



Food and Agriculture  
Organization of the  
United Nations

SUSTAINABLE  
DEVELOPMENT  
GOALS



**APCAS/24/A2.1**

# ASIA AND PACIFIC COMMISSION ON AGRICULTURAL STATISTICS

## Side Event A

### Application of Remote Sensing Big Data in Agricultural Statistics in China

30<sup>TH</sup> SESSION 19–24 May 2024  
Kathmandu (Nepal)





# **Application of Remote Sensing Big Data in Agricultural Statistics in China**

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**National Bureau of Statistics of China**



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PART 01



# Background

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# 1. Background

## ◆ Challenges

Difficult to find respondents



Rural-urban migration



Land circulation brings changes in actual operators



# 1. Background

## ◆ Challenges

- Difficult to obtain accurate data



**Due to concerns about the safety of the breeding environment, it is difficult for investigators to access farms directly to obtain survey data.**



# 1. Background

## ◆ Solutions

**How** to deal with these challenges?

The ability of **direct investigation for source data** needs to be enhanced.





A background image of an astronaut in a white spacesuit floating in space against a dark blue background with a grid pattern and stars.

## PART 02



# China's Experiences

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**2.1 Survey system**

**2.2 Applications in routine work**

**2.3 Exploratory research**







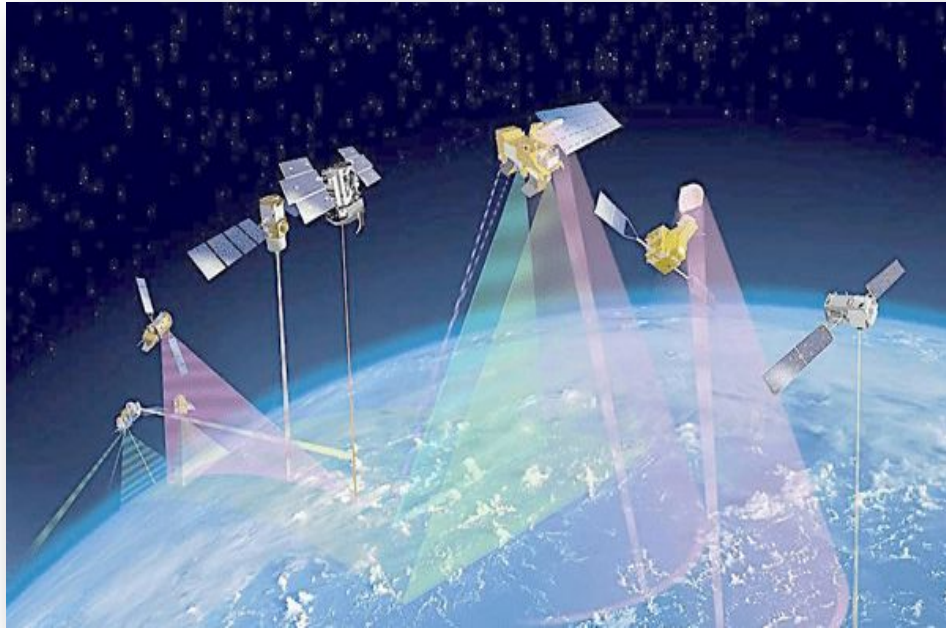
## 2.1 Survey system





## 2. China's Experiences

### 2.1 Survey system



With the rapid development of modern information technology, based on a large amount of scientific research and the practical application of The Third National Agricultural Census, relying on satellite remote sensing, UAV aerial filming and PAD survey, grain statistics of China built a **three-dimensional modern agricultural statistical survey system of “Space-Air-Ground”**.



## 2. China's Experiences

### 2.1 Survey system

The **three-dimensional modern agricultural statistical survey system of “Space-Air-Ground”** realized a leap from “household survey” to “ground survey” and opened a new era of grain statistical survey.



Household Survey



Ground Survey

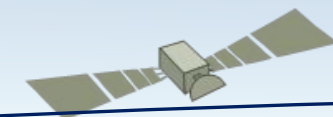




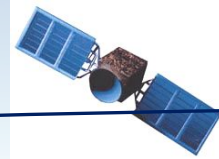
# 2. China's Experiences

## 2.1 Survey system

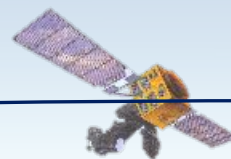
Space



Autonomous remote sensing satellite



Beidou navigation satellite



Commercial remote sensing satellite

Air

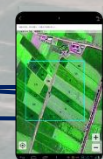


Rotary wing UAV



Fixed-wing UAV

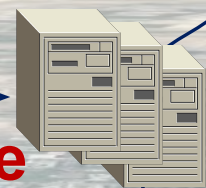
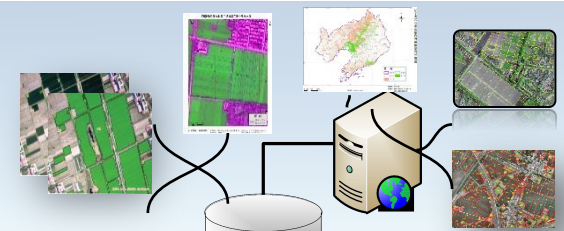
Ground



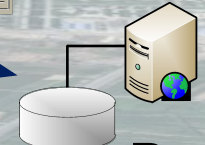
PAD

Large-scale monitoring

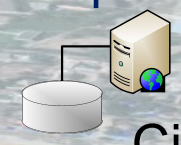
Small-scale field survey



Country



Province



City



County

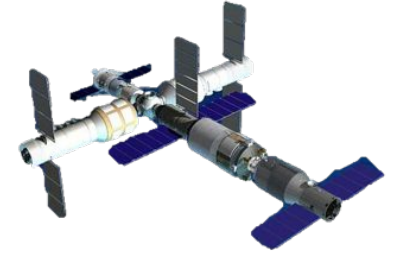




## 2. China's Experiences

### 2.1 Survey system

Space



#### (1) Remote sensing satellites

Remote sensing satellites form a "space based" survey capacity.

- **Satellite imagery source:** GF series satellite, Beijing-2 satellite, Modis, .....
- **Spatial resolution:** 0.8m, 2m, 16m





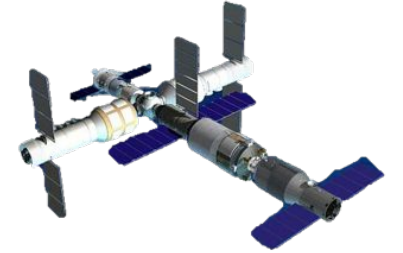
## 2. China's Experiences

### 2.1 Survey system

#### (1) Remote sensing satellites

- **Major use :**
  - Remote sensing measurement of grain sown area;
  - Remote sensing monitoring of grain crops growth;
  - As the base map of field survey;
  - Exploratory research;
  - .....

Space





## 2. China's Experiences

### 2.1 Survey system

Air



#### (2) UAV

UAV **complement** the "in-air" survey capabilities.

#### □ Advantages:

- UAV are **maneuverable**, **flexible** and **fast**, which are capable of carrying out remote automatic photography in areas that are difficult for investigators to reach;
- Double the investigation ability;
- Reduce the investment of investigation personnel;
- **Reduce** the on-site investigation **time** greatly.



## 2. China's Experiences

### 2.1 Survey system

#### (2) UAV

##### □ Major use :

- As a **supplementation** to satellite remote sensing images, the UAV can rapidly acquire **cm-scale high resolution images** of plot areas.
- Combined with artificial intelligence technology, we can also use UAV to achieve **automatic crop identification**.

Air







## 2. China's Experiences

### 2.1 Survey system

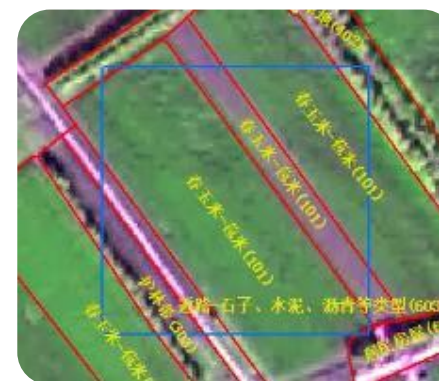
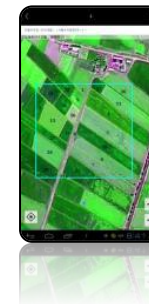
#### (3) PAD

PAD strengthens “ground” survey capabilities.

#### □ What is PAD?

PAD is a **handheld device**, which is installed with specific investigative procedures for the investigators to obtain planting information of sample plots.

Ground





## 2. China's Experiences

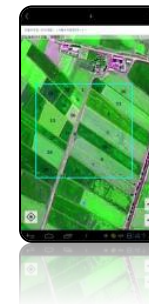
### 2.1 Survey system

#### (3) PAD

##### □How to use?

The high-resolution satellite remote sensing images are used as the base map for field survey. The PAD is used to locate the sample plots and record the planting information. Also, the investigation behavior is recorded as the investigation trajectory points, avoiding violations such as not being on site.

Ground





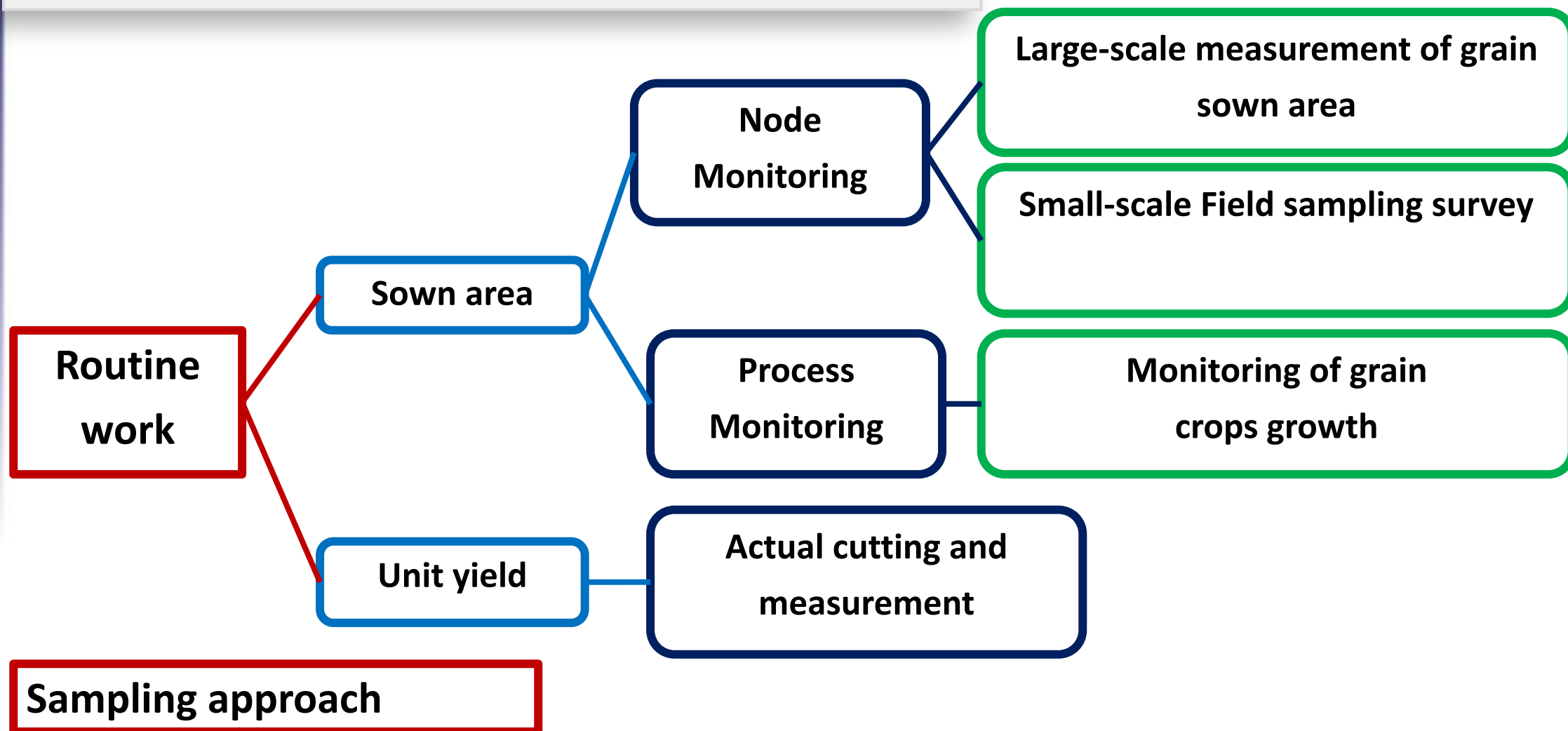
## 2.2 Applications in routine work





## 2. China's Experiences

### 2.2 Applications in routine work







## 2. China's Experiences

### 2.2 Applications in routine work

#### (1) Remote sensing measurement of grain sown area

##### □ Method:

We use **multiple** medium-resolution and high resolution satellite remote sensing images in key periods to obtain the spatial distribution of major grain crops such rice, wheat, corn, and soybeans in the main grain production areas.

□ **Spatial resolution: 16m.**

**Large-scale**



# 2. China's Experiences

## 2.2 Applications in routine work

### (1) Remote sensing measurement of grain sown area

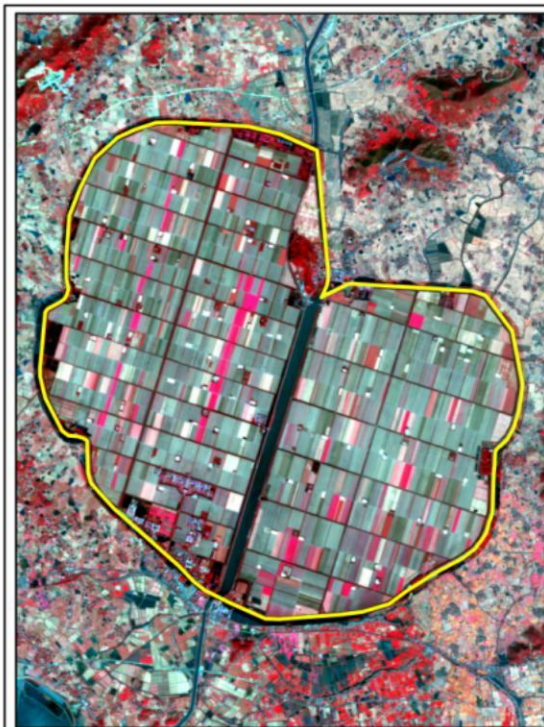


Image 1: bare land

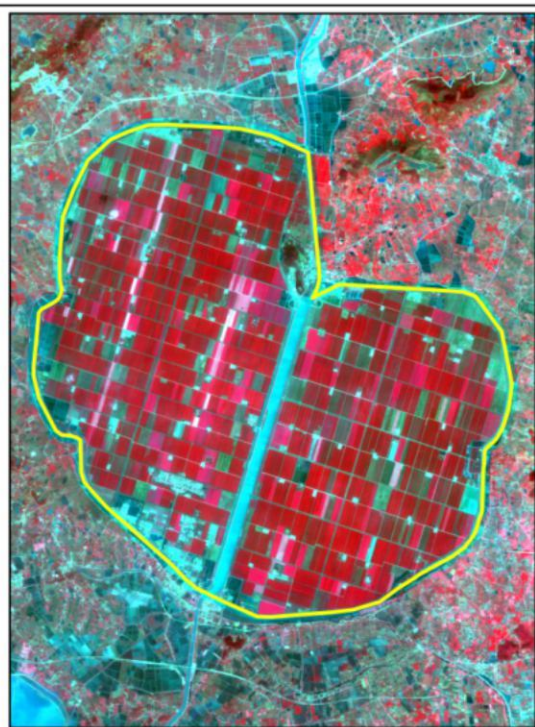
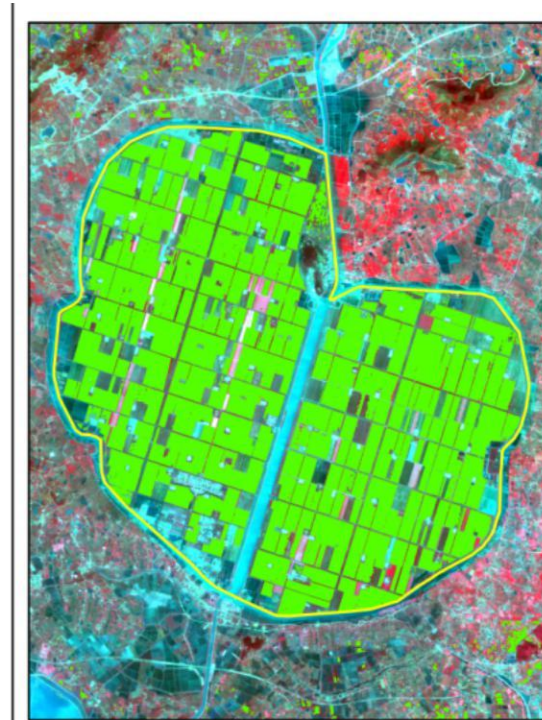


Image 2: land growing with grain

How to get the results?



Result: spatial distribution map



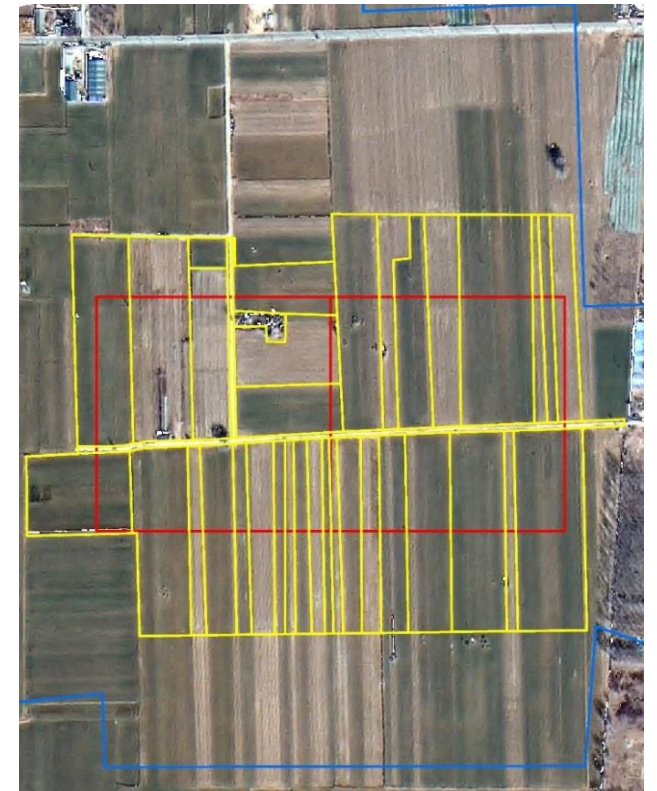
## 2. China's Experiences

### 2.2 Applications in routine work

#### (2) Field sampling survey

##### □ Method:

Field surveys have been conducted using modern survey methods such **UAV** aerial filming and **PAD** survey to obtain planting information of sample plots accurately and estimate the main grain sown areas.



Sample square

Small-scale





# 2. China's Experiences

## 2.2 Applications in routine work

### (2) Field sampling survey



Survey with PAD

当前调查对象: /太仆寺旗/三永村委会/3

清空选中状态

自然地块拆分

农作物遥感测量和地面调查表

农作物遥感测量和对地调查样方自然地块调查表

样本点名称: 太仆寺旗 (市、区、县) 三永村委会 (村)

样本点编码: 1525271042000

样方编码: 3 2023 年 春播面积 季 计量单位: 亩

自然地块编码	作物名称	作物代码	播种面积(4位小数)	是否复收(1是, 2否)	设施农业用地类型	备注
甲	乙	丙	1	2	丁	戊
13	大豆	115	23.3436	2		
5	森林	300	11.7832	2		

调查员: 审核人: 报告日期: 2023年03月24日 分类目录: 春播面积调查表

上一页 下一页 末页 第 1 页/共 1 页

the survey software of PAD





## 2. China's Experiences

### 2.2 Applications in routine work

#### (2) Field sampling survey



Survey with UAV



the survey software of UAV



## 2. China's Experiences

### 2.2 Applications in routine work

#### (3) Monitoring of grain crops growth

##### □Method:

From February to September, we utilize satellite remote sensing images with rapid revisit capabilities to conduct high-frequency growth monitoring of major grain crops such as rice, wheat, corn, and soybeans 2-3times a month. At the same time, UAV aerial filming is used to investigate and monitor the types, growth, and disasters of ground crops, timely grasping the growth status of grain crops, as well as researching and judging the agricultural production situation.



## 2. China's Experiences

### 2.2 Applications in routine work

#### (4) Yield survey per unit area



Sample cutting



Sample threshing



Sample weighing





## 2.3 Exploratory research







## 2. China's Experiences

### 2.3 Exploratory research

#### (1) Predict crop yield by using UAV



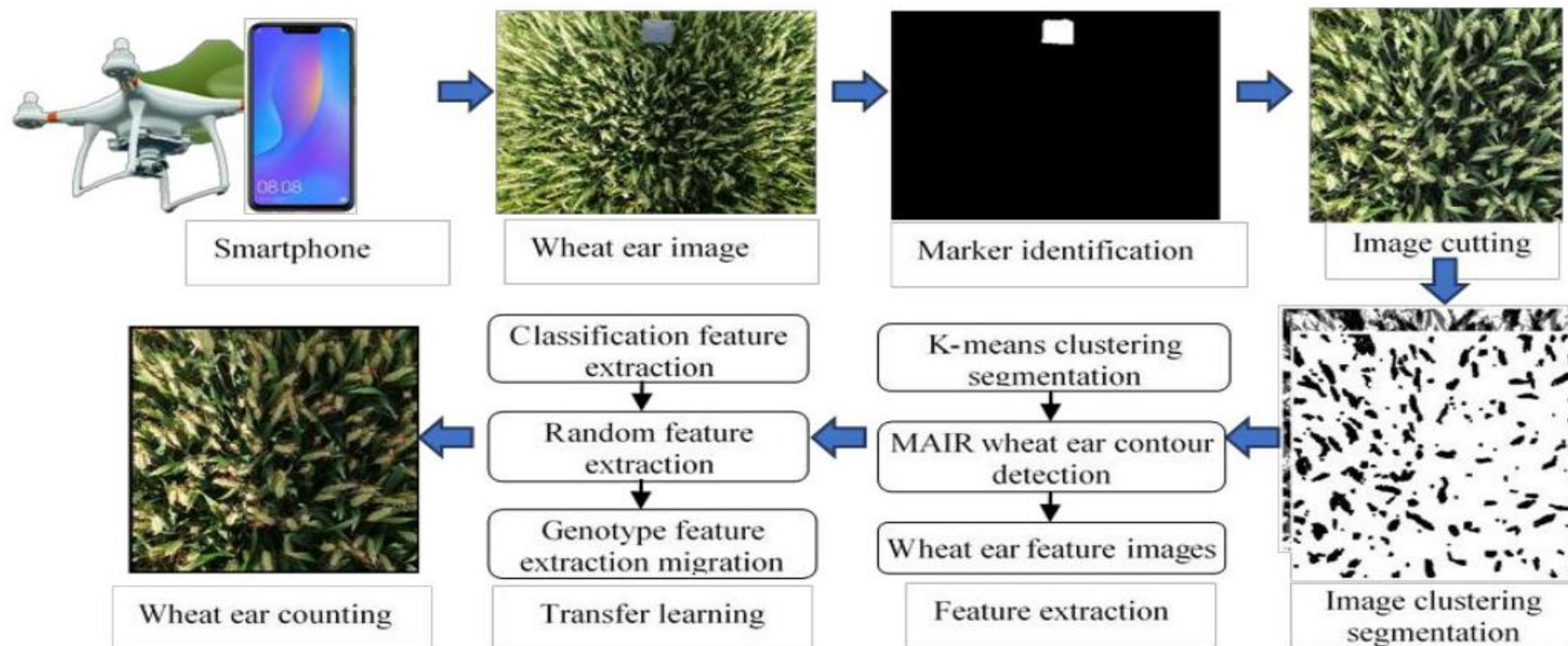
**This research is conducted to estimate unit yield by using UAV.**



# 2. China's Experiences

## 2.3 Exploratory research

### (2) Estimating the number of wheat ears by using UAV





## 2. China's Experiences

### 2.3 Exploratory research

#### (3) Facility agriculture monitoring by using remote sensing







## 2. China's Experiences

### 2.3 Exploratory research

**(4) Verifying the number of cattle or sheep on the grassland by using UAV**



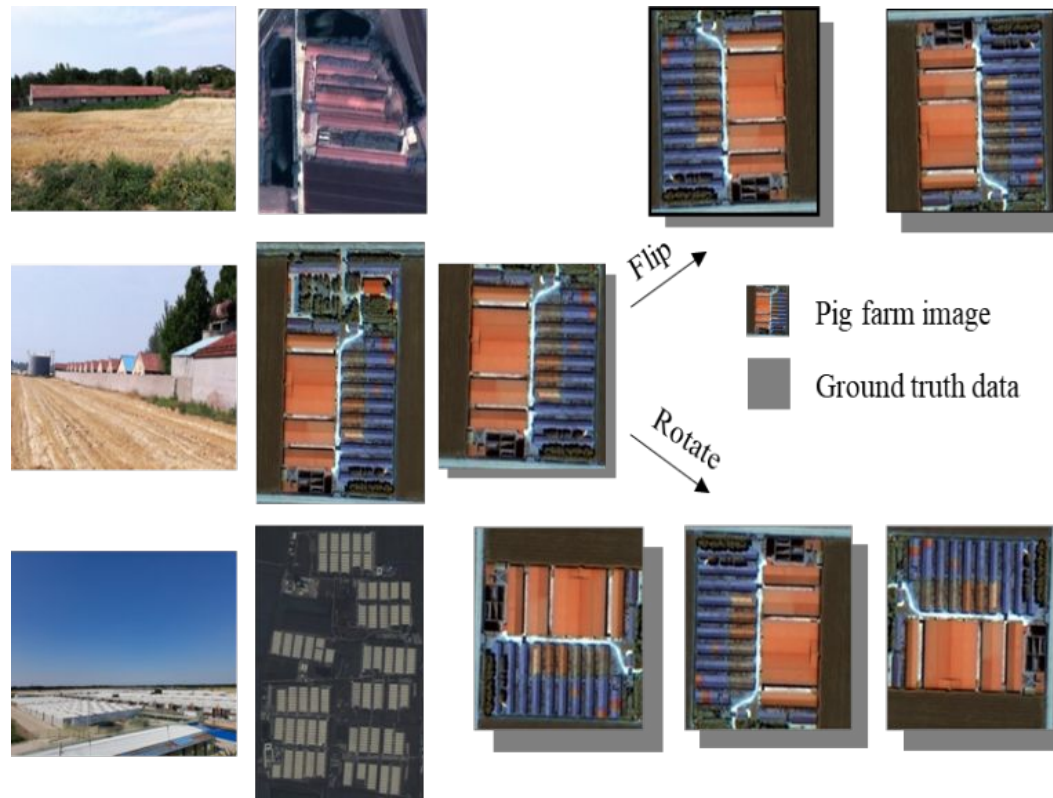




# 2. China's Experiences

## 2.3 Exploratory research

### (5) Extraction of pig breeding extent based on high resolution images



PART

03



# Future Plan

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## 4. Future Plan

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### Things to do :

- Supplement the satellite image source.
- Improve the data quality by using higher resolution satellite images.
- Gradually introduce artificial intelligence technology for automated measurement.
- Improve efficiency and reduce costs.
- .....



# Thank You !

For more information, please visit:

<https://www.stats.gov.cn/>

