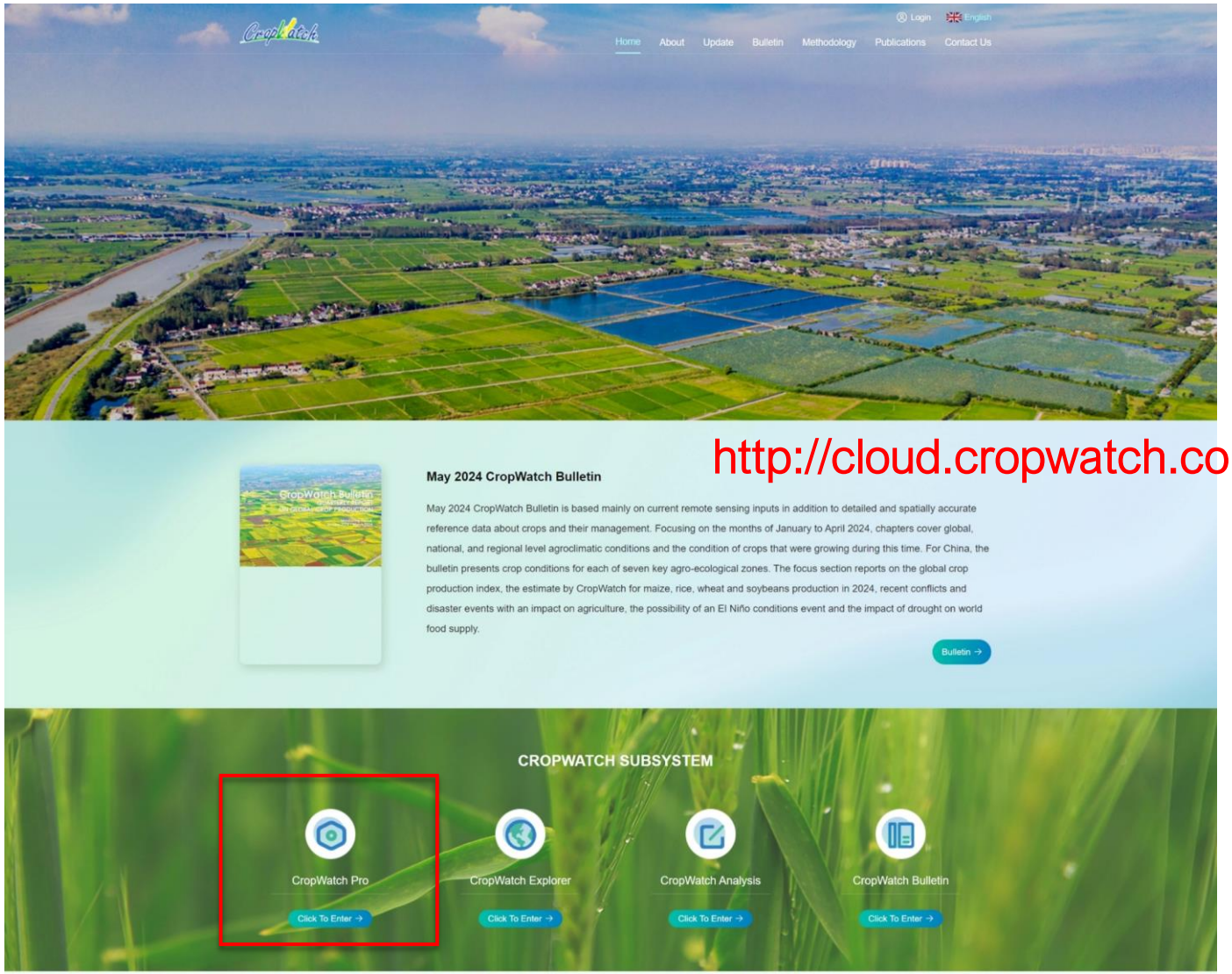
Crop condition monitoring using CropWatch Cloud Platform

Miao Zhang, on behalf of CropWatch Team
AIR, CAS

July, 2024

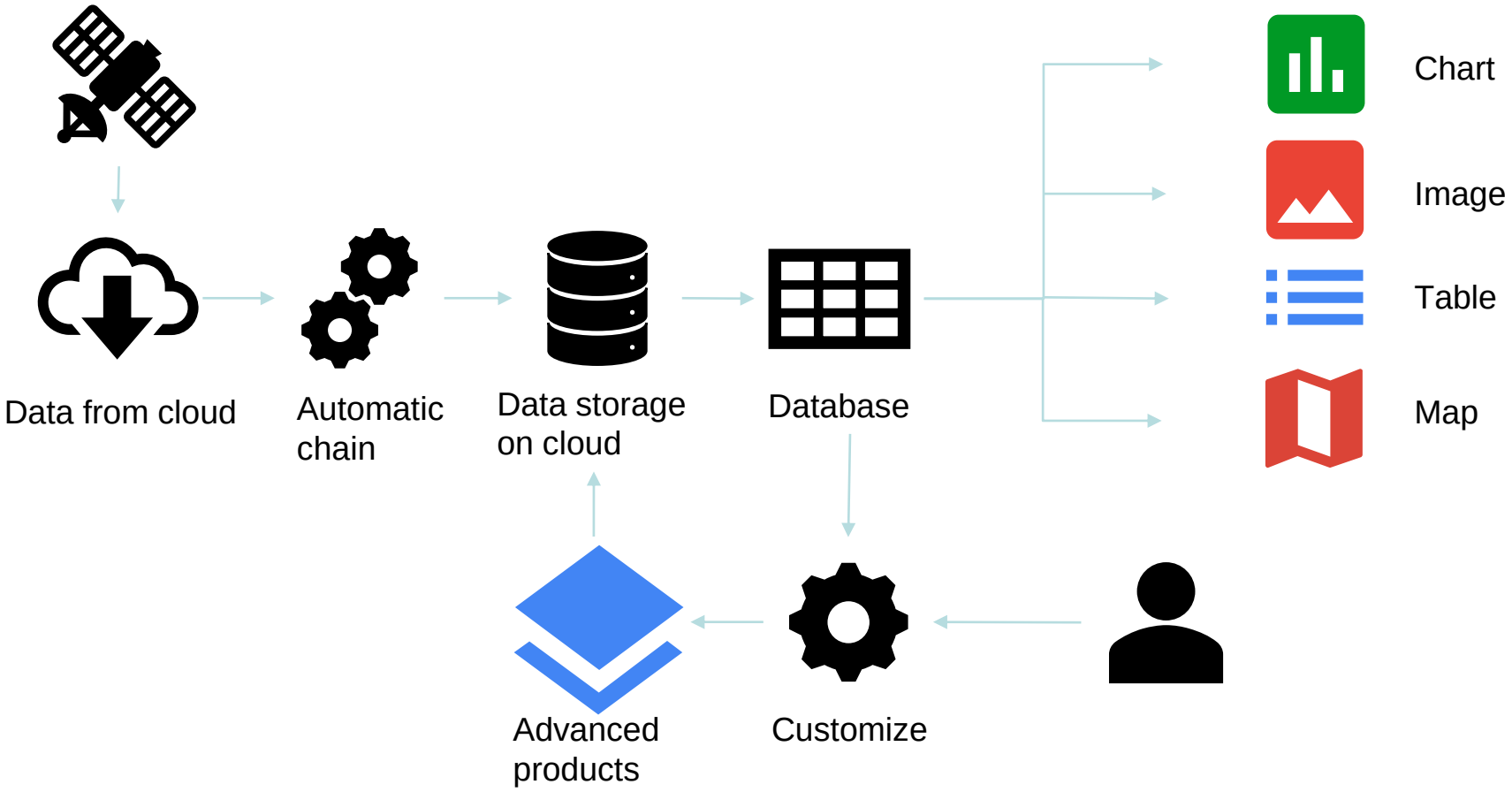
Where to access to CropWatch Pro



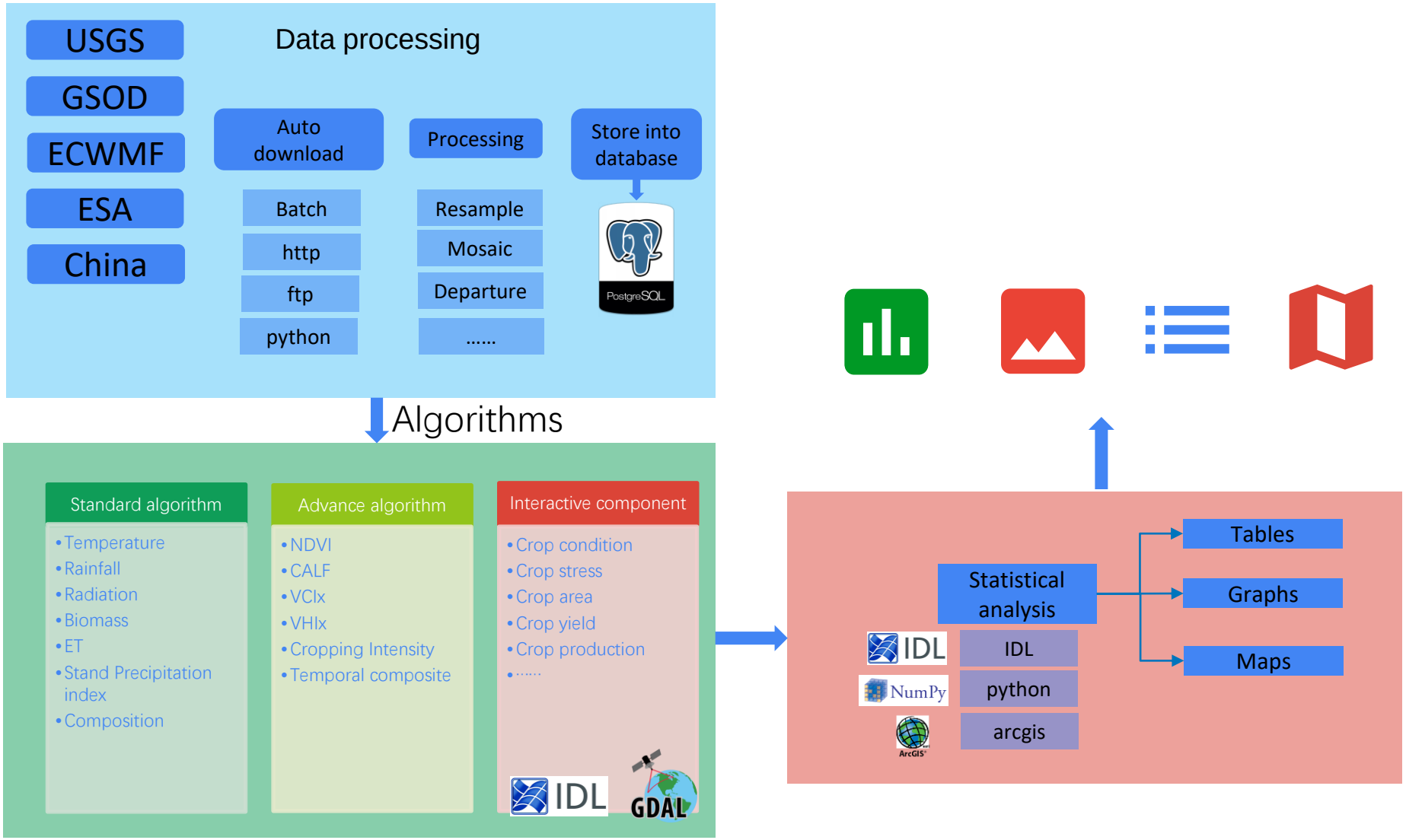
http://cloud.cropwatch.com.cn/

After registration and activation, please use ‘CropWatch Pro’ Component

Data flowchart



Architecture



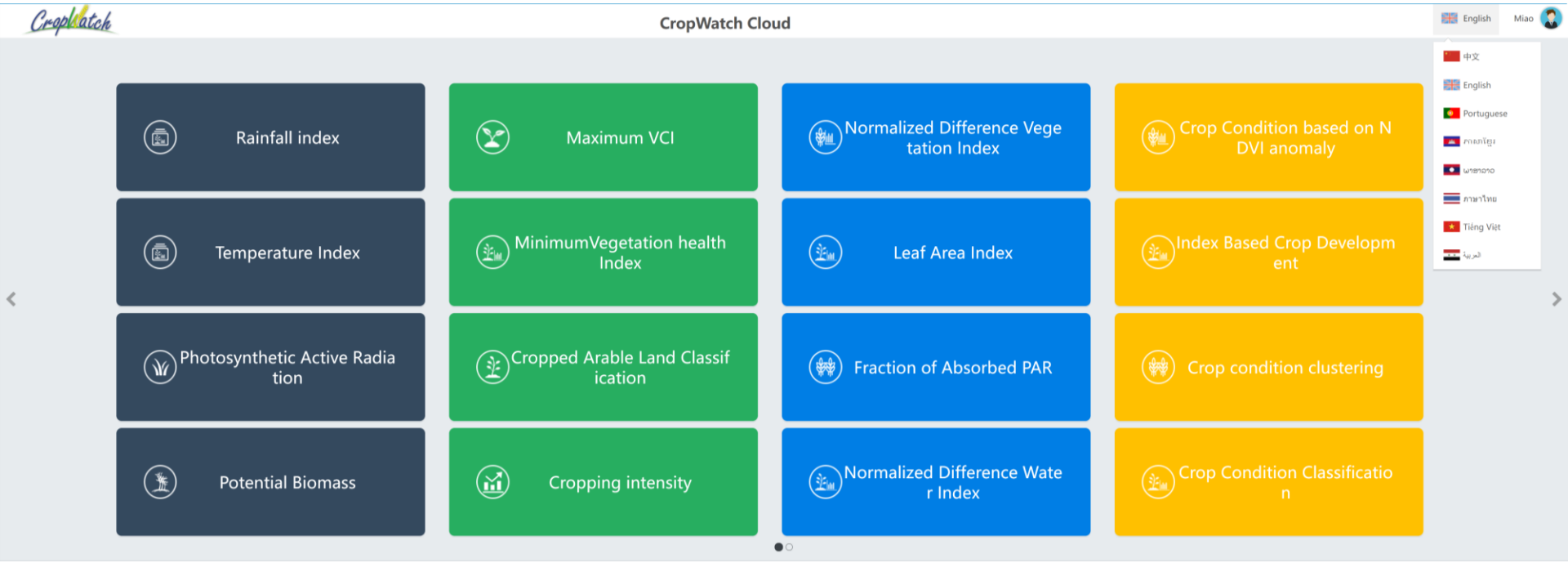
CropWatch Indictors

CropWatch is expanding its agro-climatic and agronomic indicators considering the commonly used indicators from 13 existing global and national systems

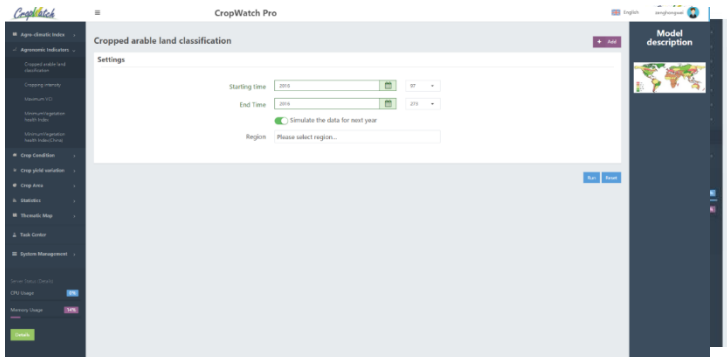
System		Coverage	AgroClimate	Crop condition		Crop production			Independent drought monitor	Food security	Reference
				Status	Stress analysis	Crop types	Crop area	Yield			
ASIS[26]		Global	P profile & P departure from average; Accumulative P and profiles	NDVI anomaly and profiles and VCI	ASI, weighted VHI over Gaul2 and mean VHI	Cropland and grassland masks	n.a.	n.a.	ASI, drought intensity and frequency	CCBS	https://www.fao.org/giews/
China CAS & CAAS	CropWatch[27]	Global	P, T, PAR and potential biomass anomalies over 15 years and profiles	NDVI anomaly and VCIx over the last five years, NDVI development and clustering	VHI, flooding, diseases and pests	Grains, wheat, maize, rice and soybean	Remote sensing-based crop type mapping; CPTP	Agro-meteo, RS index, Biomass + harvest index	SPI, VCI, TCI, VHI, NDWI, and soil moisture	Supply trend	http://cropwatch.cn
	CHARMS	China	Anomaly maps and profiles	NDVI anomaly maps and development	n.a.	Wheat, maize, rice, and soybean	Areal sampling and crop classification	RS index WOFOST model	NDDI, TVDI, and anomaly of actual ET	n.a.	Personnel communication, offline
European Union	ASAP[28]	Global	SPI1, SPI3, and GWSI	zNDVIc and mNDVId	SPI, GWSI and zNDVIc anomalies	Crop and rangeland masks	n.a.	Work in progress[29]	GWSI, NDVI, and automatic drought warning	CAF threshold	https://mars.jrc.ec.europa.eu/asap/
	MARS[30]	Europe & neighbours	SPEI, ASI, Wofost, and PET	VCI, VPI, and CNDVI	AOC maps and warning index	MARS crops	From EUROSTAT with a specific calendar	CoBo & BioMa	WSI and precipitation anomaly	n.a.	
USDA NASS, FAS/IPAD & USAID	Crop Explorer	Global	AgroClimate for Crop Explorer	NDVI departure from average, previous year and previous decade	Soil moisture and T thresholds for particular crops	CADRE crops	Unknown	Crop water production functions from CADRE	SPI, P and ET anomalies, heat damage and stress	Balance sheet	https://ipad.fas.usda.gov/cropexplorer/
	NASS, VegScape	USA	P and T departures from normal	NDVI, VCI, RVCI, MVCI, and RMVCI	n.a.	Wheat, corn, soybeans, cotton, and potatoes	June area survey with CDL	Monthly objective yield survey	n.a.	n.a.	https://nassgeodata.gmu.edu/VegScape
	FEWS-NET	30 countries	Rainfall assumptions: average and accumulative	NDVI and NDVI anomaly (%) with 2001-2018 mean, accumulative values and 8-day time series		n.a.	n.a.		WRSI, VHI, and P anomaly	SD and IPC	https://fews.net/
	GLAM[31]	Global	P, T and ET departures from normal		ESI, actual ET, SMI, and SWI anomalies	Cultivated cropland mask	n.a.	n.a.	NDWI, SWI, and P anomaly	n.a.	https://glam.nasaharvest.org/
Crop Monitor[32]		Global	Anomalies of P and T sums			Crop-specific masks	n.a.	n.a.	n.a.		https://cropmonitor.org/
WFP Seasonal Explorer		Global	P accumulation, anomalies and ranking since 1981	NDVI percentage average; development of NDVI and average	n.a.	Cropland and rangeland mask	n.a.	n.a.	P anomaly, NDVI percentage average and T ranking	n.a.	https://dataviz.vam.wfp.org/seasonal_explorer/reports
OZ-wheat[33-37]		Australia	n.a.	n.a.	n.a.	Wheat, sorghum	n.a.	Crop stress index model	Simulated crop stress with meteorological data	n.a.	
AAFS[33-37]		Australia	Seasonal P & T and their comparisons to average; P percentiles	NDVI anomaly	VHI provided by FAO ASIS	Up to 158 commodities	From ABS	Statistical forecasting methods	RSMP	Balance sheets	
PAK-SCMS		Pakistan	Monthly P v. previous year, maximum and minimum T v. last two years	NDVI, anomaly maps and profiles	Water supply, pests, and nitrogen	Rice, wheat, cotton, sugarcane	Crop classification	Remote sensing-based statistical model	Anomaly of precipitation; water supply situation	n.a.	https://suparco.gov.pk/crop-management/
FASAL		India	Anomaly map	VI anomaly map and development	n.a.	Rice, wheat, potato, rapeseed/mustard	Crop classification with in situ samples	Remote sensing-based statistical model	n.a.	n.a.	
VEGA[38]		Russia	Maps and profiles of cumulated P	NDVI anomaly map and development, MVCI, RVCI, and NDVI normalized on GDD	n.a.	Cropland, winter crops, summer crops, clean fallows	Remote sensing-based crop type mapping	Remote sensing-based statistical model	Comparison with cumulated average precipitation	n.a.	http://vega.geoglam.ru//?lang=eng
CALMS[39]		Canada	Agro-climatic models	NDVI anomaly map and development	Soil moisture and anomaly maps	Spring wheat, barley, canola	Crop classification with in situ samples	Statistical forecast with NDVI, WDI, and GDD	SM and SM anomaly	n.a.	

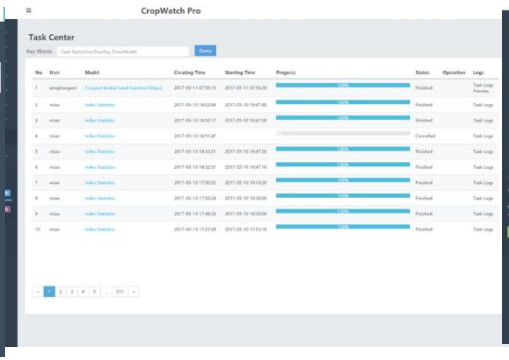
Abbreviations: AAFS=Australian Agricultural Forecasting System; ABS=Australia Bureau of Statistics; AgroClimate for Crop Explorer=percent of normal P at the 5-day, weekly and monthly scales, average, maximum and minimum T and departure from normal, extreme maximum and minimum T, snow depth and cover; AOC=areas of concern indicating excessive or deficit rain, radiation deficit, heat wave, temperature accumulation surplus or deficit, and fAPAR; ASAP=anomaly hot spots of agricultural production; ASI=Agricultural Stress Index; ASIS=Agricultural Stress Index System of the Food and Agriculture Organization of the United Nations (FAO); BioMA=crop growth modelling platform incorporated with WOFOST, CropSYS, STICS, CaneGro for sugarcane and WARM for rice; CAAS=Chinese Academy of Agricultural Sciences; CADRE crops=wheat, rice, and coarse grains (corn, barley, sorghum, and oats), oilseeds (soybeans, rapeseed, and palm), and cotton; CADRE=Crop Assessment Data Retrieval & Evaluation; CAF=critical area fraction; CALMS=Canadian Ag-Land Monitoring System; CAS=Chinese Academy of Sciences; CCBS=country cereal balance sheet; CDL=cropland data layers; CHARMS=China agriculture remote sensing monitoring system; CNDVI=accumulated NDVI from the start of the growing season; CoBo=control board with different statistical methods to produce yield forecasts; CPTP=crop-planting proportion and crop type proportion method; ESI=evaporative stress index; ET=evapotranspiration; EVI=enhanced vegetation index; fAPAR=fraction of absorbed photosynthetically active radiation; FAS=Foreign Agricultural Service; FASAL=forecasting agricultural output using space, agrometeorological and land based observations of India; FEWS-NET=famine early warning systems network; GAUL level=Global Administrative Units Layers of the FAO; GDD=growing degree days above 5°C; GLAM=global agricultural monitoring; GWSI=Global Water Requirement Satisfaction Index; IPC=Integrated Food Security Phase Classification; LAI=leaf area index; MARS=monitoring agricultural resources; MARS Crops=wheat, barley, maize, rye, triticale, rapeseed, sugar beet, potato, sunflower, and soybean; mNDVId=mean of the difference between NDVI and its long-term average over the growing season; MVCI=relative change in NDVI compared to the mean NDVI; NASS=National Agriculture Statistics Service; NDVI=normalized difference vegetation index; NDWI=Normalized Difference Water Index; P=precipitation; PAK-SCMS=Pakistan satellite-based crop monitoring system; PASG=percent of average seasonal greenness; PET=potential evapotranspiration; RMVCI=relative change in NDVI compared to the median NDVI; RSMP=Relative Soil Moisture Percentiles; RVCI=Relative NDVI change compared to the previous year; SD=Scenario Development for Food Security Early Warning; SMI=soil moisture index; SPI=Standard Precipitation Index; SWI=soil water index; T=temperature; USDA=United States Department of Agriculture; VCI=vegetation condition index; VHI=vegetation health index; VPI=vegetation productivity indicator; WDI=water deficit index; WFP=UN World Food Programme; WRSI=crop water requirement satisfaction index; zNDVIc=standardized anomaly of cumulative NDVI over the growing season.

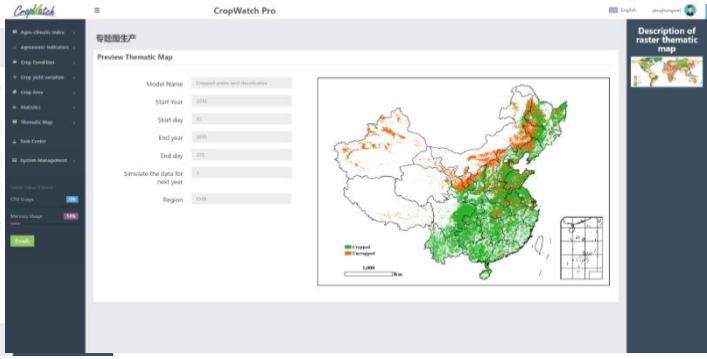
CropWatch Processing



Selectable Agro-climate, agronomic and PAY indicators







VI Anomaly analysis

Crop Condition

Crop Condition based on NDVI anomaly

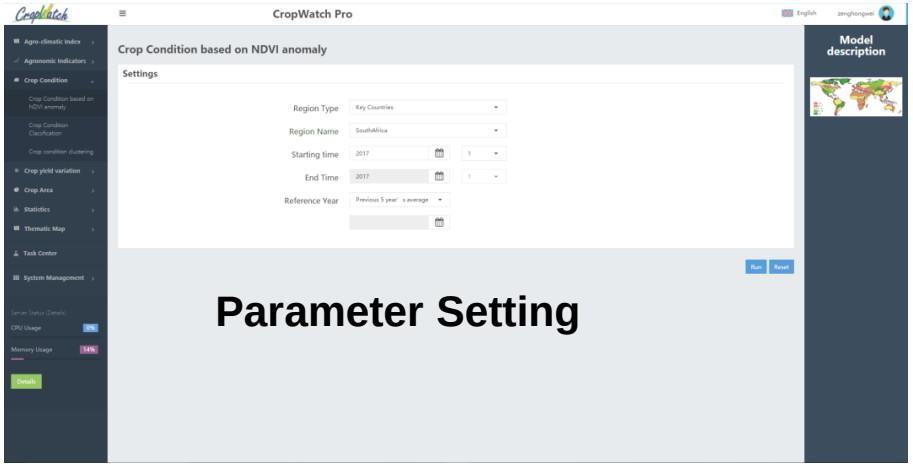
Model selection

Parameter Setting

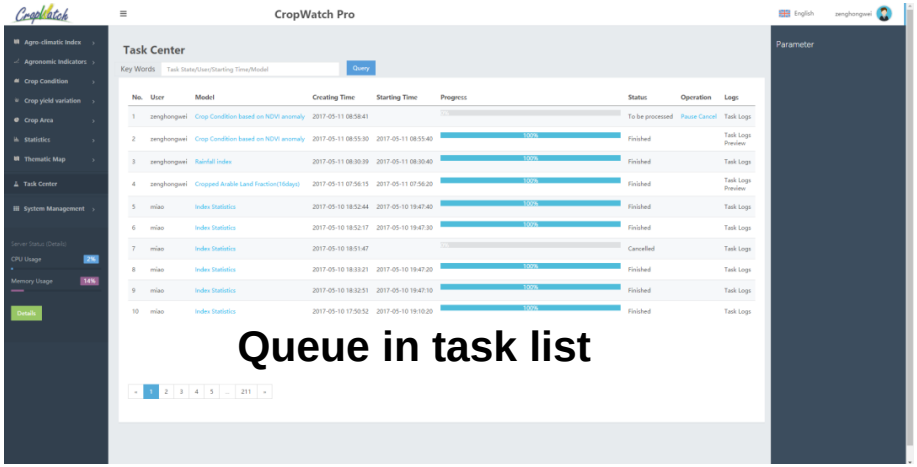
Submit task

Task finished

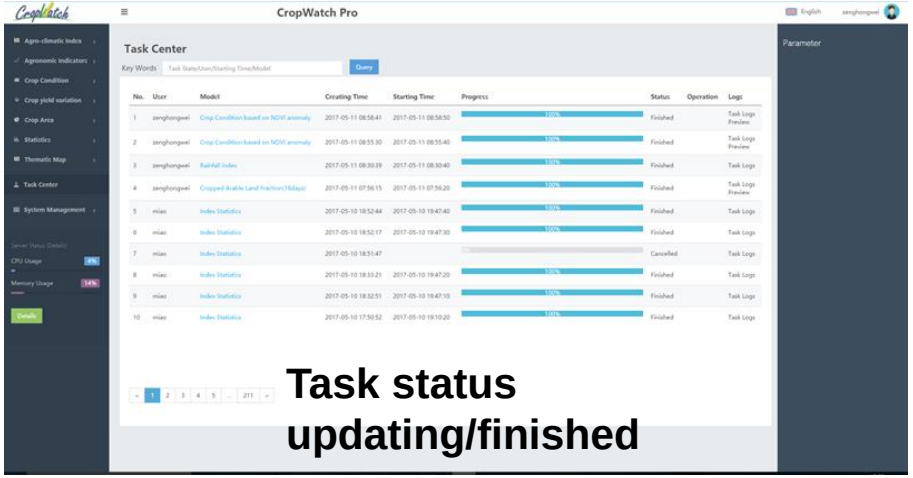
Thematic Product



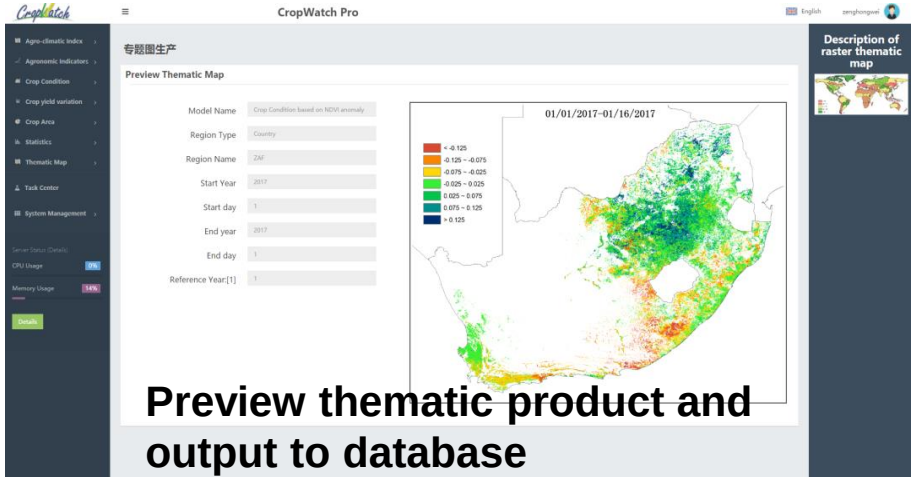
Parameter Setting



Queue in task list



Task status updating/finished



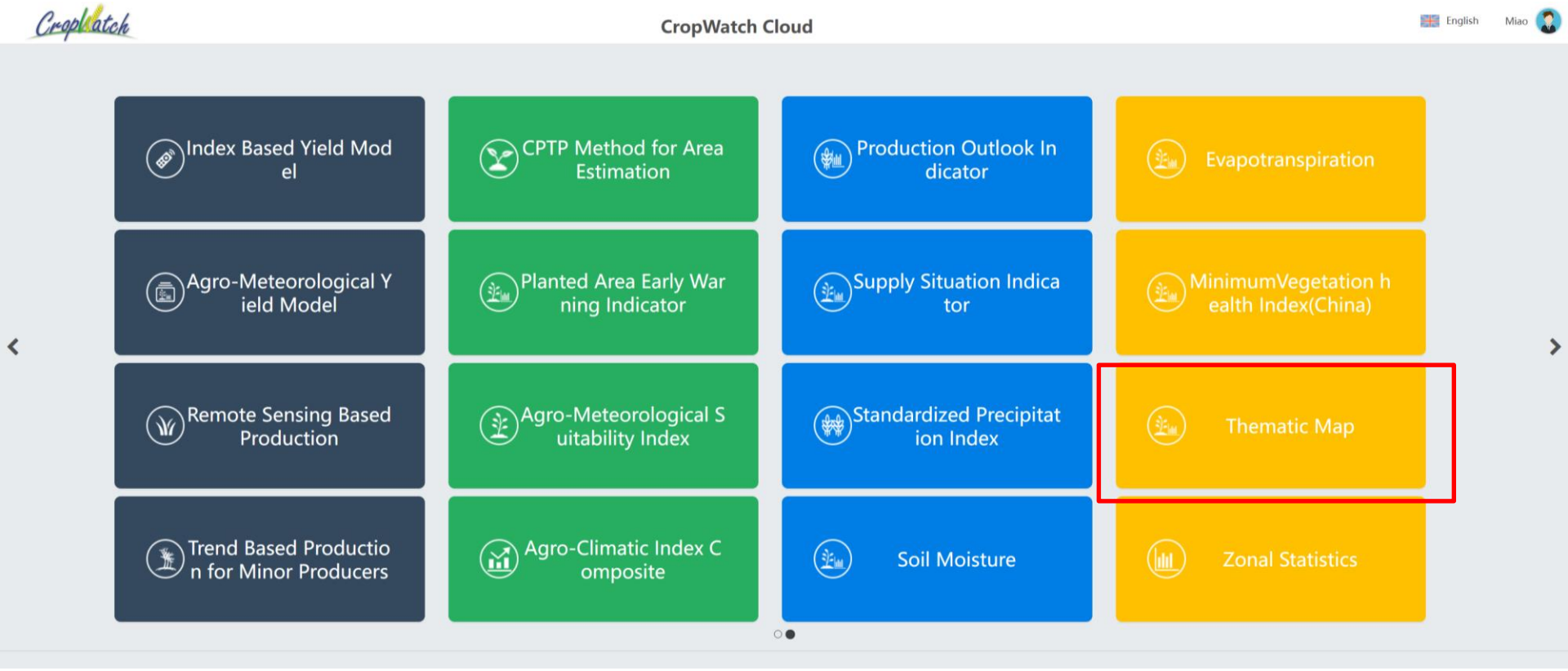
Preview thematic product and output to database

Demonstration

http://process.cropwatch.com.cn/CropWatch/

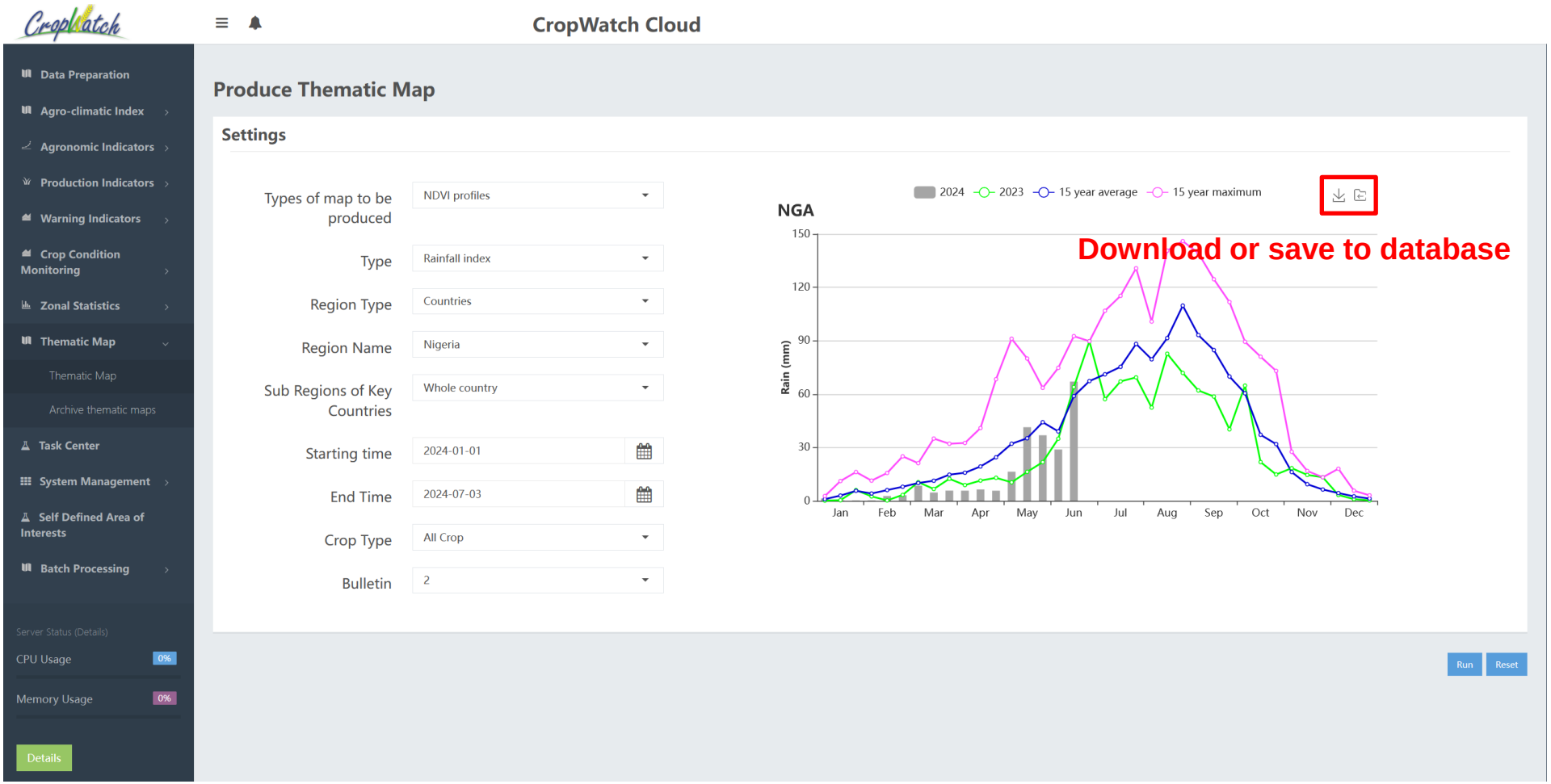
Agro-climatic Indicator

Selection the component – Thematic maps



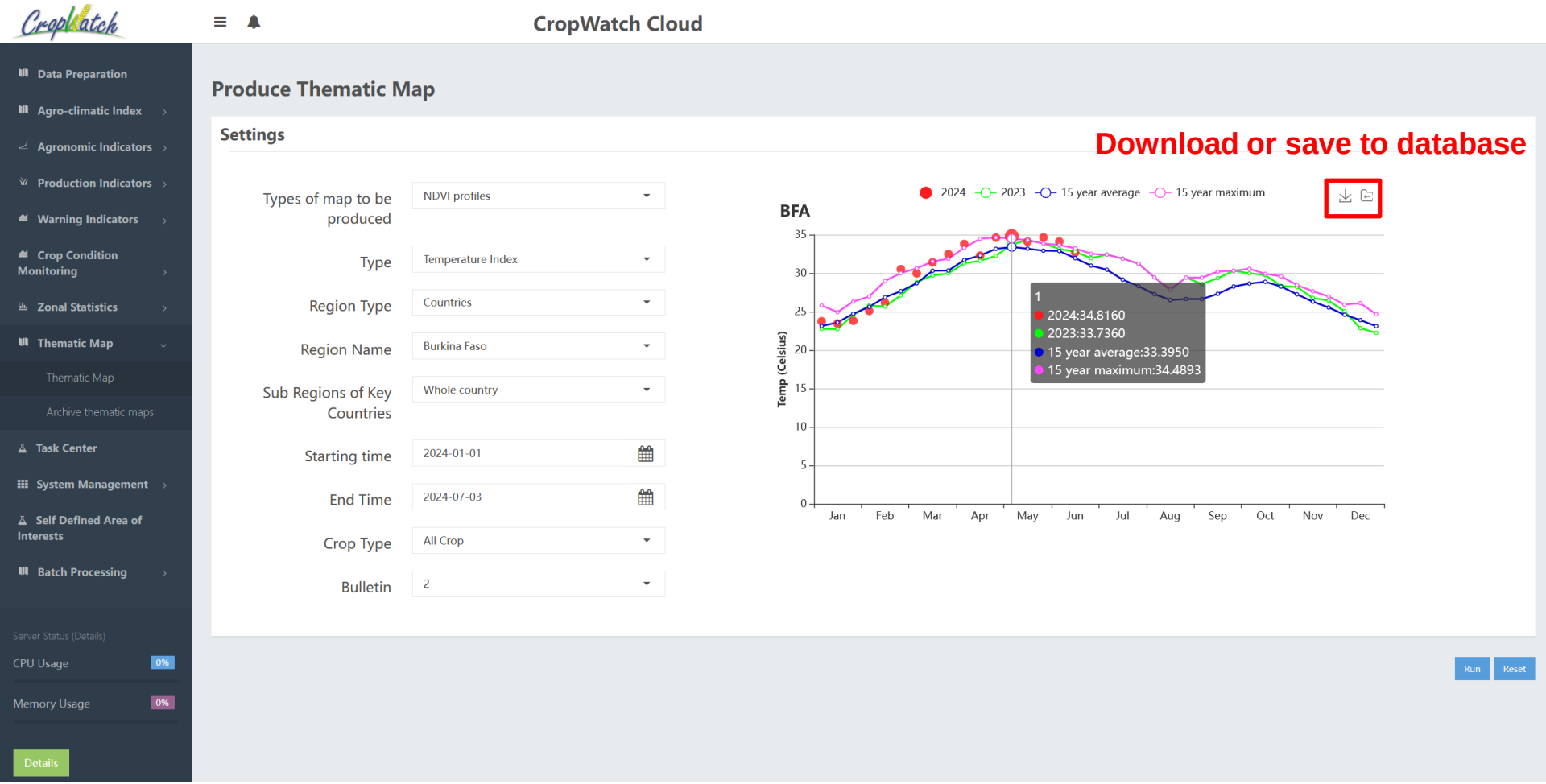
Agro-climatic Indicator

Rainfall profiles



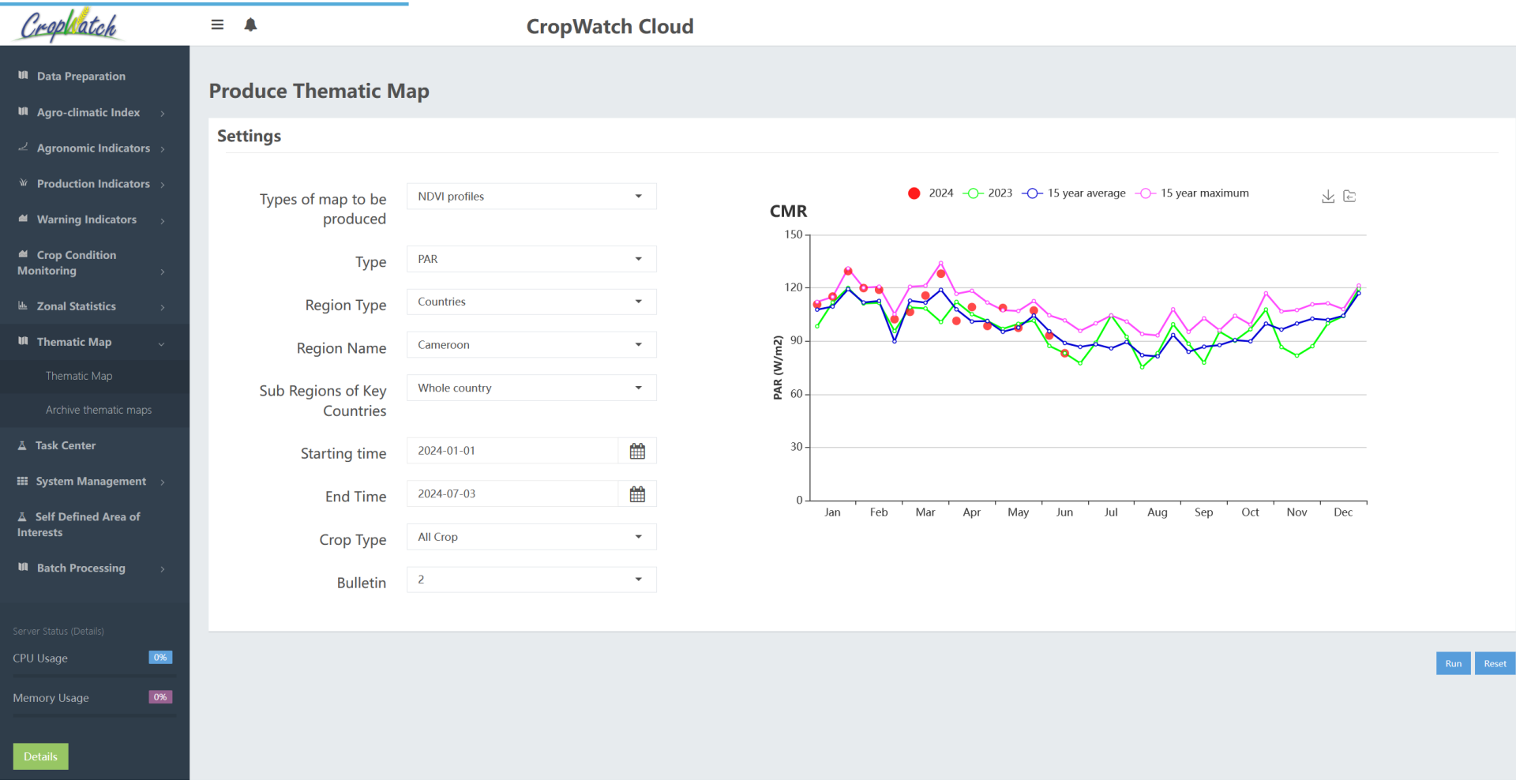
Agro-climatic Indicator

Temperature profiles



Agro-climatic Indicator

Photosynthetic Active Radiation profiles



Agro-climatic Indicator

Potential Biomass Accumulation

CropWatch Cloud

- Data Preparation
- Agro-climatic Index
- Agronomic Indicators
- Production Indicators
- Warning Indicators
- Crop Condition Monitoring
- Zonal Statistics
- Thematic Map
  - Thematic Map
  - Archive thematic maps
- Task Center
- System Management
- Self Defined Area of Interests
- Batch Processing

Server Status (Details)

CPU Usage 0%

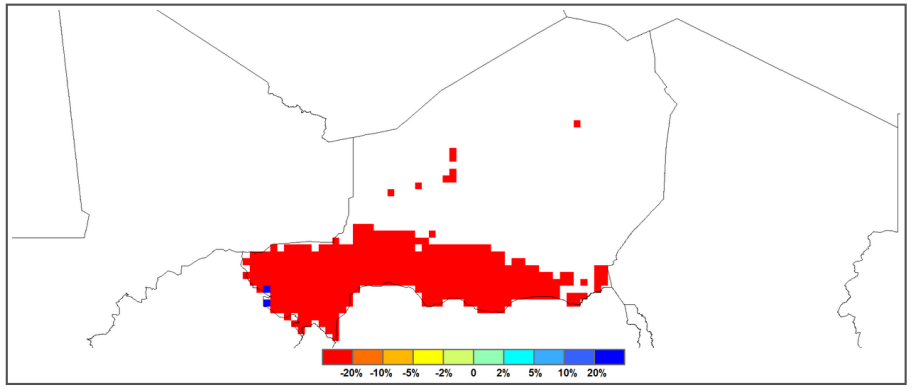
Memory Usage 0%

Details

Produce Thematic Map

Settings

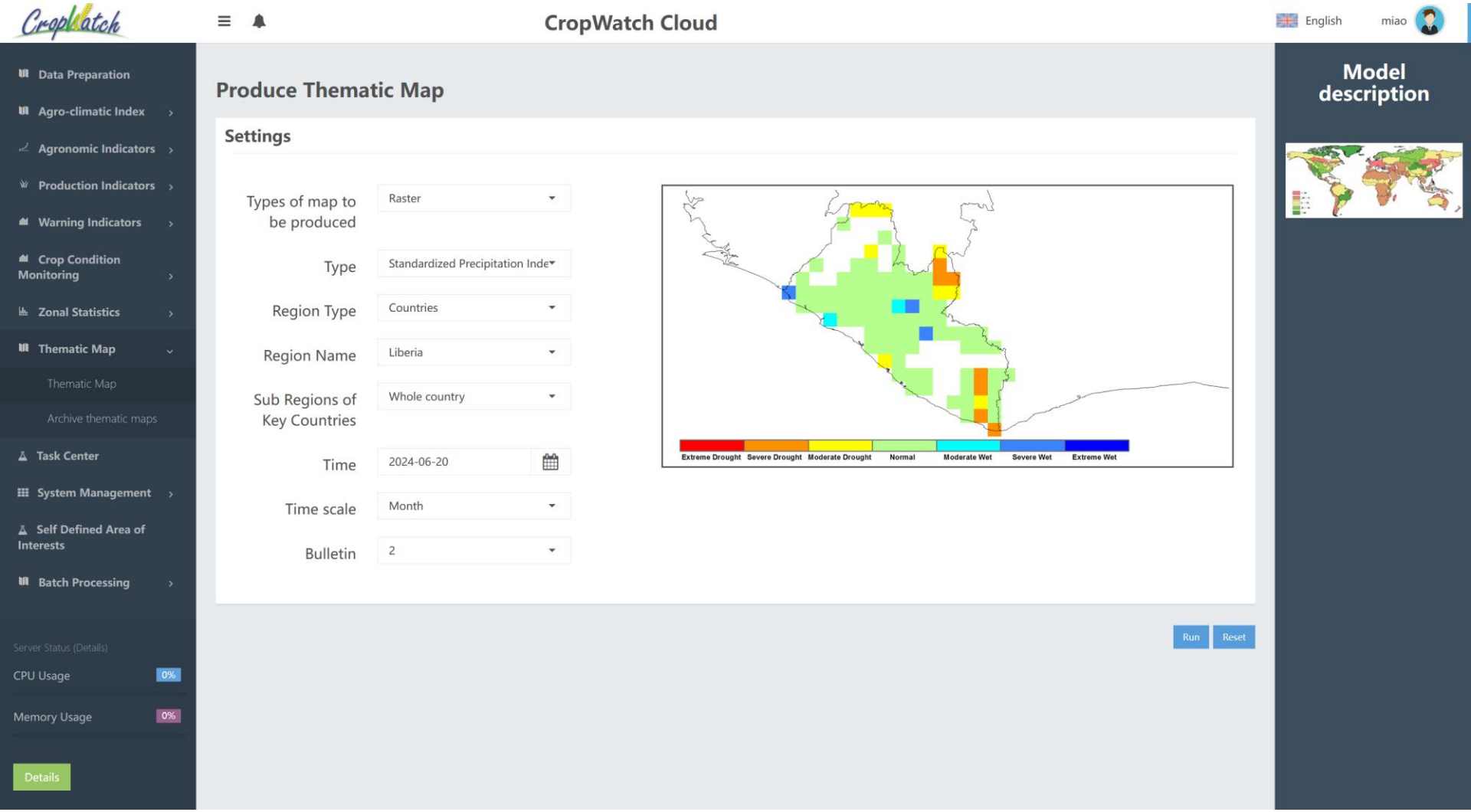
Types of map to be produced	Raster
Type	Biomass departure
Region Type	Countries
Region Name	Niger
Sub Regions of Key Countries	Whole country
Starting time	2024-01-01
End Time	2024-04-30
Bulletin	2



Run Reset

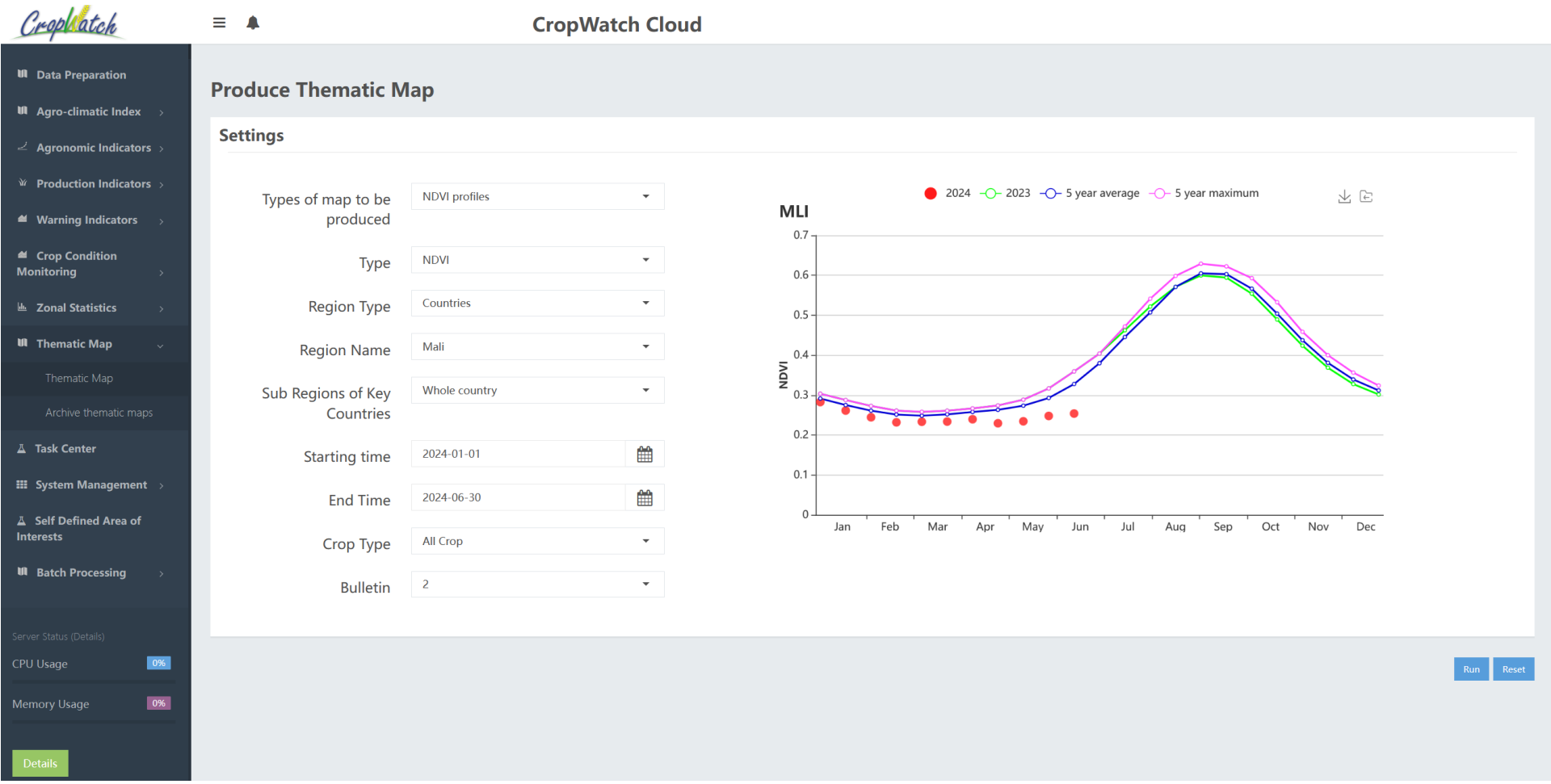
Agro-climatic Indicator

Standard Precipitation index



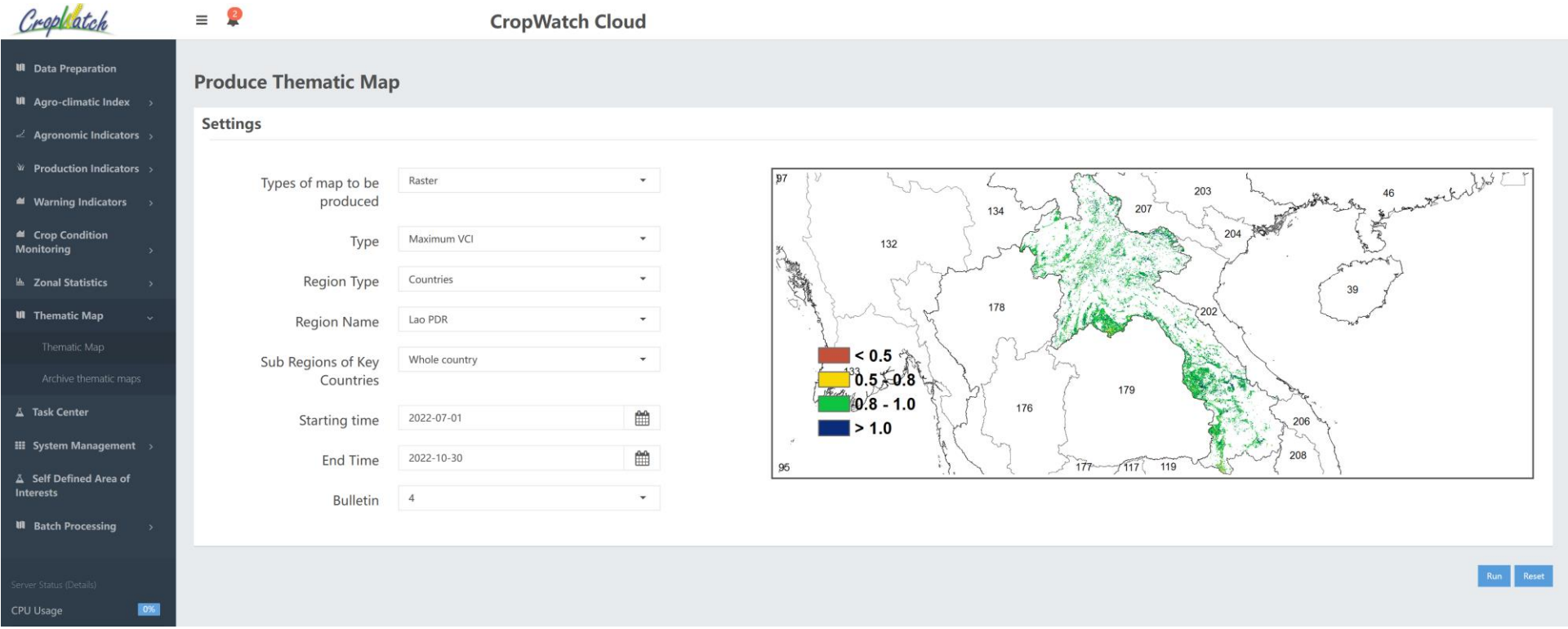
Agronomic Indicator

Crop condition monitoring based on NDVI profiles



Agronomic Indicator

Crop condition monitoring based on maximum vegetation index



Crop condition assessment

CropWatch Cloud

Crop Condition based on NDVI anomaly

Settings

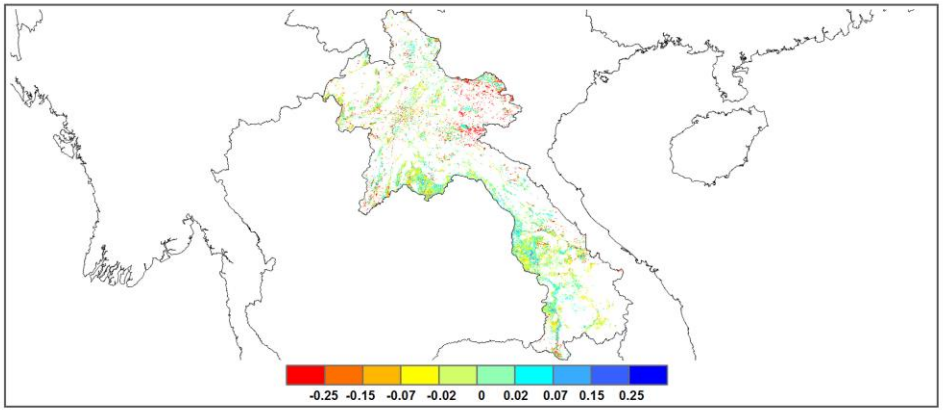
- Indicator Type: NDVI
- Region Type: Countries
- Region Name: Lao PDR
- Time: 2022-10-10
- Reference Year: Previous 5 year' s average

Run Reset

专题图生产

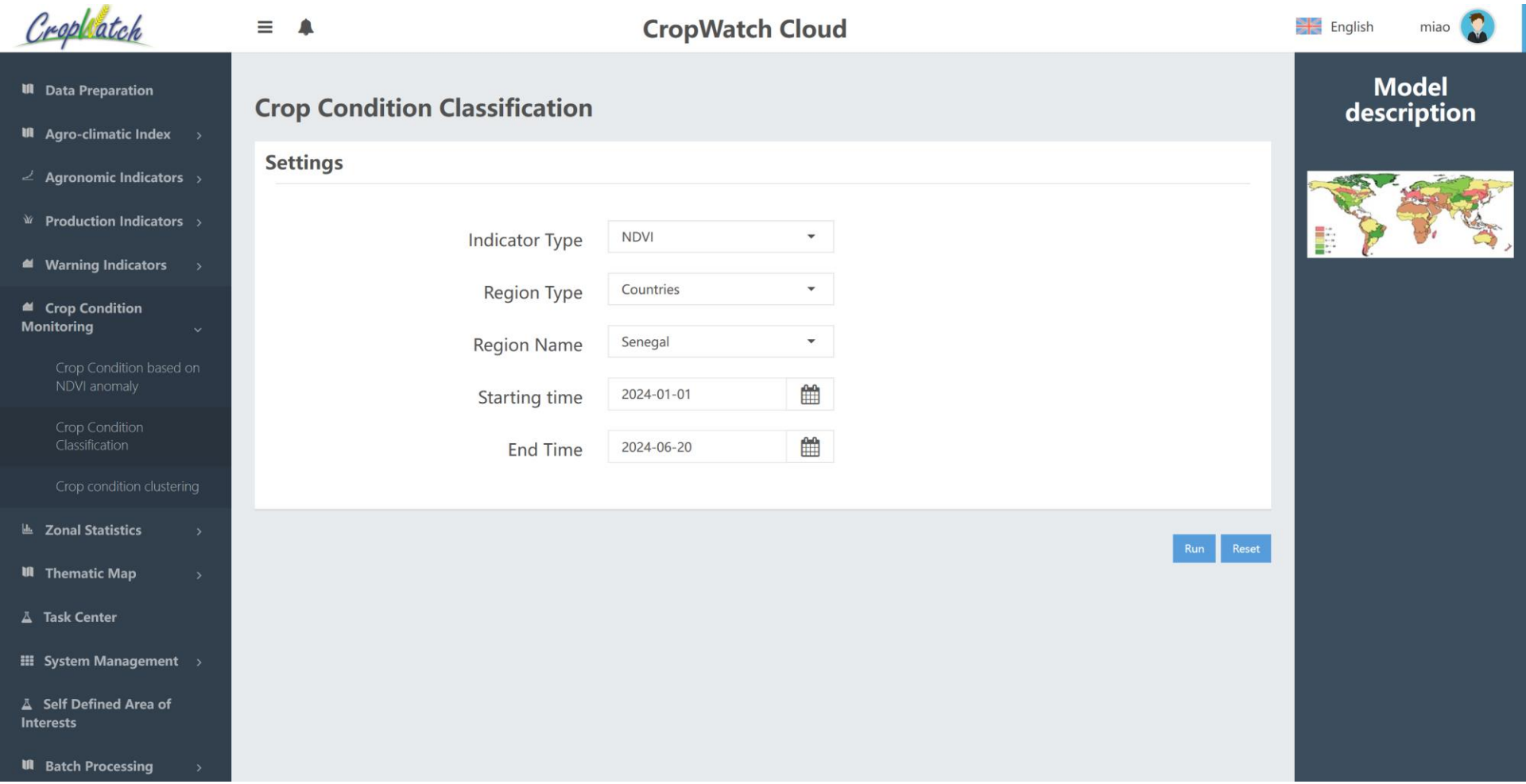
Preview Thematic Map

- Model Name: Crop Condition based on NDVI anomaly
- Indicator Type: Ndvi
- Region Type: Country
- Region Name: LAO
- Start Year: 2022
- Start day: 273
- End year: 2022
- End day: 273
- Reference Year:[1]: 1



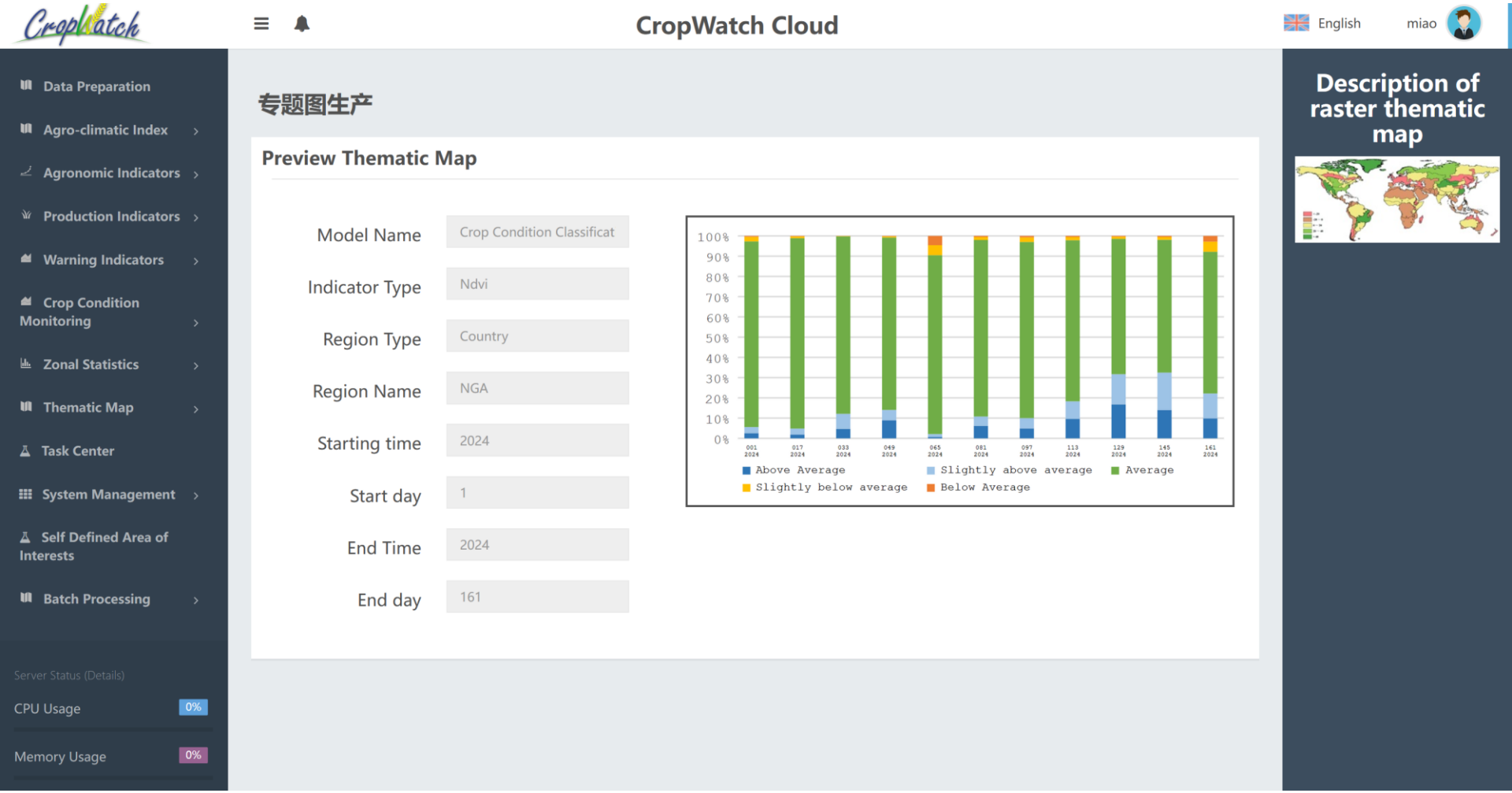
Crop condition assessment

Crop Condition based on NDVI departure classification

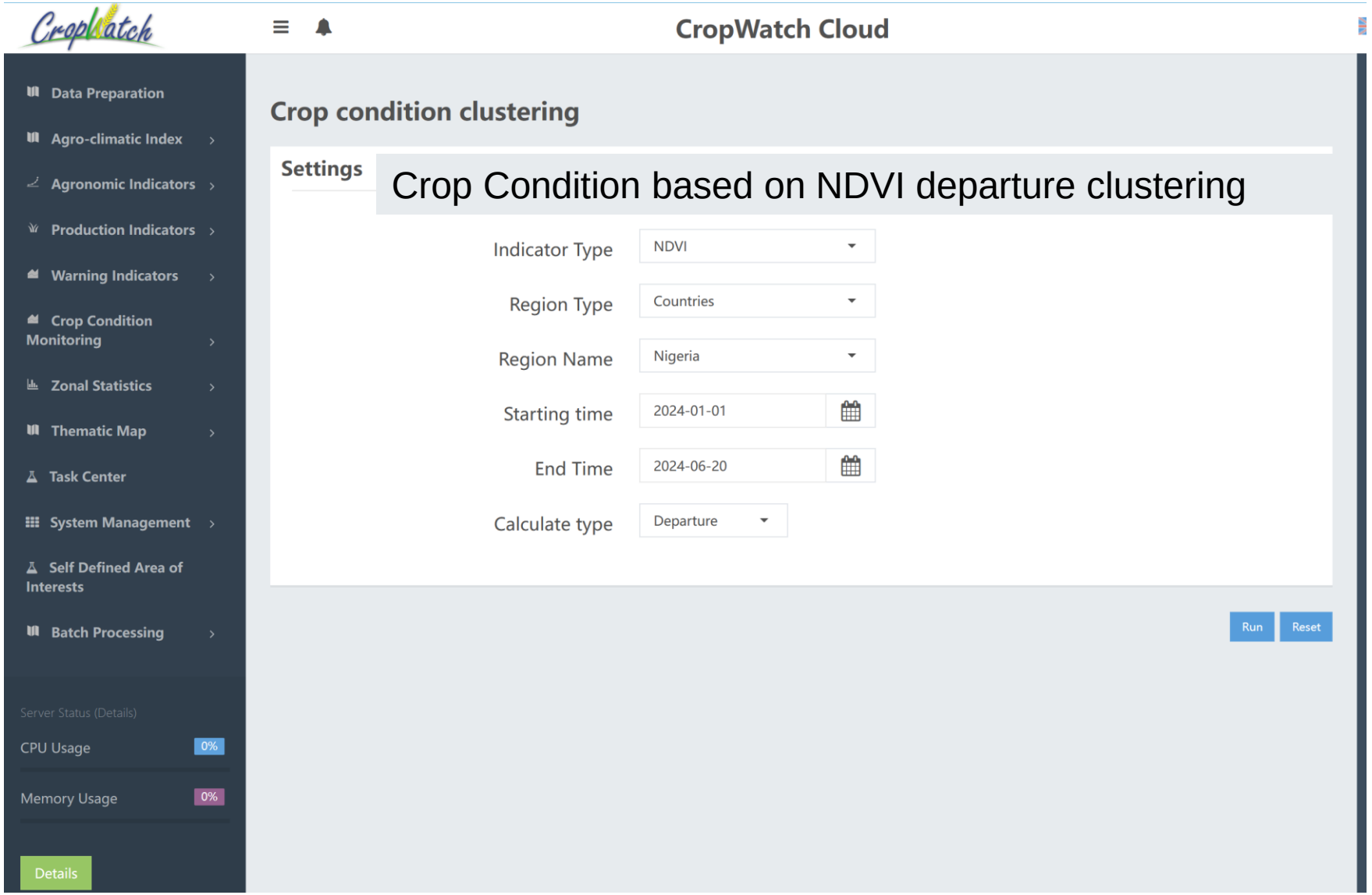


Crop condition assessment

Crop Condition based on NDVI departure classification

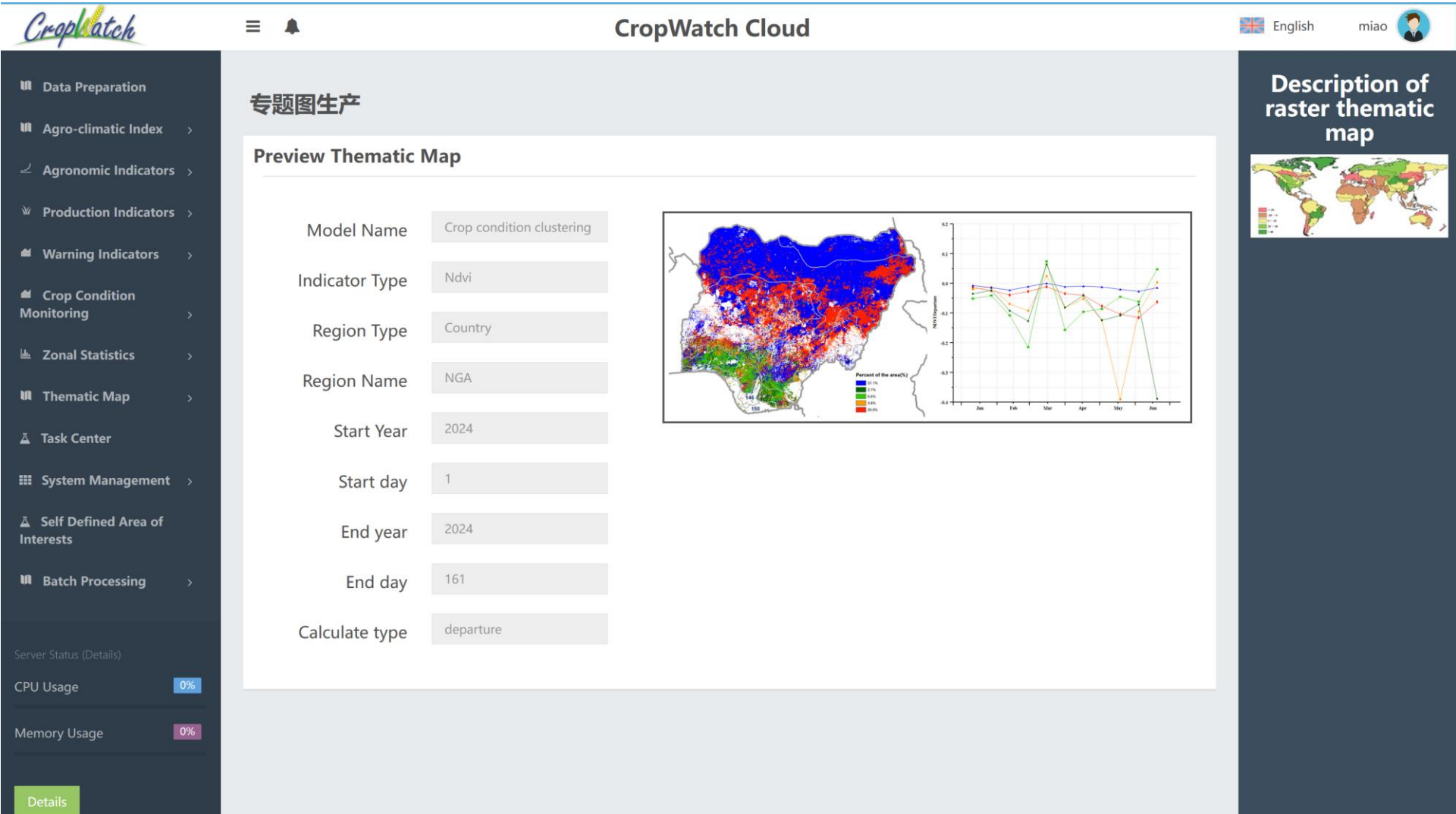


Crop condition assessment

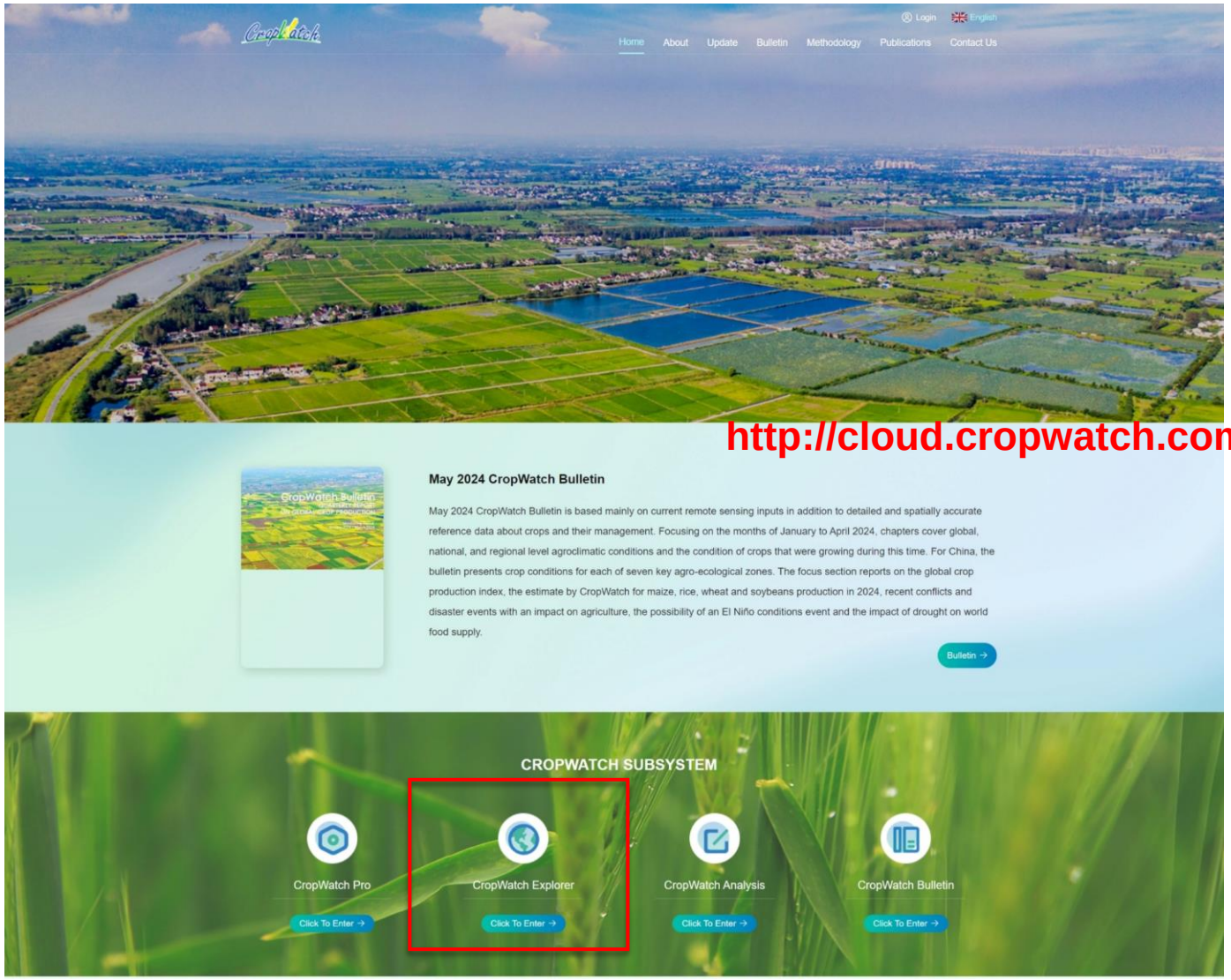


Crop condition assessment

Crop Condition based on NDVI departure clustering



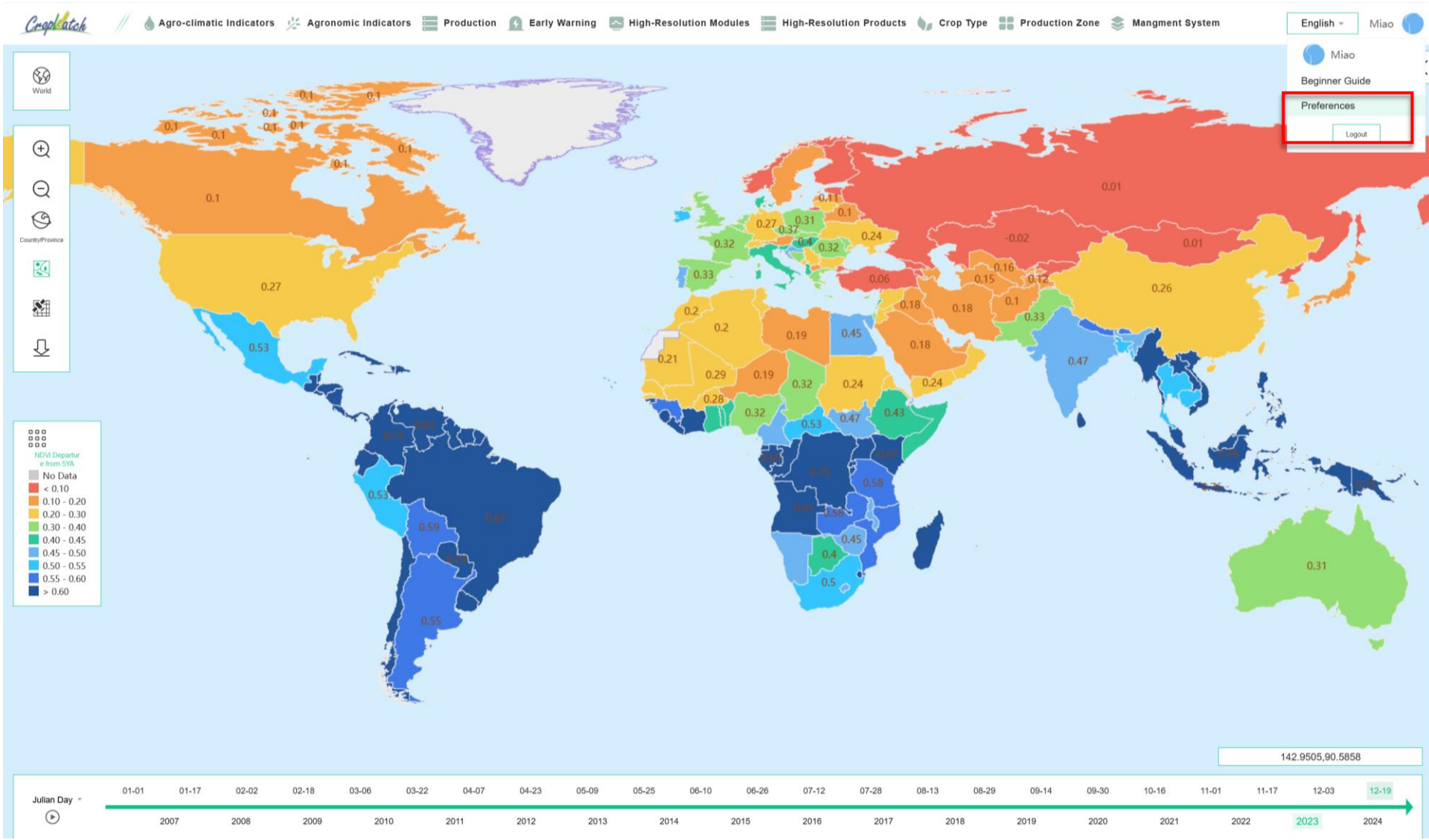
Interactive monitoring of crop condition



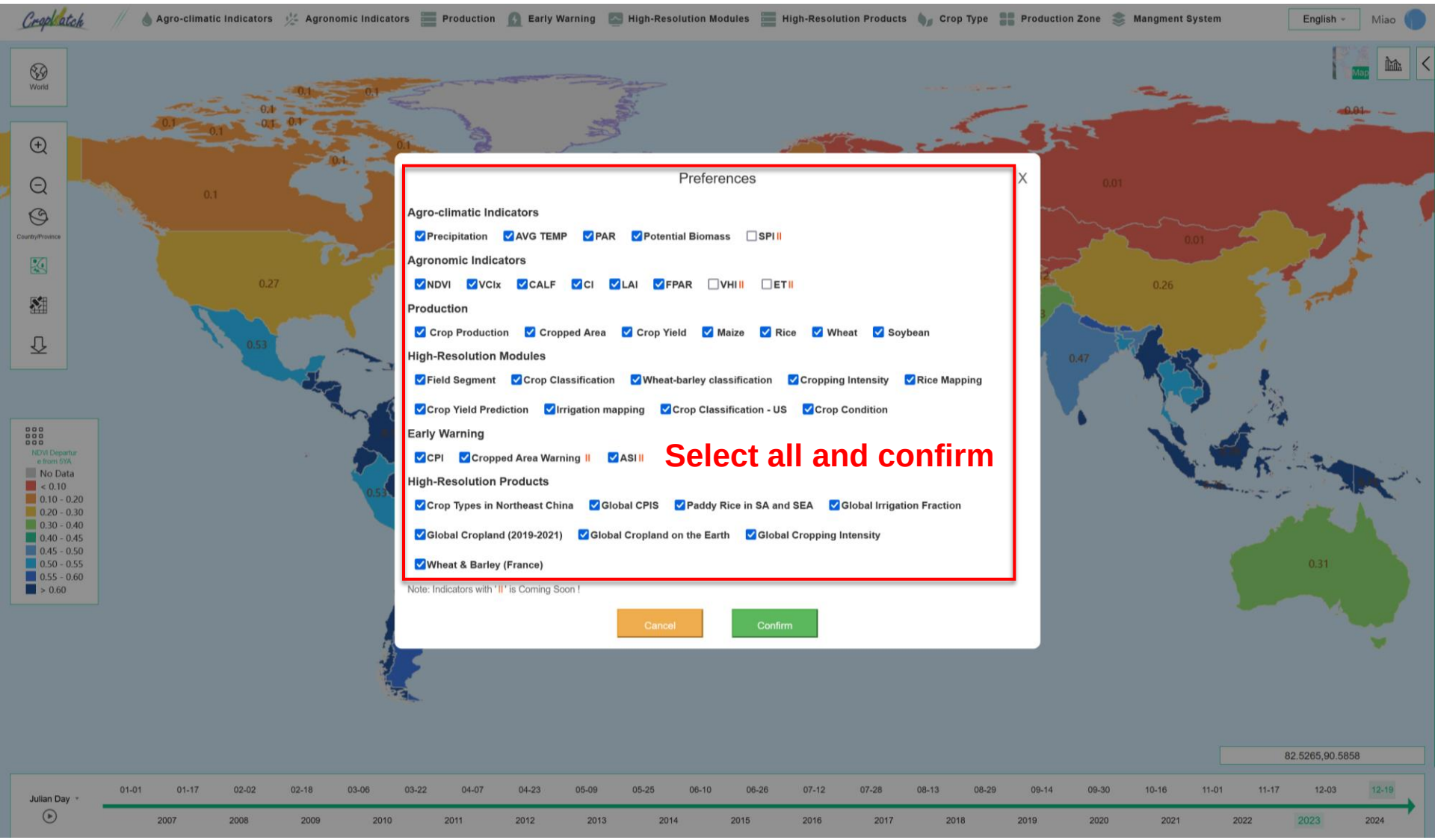
http://cloud.cropwatch.com.cn/

Access to ‘CropWatch Explorer’ Component

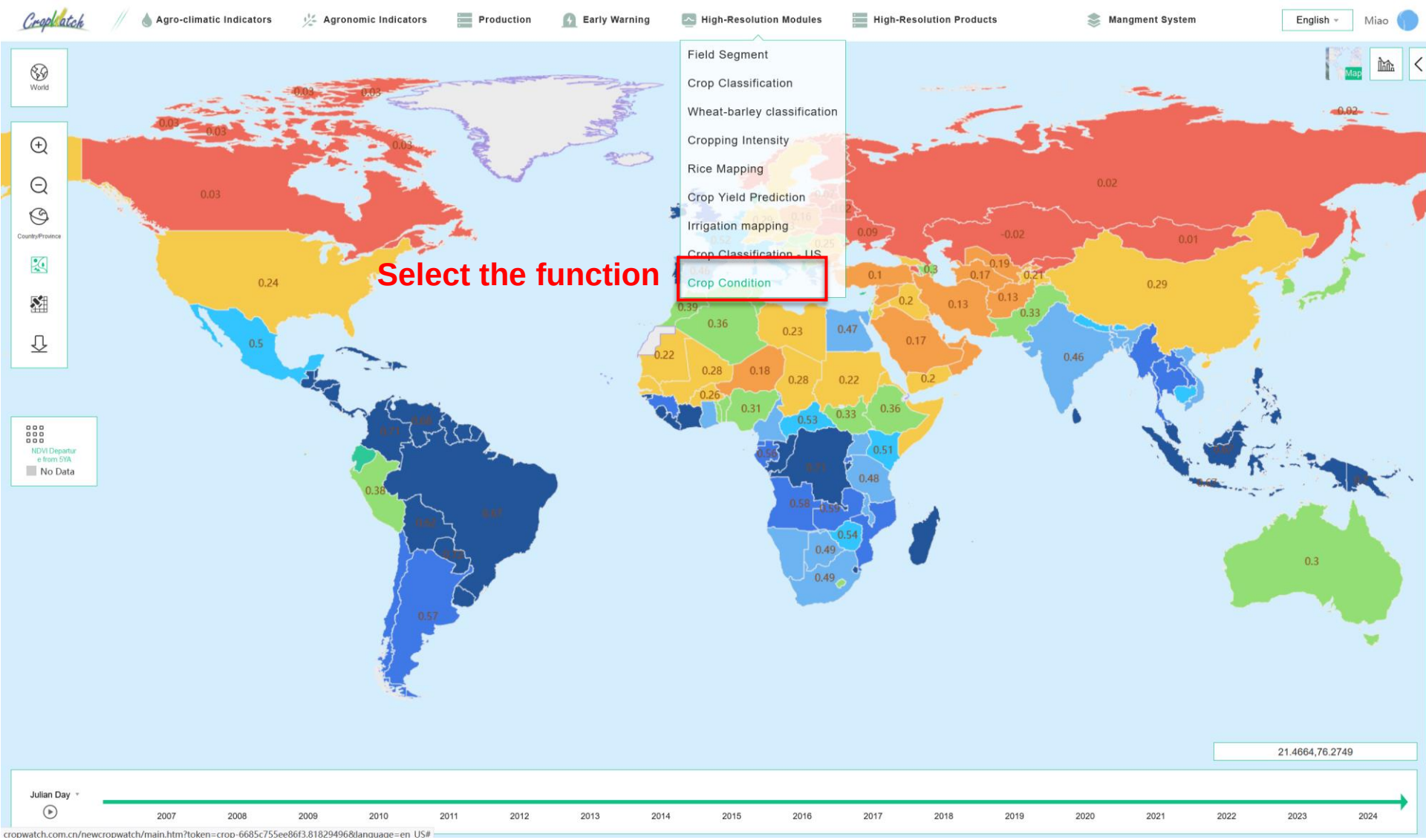
System configuration



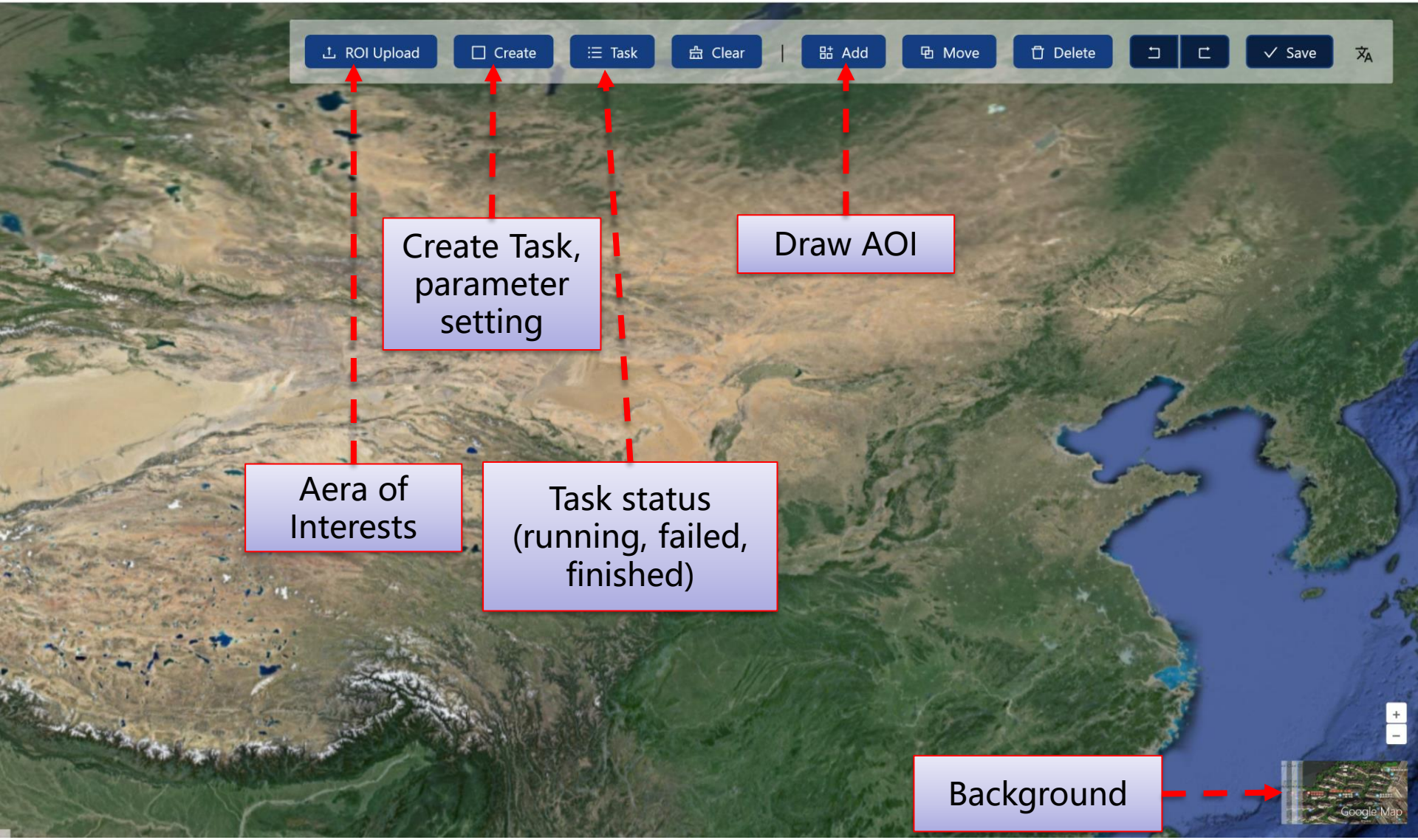
System configuration



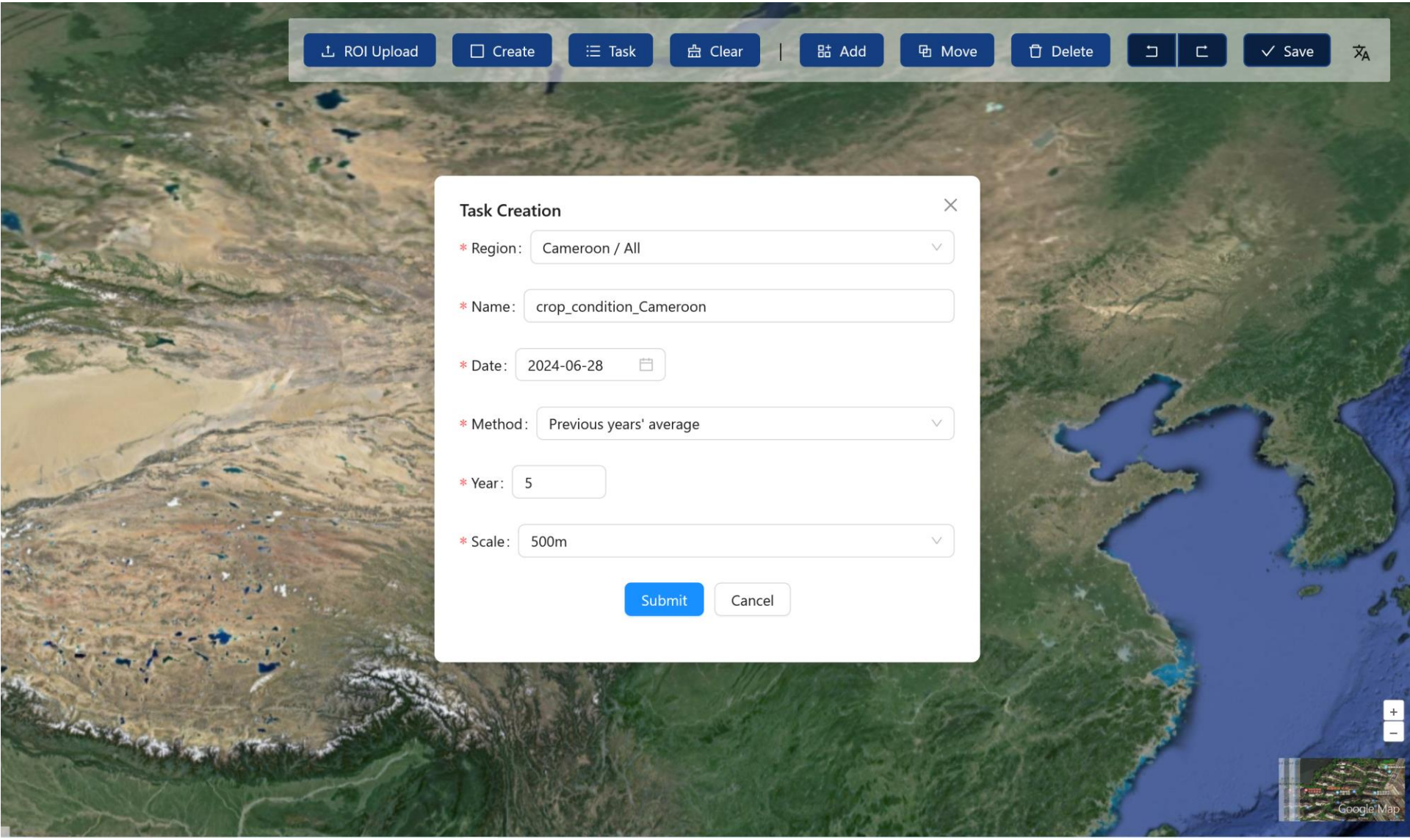
System configuration



Interface


ROI Upload
Create
Task
Clear
Add
Move
Delete
Save
Create Task, parameter setting
Draw AOI
Aera of Interests
Task status (running, failed, finished)
Background
Google Map

Parameters to monitoring for your country

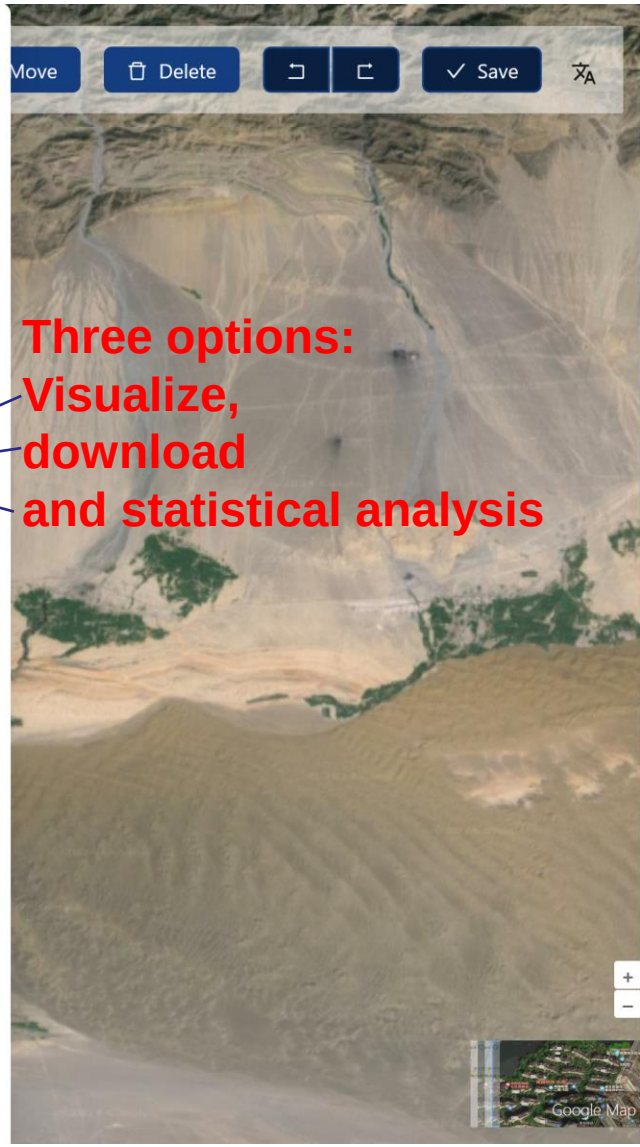


Track your monitoring

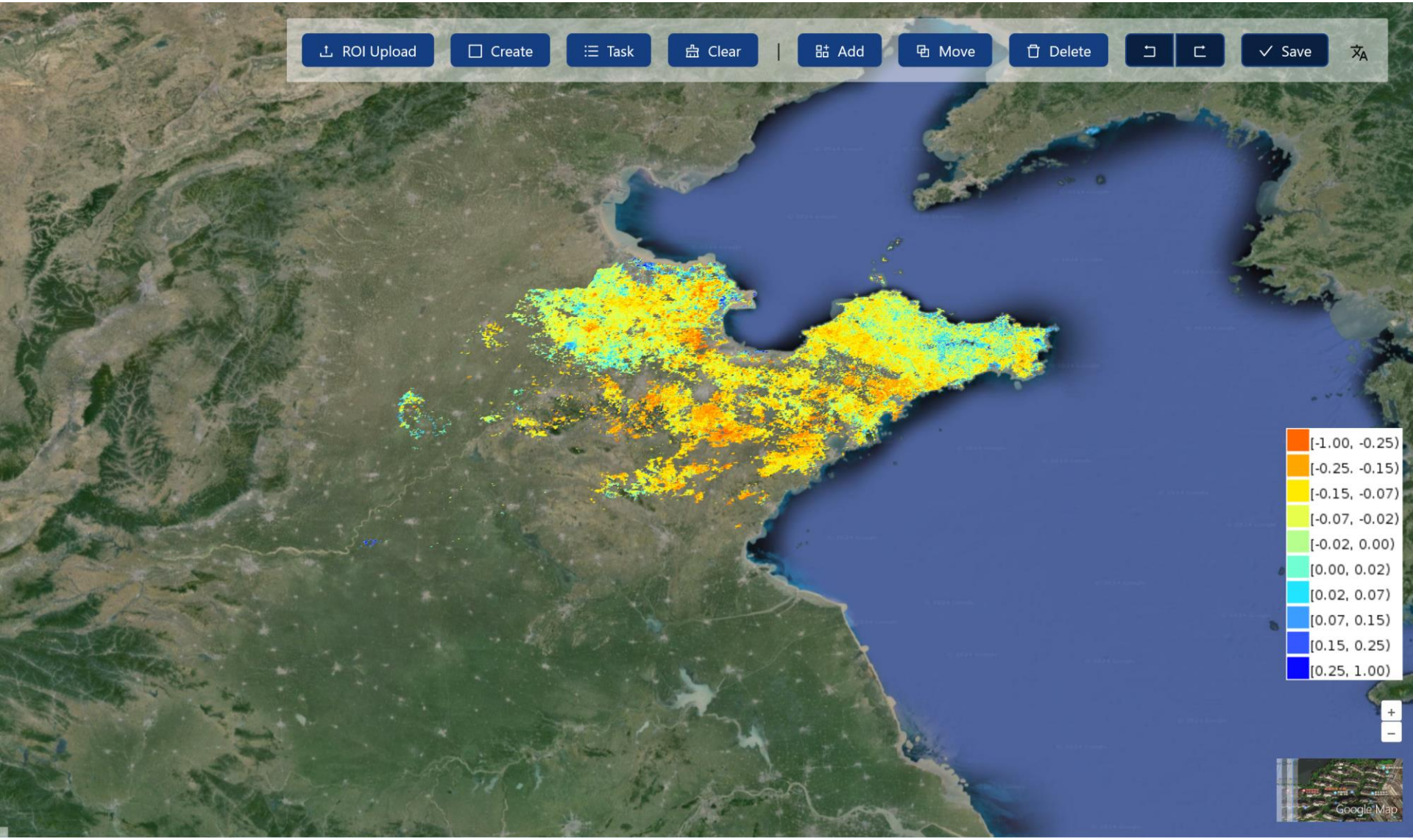
Task List

Filename: Please enter Created Time Pleas... → Pleas... Reset Query

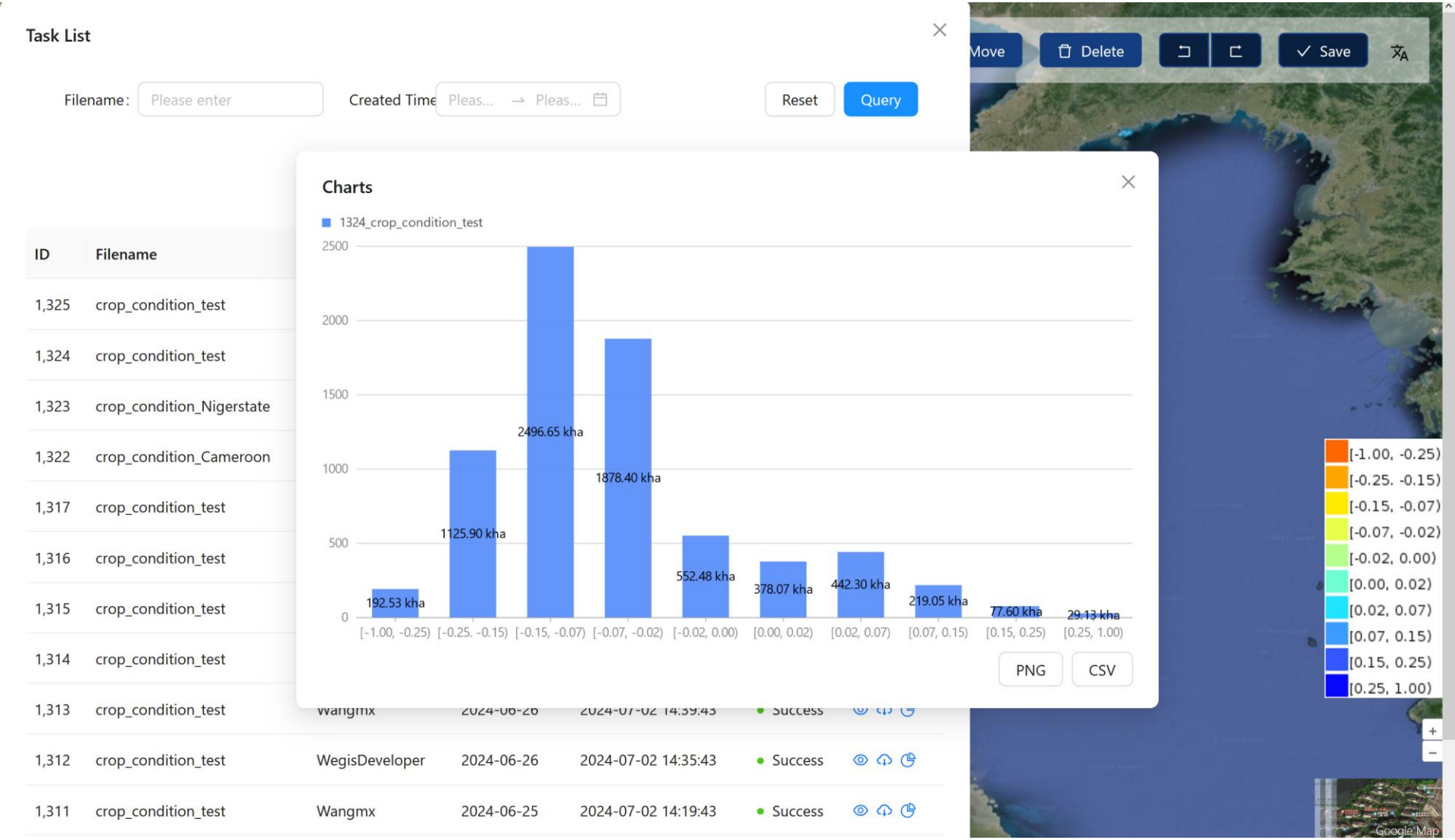
ID	Filename	User	Start Date	Updated Time	Status	Operation
1,325	crop_condition_test	Miao	2024-06-28	2024-07-04 06:52:43	Success	
1,324	crop_condition_test	Miao	2024-06-28	2024-07-04 06:47:44	Success	
1,323	crop_condition_Nigerstate	Miao	2024-06-25	2024-07-04 06:46:43	Success	
1,322	crop_condition_Cameroon	Miao	2024-06-28	2024-07-04 06:44:43	Success	
1,317	crop_condition_test	zenghongwei	2024-06-06	2024-07-02 19:09:44	Success	
1,316	crop_condition_test	zenghongwei	2024-06-26	2024-07-02 18:52:43	Success	
1,315	crop_condition_test	Wangmx	2024-06-26	2024-07-02 14:54:43	Success	
1,314	crop_condition_test	Wangmx	2024-06-25	2024-07-02 14:44:43	Success	
1,313	crop_condition_test	Wangmx	2024-06-26	2024-07-02 14:39:43	Success	
1,312	crop_condition_test	WegisDeveloper	2024-06-26	2024-07-02 14:35:43	Success	
1,311	crop_condition_test	Wangmx	2024-06-25	2024-07-02 14:19:43	Success	



Visualize your result



Statistical analysis



Thank you for your attention!

contacts: zhangmiao@aircas.ac.cn