

# China's Agriculture and Technology

Nie Fengying  
Chinese Academy of Agricultural Sciences

2012 Tokyo

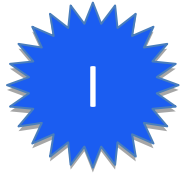


中國農業科學院  
CHINESE ACADEMY OF AGRICULTURAL SCIENCES

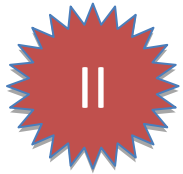


# Outline

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➔ Key Experiences of China's Modern Agriculture



➔ Modern Agriculture and technology

# Part I

## Key Experience of China Modern Agriculture

# I. China's agriculture at a glance

- **9% of the world's arable land feeding 20% of the world population**
- 1.36 billion population vs. 133 million hectare arable land(rank 4 in total and average 126 in per capita)
- 59.4% mountains and plateaus, 9.9% hill, 18.8% basin and 12.0% plain; 2/3 higher than 1000m above sea level, 25.2 % lower than 500m
- 664 counties 0.05 ha. Per capita, the early warning line by FAO

- **Rate of grain(cereal +soybean +potato) self-sufficiency in 2011: 95%**
  - **The proportion of agriculture added value in GDP:** ↓
  - **Share of agricultural employment in total employment :** ↓
- Percentage of rural population to total population:**
- 48.7%**

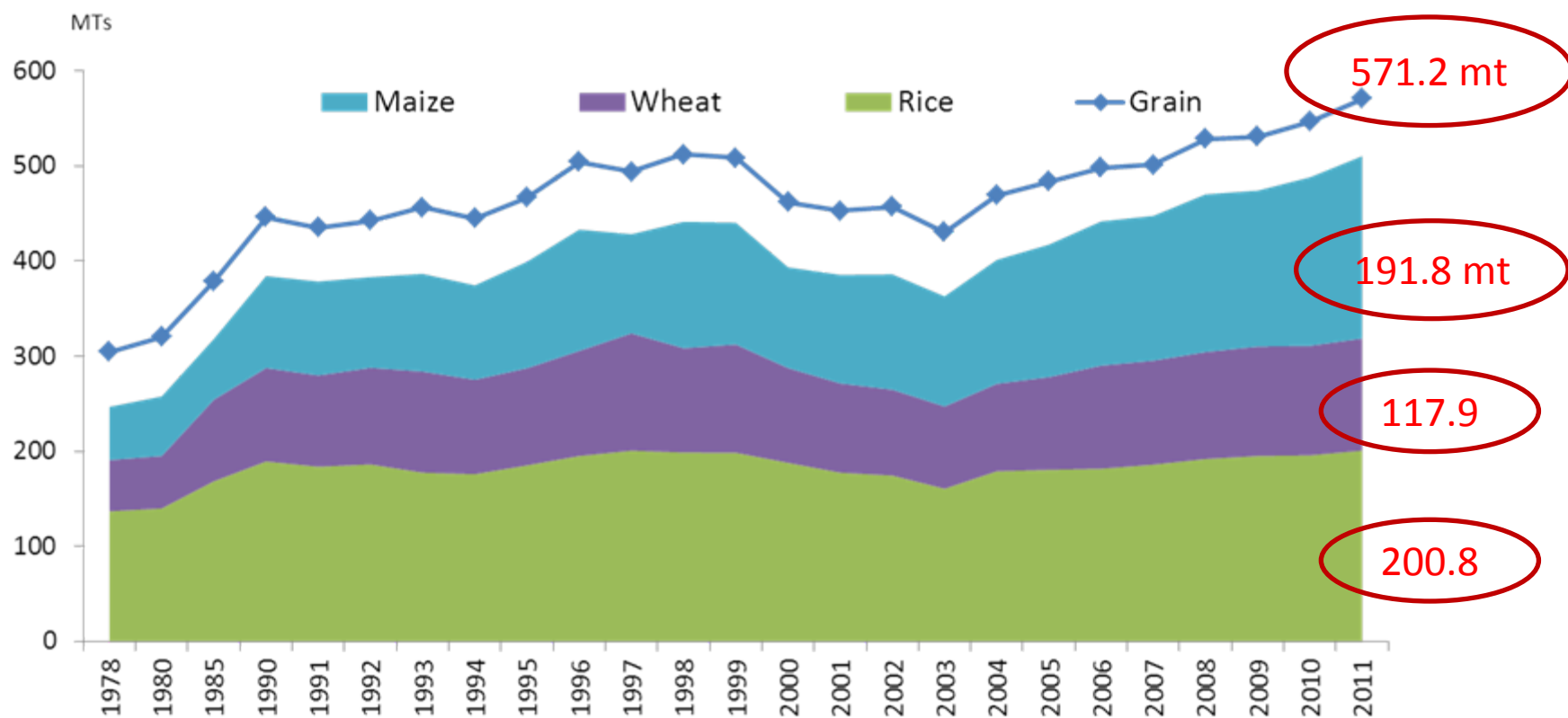
	1978	1990	2000	2010
Employment	70.5	60.1	50.0	36.7
Share in GDP	28.2	27.1	15.1	10.1

## **II. Major Achievements in the new Century**

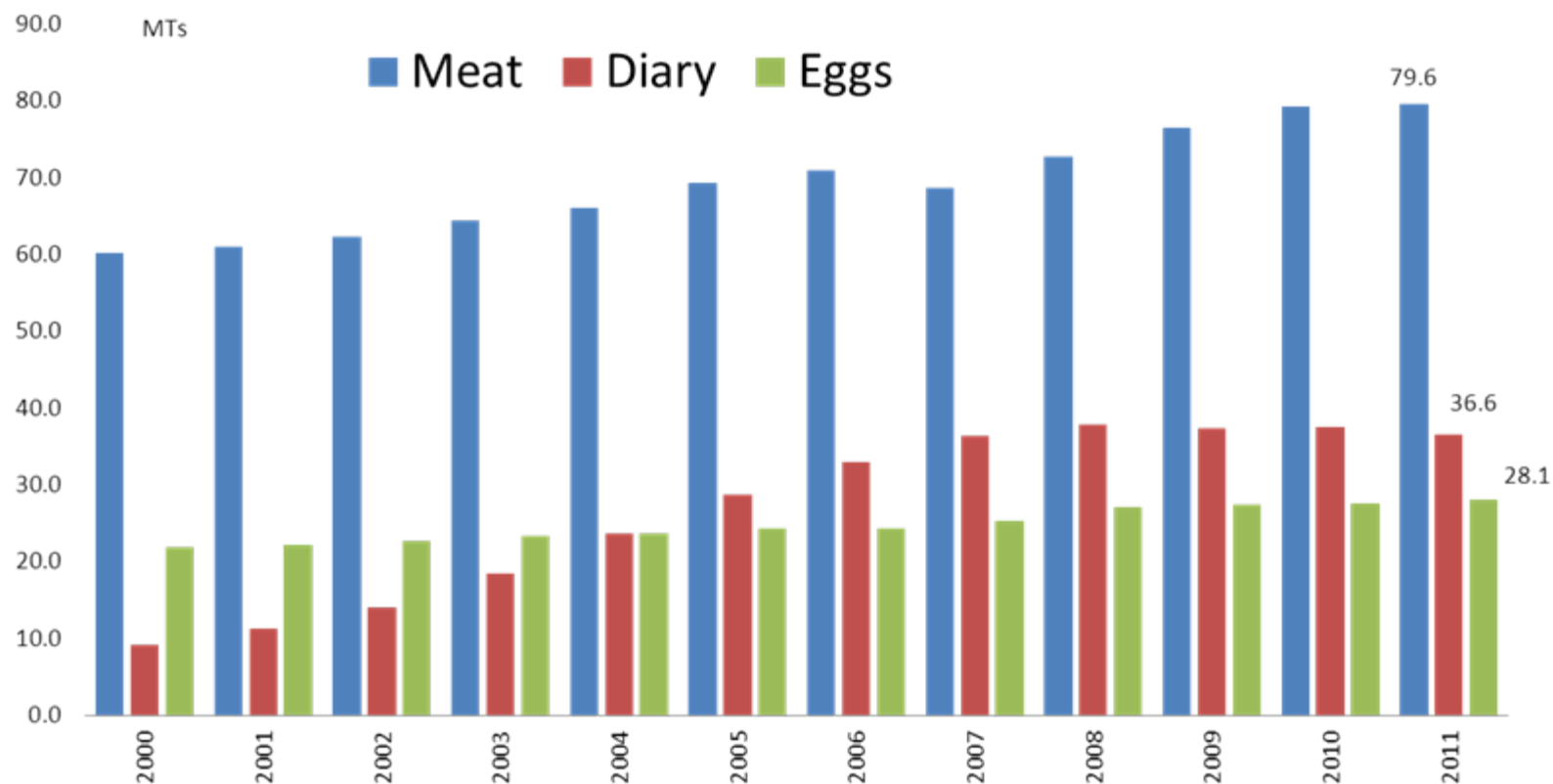
- 1. Food security enhanced**
- 2. Farmers' income increased and poverty reduced**
- 3. Agricultural trade expanded**
- 4. Agricultural S &T capacity strengthened**
- 5. Agriculture industrialization accelerated**

## 1. Food security enhanced

- Rate of grain self-sufficiency 95% (2004-2011)
- Eight consecutive years of increase, at 3.6% annually (2004-2011).



- Annual increase of livestock, poultry and diary production during 2004-2011: Meat 2.6%, Diary 13.4%, Eggs 2.3%**





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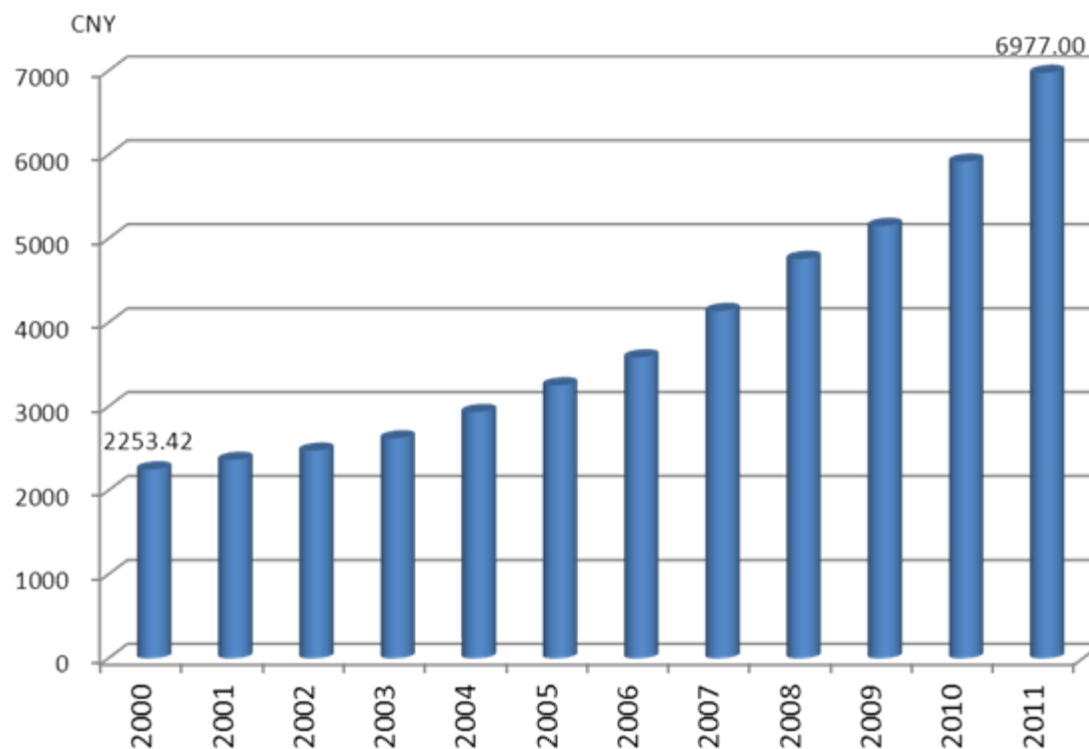
## Fruits Production in 2010

Fruits	Total Production (1000 Tons)	Area (1000 ha)	World Ranking
Apple	33,265.2	2,044.6	1
Citrus	4,886.9	174.8	1
Pear	15,231.9	1,040.6	1
Peach	10,718.0	731.3	1
Grape	8,651.8	643.9	1
Bananas	9,848.9	413.9	2

Source: FAOSTAT.

## 2. Farmers' income increased

**In 2011, farmers' annual nominal income reached 6,977 Yuan/person, with 10.8% annual rate of increase during 2000-2011**



### 3. Agricultural trade expanded

**2011**

- **Agri-products trade value: USD155.6 billion, increased by 27.6% from 2010**
  - **Export 23.0% ↑ , Import 30.8% ↑**
- **Trade deficit: USD 34.1billion, increased 47.4%**
- **Trade deficit mainly comes from soybean, milk powder, wool & leather**
- **Main export products: vegetables, fruits, fishery and aquatic products**
- **Destination countries and regions: Hong Kong, Japan, Europe**
- **Importing countries: USA, New Zealand, Australia**

# Part II

## Modern agriculture and Technology

## I. Agricultural R &D Capacity Strengthened

- ✓ **The contribution rate of science and technology to increased agricultural production was 53% in 2011**
- ✓ Over 6000 new varieties of major crops
- ✓ 4-5 times of nationwide replacement of crop varieties,
  - yield increased 10%-20% each time



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**12.6 t/ha**







**Wheat –new Variety , yield increased 15%.**



**BT cotton, yield increased 25%.**



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**15t/ha**



2004 9 17



# 4.68t/ha

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2005 10 16







## ➤ **Agricultural science and technology extension system improved**

### Agricultural technology extension system (2009 )

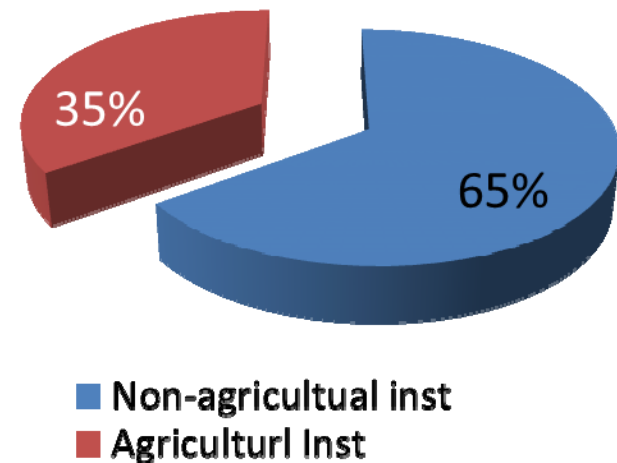
Category	Organization Number		Number of Staff	
	10,000	%	10,000	%
Crop Production	4.7	35.4	36.7	49.4
Livestock	4.0	30.1	24.0	32.2
Fisheries	1.3	9.8	3.7	5.0
Mechanization	3.3	24.7	9.9	13.4
Total	13.3	100	74.3	100

Note: Not including veterinary extension agencies

## Agricultural research is a national priority

Category	No.
Total No. R&D Organizations	3,696
Total No. Agricultural R&D Organization	1,293
Total No. R&D Staff	664,155
Agricultural R&D Staff	103,539

**35% of all public R&D organizations are in agriculture**



Source: 《Annual Statistics of China's Science & Technology, 2011》

## II. Some Areas of Modern Agriculture and Technology



**Seed Industry**



**Water Saving Agriculture**



**Animal and Dairy Production**



**Food Processing**



**Urban Agriculture**



**E-Agriculture and New Extension Systems**

## 1. Seed Industry

- **Currently about 8,700 seed companies, 180,000 retailers**
- **Only 10 stock market listed companies**
- **Estimated total market value in 2011: 53 billion Yuan (US\$ 8.4 billion)**
- **Annual seed production of crops and vegetables: ca. 8,000,000 tons**
- **60% of rice varieties and 40% of maize varieties were developed by public institutions**



## Trends and Implications

- ✓ **Consolidation**
- ✓ **Strengthened R&D capacity in the private sector**
- ✓ **Closer collaboration of public and private sectors**
- ✓ **Improved IP legislation and management**
- ✓ **Potential scope of the seed market: doubling the current market value in 5 years**





## 2. Water Saving Agriculture

### Water Scarcity & Food Security in China:

**570** billion m<sup>3</sup> of water for grain production annually

✿ **170** billion m<sup>3</sup> irrigated water

✿ **400** billion m<sup>3</sup> soil water (rainfall -green water)

✿ Irrigated Water Use Ratio=48%,

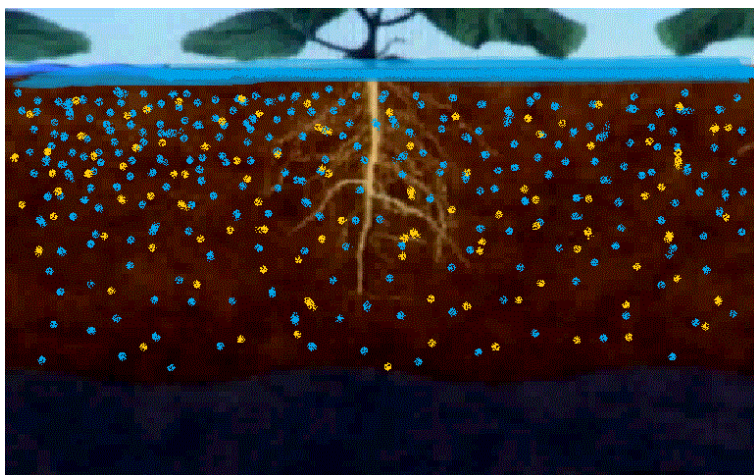
✿ Rain Water Use Ratio=56%

✿ Water Use Efficiency=1100m<sup>3</sup>/ton of grain production

✿ 30 billion m<sup>3</sup> of water shortage (current)

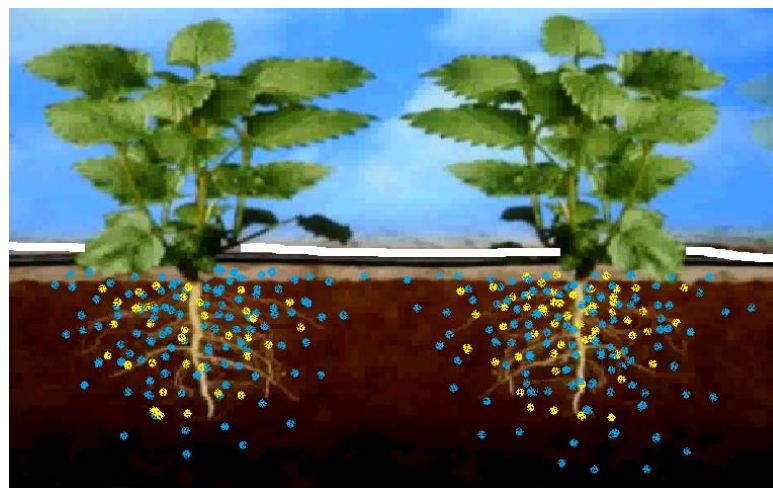
## Drip irrigation is currently the best technology for improving water and nutrient productivity

Conventional irrigation and fertilizer application



CI: High waste of water and fertilizers, low water use efficiency

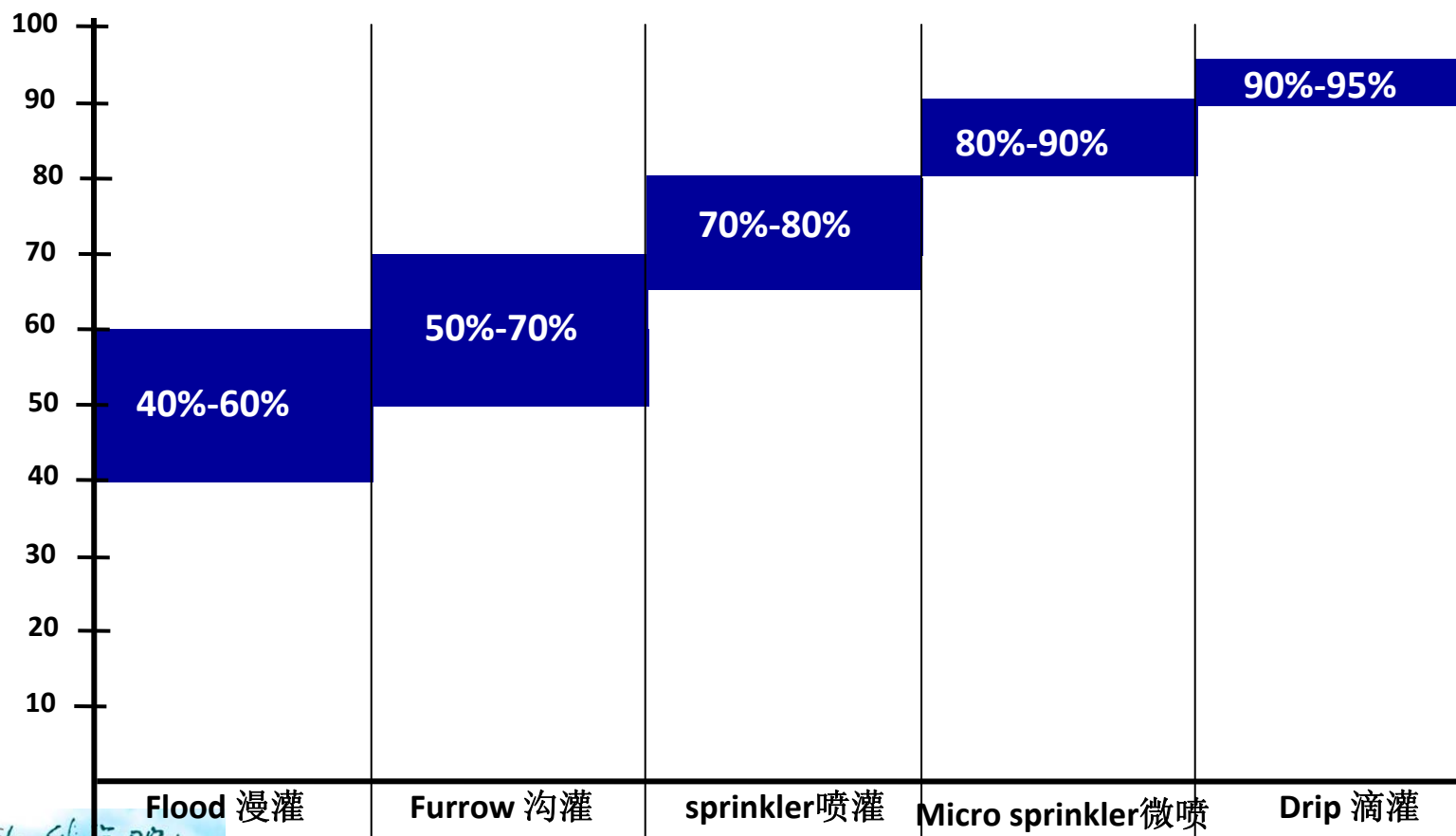
Drip irrigation integrated with fertilizer use - **fertigation**



DI: Water and fertilizer retained at the crop root zone, high water use efficiency

## Drip irrigation: A core technology for eco-intensification

Water use efficiency of different irrigation methods:



## Drip Irrigation: Extensive adaptability

**One of the main advantages of drip irrigation is the flexibility to adapt to:**

- any layout above or below grade
- different soil types , sandy soil, saline soil , waste land, irregular shaped fields and different uneven topography
- different water sources, including recycled water and brackish water





## **Drip irrigation under mulch film for row crops – a recent innovation in Xinjiang, China**

**Drip irrigation under mulch film  
(DIUMF) is a technology  
innovation that integrates drip  
irrigation, fertilization and  
plastic film mulching into one  
process in planting**



## Large scale application of DIUMF in cotton, maize and potato in Xinjiang, Inner Mongolia, Gansu





## Drip Irrigation: Yield increase and water saving in Maize

### Results from Da Qing, Heilongjiang Province:

- ✓ Average yield: 12,750-15,000kg/ha
- ✓ Water use was  $\frac{1}{2}$  of the amount in sprinkler and  $\frac{1}{7}$  of furrow irrigated field



### Results from Wu Wei, Gansu Province:

- ✓ Average yield: 14,100kg/ha, 21% more than conventional irrigation
- ✓ Water use: 2700~3000 m<sup>3</sup>/ha, 40-50% less than conventional irrigation



## Drip Irrigation: Yield increase in spring wheat in Xinjiang

**Average yield: 8,745kg/ha  
in 1,600 hectares**



**Highest yield achieved in a 10  
ha plot was 12,090 kg/ha, record  
of highest yield of spring wheat  
in the region**



## Drip Irrigation: Cost/benefit analysis of spring wheat in Farm 148, Xinjiang

Item	Wheat		
	Conventional irrigation	Drip irrigation	% Increase
Yield (Kg/mu)	340.0	583.0	71.4
Cost ( ¥/mu)	581.0	630.1	8.3
Water used (m <sup>3</sup> /mu)	450.0	280.0	-37.7
Net income ( ¥/mu)	189	625.9	231.1
<b>WUE (Kg/ m<sup>3</sup>)</b>	0.76	2.08	173.97

\* Data from Xinjiang TianYe Irrigation Co.

## Drip Irrigation: Applications in alfalfa and rice

Alfalfa: Average yield of 27,000 kg/ha dry hay in 400 ha, 2009 in Xinjiang. Two more cuttings and 3 times yield increase than furrow irrigated fields.



Rice: Average yield of 9 ton/ha in a 40 ha plot in Xinjiang in 2010



## Comparison of the Tianye DI technology and products with imported Israeli products in China

Item	Israeli Products	Tianye Products
Application Fields	Mainly in protected agriculture (greenhouses)	Mainly in open field crops
Water quality requirement	High	Low
One time system investment	2300 Yuan/mu (34,500 Yuan/ha)	600Yuan/Mu (9,000 Yuan/ha)
Annual replacing material cost	100 Yuan/Mu (1,500 Yuan/ha)	80-120 Yuan/Mu (1,200-1,800 Yuan/ha)

## Trends and Implications

### —Double China's DI Application Area, Revolutionize Farming

- 4.6 million ha of DI application in 2009,
  - 7.7% of the total irrigated agricultural area
  - Mainly in horticultural crops and greenhouses, with exceptions of Xinjiang and pilot plots in some provinces .
- To double the DI area to 15% of the total irrigation area by 2015, and to 30% by 2020.
- This will lead to profound changes in farming systems and associated services.

### 3. Animal and Dairy Production

- Number one in the world in meat and poultry production
- Rapidly growing production and market demand



## Development of Animal, Dairy and Fishery Production ( in '000 tons)

Year	Total Meat	Pork	Milk	Poultry	Fisheries
1990	28,570	22,810	4,160	7,950	12,370
2000	60,140	39,660	8,270	21,820	37,060
2011	79,570	50,530	36,560	28,110	56,000

(Source: State Statistics Bureau 2011)

## Animal, Dairy and Fishery Products Per Capita ( in kg/year)

Year	Total Meat	Milk	Poultry	Fisheries
1990	25.2	3.7	7.0	10.9
2000	47.6	6.6	17.3	29.4
2011	59.3	26.7	20.7	40.2

(Source: State Statistics Bureau 2011)

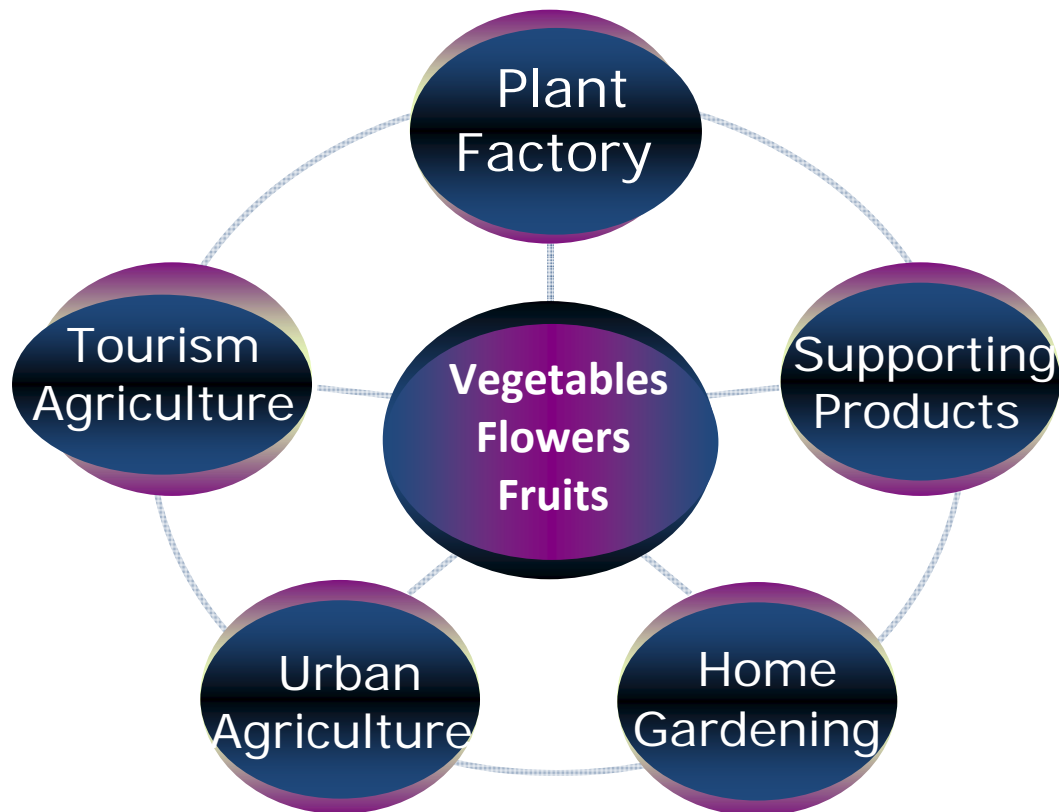


## Trends and Implications

- ✓ **Transportation of meat, milk and feed grain from North to the South.**
- ✓ **Transportation of poultry and eggs from East to the West.**
- ✓ **Continued increase in importing maize and soybean in the next 3-4 years.**
- ✓ **Investment in ruminant (e.g. goats)) and dairy production (e.g. dairy water buffalo) in the South and Southwest of the country**
- ✓ **Research in animal breeding, veterinary, and meat and dairy processing in South and Southwest of China.**



## 4. Urban Agriculture



# Future Farming in Cities: Hydroponics, Symbiosis



## Eco-Offices with green walls and plant surroundings supported by hydroponic systems





## Greenhouse production of vegetables with hydroponic systems and LED lighting



## Vegetable Production in Farmer's Greenhouses

Yielding 40,000 Yuan per greenhouse of 1.2 mu per year in  
Beijing Suburbs





## Trends and Implications

- ✓ **Direct supply of “organic” vegetables from the city for the city.**
- ✓ **Development of “vegetable and flower center/garden” in the subdivisions and residence complexes**
- ✓ **Integration of production, marketing, and distribution**
- ✓ **Quality standards and specialized production and processing**

## 5. E-Agriculture and New Extension Systems

- ✓ **Application of new ICT technology to empower farmers and production cooperatives to access technical and market information**
- ✓ **3G-based extension information system to enhance the extension agents' self-learning, information and knowledge base, solutions for farmers' questions and their management**

## 3G-Based Agricultural Extension Information System Supported by a Vast Database at CAAS



**2010年10月27日**  
【虎】丙戌月 庚戌日 庚寅年 九月二十  
**17 32**

10月27日 白天 泰州 多云  
15℃~6℃  
风力: 3-4级

未来天气  
10-28 10-29  
16/8C 17/11C

此基于3G等现代信息技术的全国基层农技推广信息化平台,是由农业部科技教育司指导,中国农业科学院农业信息研究所建设并管理,旨在创新基层农技推广手段与管理,拓展服务功能,全面提升基层农技推广公共服务能力。

- 诊断处方
- 农技咨询
- 专家会诊
- 工作交流
- 推广地图
- 市场行情
- 推广日志
- 网络书屋
- 农情报送
- 培训课件
- 通知通报
- 农技影视

3G Notebook and printer

## 3G Mobile Phone Extension System



## A system that can provide extension service any where in the field





# Extension Agents conducting diagnosis and producing “prescription” for the farmer in her field



## 兴化市农业科技入户工程技术指导

### 处方笺

示范户姓名： 成俊杰      所在村组： 陆横村15  
种植作物品种： 草莓      指导时间： 2010-10-11

1、主要症状： 草莓叶片出现点状黑恶色斑点、多出现在老叶上，尤其在红颊草莓上表现突出，继而影响植株生长缓慢，甚至整个植株枯死

原因分析： 高温、高湿，土壤带菌等

3、建议措施： 1.加强草莓够系清理，确保水流畅通 2.及时用药预防。可选用咪唑胺等系列杀菌剂预防

指导员：李开江

编辑

返回

## Expert remote diagnosis



## Training of Farmers and Extension Agents





## Conclusion

- ✓ **Great achievement in food security but malnutrition and food insecurity of vulnerable people in poverty.**
- ✓ **Because of shortage of arable land and water, technology is the solution.**
- ✓ **Great needs in cooperation between private and public sector, and among economy in APEC.**



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# *Thank You!*

