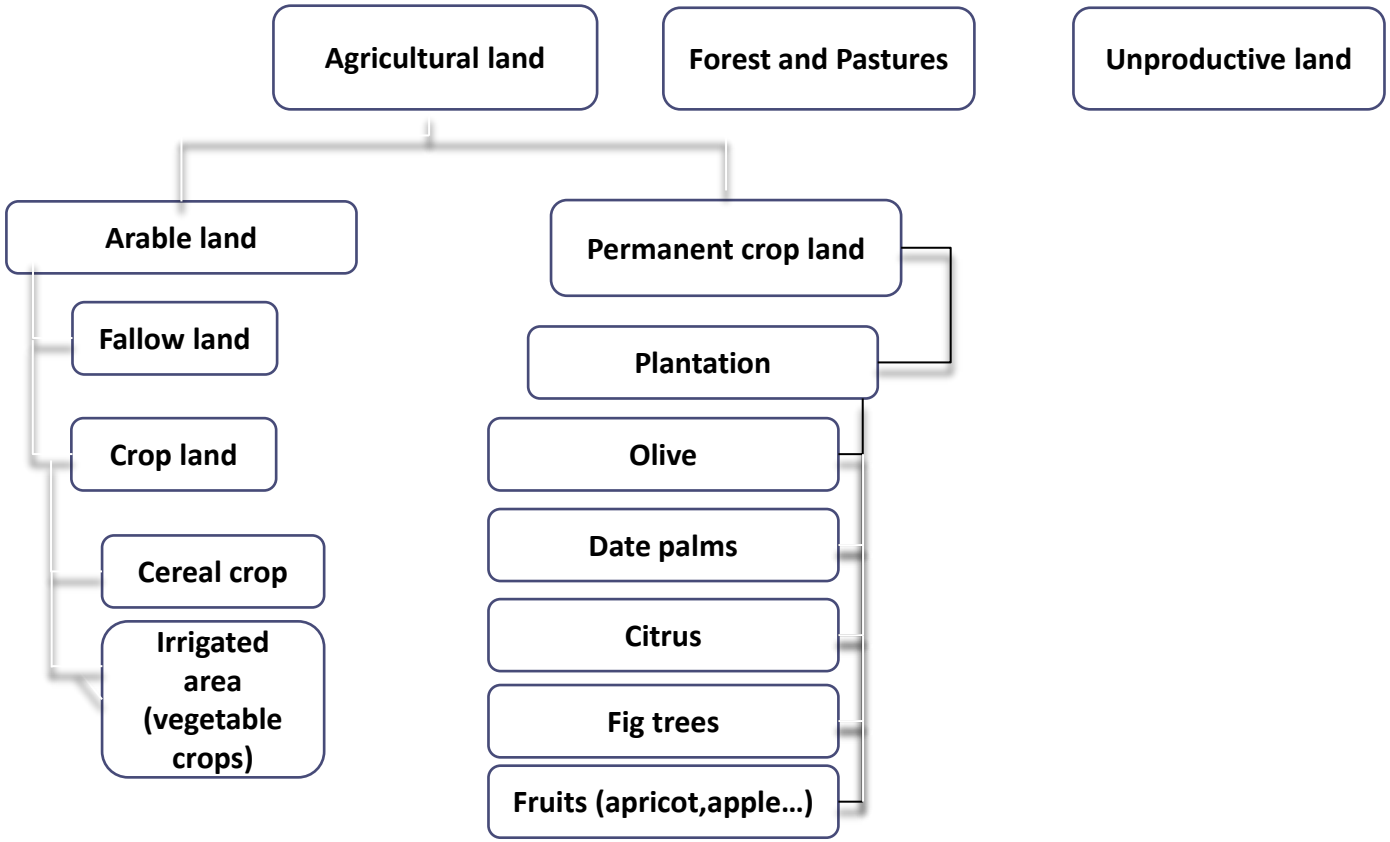




Cereal farming has found, in higher regions, with a more harsh climate, an environment more in keeping with its needs: it is there, in the median depression of the **Tellian Atlas**, from **Tlemcen to Souk-Ahras**, passing through the regions of **Sidi-Bel-Abbes, Médéa, Bordj-Bou-Arreridj and Sétif,** that meet the most **beautiful cereal** lands that constitute one of the greatest wealth of Algeria. These cereal lands overflow to the **Highlands** where the environment is still favorable: the **Sersou, Boghari**, north of the Algiers highlands, the region of **Batna, those of Constantine.**

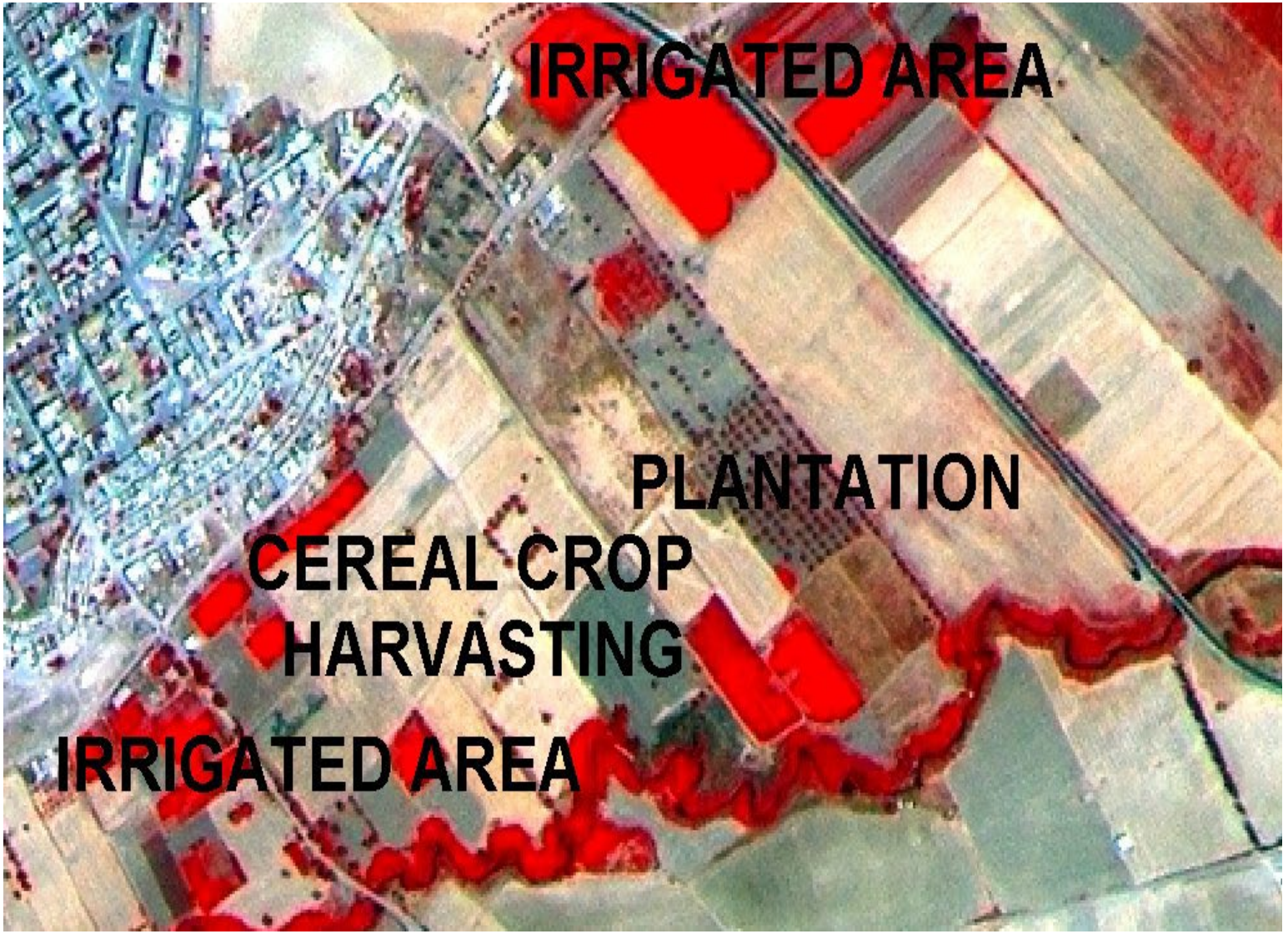

BOUMERDES
TIZI OUZOU
BLIDA ALGER
TIPAZA
BOUIRA
BEJAIA
JIJEL
SKIKDA
ANNABA
EL-TARF
MILA
GUELMA
SOUK-AHRAS
AIN-DEFLA
SETIF
CONSTANTINE
MOSTAGANEM
CHLEF
MEDEA
BORDJ BOU ARRERIDJ
ORAN
RELIZANE
TISSEMSILT
OUM EL BOUAGHI
BATNA
AIN-TEMOUCHENT
MASCARA
M'SILA
KHENCHELA
TEBESSA
TLEMCEN
SAIDA
TIARET
BISKRA
SIDI BEL ABBES
DJELFA
LAGHOUAT
NAAMA
EL OUED
EL BAYADH
GHARDAIA
OUARGLA
BECHAR
ADRAR
Légende
Tel-nord_region
limite-Nord_algérie_region
48 000
BD_SU_MOY
BT_SU_MOY
OR_SU_MOY

Distribution of land in Algeria



The different classes of land use found in Algeria

Alsat 2A Data Characteristics High spatial variability of cropping systems



D.MANSOUR & al: National Alsat-Users Workshop, Oran April 05 and 06, 2017

Land fragmentation in a mixed farm, image fusion (ALSAT2A, 2.5 m)

D.MANSOUR & al: National Alsat-Users Workshop, Oran April 05 and 06, 2017

3. Existed agricultural projects related to remote sensing

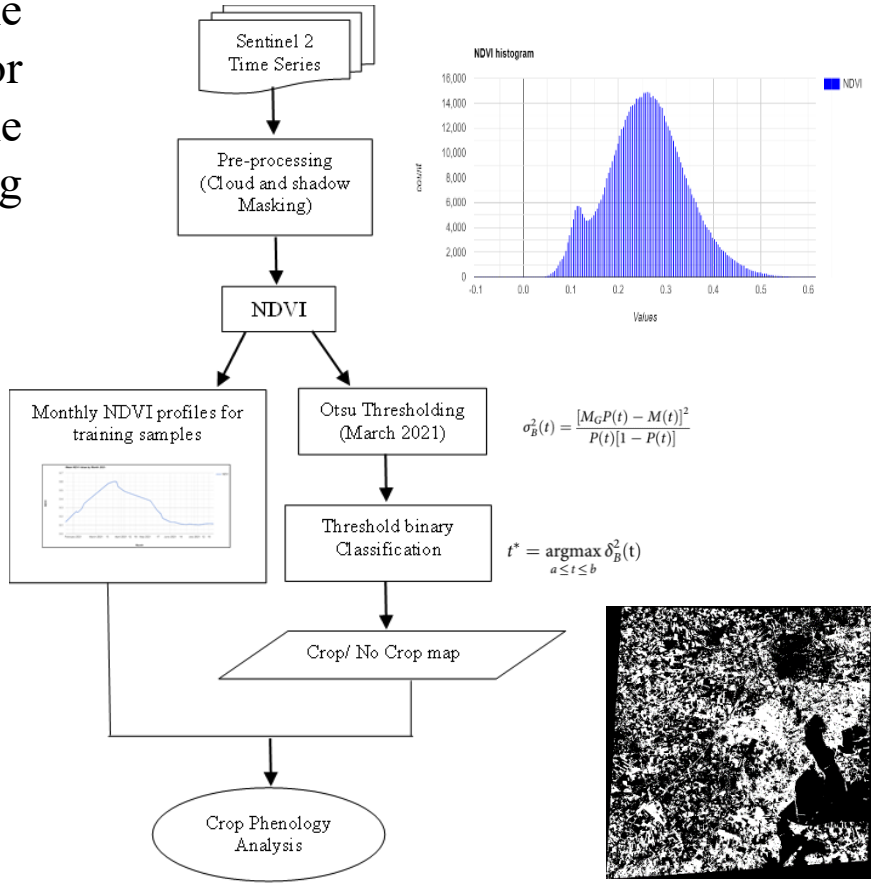
The Algerian space agency made significant progress in the space sector with the launch of four earth observation satellites, namely Alsat1 **(2002)**, Alsat2a **(2010)**, Alsat2b **(2016)**, and Alsat1b **(2016)**. This advancement had a significant impact, particularly in the agricultural sector.

1. One crucial project for the country's food security is the **mapping of cereal** areas using satellite imagery. **ASAL collaborated with the Ministry of Agriculture** to improve agricultural statistics using time series to cover the **crop growth cycle** and generate NDVI growth profiles through field data, enabling the definition of **typical profiles** after understanding the **spectral behavior of cereal crops (pilot zone Sidi bel Abbes)**.
2. Among the products requiring special attention is **potatoes**, as it is a widely consumed commodity in Algeria. Using remote sensing to detect areas dedicated to potato cultivation becomes a priority. To this end, ASAL initiated work in a **pilot zone (Mostaganem)** to test deep learning technology for potato identification, discriminating it from other seasonal products like cauliflower, green beans…
3. Another critical project involves the nationwide **counting of olive and palm trees**. ASAL also intervened in this matter, employing techniques for **automatic object extraction** from remote sensing data.

4.Crop phenology for main crops

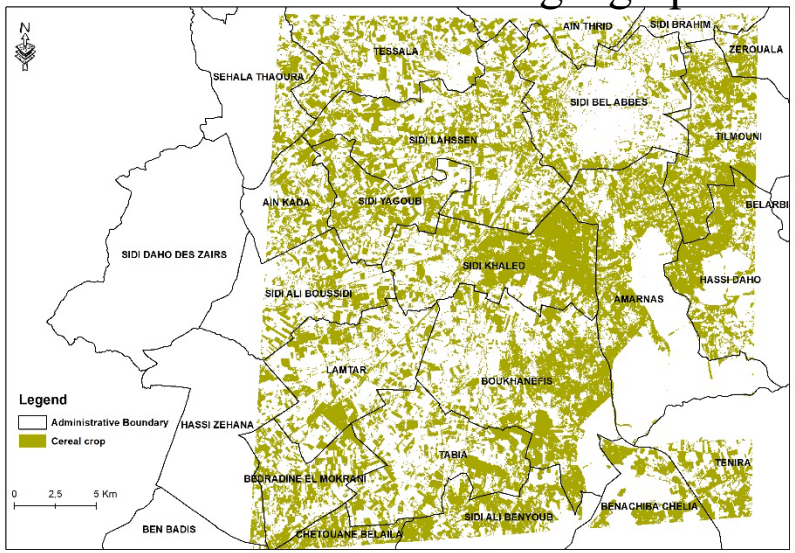
The study that we conducted is based on time series analysis using Sentinel2 images to monitor the cultivated cereal crops, combined with the field data including cereal plots for the growing season of 2020-2021..

The methodology adopted in this study focused mainly on the processing of a Normalized Difference Vegetation Index (NDVI) time series. The analysis of the NDVI time series from October to July 2021, allowed us to determine the typical profiles of cereal crops, based on thresholding obtained to extract the areas cultivated by cereal crops

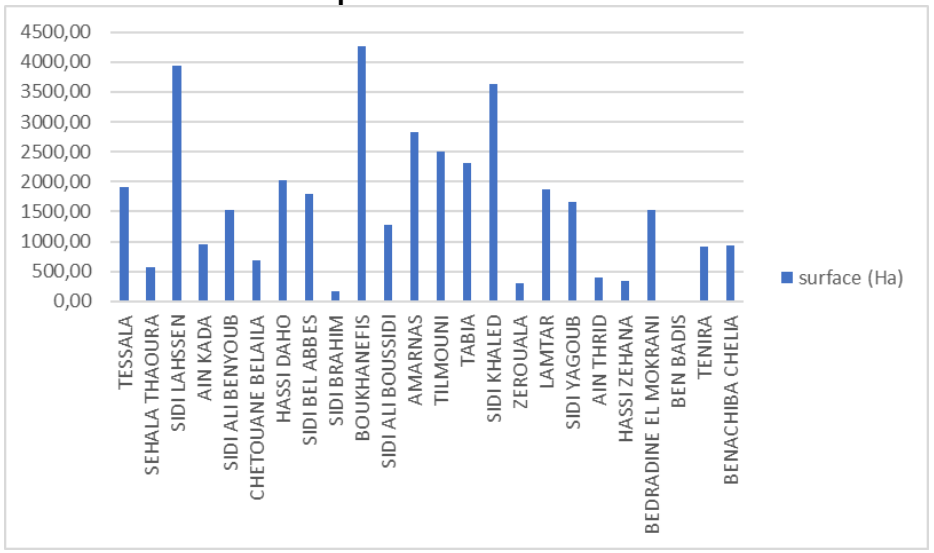


Mansour, D., Attaf, D., and Ghabi, M.: CEREAL CROP IDENTIFICATION USING SENTINEL2 TIME SERIES, CASE OF SIDI BEL ABBES AREA, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLVIII-M-1-2023, 183–188, https://doi.org/10.5194/isprs-archives-XLVIII-M-1-2023-183-2023, 2023.

The geographical extent of cereal crops.



Thresholding mask of cereal



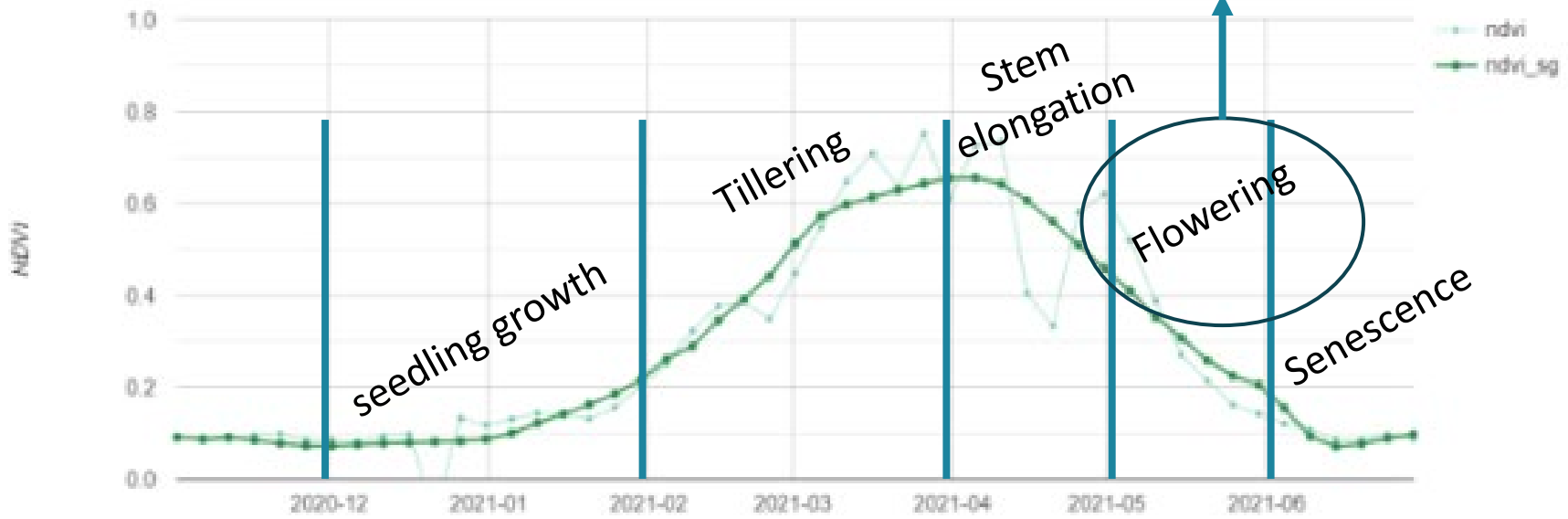
Graphical representation of the results obtained.

The geographical distribution of cereal in terms of area represents a high density of green biomass in the highlands and a low density of vegetation towards the plain and the highlands of the northwest area.

Mansour, D., Attaf, D., and Ghabi, M.: CEREAL CROP IDENTIFICATION USING SENTINEL2 TIME SERIES, CASE OF SIDI BEL ABBES AREA, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLVIII-M-1-2023, 183–188, https://doi.org/10.5194/isprs-archives-XLVIII-M-1-2023-183-2023, 2023.

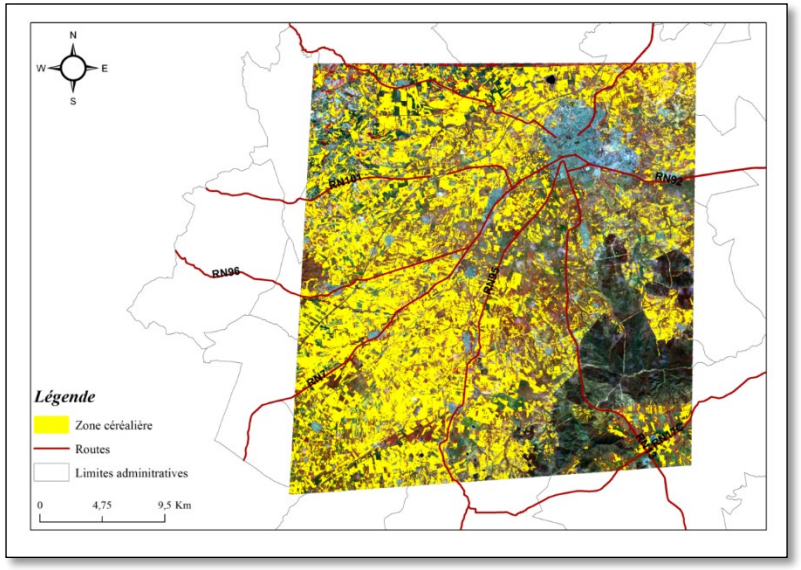
NDVI profile during the growing period (Sidi Bel Abbes 2020-2021)

Field observation
10 May 2021

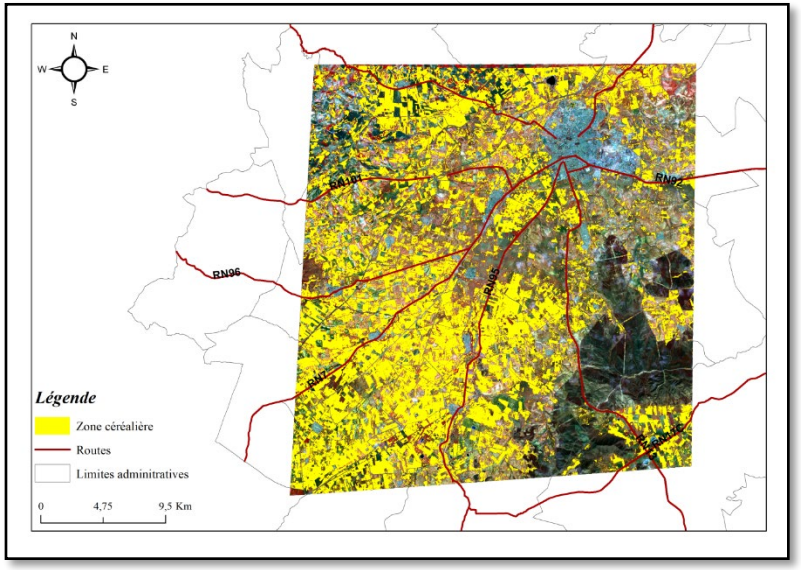


Results obtained in the course of student supervision work year 2023 (Mansour Djamel & Touil Bouchra).

NDVI thresholding



RF Supervised classification

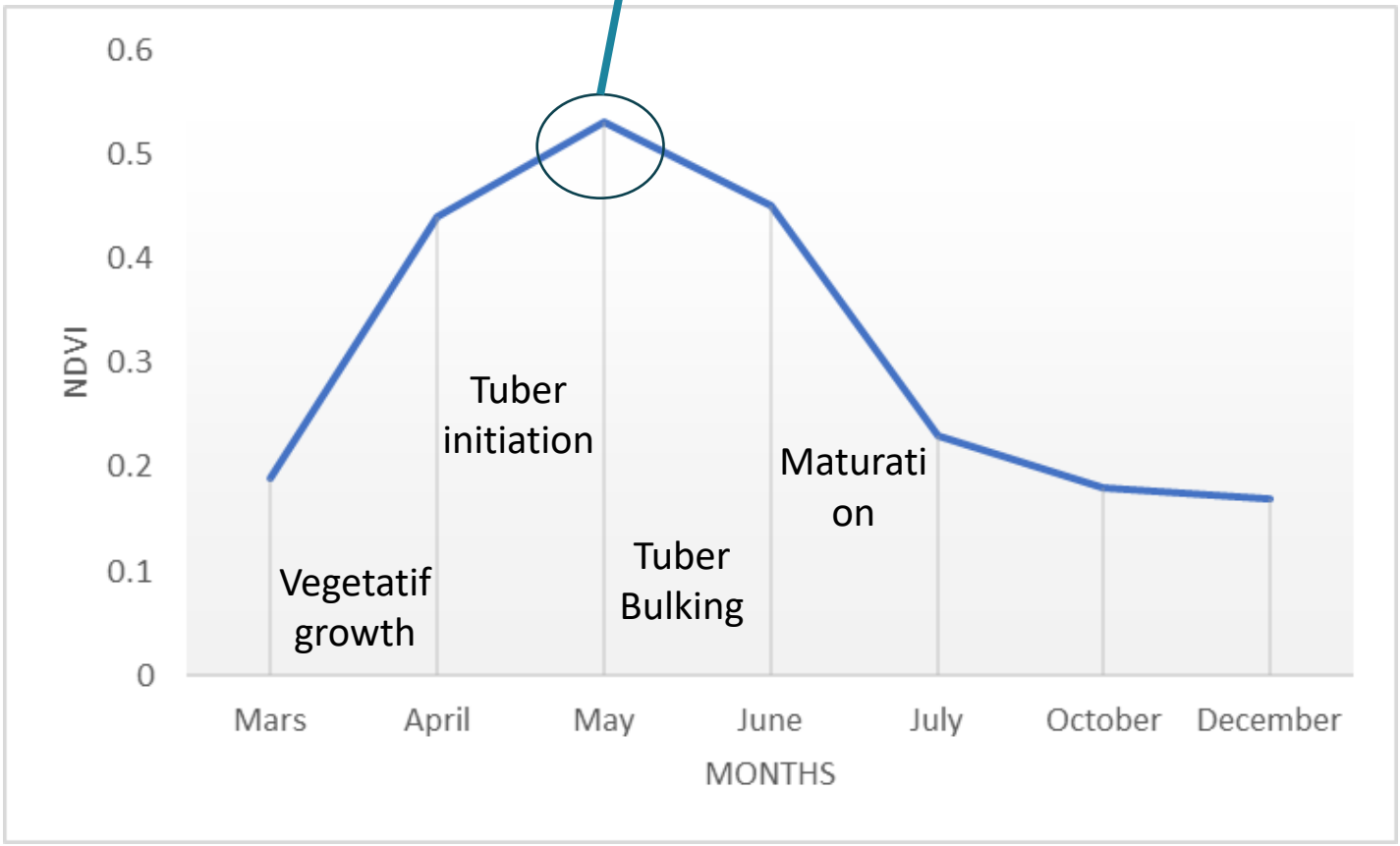


Department	Areas.thresholding NDVI (ha)	Areas.DSA (ha)	Rate (%)
SIDI LAHSSEN	3421,26	5034,5	16,13
SIDI YAGOUB	1123,48	1663,1	5,39
SIDI BEL ABBES	1674,84	1310,05	-3,64
AMARNAS	1050.98	1719.8	6.68
SIDI KHALED	1778.23	3076.61	12.98
LAMTAR	3374.89	3112.8	-2.62
BEDRADINE ELMOKRANI	1943.11	984.67	-9.58
BOUKHANEFIS	4248.75	4523	2.74
TABIA	3432.7	2623.5	-8.09
TOTALE	22 048	24 048	19,99

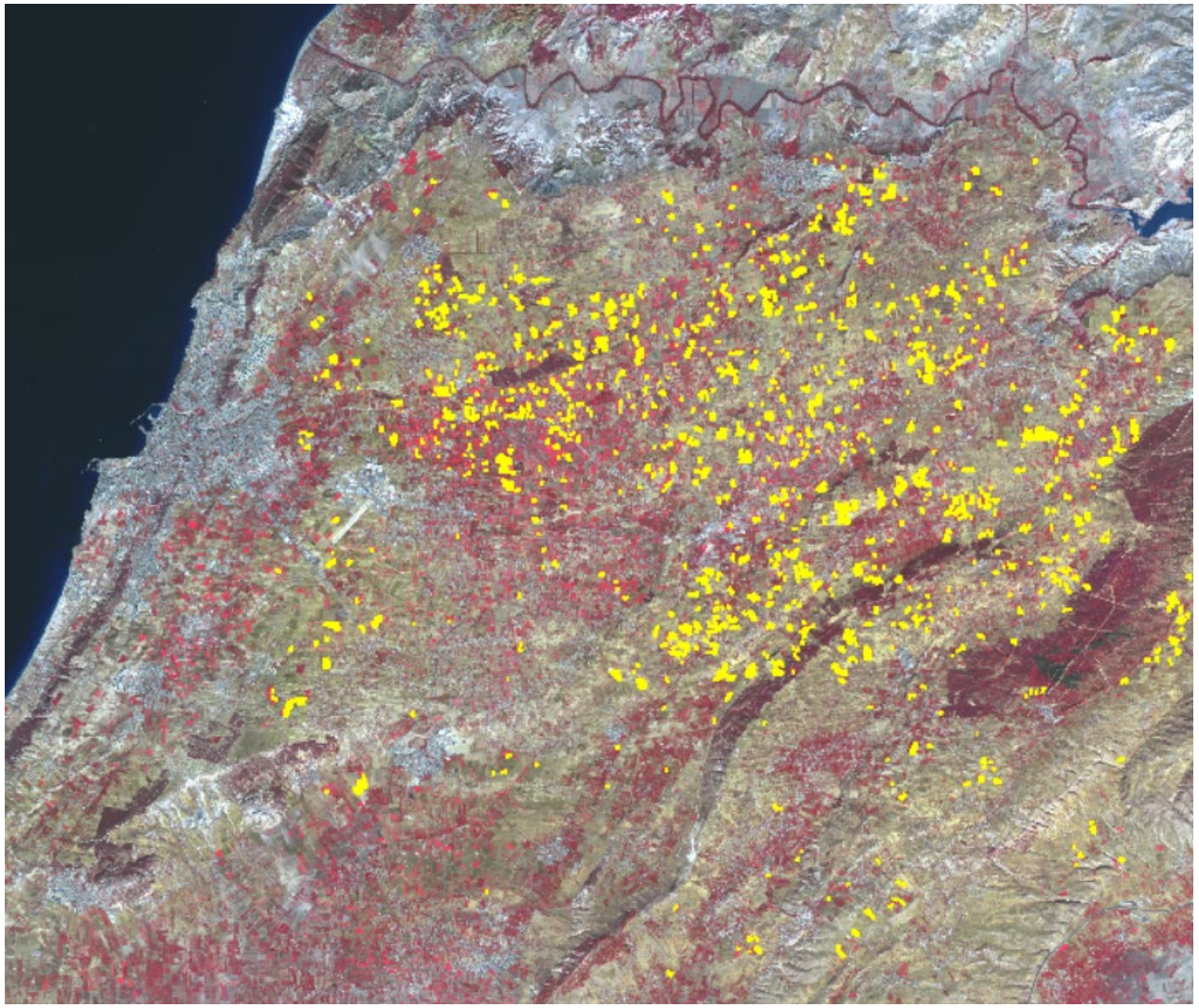
Department	Areas.RF classification (ha)	Areas.DSA (ha)	T.B (%)
SIDI LAHSSEN	4136.53	5034.5	8.97
SIDI YAGOUB	1587.90	1663.1	0.75
SIDI BEL ABBES	**1721.55**	**1310.05**	**-4.11**
AMARNAS	833.27	1719.8	8.86
SIDI KHALED	2012.17	3076.61	10.64
LAMTAR	**3572.93**	**3112.8**	**-4.60**
BEDRADINE ELMOKRANI	**1623.00**	**984.67**	**-6.38**
BOUKHANEFIS	3776.49	4523	7.46
TABIA	**3447.62**	**2623.5**	**-8.24**
TOTALE	**22 711**	**24 048**	**13,36**

NDVI profile during the growing period (Potato-2021)

φ :35°13'33.27"N
λ :0°39'10.76"O



Results obtained in the course of student supervision work year 2023 (Mansour Djamel, Seddik Youcef & Ketrane Waffa).



Mask in yellow, cultivated potato areas (2021)

Image landsat 1987

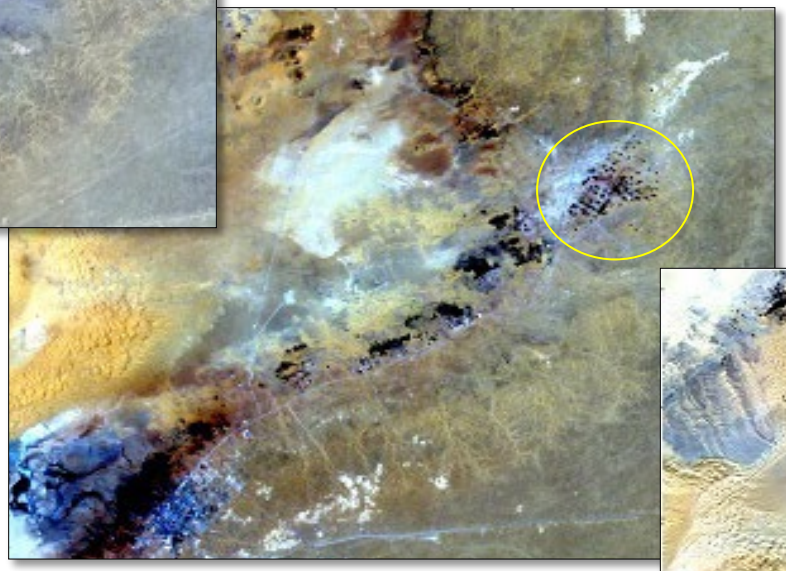


Image landsat 2009

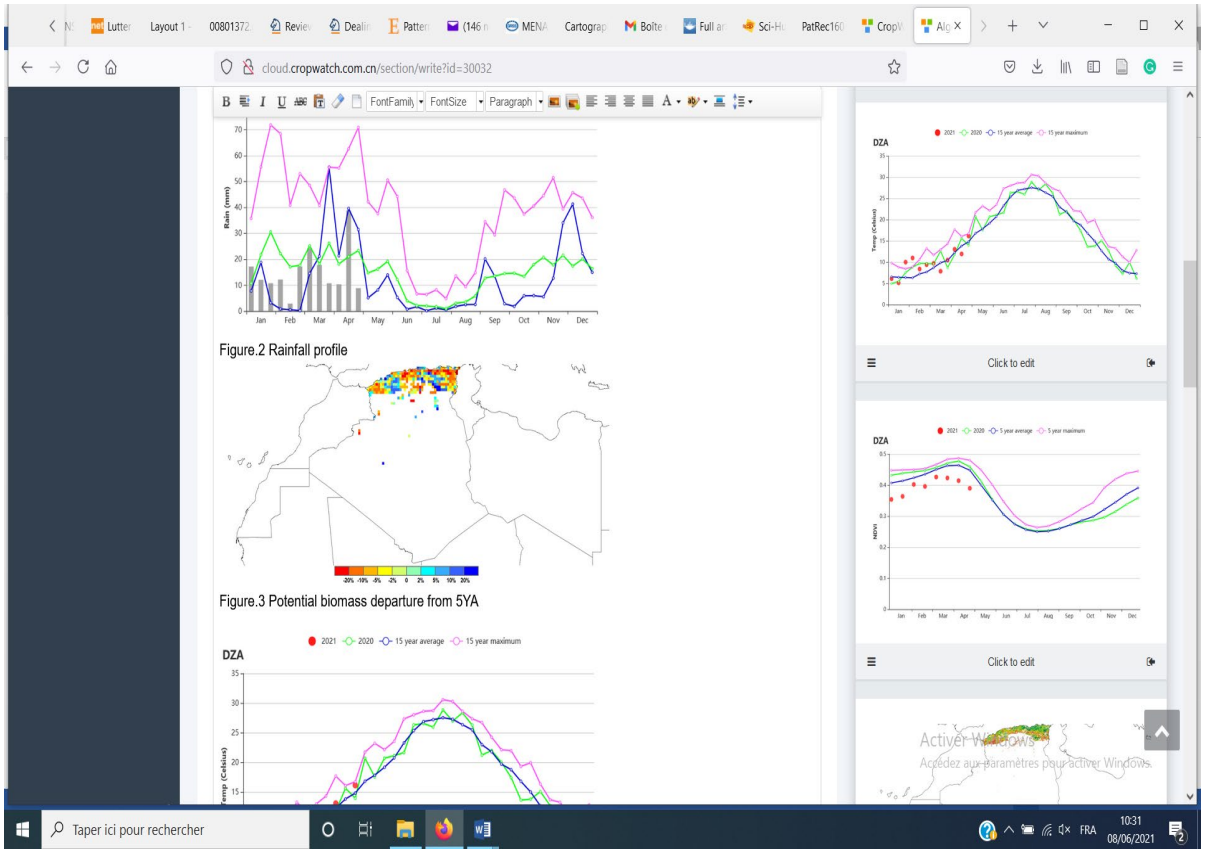
Image landsat 2021

- The near infrared channel (TM4) is color-coded red.
- The red channel (TM3) is color-coded green.
- The blue channel (TM1) is color-coded blue.

As part of the CropWatch project, I actively participated in various activities, including:

1.Acquiring in-depth knowledge of essential meteorological indicators such as precipitation, temperature, NDVI (Normalized Difference Vegetation Index), and crop conditions.

2.Collaborating closely with the CropWatch team to analyze and interpret these indicators in relation to agriculture in Algeria.



3. Making a significant contribution to the drafting and dissemination of CropWatch bulletins, aiming to provide accurate and useful information to local farmers.

February 2023 CropWatch Bulletin (Vol.23, No.1)

February 2023 CropWatch Bulletin is based mainly on current remote sensing inputs in addition to detailed and spatially accurate reference data about crops and their management. Focusing on the months of October 2022 to January 2023, chapters cover global, national, and regional level agroclimatic conditions and the condition of crops that were growing during this time. For China, the bulletin presents crop conditions for each of seven key agro-ecological zones. The focus section reports on global crop production index, the production outlook of major cereal and oil crops countries in the Southern Hemisphere and some tropical and sub-tropical countries, regional conflict and recent disaster events and an update on El Niño or La Niña.

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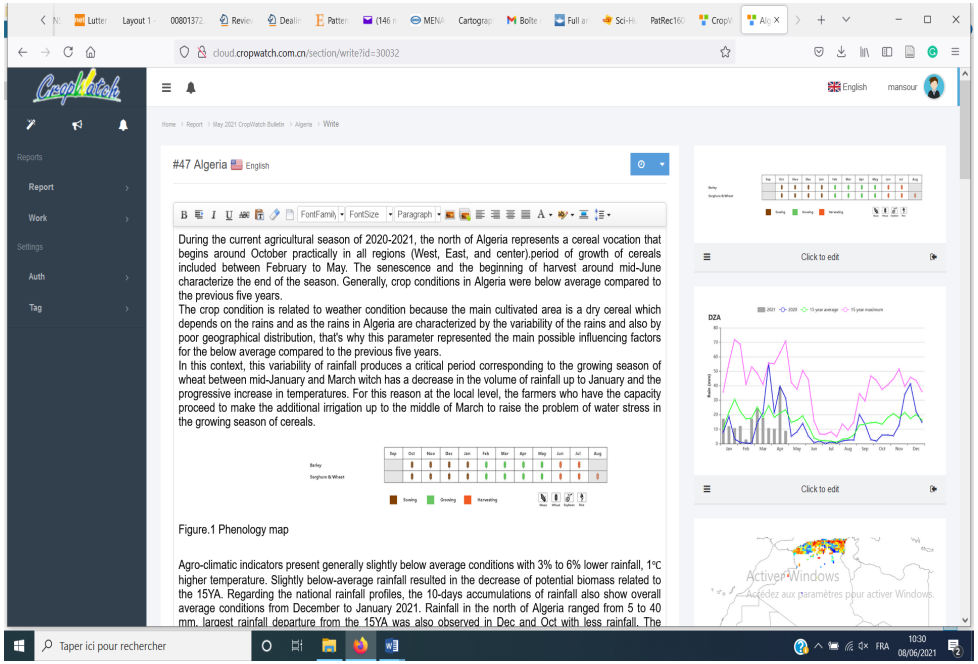
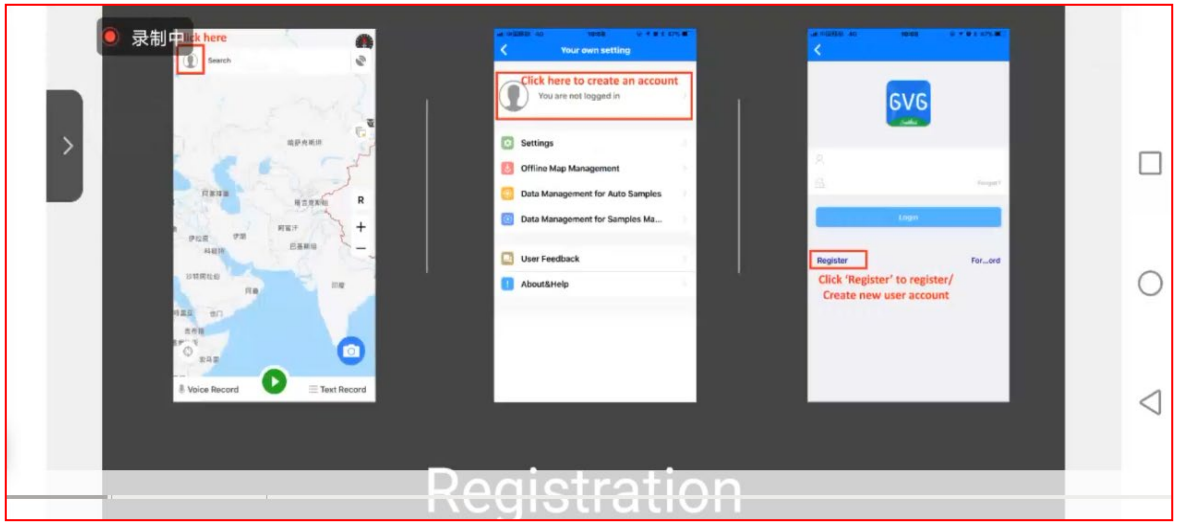
General Bulletin Resources

- A. Definition of spatial units
- B. methodology
- C. Time series of indicators
- D. Country profiles
- E. Country Long Term Trends

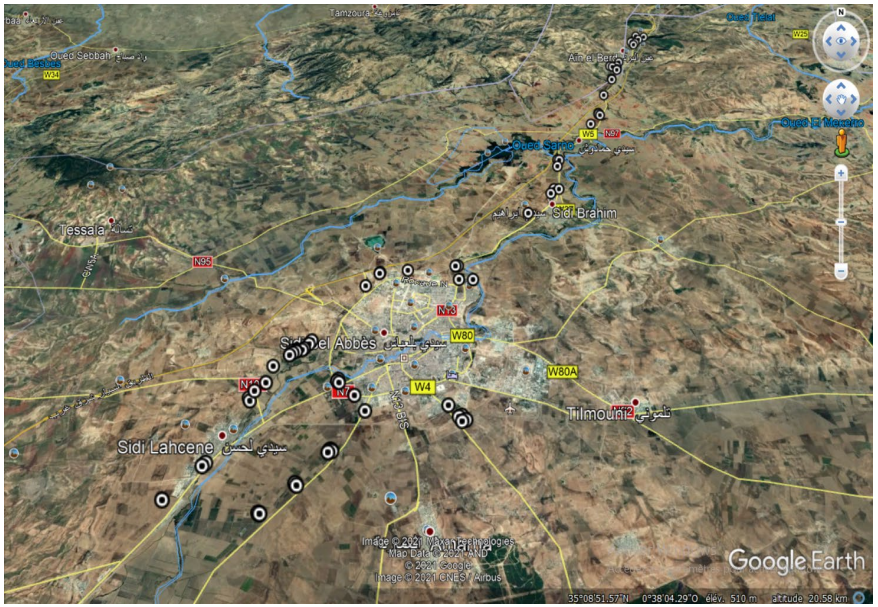
November 2022 CropWatch Bulletin (Vol.22, No.4)

November 2022 CropWatch Bulletin is based mainly on current remote sensing inputs in addition to detailed and spatially accurate reference data about crops and their management. Focusing on the months of July to October 2022, chapters cover global, national, and regional level agroclimatic conditions and the condition of crops that were growing during this time. For China, the bulletin presents crop conditions for each of seven key agro-ecological zones, an updated estimate of trade prospects (import/export) of major crops. The focus section reports on the estimate by CropWatch for maize, rice, wheat and soybeans production in 2022, recent disaster events with an impact on agriculture, and the possibility of an El Niño event.





4. Conducting fieldwork in November 2022 using the GVG application, which facilitated efficient data collection and integration into the overall project analysis.



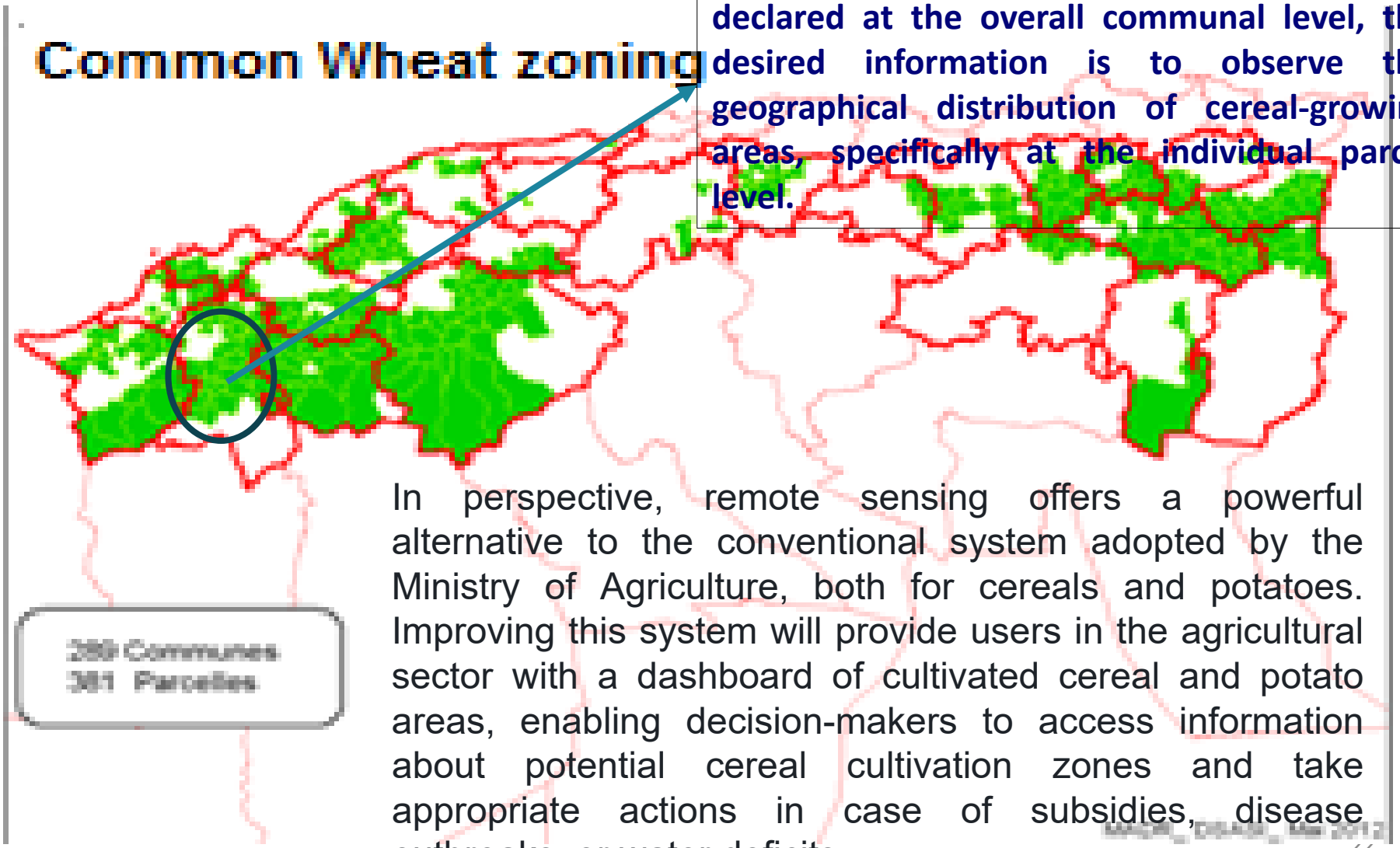
5. Current problems

Currently, the cereal sector requires digital information through remote sensing, and the products developed at this stage require precision. To enhance accuracy, fieldwork is necessary, especially for covering a crop growth cycle like cereal or potato cultivation. Periodic visits are necessary to gather more information regarding green biomass to estimate yields.

The agricultural administration faces difficulties linked to insufficient resources and expertise in the field of remote sensing. Training experienced staff in the use of remote sensing tools requires considerable effort and resources to enable effective sample collection in the field.

The traditional system relies on declarations based on the surfaces or yields reported by farmers. However, agricultural delegates lack to cover the entire communal territory, resulting in incomplete information about local cereal potential.

6. Requirements and expectation.



While the information provided here is declared at the overall communal level, the desired information is to observe the geographical distribution of cereal-growing areas, specifically at the individual parcel level.

In perspective, remote sensing offers a powerful alternative to the conventional system adopted by the Ministry of Agriculture, both for cereals and potatoes. Improving this system will provide users in the agricultural sector with a dashboard of cultivated cereal and potato areas, enabling decision-makers to access information about potential cereal cultivation zones and take appropriate actions in case of subsidies, disease outbreaks, or water deficits.

6. Requirements and expectation.

Indeed, customizing the CropWatch system to operate at the local level, particularly in two pilot zones like Sidi Bel Abbes (cereal) and Mostaganem (potato. The objective is to provide valuable information regarding cultivated areas, yields, and the detection of anomalies in the crop growth cycle. By tailoring the system to specific regions, it will offer more accurate and targeted insights, aiding in better decision-making and resource management for agricultural activities in these areas.

As part of customizing the CropWatch system for the pilot region of Sidi Bel Abbes, it is essential to obtain the calculated parameters specific to this pilot region. These parameters include:

- NDVI profile;
- Rain, PAR, Temperature;
- Biomass map;
- CALF map;
- Biomass departure;
- VCIx map;
- VHI minimum;
- NDVI departure clustering.

Thank you for your attention.

Contact:
dmansour@cts.asal.dz