NIGERIA CUSTOMIZED CROPWATCH PLATFORM AGRICULTURE DEVELOPMENT AND CROP MONITORING FOR FOOD SECURITY

BY

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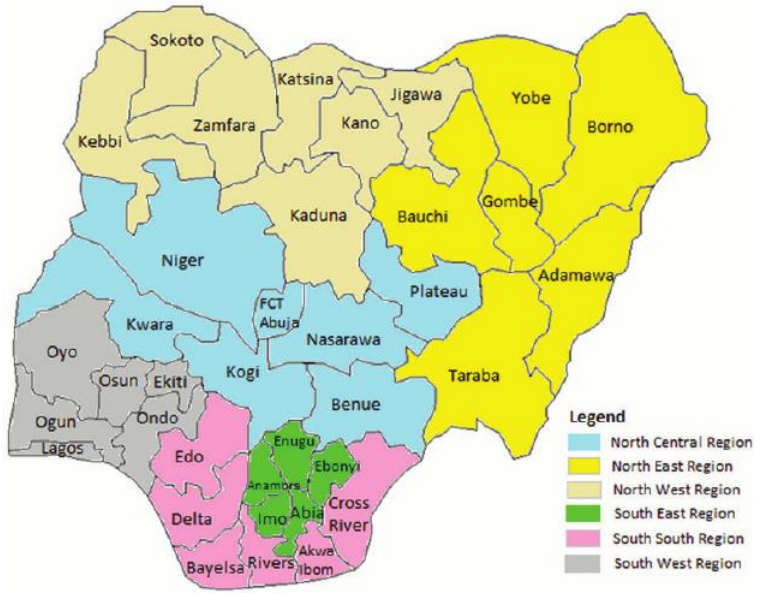
National Space Research and Development Agency (NASRDA)

Regional CropWatch Training and Feild data collection workshop, Johnwood Hotel, Abuja, 2-5 July, 2024

07/10/2023

INTRODUCTION

- Food Security is a priority for every Nation.
- The importance of agriculture has received renewed impetus by the Nigerian administration as the government seeks to diversify the Nigerian economy.
- As such, sustainable approaches towards effective monitoring of agricultural produce to optimise yield have become imperative.
- Technologies and innovations are critical for boosting farm productivity.
- Remote sensing technologies have been identified as a reliable proxy for providing accurate and up-to-date information on crop yield and phenology for farmers, agronomists, and research.



NIGERIA AGRICULTURAL POLICIES

The EGRP and Agriculture

- The Federal Government of Nigeria (FGN) has made agriculture one of the major pillars of its strategic vision for growth and development through the Next level policy.
- The Next Level policy is operated through the Economic Growth and Recovery Plan (EGRP).

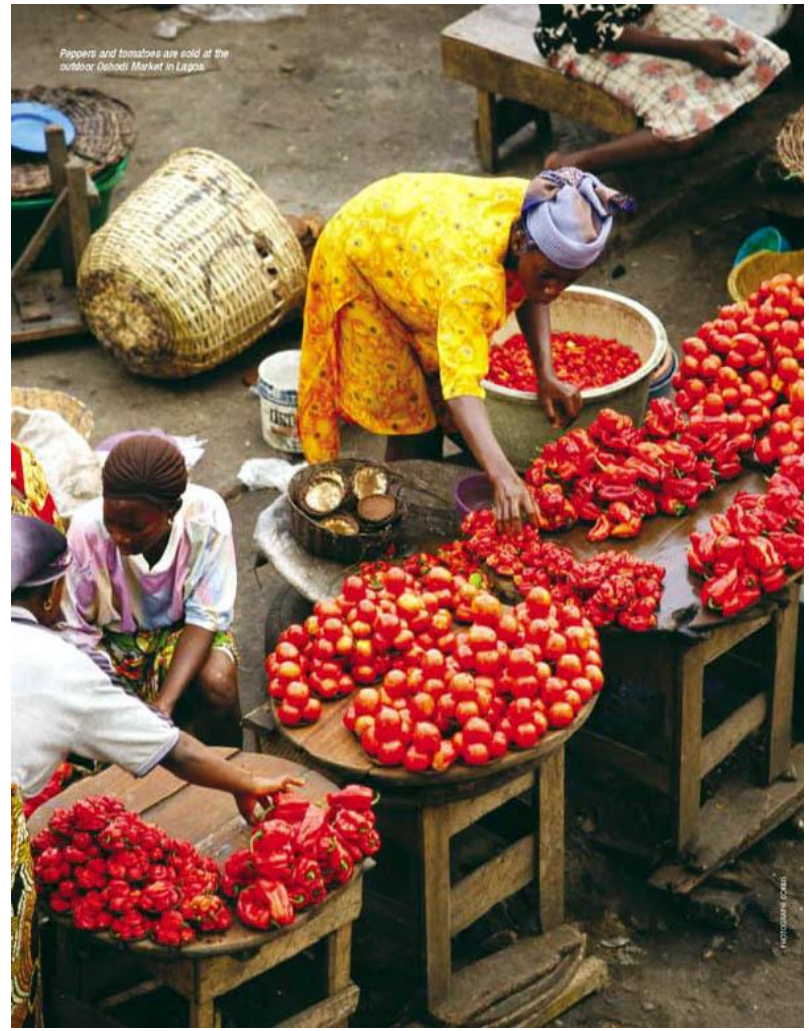
The government's long-term interest to promote agricultural growth has been exemplified in different long term and medium-term plans implemented in the country. For instance,

- The National Accelerated Food Production Programme
- Green Revolution
- Nigerian Vision 20: 2020
- Agricultural Transformation Agenda,
- Agricultural Promotion Policy etc.

The New President of Federal Government of Nigeria declared State of Emergency on food insecurity.

Under food security program of Nigeria:

- 200,000 metric tons of grains from the national reserve to be released
- 225,000 MT of fertilizers and seedlings to go to farmers
- N50bn to cultivate rice
- N50bn to cultivate casava and wheat



THE NIGERIAN SPACE PROGRAMME

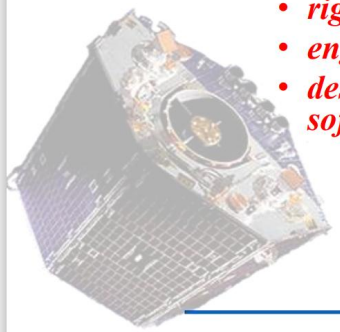
National Space Research and Development Agency:

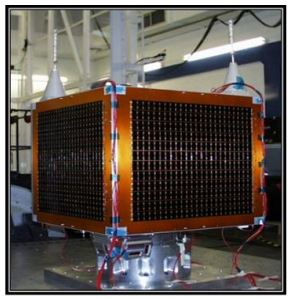
- NASRDA was established in 1999 with the clear mandate to:

"vigorously pursue the attainment of space capabilities as an essential tool for the socio-economic development and the enhancement of the quality of life of Nigerians".

- NASRDA is to achieve this mandate through:

  - ***research ,***
  - ***rigorous education,***
  - ***engineering development,***
  - ***design and manufacture of appropriate hardware and software in space technology.***





Nigeriasat-1 (2003)

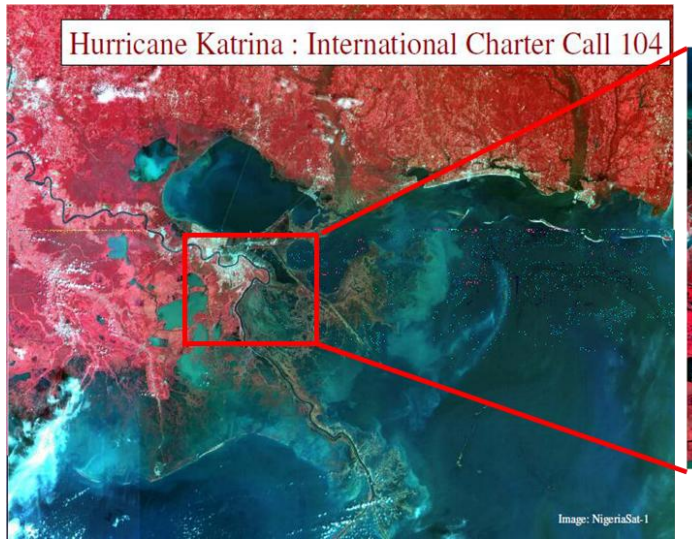
NigComSat (2007)

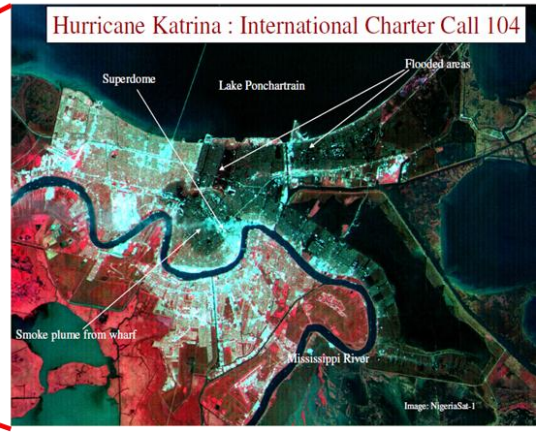
Nigeriasat-2 (2011)

NigeriaSAT-X (2011)

NIGCOMSAT -1R (2011)

Nigeria EduSat-1 (2017)

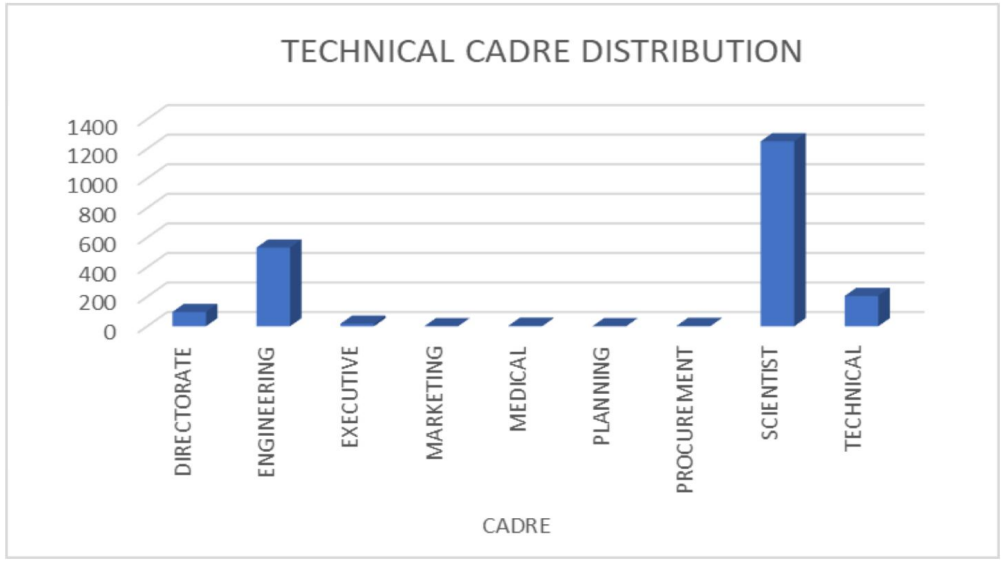


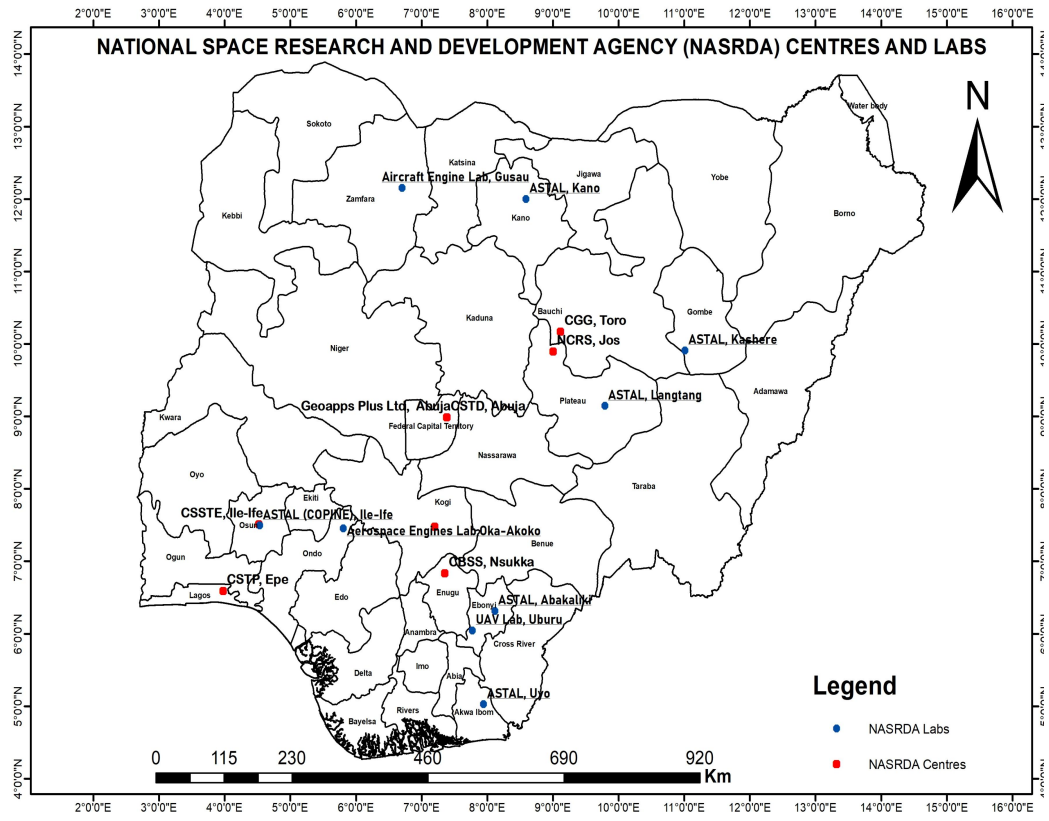


NASRDA AND ITS OPERATIONAL CENTRES/LABs

NASRDA has Staff strength of over 5000 workers: with almost 3000 Technical Expertise (Engineering, Sciences, Social Sciences etc).

Strategic Space Applications (SSA) department is located at NASRDA headquarter saddled with the responsibility of using Space derived data as a powerful planning tool to support Government Sustainable Programmes in environment, land use planning, agriculture, urban planning, water resources mapping, monitoring and management etc.





NASRDA & AIRCAS Collaboration

National Space Research And Development Agency (NASRDA)

- The National Space Research and Development Agency is mandated to vigorously pursue the attainment of space capabilities as an essential tool for its socio-economic development and the enhancement of the quality of life of its people.
- The Agency is to achieve this mandate through:
  - research ,
  - rigorous education,
  - engineering development,
  - design and manufacture of appropriate hardware and software in space technology.

Aerospace Information Research –Chinese Academy of Sciences (AIR-CAS)

CROPWATCH

- The China CropWatch System (CCWS) has served as China's leading crop monitoring system since 1998. The China CropWatch research team, part of the Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences, assesses national and global crop production and related information using remote sensing and ground-based indicators. Each quarter, the group's findings are published in the CropWatch bulletin, which is issued in both English and Chinese.

AIM:

Aimed at developing a "Nigerian customized CropWatch cloud service platform" to effectively monitor crops based on accurate, reliable, and timely availability of information for appropriate decision making to improve crop yield.

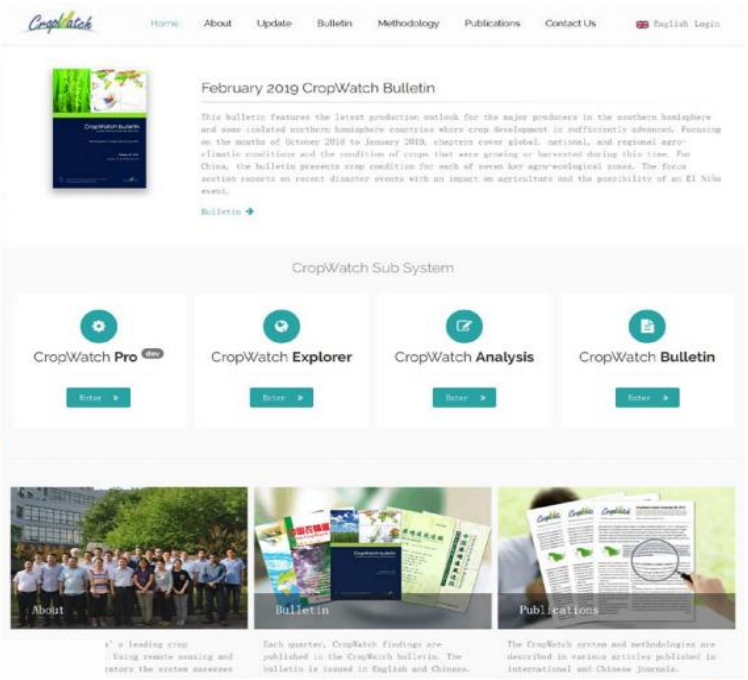
CropWatch Cloud

CropWatch-Pro
- An online tool for people to produce crop monitoring products at any time and anywhere.

CropWatch-Explore
- An online interface for people to explore and analysis all the crop information data easily.

CropWatch-Project
- An online platform for people to create and write the crop bulletin.

CropWatch-Bulletin
- An webpage for people to read CropWatch bulletin.



- Release CropWatch Bulletin
  - Quarterly and annually
  - grain production outlook
  - covering 173 countries and regions down to provincial scales, with special focus on 43 key agricultural countries

http://cloud.cropwatch.com.cn/

- **Analysis-ready products**
  - **32 Indicators ready** in CropWatch Cloud considering most indicators used in existing system
  - Cloud based system **assessible from internet everywhere** without much investment on computing infrastructure, storage, etc
- **Customizable to improve and promote ownership**
  - **Indicators customizable**, easy to include new national or regional specific indicators
  - CropWatch Cloud can be **customized according to the specific demand for each country** and work as a national/regional system
  - After customization and training, countries will **strengthen the agricultural monitoring capacity** on your own

NIGERIA CROPWATCH OBJECTIVES

Why CropWatch?

In Nigeria, 70% of the populace are engaged in subsistence farming with little or no access to information or technology leading to poor farm handling and poor yields.

- To increase agricultural productivity in a sustainable manner to meet the growing demand both nationally and globally while adapting to a changing climate
- To provide access to a timely national food information system
- To facilitate and stimulate agricultural monitoring for the advancement of the SDG goal of zero hunger through a joint research and capacity building with NASRDA
- To customize CropWatch to meet specific needs of Nigeria and strengthen the capacity of relevant stakeholders to identify suitable climate resilient agricultural practices
- To improve crop production by integrating geospatial information for agricultural production.

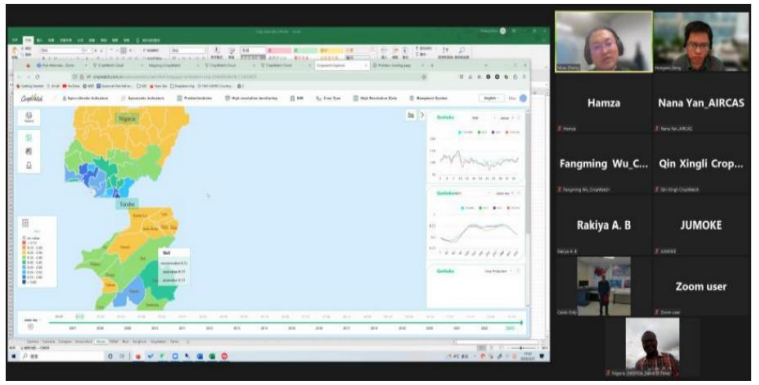
2023 NDVI @ NATIONAL LEVEL

UNITED NATIONS
UNCTAD

Customize Nigeria CropWatch-ICP Project: Activities so far

The Status So far:

- **Invited by UNCTAD** to participant in Online Training 2021.



Exchanges on the system customization

- **MoU (Memorandum of Understanding)**

  An MOU was signed between NASRDA and AIRCAS. The online ceremony was chaired by Dr. Jie Liu, Chief of International Cooperation Department, Aerospace Information Research Institute, Chinese Academy of Science (AIRCAS) supported by ANSO and UNCTAD. It was a successful event that marks the beginning of Customization of Nigeria CropWatch.

Signing MOU online

- **The 1st NASRDA held stakeholders meeting** and discussed the initiative which received a positive response: The meeting was well attended by representatives from various stakeholders. Among those that were in attendance are; NARSDA, AIRCAS (virtual), Federal Ministries (Agriculture and Rural Development, federal Water Resources, Environment, Nigerian Meteorological Agency, Nigeria Hydrological Services Agency, Nigeria Integrated Water Resources Management, Bureau of Statistics and SDG office. Some of the decisions taken at the meeting were: Type of crops to be monitored and the scope of the coverage area (National, State and Local level)

- **2nd Stakeholders Meeting** : Nigeria CropWatch Project (Status & Update), 6th July, 2023

Picture participants at the 2nd stakeholders Meeting

Customize Nigeria CropWatch-ICP Project: Activities so far

- **CropWatch Platform down scaling data to local Government level**

  The deliverables such as Biomass, NDVI, VCI, Temperature, Precipitation etc can be access and download from National, State and Local Government level. This a tremendous improvement for Nigeria.

DATA FOR CROPWATCH Shared by NASRDA

S/N	Data	Source	Resolution	Coverage	Date	Size
1	Agro-Ecological Zone	IITA, Ibadan	Shapefile	Nigeria	2021	0.253692 MB
2	LULC	Landsat	30m	Nigeria	2000,2010,2020	4.348 GB
4	Multispectral Satellite Image	NigeriaSat-X (NASRDA)	22m (Green, Red, Blue and NIR)	Nigeria	2011	4.0471 GB
5	Multispectral Satellite Image	NigeriaSat-1 (NASRDA)	32m (Green Red and NIR bands)	Nigeria	2007	13.0462 GB
6	Nigeria Administrative Boundary	OSGOF	Shapefile	Nigeria	2021	10.6502 MB
7	Nigeria Soil	FAO	1000m	Nigeria	2011	30.5527 MB
8	Rainfall	TRMM	0.25 degrees	Africa	1989-2017	27.1 MB
9	SPOT		2.5m	Nigeria	2015	294.6 GB Packed on Zip
10	Wetlands	FAO	1000m	Nigeria	2020	1.9866 GB
11	Weather Stations	NIMET	Shapefile	Nigeria	2022	0.00769329 MB

- **Knowledge Building**

✓ CropWatch-ICP Online Training: Video Conferencing, (22 March – 28 May 2021)

✓ Bilateral Research Exchange Workshops (August 2021 to January 2022):

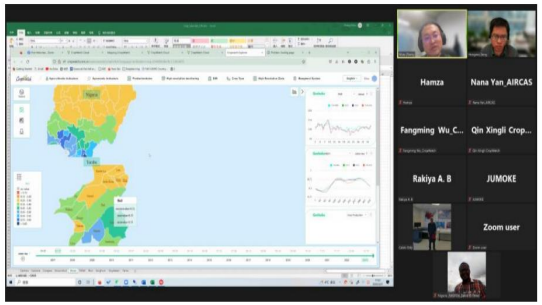
✓ Consultative Meetings with NASRDA project implementation team

✓ CropWatch Bulletin Publications: 7 editions (from 2021 till date)

✓ Exchange of Data with AIRCAS:

✓ NASRDA Staff attended UNCTAD Geneva Meeting in March 2023

✓ NASRDA staff Attended the GEO Symposium and GEO Open Data and Open Knowledge Workshop as a young researcher representative from Africa



Exchanges on the system customization

- **Second Stakeholders Briefing on the Update/use of the platform: July, 2023**

- **Attended Training in Mauritius in August, 2023**

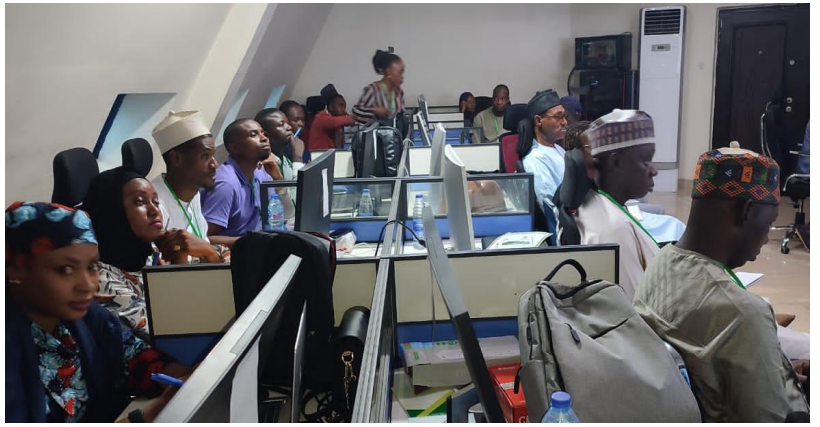
Bilateral discussion

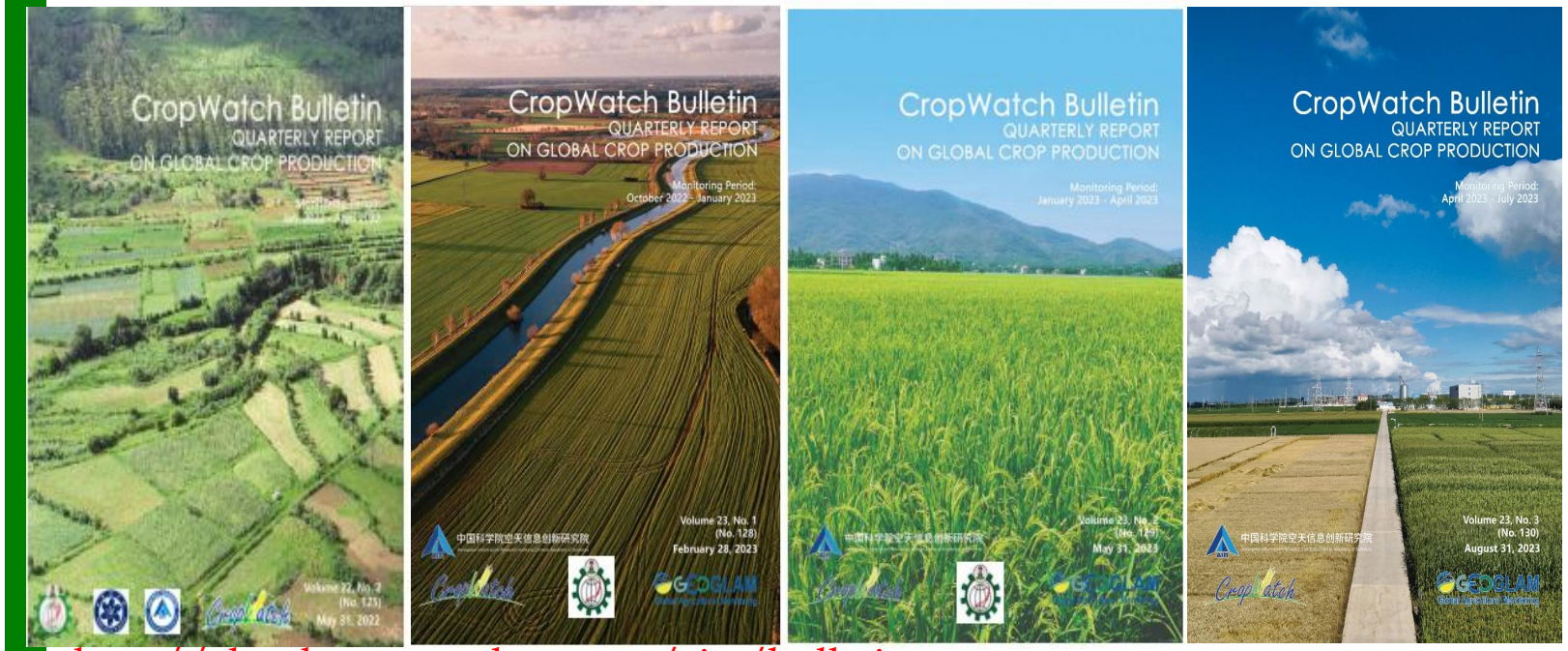
Customize Nigeria CropWatch-ICP Project: Activities so far

- **Workshop and Field Data Collection Training** using the GVG App. As part of the CropWatch Innovation Cooperation Programme. GRID3 Lab, NASRDA, Abuja Nigeria 09 - 13 October, 2023

- **CropWatch quarterly bulletin**

  NASRDA has been participating in the publication of cropwatch bulletin quarterly report on global crop production including Nigeria (from last quarter of 2021- till date)



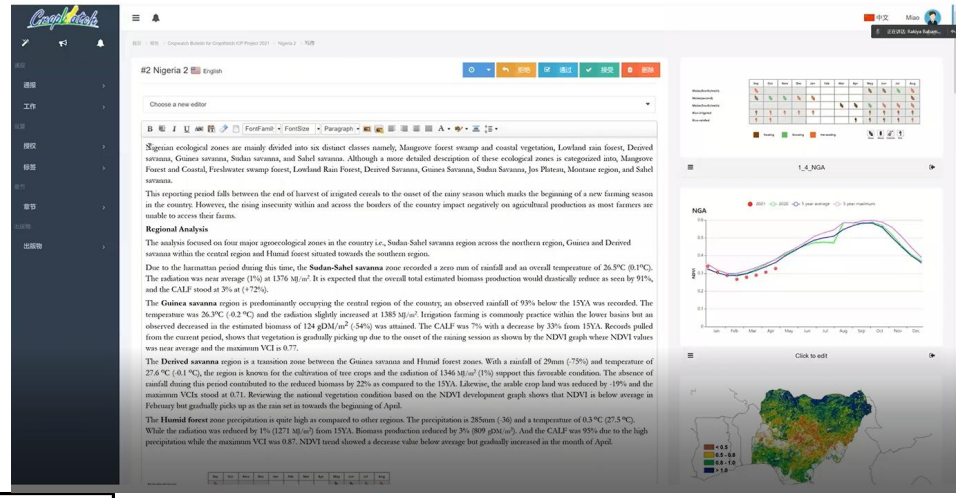


http://cloud.cropwatch.com.cn/site/bulletin

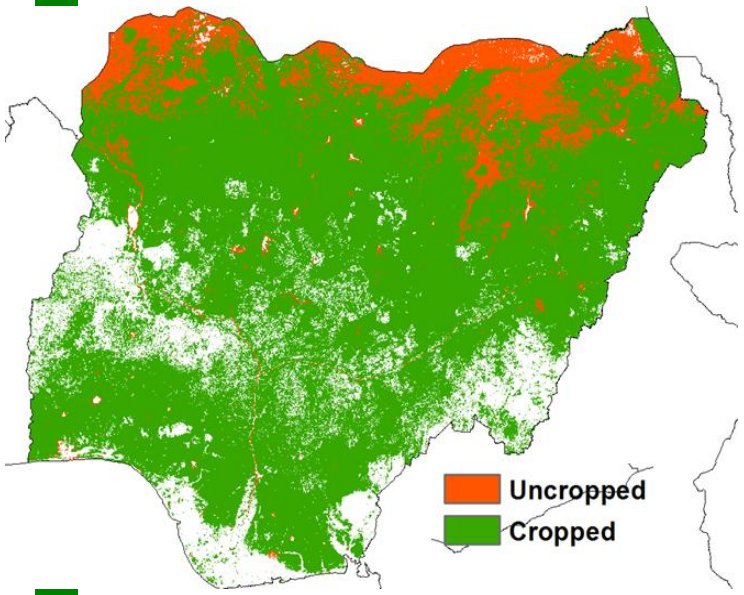
Customize Nigeria CropWatch-ICP Project

CropWatch Innovative Programme for Agricultural Monitoring (Crop-Watch) is to **facilitate and stimulate agricultural monitoring of the developing countries** for the advancement of the **SDG goal of zero hunger through joint research and capacity building.**

Nigeria draft analysis



CROP ARABLE LAND 2022 PRODUCED FROM CROPWATCH SITE



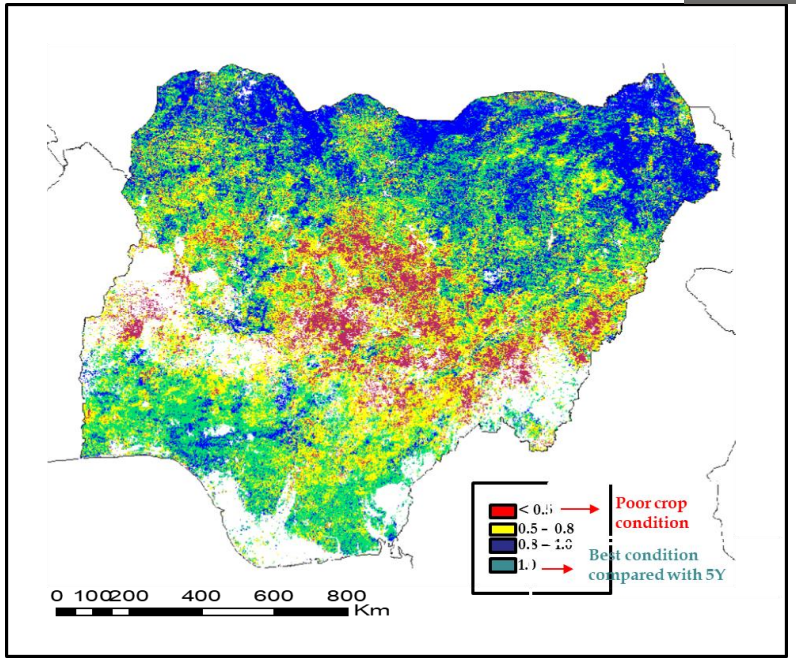
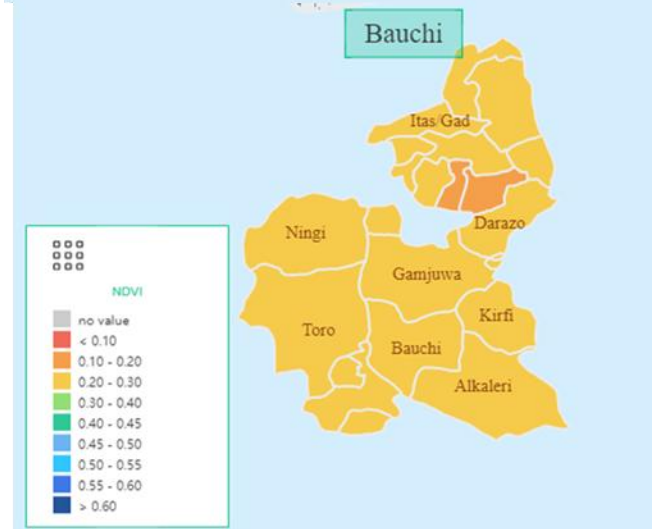
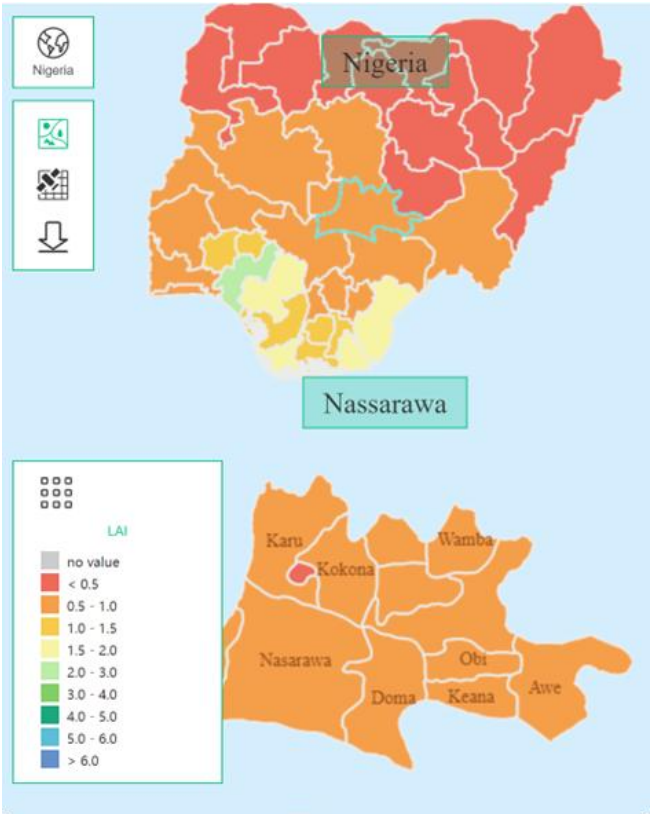


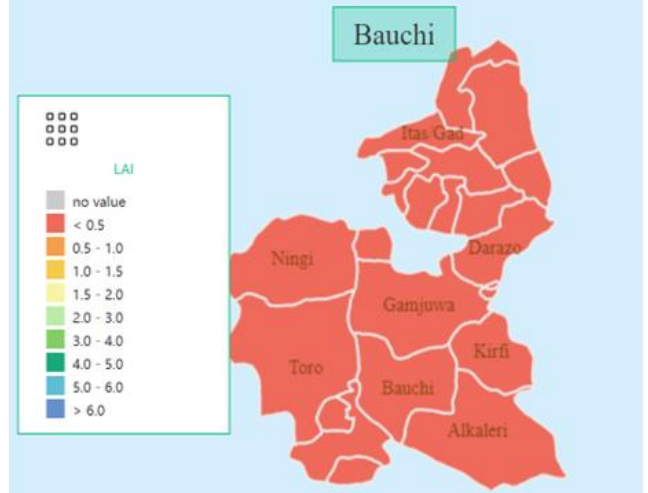
Table 3. 55 Nigeria's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, January - April 2023

Region	RAIN		TEMP		RADPAR		BIOMSS	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)	Current (gDM/m²)	Departure (%)
Derived Savannah	70	-54	28.1	-0.2	1270	0	584	-14
Freshwater Swamp Forest	398	-23	26.9	-0.2	1293	1	1038	-10
Guinea Savannah	15	-73	26.8	-0.5	1350	0	481	-12
Jos Plateau	7	-80	23.5	-0.5	1399	0	427	-14
Lowland Rainforest	256	-31	26.9	-0.2	1272	0	860	-12
Mangroove Forest	538	-21	26.7	-0.3	1308	0	1134	-10

Customize Nigeria CropWatch-ICP Project Cont'D







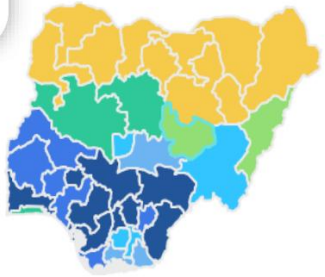
CROPWATCH

Nigerian CropWatch Platform for Effective Crop Monitoring

SOME DELIVERABLES FROM THE CROPWATCH PROJECTS

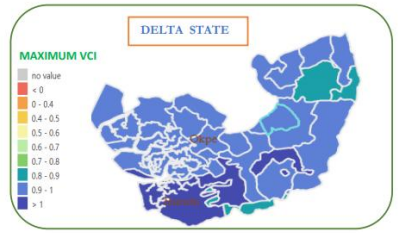
PHENOLOGY: Tells the farmer when it's safe to start planting various crops for the year in different regions of the country.

2023 NDVI @ NATIONAL LEVEL



Normalized Difference Vegetation Index: Helps quantify the greenness of the farm, plant stress, healthiness of plants determine drought and predict yield.

Arable Cropland: Information on the suitable land for cropping various crops.



Vegetation Condition Index: It focuses on the impact of drought on vegetation and can provide information on the onset, duration and severity of drought.

WHY CROPWATCH?

In Nigeria, 70% of the of the populace are engaged in subsistence farming with little or no access to information.

Leading to poor farm handling and poor yield.

SOLUTION

CropWatch is a system that uses satellite data to monitor crop conditions and integrates this with other climate-related data to produce near accurate, reliable, and timely information for appropriate decision making to improve crop yield.

National Space Research and Development Agency

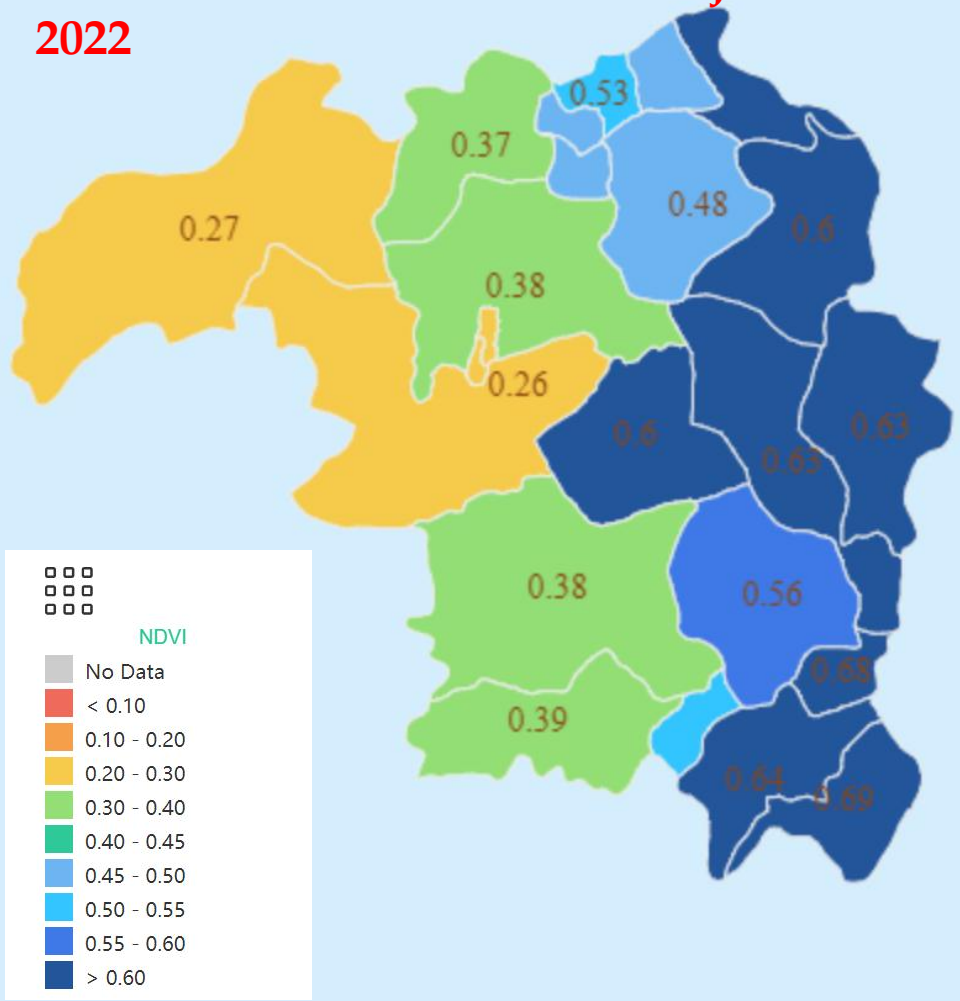
Aerospace Information Research-Chinese Academy of Sciences

UNCTAD

ANSO

Contact Us: NASRDA CropWatch Team. Phone: +2348068244724 Email: rakiya.babamaaji@gmail.com

KADUNA STATE NDVI FOR JULY 2022



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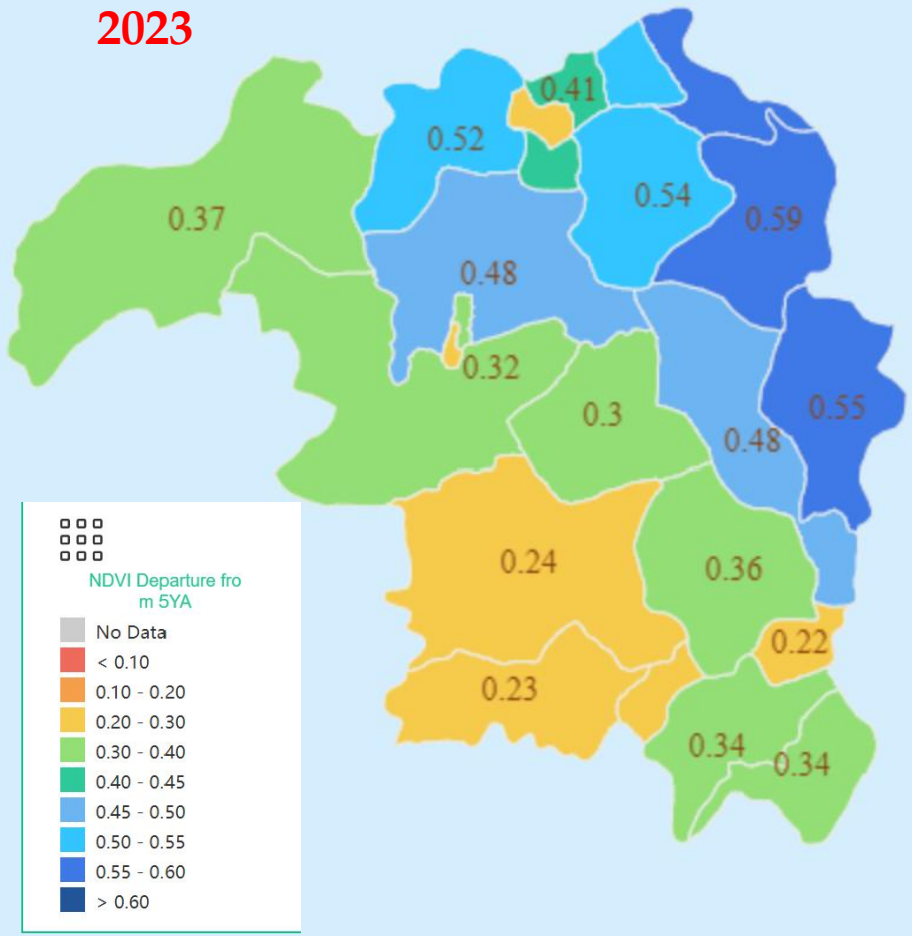
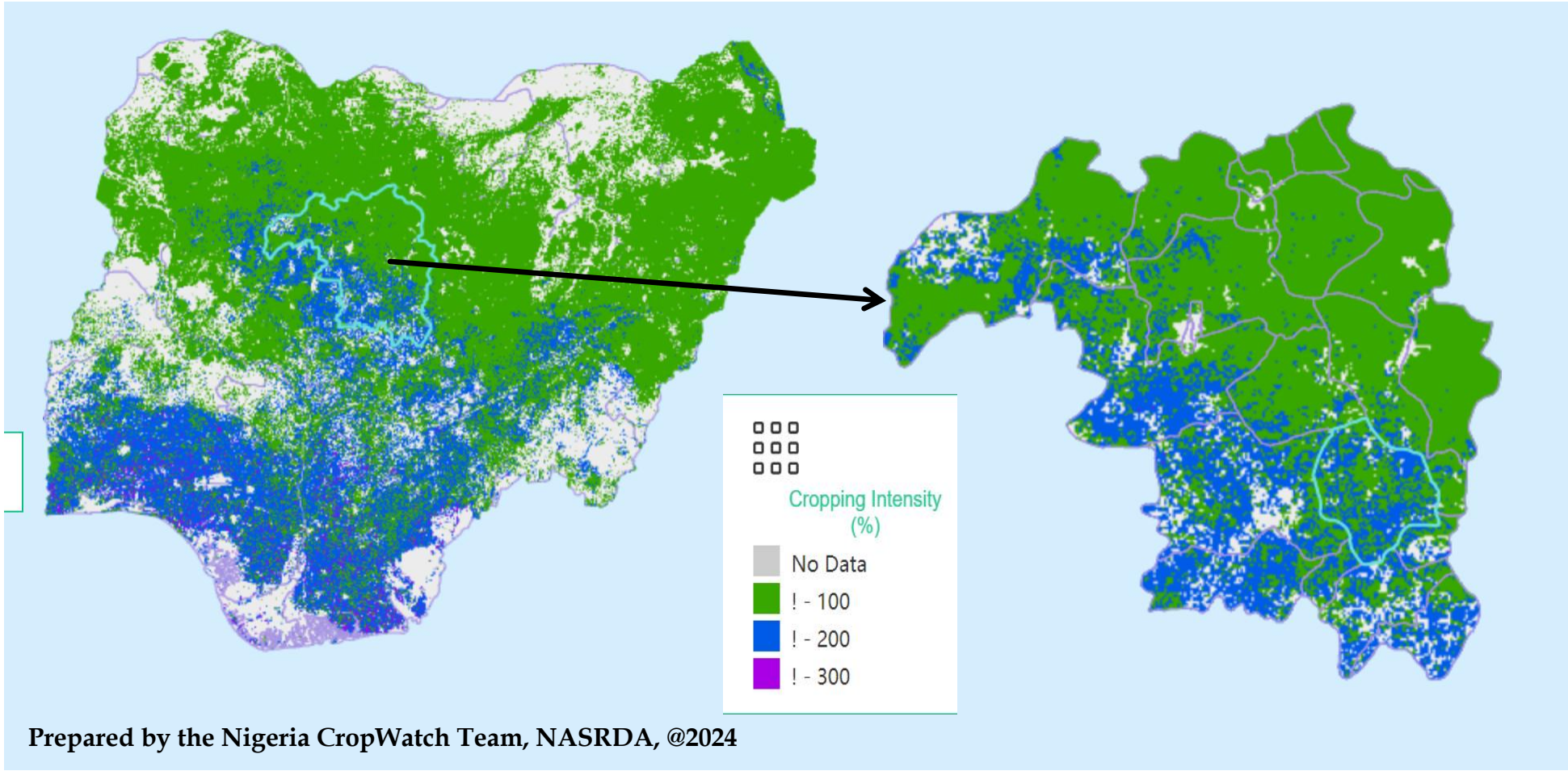


Source: CropWatch Nigeria Team NASRDA

KADUNA STATE CROPPING INTENSITY FOR THE YEAR 2021



Prepared by the Nigeria CropWatch Team, NASRDA, @2024

National Agricultural Development Fund: NADF

The National Agricultural Development Fund (NADF) is a transformative institution dedicated to empowering and revolutionizing the Nigerian agricultural standards and secure its food future.

https://nadf.gov.ng

Customize Nigeria CropWatch-ICP Project: Activities so far

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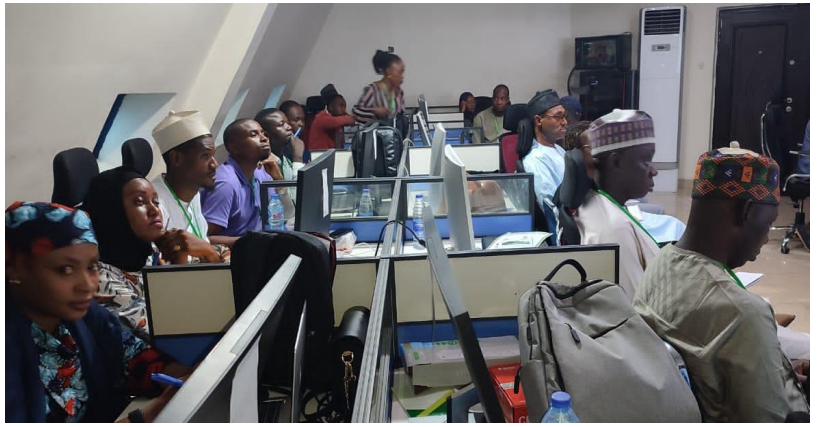

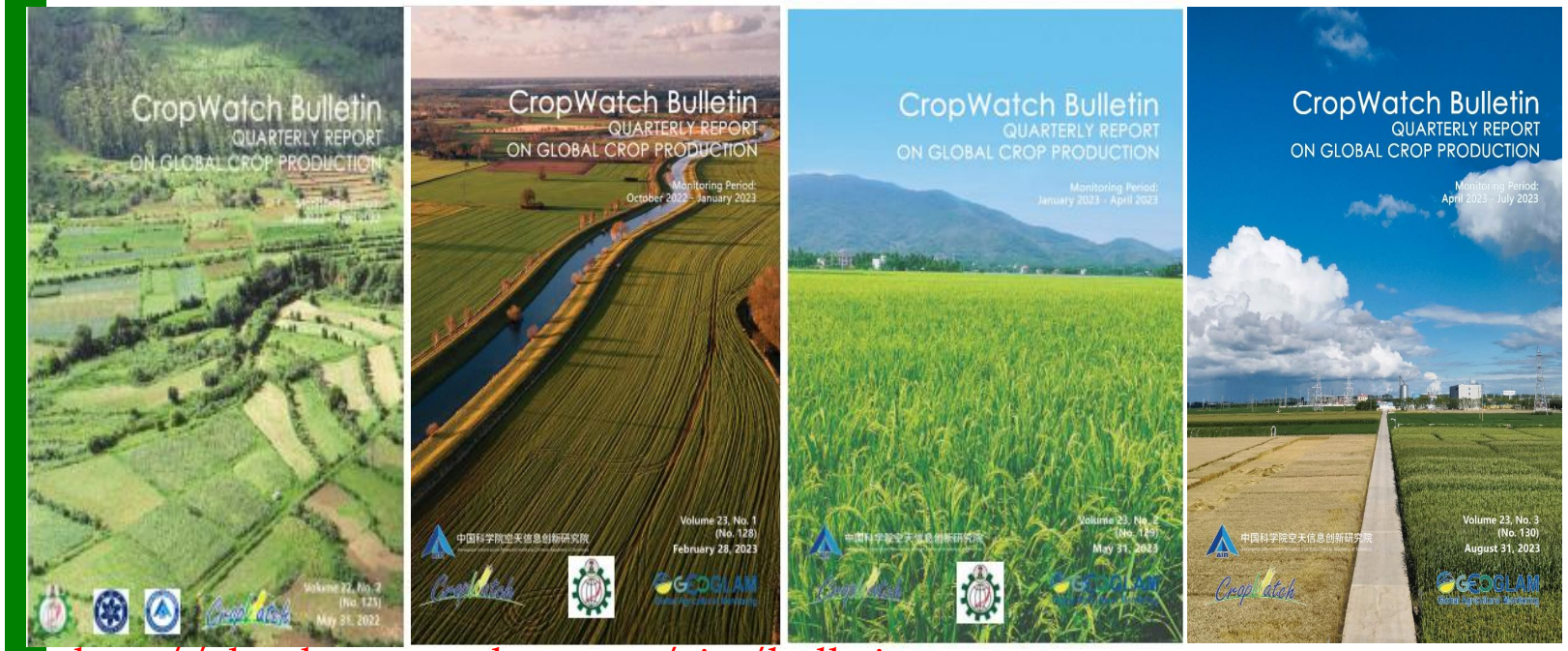

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Workshop and Field Data Collection Training using the GVG App. As part of the CropWatch Innovation Cooperation Programme. GRID3 Lab, NASRDA, Abuja Nigeria 09 - 13 October, 2023

Customize Nigeria CropWatch-ICP Project: Future Plan

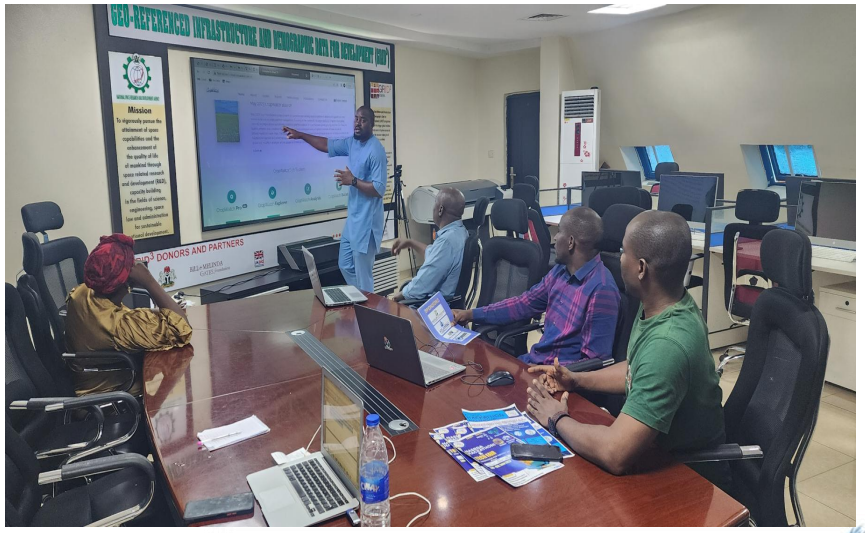
- NASRDA will continue to liaise with ECOWAS directorate of Agriculture for possible involvement of other ECOWAS countries in the CropWach program.
- NASRDA in Collaboration with FMAFS to Train the Agricultural Extension workers and frontliners on basic RS/GIS knowledge to enhance their ability to relate with geospatial data from the CropWatch platform and convey the uses to farmers and interested parties.
- Sensitization, Encouragement and Engagement for the youth and policy makers inembracing Space Technology in Agricultural Extension Services using the knowledge acquired from CropWatch to assist farmers.
- Nigeria Customized Platform will be fully ready with other missing components very soon.
- For sustainability NASRDA need to train young scientist in RS applications in Agriculture especially support in sending staff in scholar visit to AIRCAS facilities or acquire M.Sc/PhD

Capacity Building for NASRDA Staff

Requirements and expectation

In conclusion, with the increasing population, estimated to reach 400 million by 2050, enhanced agriculture productivity through adaptation of new technologies and innovations is necessary. Support from all partners to the efforts by the federal and state governments is central for achieving the geovernment goal in food security and SDG 2.

- Relevant stakeholders at the national and state levels to have the capacity and knowledge to use the customized cloud-based crop monitoring platform and the generated information on agro-climatic condition, agronomic and major production zone for the effective development of climate resilient agricultural practices in various crop production.
- For sustainability NASRDA need to train young scientist in RS applications in Agriculture especially support in sending staff in scholar visit to AIRCAS facilities or acquire M.Sc/PhD
- NASRDA Dedicated Equip Lab for CropWatch



CROPWATCH PARTNERS

United Nations Conference on Trade and Development provides funding of CropWatch preprograms.

Alliance of International Science Organizations aids in catalyzing and implementing programs and initiatives in Science, Technology, Innovation and Capacity Building (STIC) for the promotion of shared development and the advancement of the UN SDGs.

Aerospace Information Research Institute, Chinese Academy of Science is the research institute that integrates both research and higher education and committed to training talented scientists. It is responsible for providing the technical manpower for the CropWatch programmes and publication of the quarterly bulletins.

The National Space Research and Development Agency is mandated to vigorously pursue the attainment of space capabilities as an essential tool for its socio-economic development and the enhancement of the quality of life of its people.
NASRDA signed MoU with AIRCAS on the 4th of July 2022 to advance crop monitoring using the CropWatch platform.

CONTACT

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Thanks for listening