



## Mechanized Planting Techniques of Rice in China

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2015/11/27 -1-



中國的行政區分布  
Distribution of Administrative Divisions in China



2015/11/27 -3-



2015/11/27 -5-



## Outline

1. Introduction to rice planting in China
2. Raising machine for hybrid rice seedlings
3. Weeding machine for organic rice production
3. Rice blast detection using hyperspectral and micro image analysis

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Annual average temperature is 26 ° C in Guangzhou.



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### 1.Introduction to rice planting in China



- RME1: Southern China (two crops a year)
- RME2: Central China (rice-wheat; rice –rape)
- RME3:North-eastern China (one crop a year)

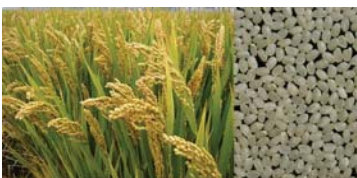
Annual harvested area is about 30 million hectares ;  
The production is about 200 million tons each year.

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### 1.Introduction to rice planting in China

#### Two geographical races of rice



#### Japonica rice

Short  
Roundish  
Amylose content:0~20%



#### Indica rice

Long to short  
Slender  
Amylose content:23~31%

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### 1.Introduction to rice planting in China



- RME1: Indica rice
- RME2: 60% Indica  
40% Japonica
- RME3:Japonica rice

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## 1.Introduction to rice planting in China



Long ping Yuan  
The Father of Hybrid Rice

- 1.Developing the first **hybrid rice** varieties in the 1970s.
- 2.It can produce up to 30% more rice comparing to **inbred rice**.
3. More than 60% rice areas plant hybrid rice.
4. Most indica rices are hybrid rice in China now.

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## 2.Raising machine for hybrid rice seedlings

Rice planting can be done in two ways



Direct seeding



Transplanting

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## 2.Raising machine for hybrid rice seedlings

- 1.Hybrid rice is more vigorous at seedling stage.
2. The planting density of hybrid rice is lower than inbred rice.
3. The seeding quantity of one tray is much lower.
4. The precision sowing is needed.

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## 2.Raising machine for hybrid rice seedlings

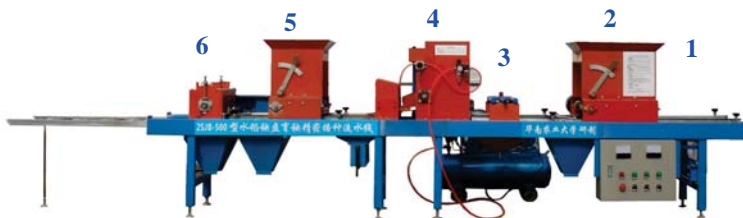


Rice raising machine ( Iseki, Japan )

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## 2.Raising machine for hybrid rice seedlings



- 1 Feeding trays → 2 Paving bed soil → 3 Watering → 4 Sowing → 5 Covering soil → 6 Brushing soil

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## 2.Raising machine for hybrid rice seedlings



Pneumatic vibration sowing device

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## 2.Raising machine for hybrid rice seedlings

1. Productivity: 500 trays/h
2. Sowing performance:2~5seeds/bowl, sowing qualified rate is >90%
3. The yield using this machine is 6% more than comparison.



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## 2.Weeding machine



### Herbicide

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## 2.Weeding machine



Marching type weeder

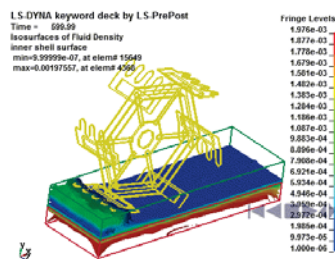


Wide –weeding machine

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## 2.Weeding machine



Marching type weeder

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## 2.Weeding machine



Wide –weeding machine

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## 2.Weeding machine



Wide –weeding machine

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### 3.Rice blast detection using hyperspectral and micro image analysis

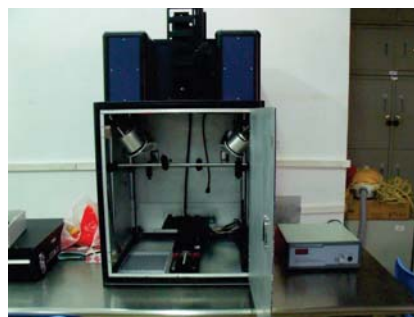


Leaf blast



Panicle blast

### 3.Rice blast detection using hyperspectral and micro image analysis

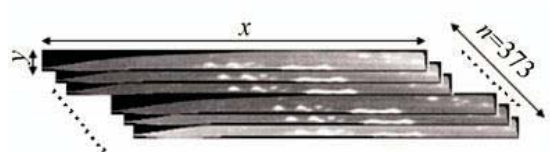


Hyperspectral imaging system

### 3.Rice blast detection using hyperspectral and micro image analysis

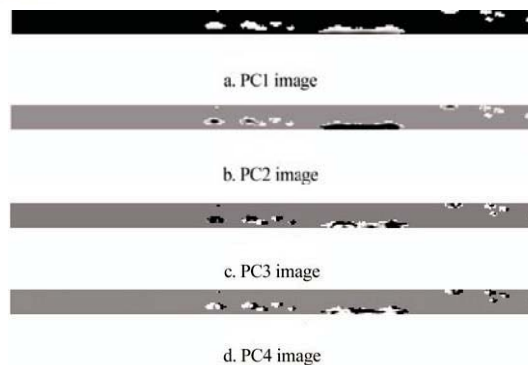


RGB image



Hyperspectral image

### 3.Rice blast detection using hyperspectral and micro image analysis



Principal Component analysis (PCA)

PC2 image was obtained to identify brown disease spots and gray disease spots

### 3.Rice blast detection using hyperspectral and micro image analysis

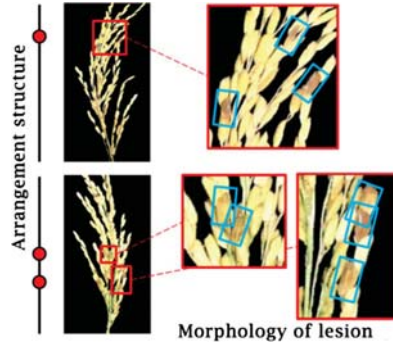
After segmentation, the shape parameters and infected area were used to grade the severity. Classification accuracy was 96%.



Panicle blast

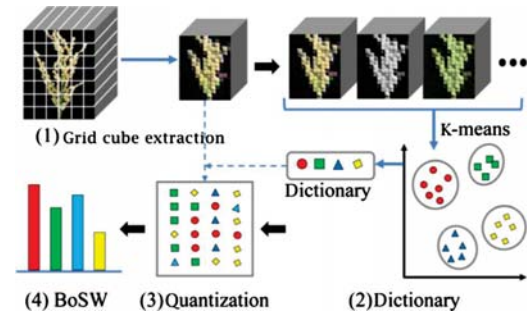


### 3.Rice blast detection using hyperspectral and micro image analysis



Arrangement structure and morphology of lesion of infected spikelet

### 3.Rice blast detection using hyperspectral and micro image analysis

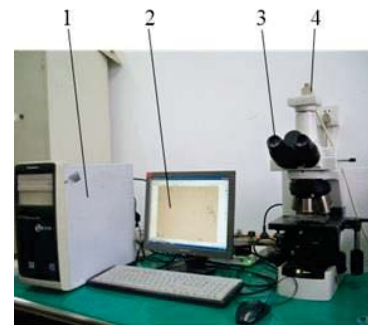


Bag of spectra words(BoSW)

### 3.Rice blast detection using hyperspectral and micro image analysis

Data set	BoSW	AveraFull	AveraPCA	PCAimage	SenPoCorr
First batch	80.05 ± 4.02%	62.20 ± 7.1 0%	69.51 ± 5.1 2%	27.16 ± 4.8 0%	60.37 ± 6.9 1%
Second batch	82.60 ± 4.42%	55.25 ± 4.8 6%	65.19 ± 4.5 7%	18.81 ± 3.3 68%	55.06 ± 5.7 8%
Combination of two batches	80.26 ± 3.56%	60.21 ± 3.6 4%	67.33 ± 3.5 3%	21.71 ± 3.4 2%	59.41 ± 3.7 2%

### 3.Rice blast detection using hyperspectral and micro image analysis



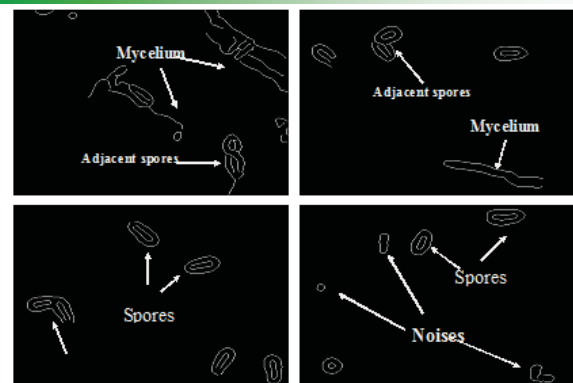
Micro imaging system

### 3.Rice blast detection using hyperspectral and micro image analysis



Spores of the rice blast

### 3.Rice blast detection using hyperspectral and micro image analysis



Edge detection using canny operator



### 3.Rice blast detection using hyperspectral and micro image analysis



Binary image including only spores



### 3.Rice blast detection using hyperspectral and micro image analysis



Adjacent spores segmentation using DT-GF-WA method



# Thanks



# Questions ?

Please speak slowly