



# **Unmanned Farm**

## **—One of the Ways to Realize Smart Agriculture**

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**Smart agriculture is the development direction of modern agriculture.**

**Unmanned farm is an important way to realize smart agriculture.**



# Outline

1. The concept of unmanned farm
2. The key technologies for unmanned farm
3. Unmanned rice farm developed by South China Agricultural University ( SCAU )



# 1. The concept of unmanned farm

Take the plant production as example, the unmanned farm should has the following 5 functions:

- (1) All the production links, including tillage, planting, management and harvesting, should be unmanned;
- (2) The unmanned machineries can automatically transfer between garage and field;
- (3) The machineries can automatically avoid obstacle and stop by emergency-triggered;
- (4) The whole producing processes are real-time monitored;
- (5) Decision-making and precision operations are all intelligence-based and unmanned.



## 2. Key technologies for unmanned farm

**The key technologies for unmanned farm:**

**(1) Digital information perception**

**(2) Intelligent decision making**

**(3) Precision operation**

**(4) Intelligent management**



# 2.1 Digital information perception

## —For plant production

### 2.1.1 The information of digital perception

#### (1) Soil information

**Soil tillage resistance**

**Soil nutrition**

**Soil moisture**

#### (2) Plant growing information

#### (3) Disease, insect pest and weed



# 2.1 Digital information perception

## —For plant production

### 2.1.2 Digital information perception technologies

**“Satellite”** : use satellite images to analyze disease, insect pest and weed

**“Aircraft”** : use manned or unmanned aircrafts images to analyze disease, insect pest and weed

**“Ground”** : use ground machinery images to analyze disease, insect pest and weed





# 2.1 Digital information perception

## —For plant production

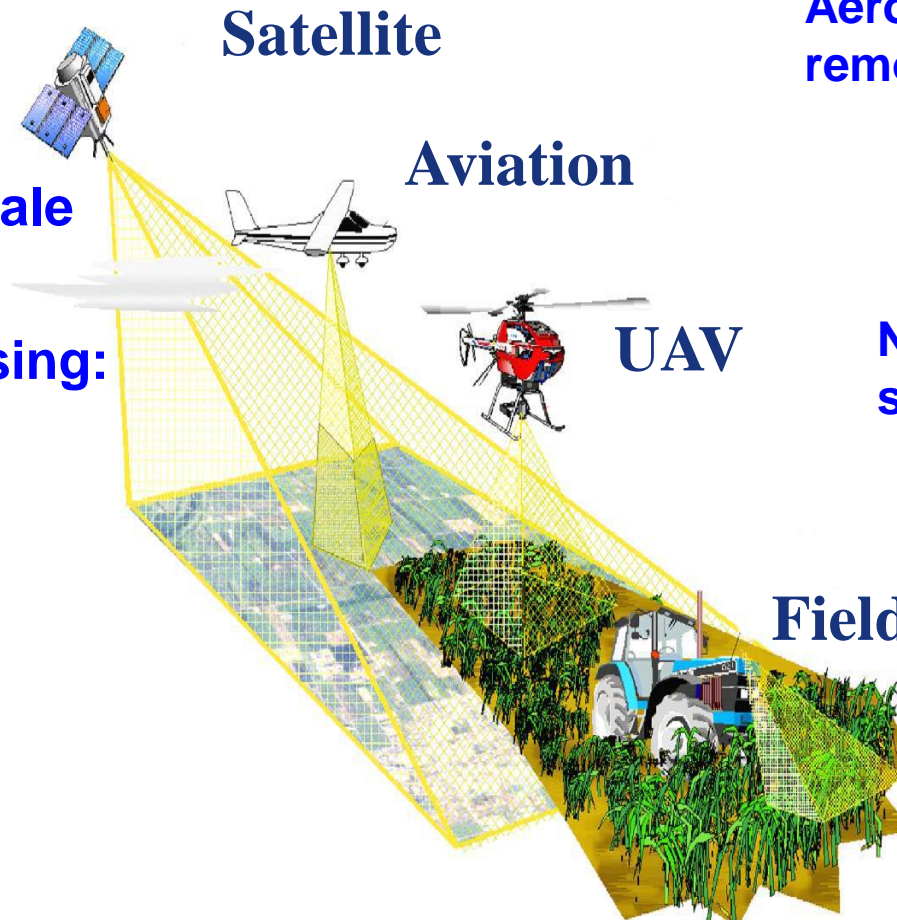
### 2.1.2 Digital information perception technologies

**Satellite remote sensing: global scale**

**Aerial remote sensing: regional scale**

**Lift platform: field scale**

**Field machinery: sample plot scale**



**Aerospace and aeronautical remote sensing:**

- Timeliness problem
- Weather window problem

**Near-earth remote sensing: low cost**

- High Flexibility
- High Timeliness
- High Precision

**Microminiature:**

- Easy operation



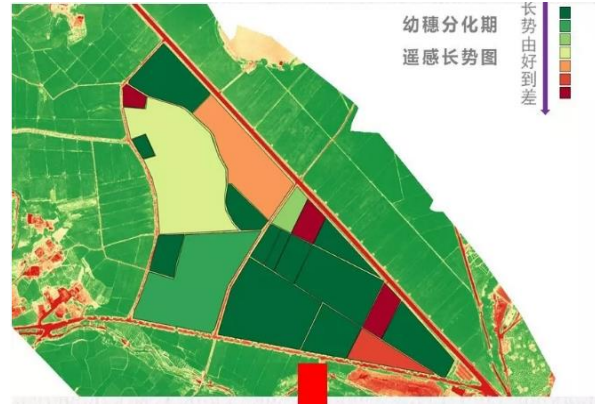


# Remote sensing information acquisition and fertilization management of rice nitrogen by micro-UAV

(South China Agricultural University)

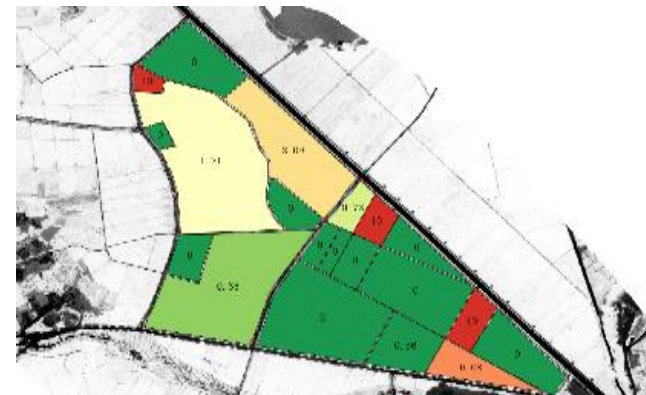
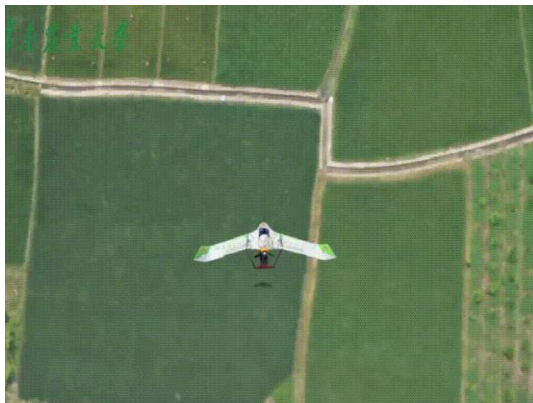


Remote sensing information acquisition by micro-UAV



Rice growing map

Results of early rice in Luoding in 2019: reducing nitrogenous fertilizer by **28%** on average of 10 ha;



Fertilizer application map

Results of late rice in Luoding in 2019: reducing nitrogenous fertilizer by **22.5%** on average of 10 ha.



## 2.2 Intelligent decision making

- (1) Intelligent decision making for **land consolidation**;
- (2) Intelligent decision making for **tillage**;
- (3) Intelligent decision making for **planting**;
- (4) Intelligent decision making for **sowing**;
- (5) Intelligent decision making for **field management**;
- (6) Intelligent decision making for **harvesting**.



## 2.3 Precision operation

### 2.3.1 Automatic navigation

### 2.3.2 Precision operation

## 2.3.1 Automatic navigation



Unmanned high ground clearance sprayer

## 2.3.2 Precision operation

(1) Tillage

(2) Planting

(3) Field management

(4) Harvesting

(5) Drying





## 2.4 Intelligent management

### (1) Crop growth management

### (2) Agricultural machinery management

- ① Remote monitoring of agricultural machinery operation location, operation progress, operation quality
- ② Remote monitoring of farm machinery operation and failure warning and maintenance guidance
- ③ Remote dispatching of agricultural machinery

### (3) Farm management

- ① Agricultural business management
- ② Agricultural materials management
- ③ Operating management



# Remote monitoring the location, operating speed, working quality of agricultural machineries

**历史轨迹回放**

查询设置

起始时间	2012-06-09 09:07:07
终止时间	2012-06-10 08:07:07
所属区县	灵宝市
合作社	灵宝市红阳农机专业合作社
车台编号	000000036

查询

记录信息

经度	110°43'43.59"N
纬度	34°36'7.15"E
速度	8.85 km/h
航向角	267.29°
时间	2012-06-09 11:01:58

播放控制

是否追踪 播放速度 16 播放

关闭



### 3. Unmanned rice farm developed by SCAU

#### Rotary tillage







### 3. Unmanned rice farm developed by SCAU

#### Sowing





### 3. Unmanned rice farm developed by SCAU



**Fertilizer applying**

**Pesticide spraying**





### 3. Unmanned rice farm developed by SCAU

#### Pesticide spraying





### 3. Unmanned rice farm developed by SCAU

**Harvesting** — following for unloading mode





### 3. Unmanned rice farm developed by SCAU

**Harvesting** — waiting for unloading mode





# Early season rice in 2021

## Unit yield: 9.9 t/hm<sup>2</sup>





**Thank you**