



UNITED NATIONS / AUSTRIA
SYMPOSIUM
2021

**Space applications
for food systems**



Remote sensing for agricultural monitoring and food security

GAO Maofang

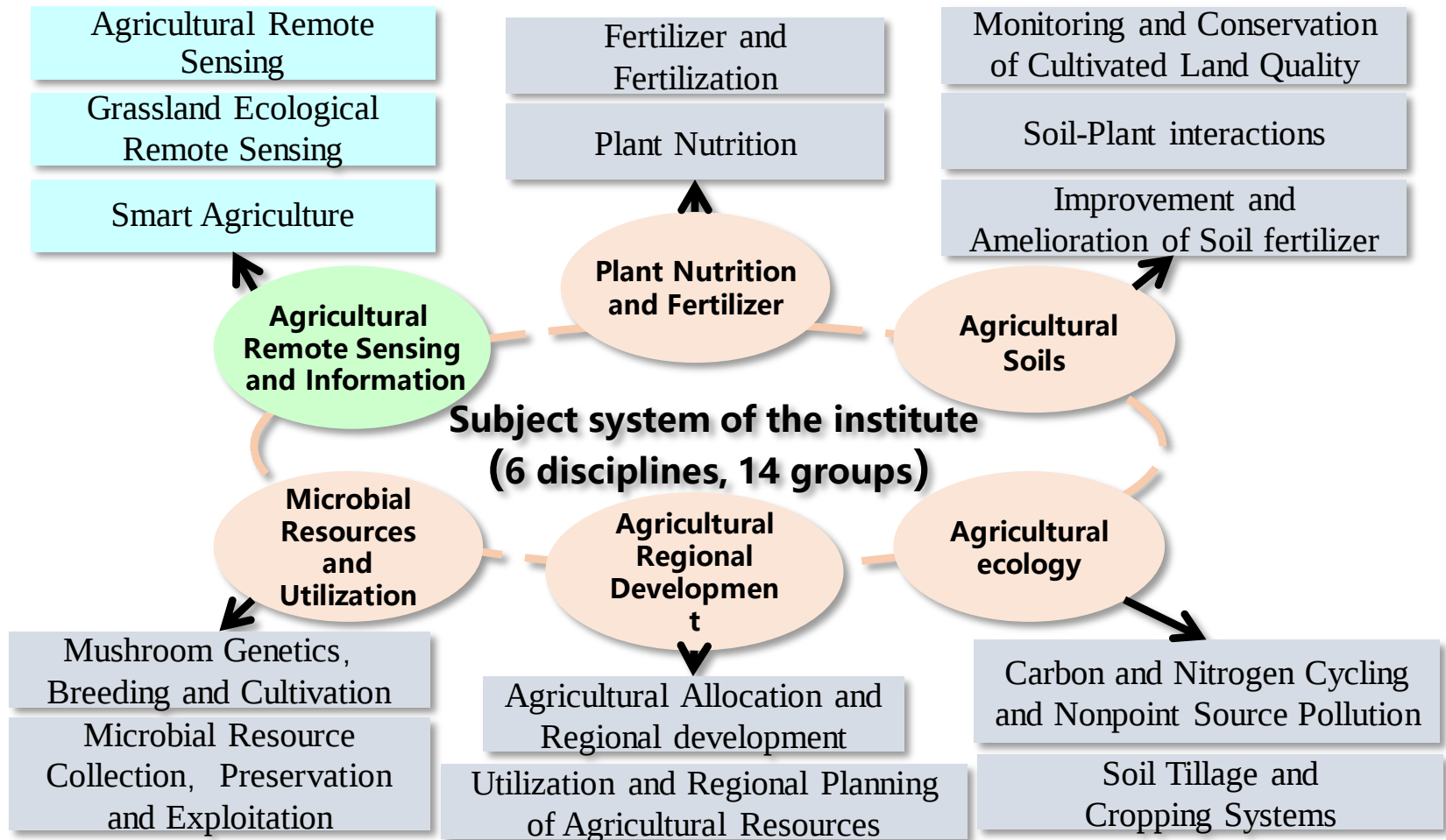
gaomaofang@caas.cn

Institute of Agricultural Resources and Regional Planning

Chinese Academy of Agricultural Sciences

7-9 September 2021

Major research field and groups in IARRP



Contents

1. **Multi-source Sensing**: Data acquisition system
Integrated space, sky and land surface
2. **Quantitative Retrieval**: High precision inversion
of key parameters
3. **Monitoring and Analysis**: Agricultural resource
investigation and statistics

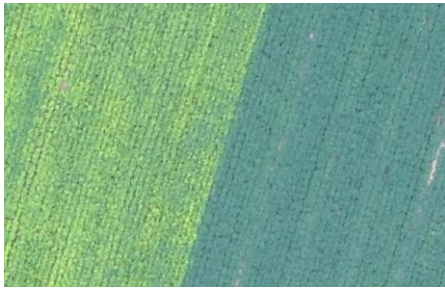
(1) Wireless sensor network data



Sensor: solar radiation、air temperature、air water vapor、soil temperature、soil moisture、video、wind speed and direction



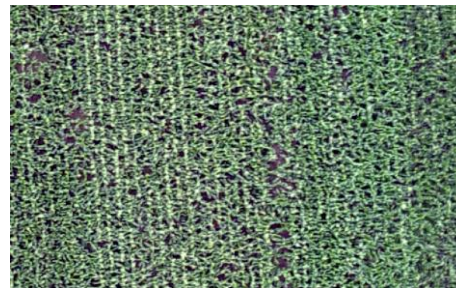
(2) Unmanned Aerial Vehicle(UAV) Photography



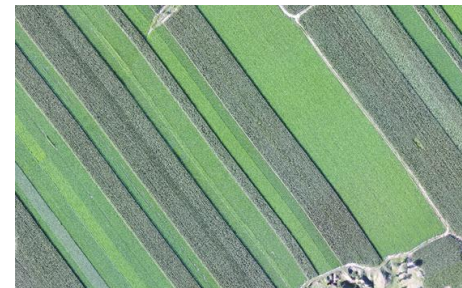
**Different cultivar of peanut
(Xinxiang Henan 20170728)**



**Tobacco
(Luohe Henan 20170729)**



**Spring Maize in heading
period(Zhuozhou, Hebei20170725)**



**Rice
(Tianjin 201708)**



Oil seed rape



Rice



Greenhouse



UAV

Taken by DJI PHANTOM 4 PRO , safety、 stability、 easy to use in the field with different landform

(3) Common satellite data

Optical data

- High resolution satellite data: better than 5m, such as WorldView2、GF-2;
- Medium resolution satellite data: 5~100m, such as Landsat8、GF-1、RapidEye、Sentinel2A/B;
- Low spatial resolution satellite data: lower than 100m, such as NOAA、MODIS。

SAR data

- C band: GF-3、Radarsat2、Sentinel-1、ENVISAT ASAR
- X band: TerraSAR-X

Optical

10:30 am



14:30 pm



22:30 pm



SAR

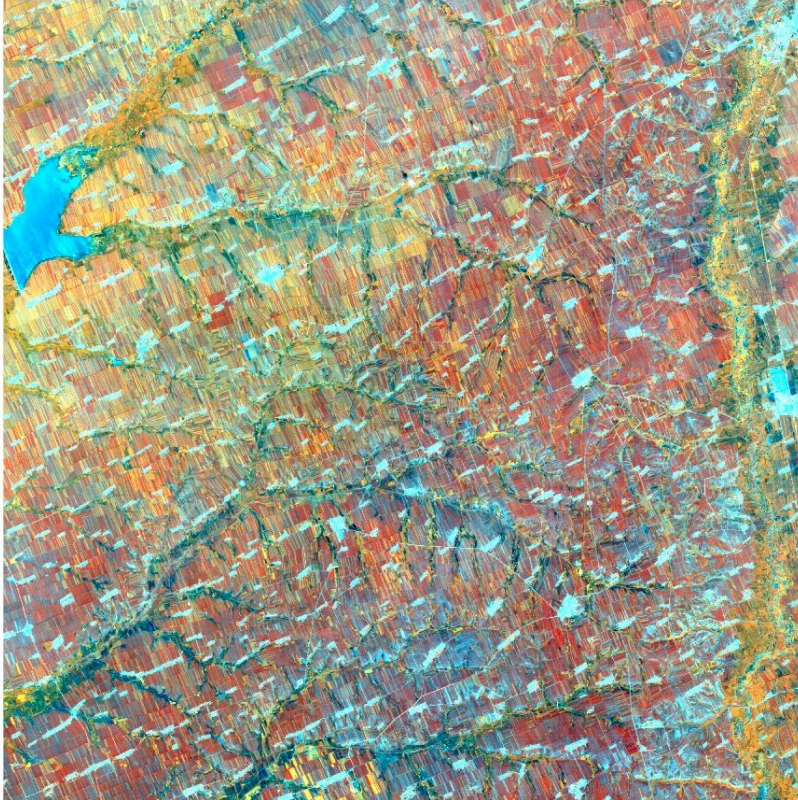


How to choose satellite data?:

Purpose、Satellite、Sensor parameters

Remote world agricultural scenery, feel the joy of fruitful years (Chinese GF-6 images)

Grain and soybean rotation in Hailun of Heilongjiang

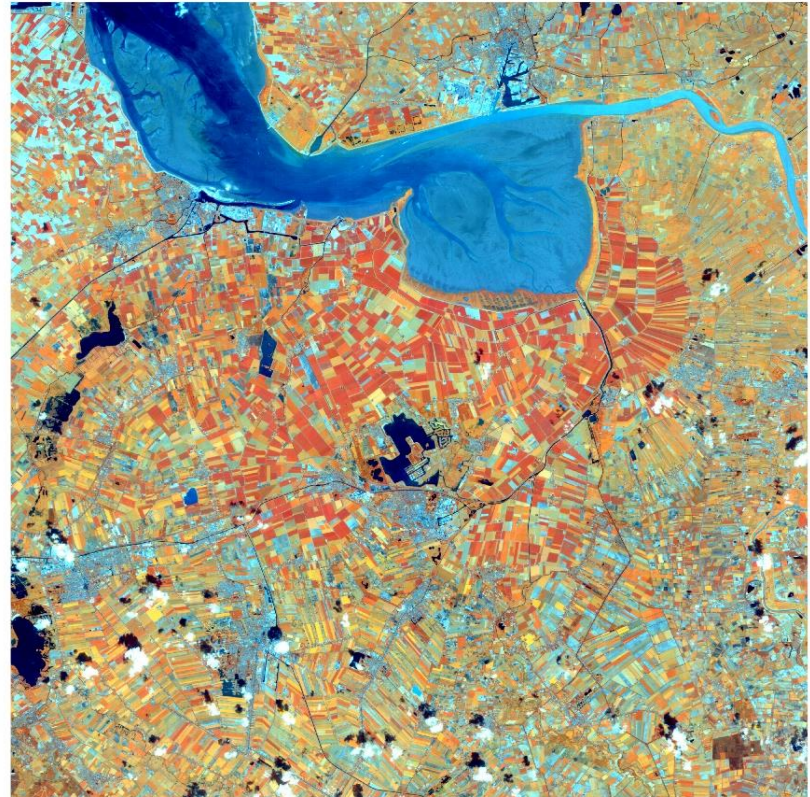


红色、黄色和橙色的区域分别是玉米、大豆和水稻种植区

接收日期：2018年07月01日

July 1st, 2018

Cropland in the area of Netherland and Germany



中红色和黄色区域分别是作物和花卉种植区

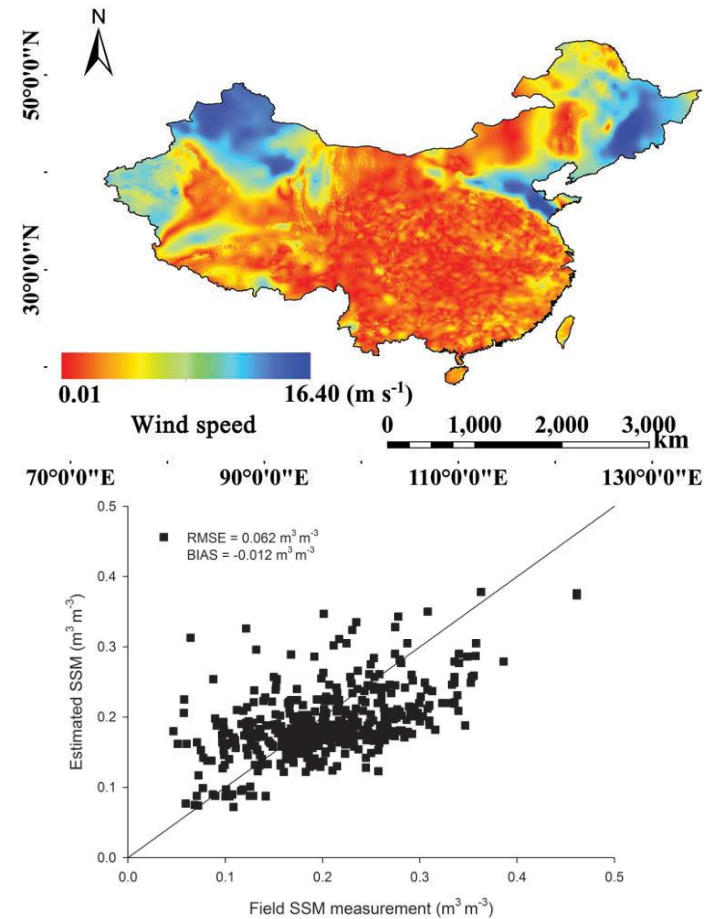
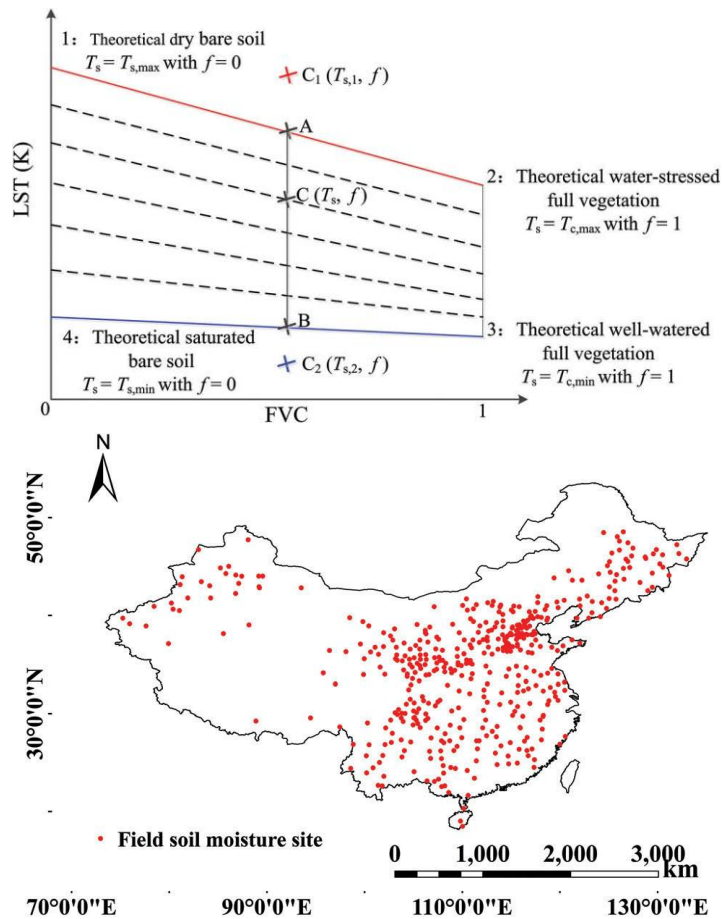
接收日期：2018年06月06日

June 6th, 2018

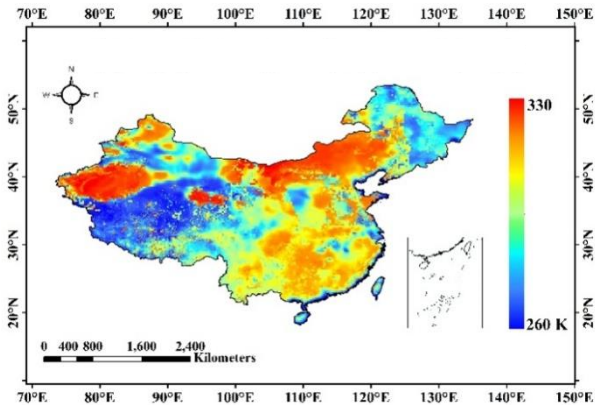
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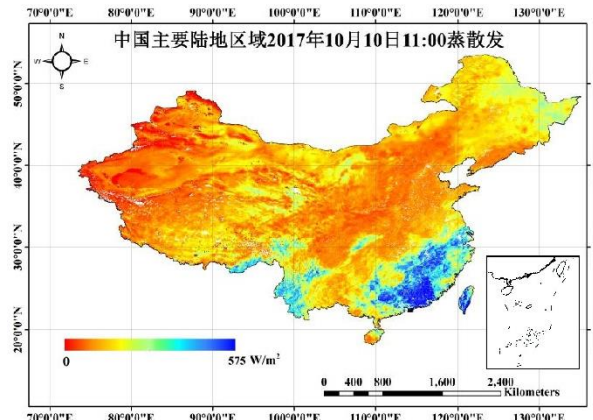
All weather soil moisture retrieval



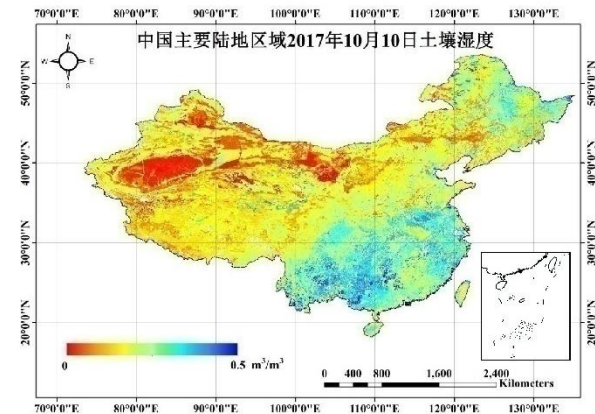
Land Surface Parameter Product



MODIS 2017 All weather
LST



MODIS 2017 All weather
evapotranspiration

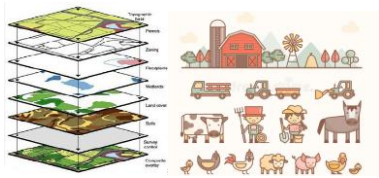


MODIS 2017 All weather
Soil moisture

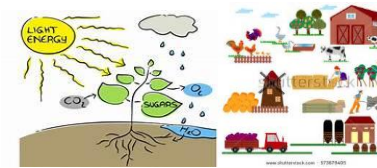
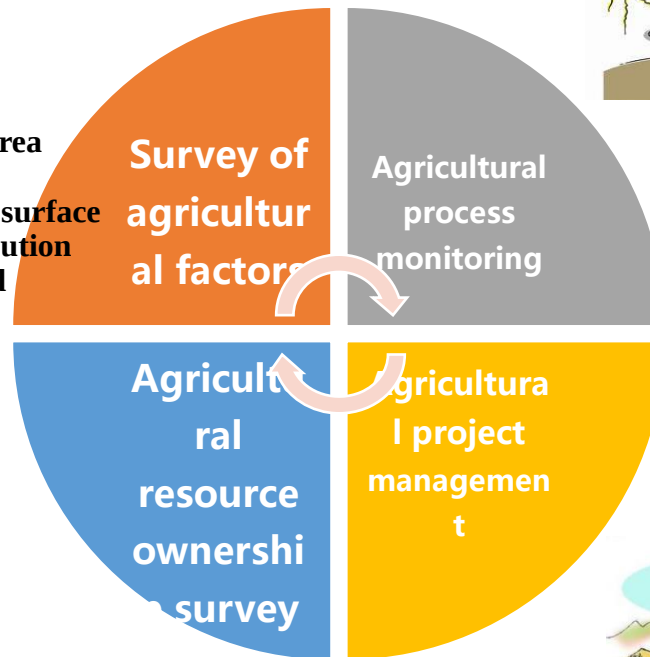
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3. Monitoring and Analysis: Agricultural resource investigation and statistics



- Main grain production area
- Crop plot
- Land aquaculture water surface
- Saline-alkali land distribution
- Facility agricultural land
- Areca planting area
-
- Collective ownership land approval
- Grassland approval
-

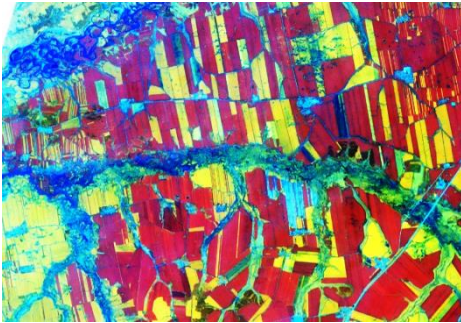


- Crop yield estimation
- Crop quality estimation
- Fish fishing forecast
- Crop harvest progress tracking
- Agricultural drought monitoring
-
- Remote sensing verification of farmland rotation and fallow system
- Agricultural industrial park planning
- Verification of agricultural film subsidies
- Evaluation of subsidy and reward policies for grassland ecological protection
-

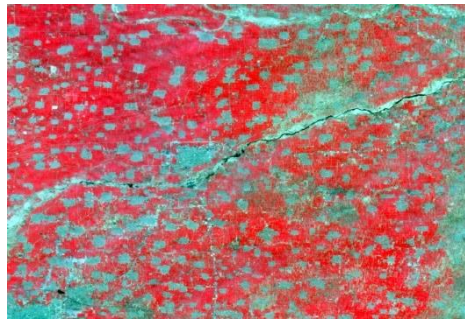


Crop area monitoring

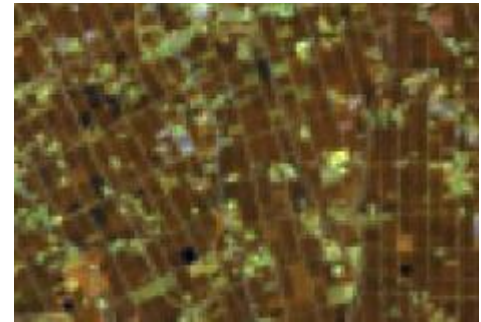
Images of crop in different regions



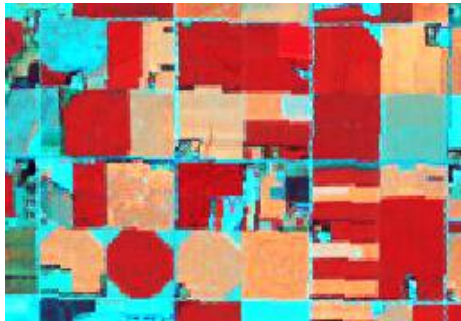
Maize/soybean in China



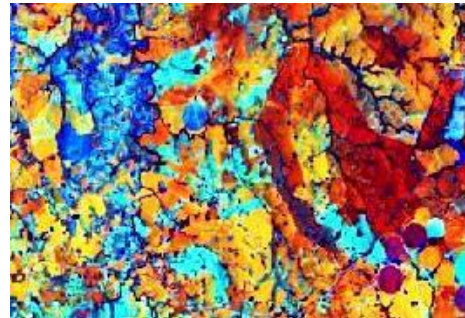
Wheat in China



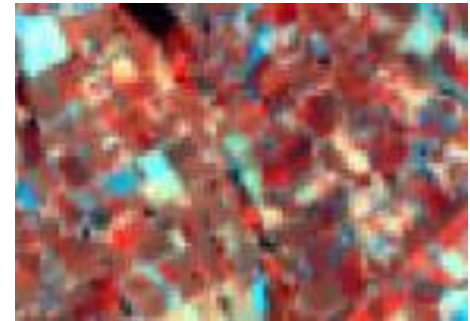
Rice in Japan



Maize/soybean in USA

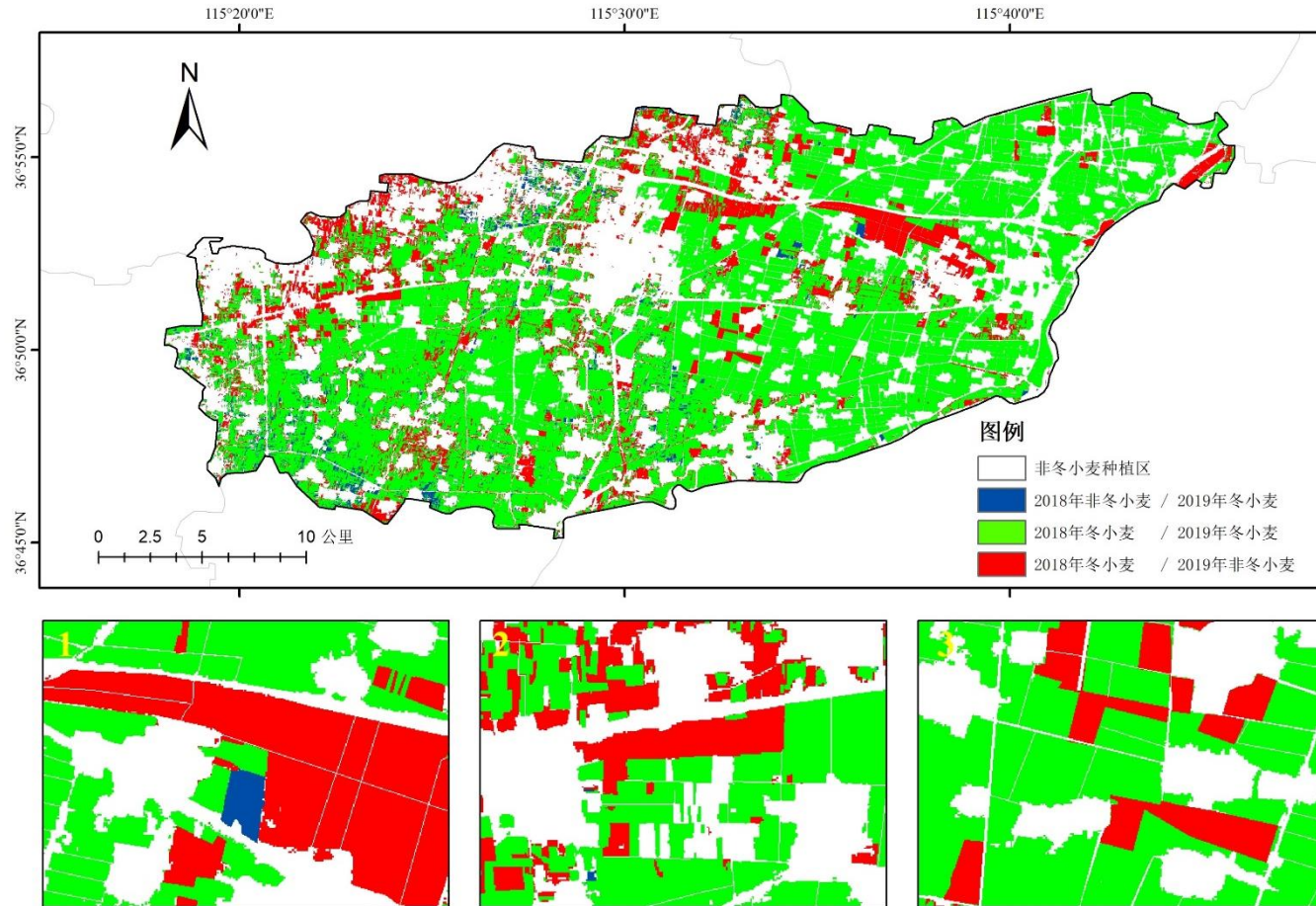


Maize/soybean in Brazil

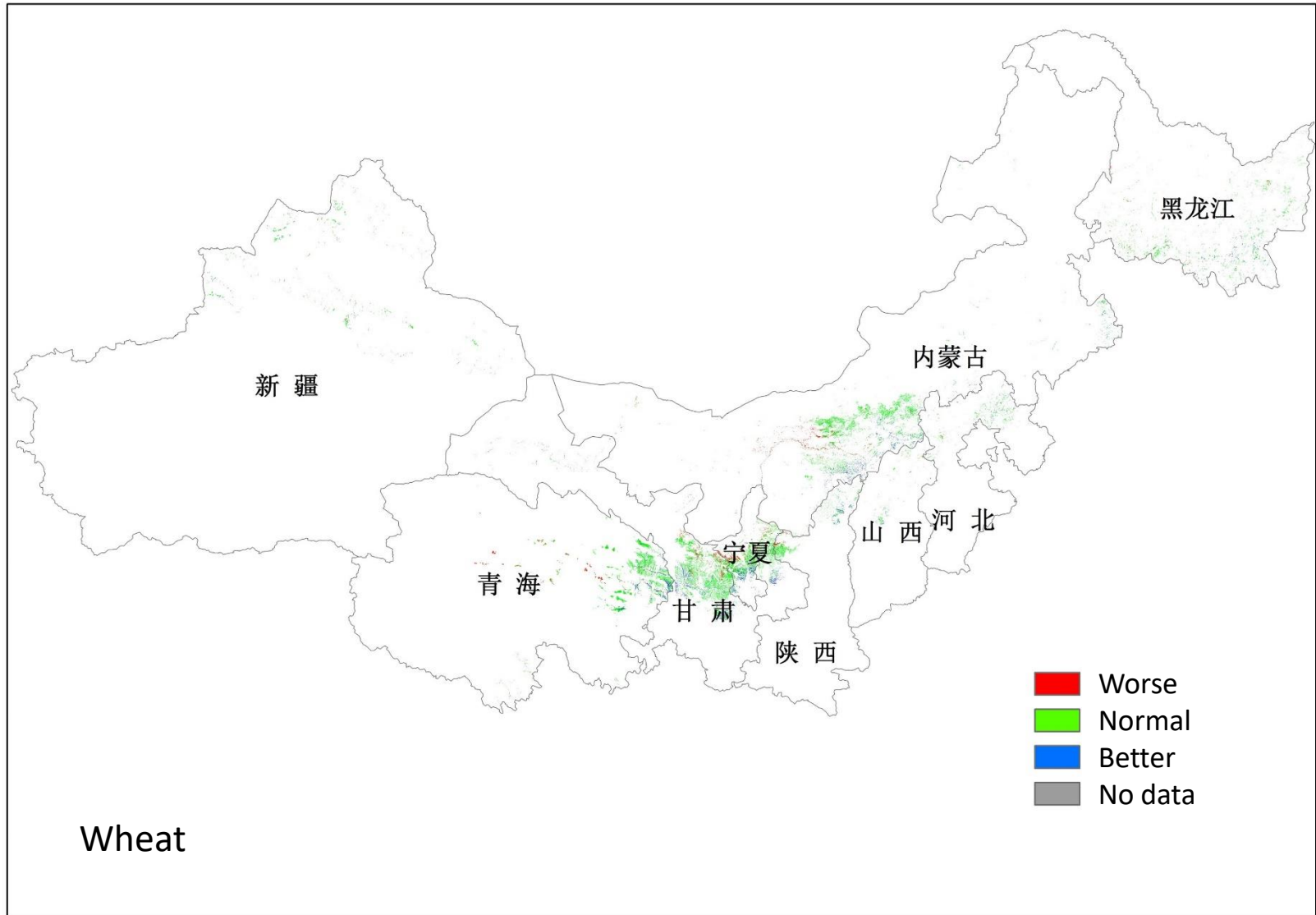


Maize/soybean in Kenya

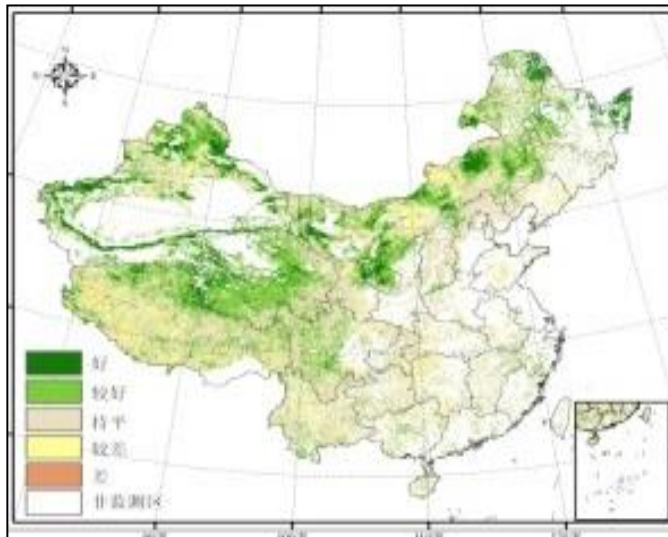
Variation of wheat area in Linxi, Hebei 2018-2019



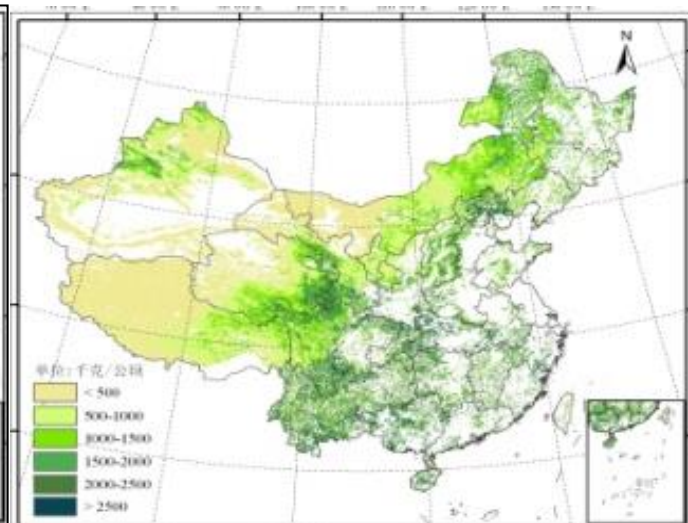
Crop growth evaluation



Grassland Investigation

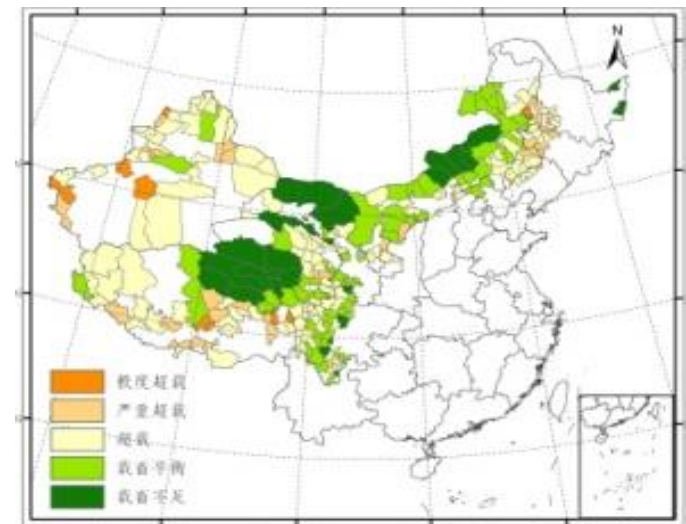


Grassland growth
monitoring



Grass yield estimation

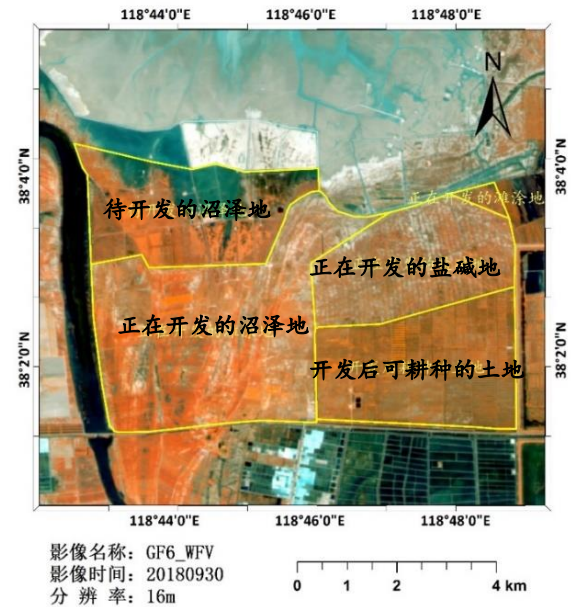
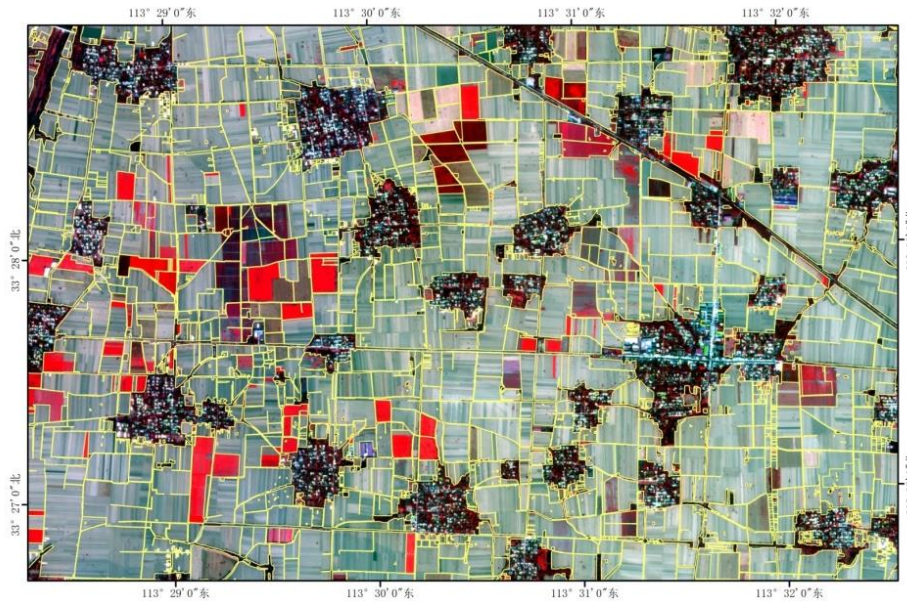
Grassland and
livestock balance
evaluation



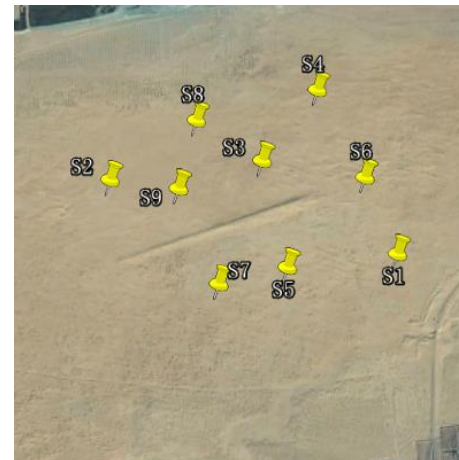
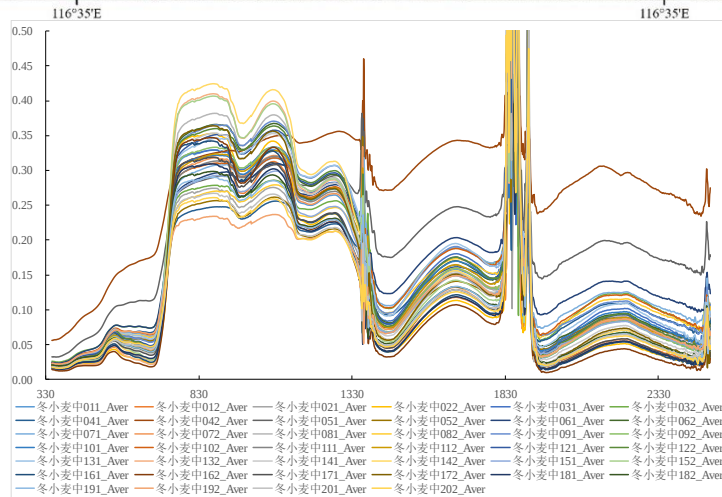
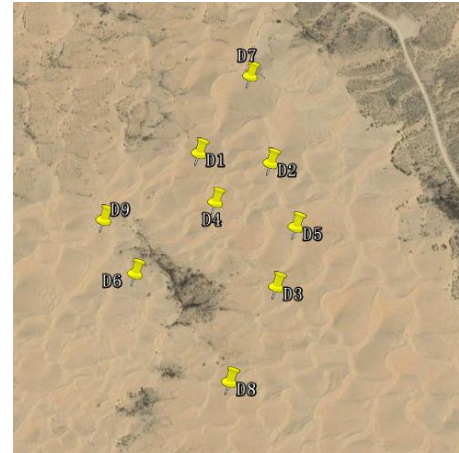
Agricultural resources investigation

Remote Sensing Investigation of Arable land and Reserve resources

- Delineation of land boundaries
- Monitoring of sown area



Observation and Experiment





农业农村部农业遥感重点实验室

KEY LABORATORY OF AGRICULTURAL REMOTE SENSING, MINISTRY OF AGRICULTURE AND RURAL AFFAIRS , P.R.C

Thank You!