



Market Prospect of Slow  
Release Fertilizer in China

and

Hanfeng's Specialty Slow  
Release Fertilizer  
Technology

Lv Yunfeng

HANFENG EVERGREEN INC.




## The Significance of Fertilizer in Chinese Agriculture

During the past 20 years, crop yield has increased 44%, cash crop yield has increased 1 to 3 times (except for cotton), vegetable yield has increased 7 times and fruit yield has increased 8 times. 40% of the achievement is brought by fertilizer.





## Fertilizer Production Status

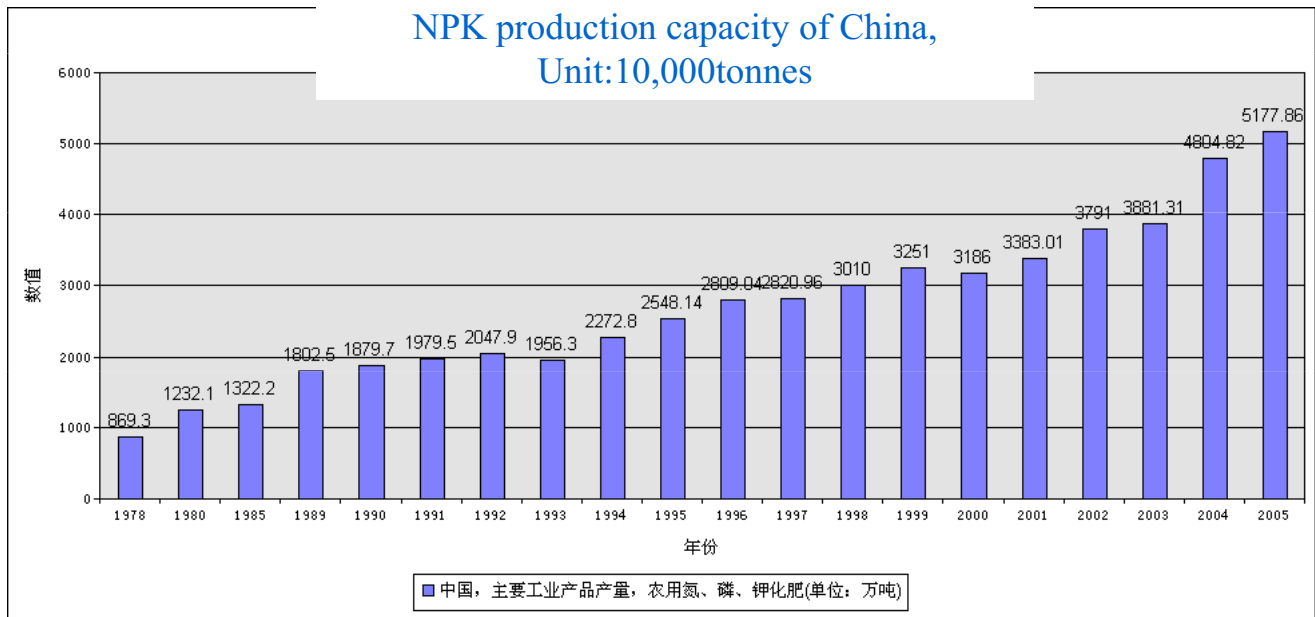
-  By year 2004, there are over 1000 commercial scale fertilizer manufacturers, including 500 nitrogen manufacturers, 500 phosphate manufacturers and 40 potash manufacturers.

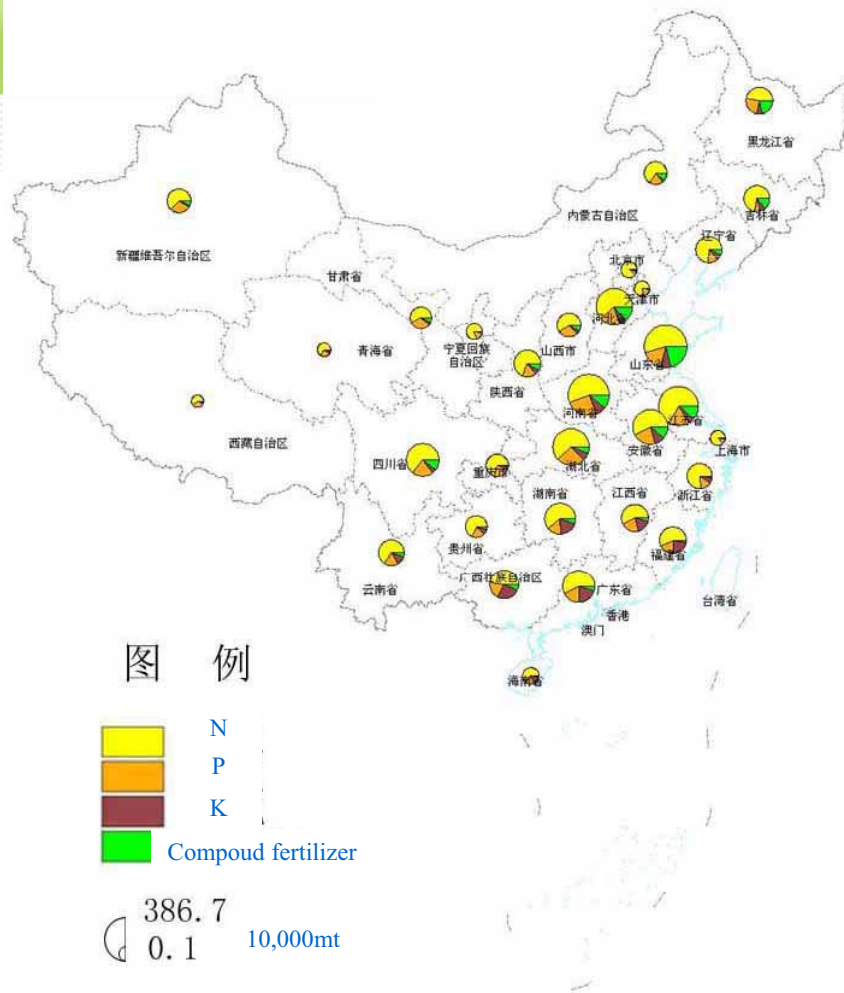
Total capacity is 45.77 million metric tons (based on 100% effective nutrient) which is ranked the world's top, including 35.39 million metric tons of N, 9.93 million metric tons of P and 2.25 million metric tons of K.





NPK production capacity of China,  
Unit:10,000tonnes







## Fertilizer Production Status

Variety and volume of high-concentration compound fertilizer is increasing with years. Over 60% of total nitrogen fertilizer is high-concentration urea; high-concentration phosphate and compound fertilizer has increased to 45% of the total.

Percentages of High/Low Concentration		
Type	High Concentration	Low Concentration
Nitrogen Fertilizer	63	37
Phosphate and Compound Fertilizer	45	55

## How does fertilizer contribute to agriculture?



It is estimated by FAO that fertilizer can increase per unit area grain yield by 55-57%, and total grain yield by 30-31%.

- Played an important role in the development of agricultural development

The total grain yield has dramatically increased from 113.2 billion kg to 462.2 billion kg, and the cotton yield has increased from 0.44 million tons to 4.42 million tons.

By 2030, the population of China will break 1.6 billion, when the grain demand will increase to 0.64-0.72 billion tons, 0.14-0.22 billion tons more based on the current 0.5 billion tons, which means the per unit area grain yield has to be increased by 31%-47%. The increase in grain yield is subject to fertilizer input. Assuming 8-10 tons grain can be produced by 1 ton fertilizer, 14-17 million tonnes additional fertilizer has to be produced to feed the 1.6 billion mouths.



## The problems existing in fertilizer application

China consumes 30% of the world's fertilizer on its 7% land area, which triples the average per unit fertilizer consumption rate worldwide.

- Excessive fertilization decreases fertilizer use efficiency
- The over-development of nitrogen production consumes energy and increases greenhouse gas emission
- The over-production of phosphorus accelerates the exhaustion of phosphorus resource in China

Concerns on the hidden troubles caused by irrational fertilizer application and the resource and energy waste caused by the unrestricted fertilizer production are becoming stronger.





**Nitrogen wasted by eluviation and volatilization each year is about 9 million MT valuing 40 billion RMB. The wasted nitrogen brings heavy pollution to the environment and a cost of 73 billion RMB for environmental impact annually .**



## Development Trend

- High-efficiency, energy saving complex fertilizer will become mainstream, developing toward high-concentration, granular, multi-functional and specialized products.
- Quality control and after service will be more normalized and institutionalized.





## Outlook on the slow-release fertilizer market

•In order to amend the situation, the consumption of conventional fertilizer must be reduced and the soil-survey-based fertilizer and slow-release fertilizer must be promoted on the condition that the agricultural production shall be guaranteed or improved.

•Premier Wen Jiabao put forward in the government work report that during the “Eleventh Five-Year Plan” period, therefore stress that Slow release fertilizer increasing fertilizer use efficiency is an effective way towards Energy Conservation and Consumption Reduction.





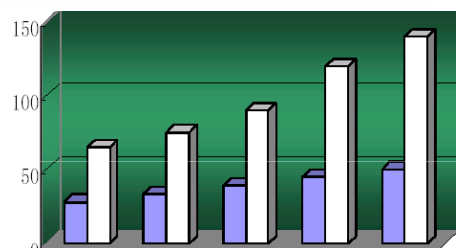
**The slow-release fertilizer is an environmental-friendly fertilizer which can slow down or control the nutrient release rate, to reduce nutrient loss and increase fertilizer use efficiency.**

**This fertilizer can:**

- Increase fertilizer use efficiency. Generally speaking, slow/controlled release fertilizer can increase fertilizer use efficiency by 10-30% compared with instant nitrogen.
- Decrease fertilizer application rate and save labor. Slow/controlled release fertilizer can produce the same yield with the rate 10-40% less than conventional fertilizer. Sometimes, only single application is required, which can reduce labor cost by 75%.
- Reduce environmental pollution caused by fertilizer

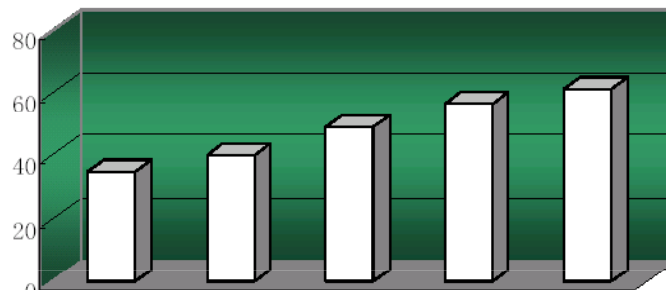
To increase fertilizer use efficiency with slow/controlled release technology equals to the increase in fertilizer production. The current urea production in China is approximately 20million tonnes, if coated with sulfur, the nitrogen use efficiency can be improved by 20%, which means the urea production is increased by 4million tonnes.

### 2001-2005 Volume and Capacity of China's Slow Release Fertilizer Production



	2001	2002	2003	2004	2005
Production volume(10,000mt)	28	33	39	45	50
Production capacity(10,000mt)	65	75	90	120	140

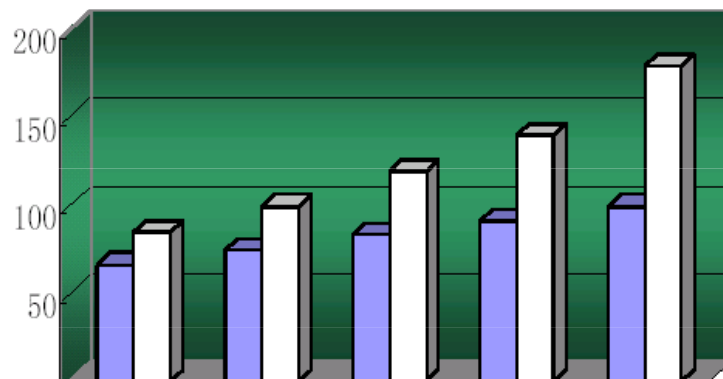
### 2001-2005 China's Consumption of Slow Release Fertilizer



	2001	2002	2003	2004	2005
consumption(10,000mt)	35	40	49	57	62



### 2001-2005 China's Potential Demand of Slow Release Fertilizer



	2006	2007	2008	2009	2010
Actual consumption (10,000mt)	67	75	84	92	100
Potential consumption (10,000mt)	85	100	120	140	180

## Hanfeng Evergreen Inc



- **CEO & President: Xinduo Yu**
- **Core Business: Slow /Controlled Release Fertilizer**
- **Main Operations:**
  - Hanfeng Slow-Release (Shanghai) Co., Ltd.
  - Hanfeng Slow-Release (Jiangsu) Co., Ltd.
  - Hanfeng Slow-Release (Heilongjiang) Co., Ltd.
- **TSX:HF**
- **Production Capacity: 650,000tonnes in 2007**



# Operation



Shanghai plant

Jiangsu plant



Heilongjiang plant



## Shanghai R&D Centre



- As the first privately owned R&D Center by enterprise in China.
- Equipped with good R&D facilities and inspecting instruments for slow release fertilizer.
- The R&D Center is led by a research team consisted of well-known experts on slow-release fertilizer, plant nutrition, machine etc. The R&D Center has close cooperative relation with many famous university and institutions.
- Several proprietary slow/controlled release fertilizer products have been developed by the R&D Center, such as resin coated fertilizer, UF, tower granulation compound fertilizer and other special fertilizers, 6 nation patent.

R&D Centre and training centre



## Jiangsu plant



Products	Sulfur coated Urea,Sulfur coated compound fertilizer , Tower prill compound Fertilizer,Bulk Blend Fertilizer
Market	High value economy crops,horticulture, Modern agriculture
Capacity	200 , 000mt/year
Founded	Production started in2006,3

Prill Tower

SCU plant

Port



## Heilongjiang Plant

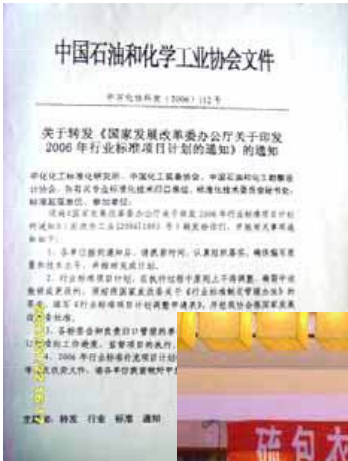


Products	Sulfur coated Urea,Sulfur coated compound fertilizer , Tower prill compound Fertilizer, Urea Melt Spraying Granulation Compound Fertilizer, Urease and Nitrification inhibitors,UF/MU.
Market	Modern agriculture,Slow release raw material fertilizer
Capacity	400 , 000mt/year
Founded	Production started in2006,5





# Establish SCU national Standard



The establishment of national SCU standard has further elevated Hanfeng's leading position in the slow release fertilizer industry in China.



## International Symposium



**2001** International Turf &golfing Conference and Expo

**2002** Beijing Shanghai Dalian The 2<sup>nd</sup> International symposium on living Environment & Green Industry

**2003** The 3<sup>rd</sup> International Symposium on Urban Landscaping &Greening Industry

**2004** The 4<sup>th</sup> International Symposium on Eco-Industry &Sustainable Development

**2005** The 10<sup>th</sup> National Annual Conference of Development & Applied Technologies of Specialty fertilizers-  
Hanfeng International Symposium on Slow-release Fertilizer.Establishment of National Slow-release Fertilizer  
Network of China

**2006** The 6<sup>th</sup> International Symposium on Eco-Industry & Sustainable Development- Slow-release Fertilizer  
Technology &Application in Belgium



2001 Dalian



2002 Beijing, Shanghai



2003 Shanghai



2004 Vancouver



2005 Shanghai

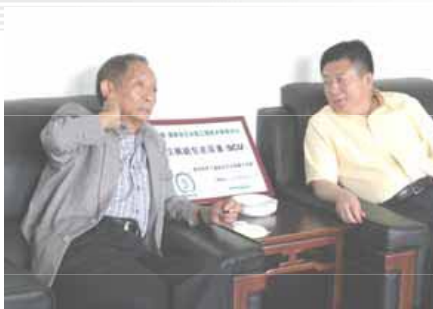


2006 Gent Belgium

Dalian



## Cooperation and communion



Dr. Yuan Longping



China Agriculture University



Ministry Agriculture of PRC



China Nitrogen Fertilizer Industry Association



The Institute of Soil Science, Chinese Academy of Sciences

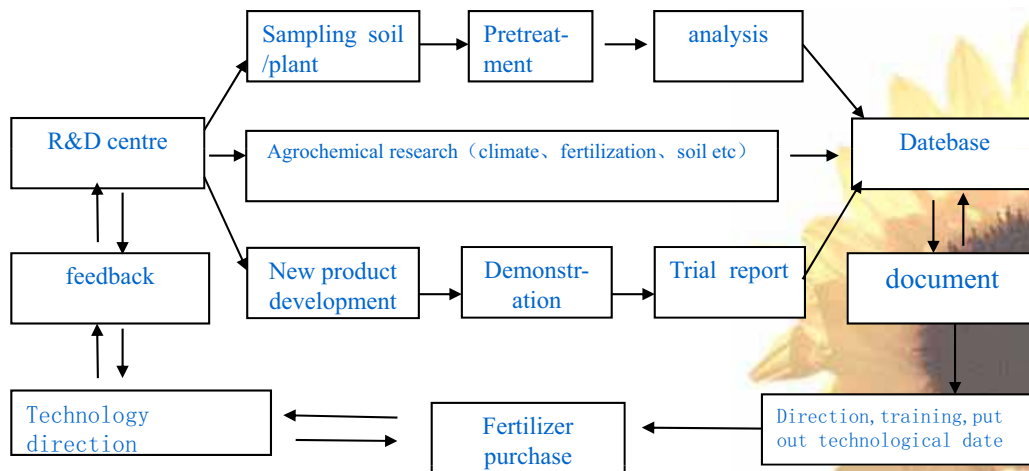


The Chinese Academy Of Agriculture Sciences

## Agrochemical service



- To measure and understand the accurate demand of customer;
- To bring value by providing customer-oriented services;
- To build cooperation relationship through mutual trust and respect.



## Training and Agrochemical Service



Sales and marketing are supported by field tests, clients' education and trainings



## Hanfeng product and technology



- Sulfur Coated Urea
- Sulfur Coated Compound Fertilizer
- Resin Coated Fertilizer
- Urea formaldehyde
- Urease and Nitrification inhibitors
- Tower Melt Spraying Granulation Compound Fertilizer
- Urea Melt Spraying Granulation Compound Fertilizer
- Water Soluble Fertilizer
- Bulk Blend Fertilizer





## SCU(sulfur coated urea)

Slow release nitrogen fertilizer, which is manufactured by moving granulated or prilled urea through a stream of molten sulfur. Hanfeng's SCU technology is licensed by Nu-Gro, and the outer coating applied is microcrystalline wax, which helps the coating more flexible and solid.

**Hanfeng SCU production capacity is 20,000 tonnes, the biggest SCU (Sulfur Coated NPK) line in the world.**

**SCU can be used as a substitute for urea, and also as the raw material in BB fertilizer.**



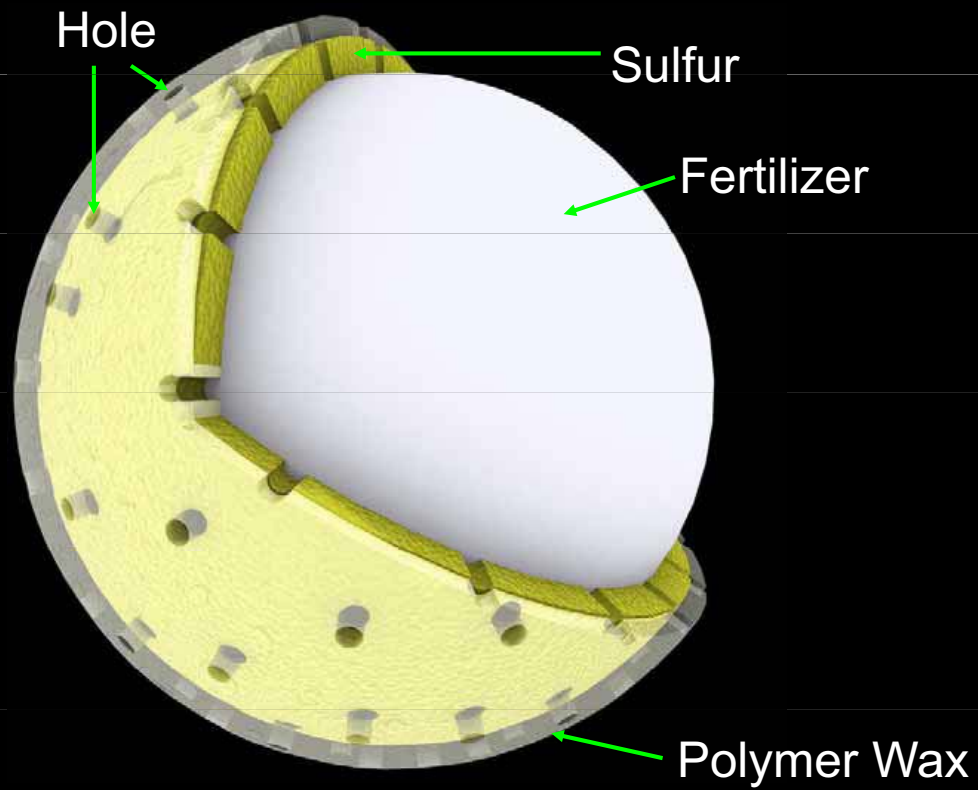
### Sulfur Coated Urea

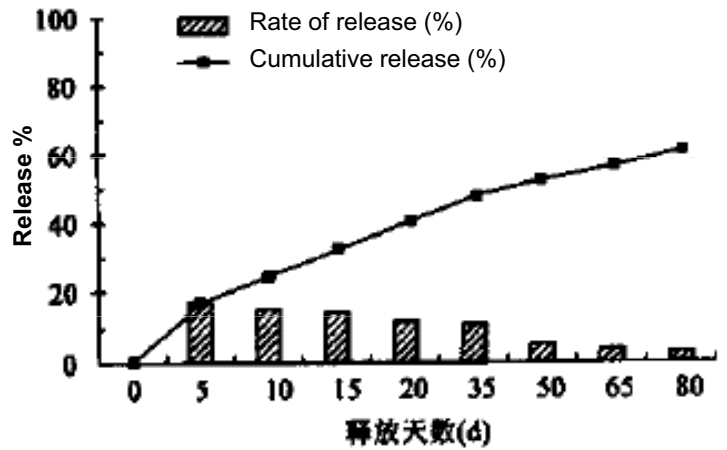
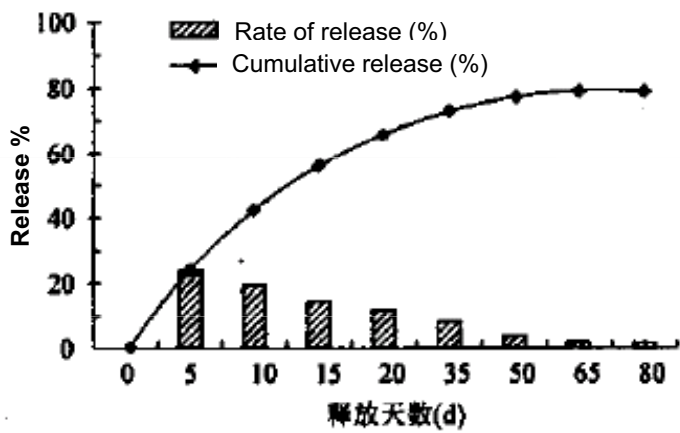


- 32-38% N
- Release depends upon
  - Thickness of sulfur coating
  - Biological activity
  - Soil environment
    - Temperature
    - pH
- Cool season response erratic
- Coating fragile

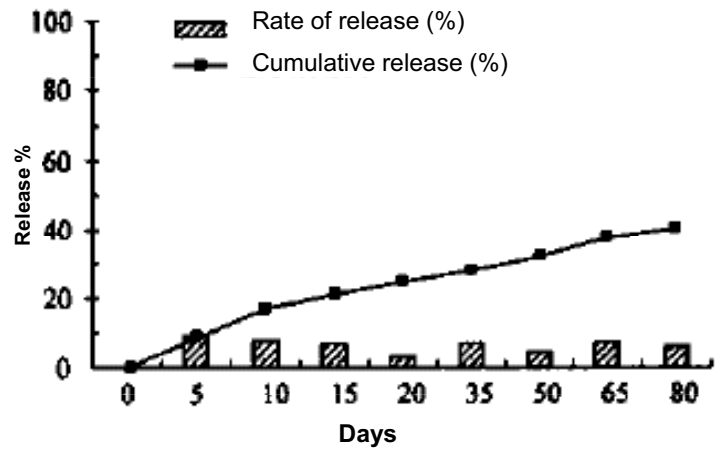
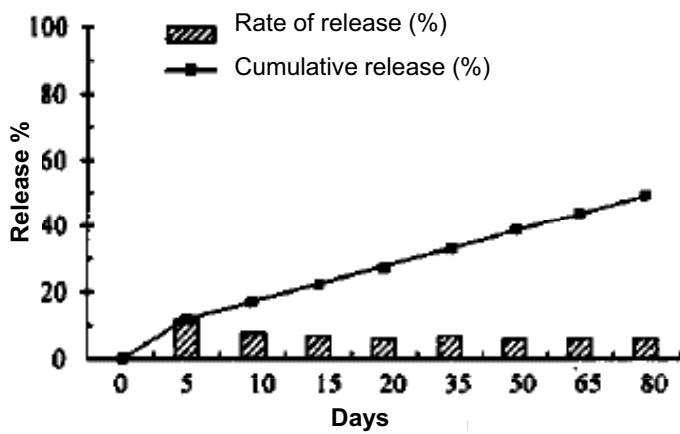


## Dual layer coating – sulfur & polymer wax

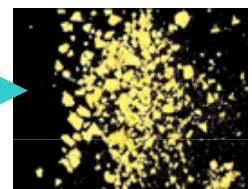




## Release Curves



# SCU using bio-degradable coating materials



Just applied  
into soil

1 month after

Nutrient is  
releasing  
slowly

6 months after

Nutrient release  
finished. Some  
sulfur coating  
cracked

8 months after

Sulfur coating  
cracked and  
disintegrate

10months after

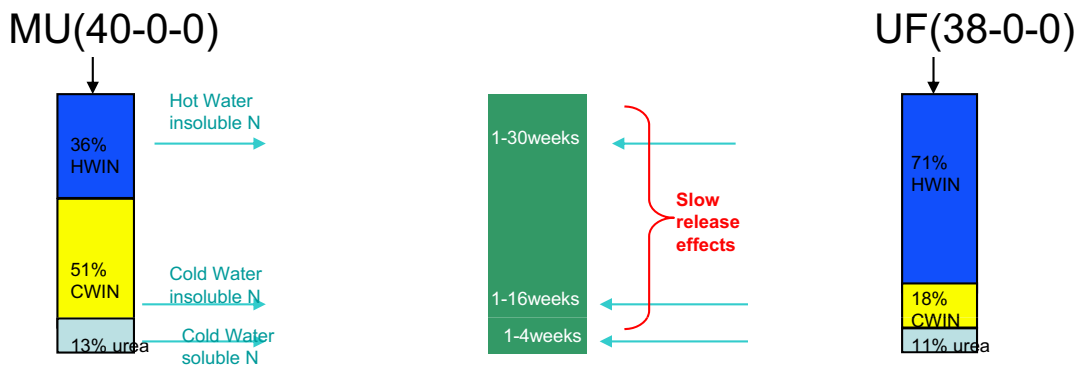
Sulfur cracked  
to small pieces  
and degradable  
by micro-organism



## UF/MU

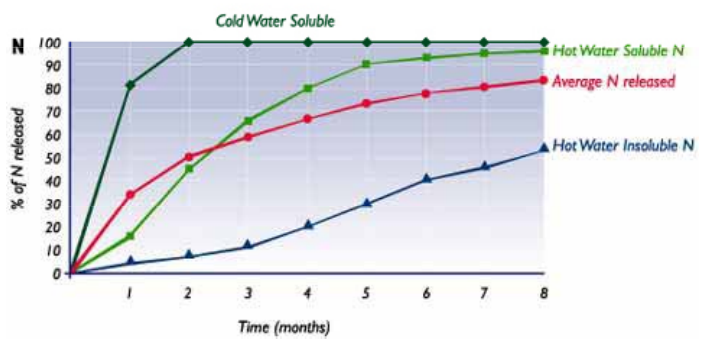
Urea Formaldehyde(UF) is produced by reacting urea with formaldehyde, creating intermediate long-chain polymers of methylene urea, collectively called urea form. Approximately two-thirds of nitrogen are insoluble in water and need microbial activity to be released. The remaining one-third of the nitrogen is composed of water-soluble, short-chain methylene urea polymers and a slight amount of urea.

Methylene-Urea (MU) polymer nitrogen has a unique Triple-Action Release for quick, intermediate and long-lasting results. Through a combination of hydrolysis and microbial activity, nitrogen is evenly released over a 12 to 16 week period under a broad range of environmental conditions. It enriches the soil microbiology and feeds the plants at the same time. MU with a guaranteed analysis of 40-0-0.





# Nitrogen release 3 fractions of UF

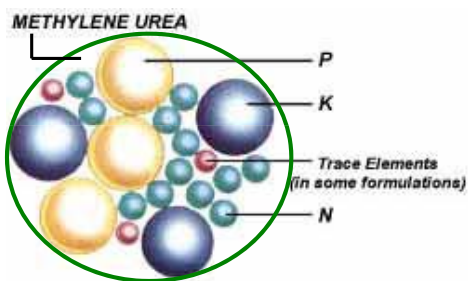




## Apply to production golf green fertilizer



With methylene urea (MU) as the release nitrogen source, the scientific ratio of phosphorus, potassium and mid-elements and trace elements, are added by chelation, to improve absorption by plants. A special granulation processing is applied to the manufacturing process, producing a fertilizer that consists of uniform fine granules, with nutrient balance, exclusive slow release nitrogen, and scientifically accurate nutrient formula which promotes the growth of strong, healthy lawns. It is particularly suitable for golf greens.

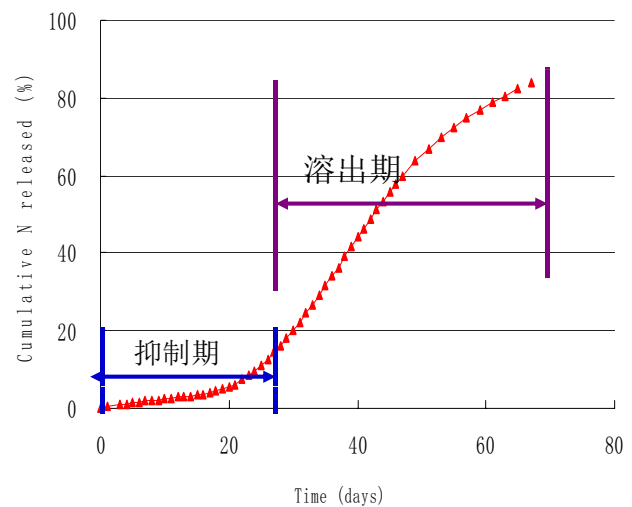






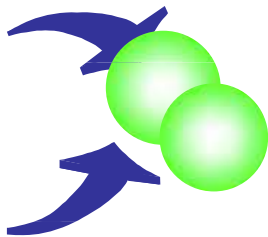
## RCF(resin coated fertilizer)

- HANCOTE's Patented Polymer Coating sets the standard for controlled release fertilizers. Total Products deliver controlled release of N, P and K along with essential micronutrients. For Professional Greenhouse and Nursery use with predictable release by high-tech coating providing no crack, burst or flash release. And after nutrition completely released, the coating can be decomposed, is friendly to environment.



## The Release mechanism

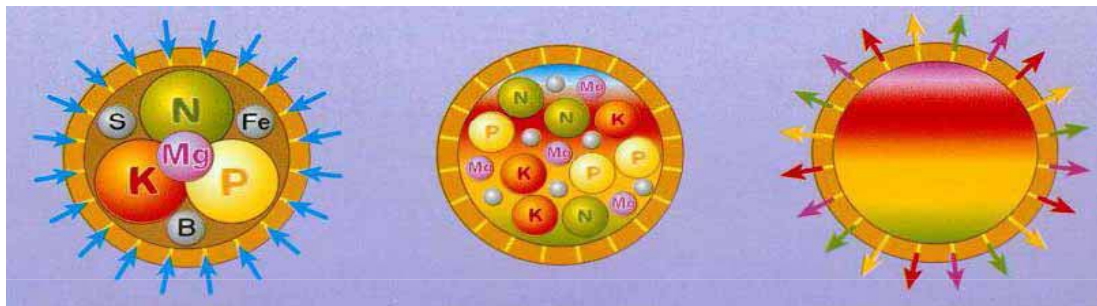
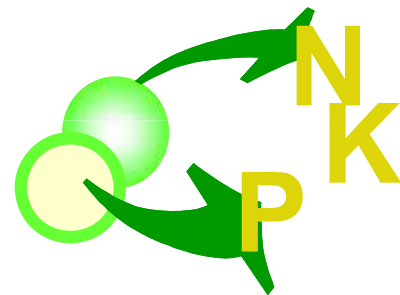
1.  
Water vapor penetrates the polymeric coating



2.  
The moisture dissolves the nutrient content in the granule



3.  
Nutrients diffuse through the coating to the soil



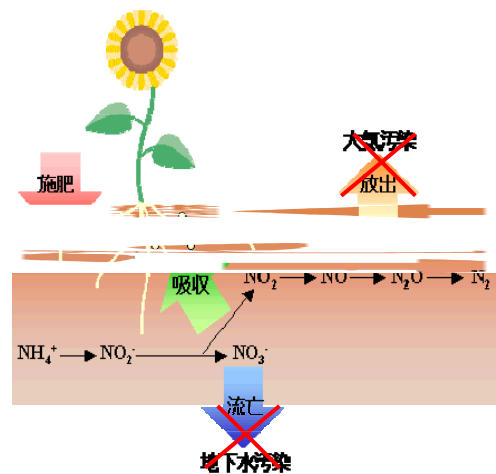
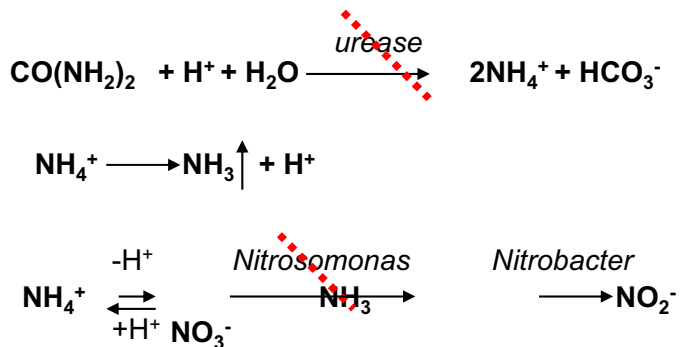
# Resin coated Fertilizer





## Urease and Nitrification inhibitors----LN

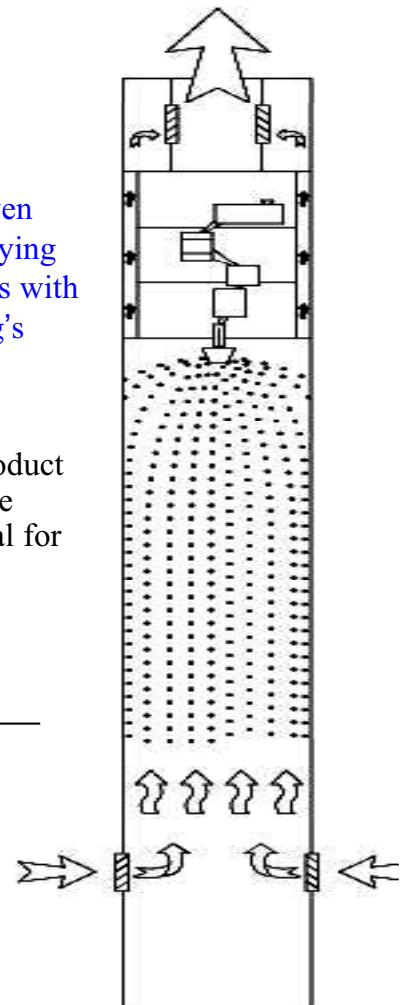
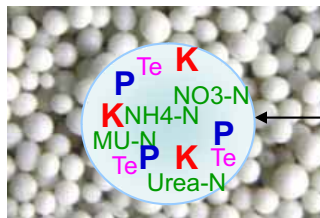
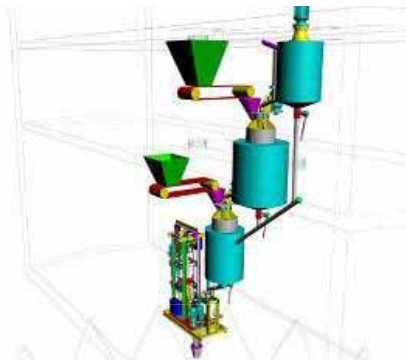
- LN is a uniquely formulated combination of HQ, a urease inhibitor, dicyandiamide; a nitrification inhibitor, and HQ stops volatilization for up to 2 weeks thus minimizing nitrogen loss and reducing the potential for crop burn. Dicyandiamide blocks the microbial conversion of ammonium nitrogen to nitrate nitrogen. This keeps the nitrogen in the stable ammonium form and in the soil for more efficient plant utilization. It also greatly reduces the leaching of nitrates that can contaminate groundwater. It is used as a nitrogen component in blended fertilizers and as a nitrogen inhibitor for use in compound fertilizer applications. LN is ideal for use on Crop or golf courses or where ever quality turf is desired.



## Tower Prill Compound Fertilizers

- Applying first-class technology, we take the molten urea as the carrier, an even mixture of P and K as raw materials, and achieve granulation by ceiling spraying followed by a cooling process. In order to achieve long-lasting characteristics with fast release and high efficiency at the application stage, we also add Hanfeng's proprietary Long-lasting Additives technology (MU or inhibitor).

Hanfeng's proprietary 3-stage reaction system generates a more rational product structure, the water-free urea melting system on top of the tower reduces the biuret content, and the pore free feature enables it to serve as the core material for the coating process.







## Urea-Based Compound Fertilizer

Upon evenly blending P and K with molten urea, we granulate this product by ceiling spraying in the coating drums. N, P, and K are synthesized in the chemical reaction, which will stimulate each nutrient's uptake.

N can be transferred to two forms: 1) still in the original fast-release N condition, 2) Methylene Urea (MU). Both forms can be gradually dissolved in the soil so as to extend the release period, decrease the number of applications, increase fertilizer efficiency, and save costs. P can be transformed into phosphate, and K can be transformed into  $K^+$ , which can be easily absorbed by the plants.

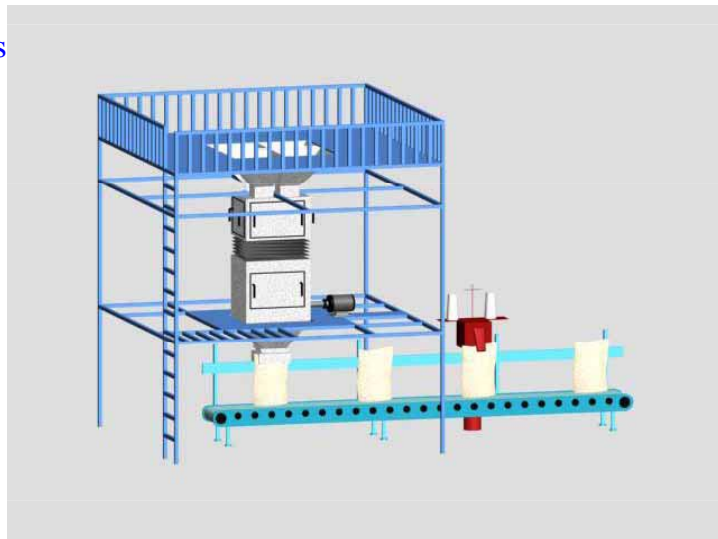


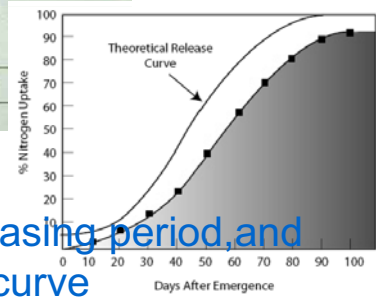
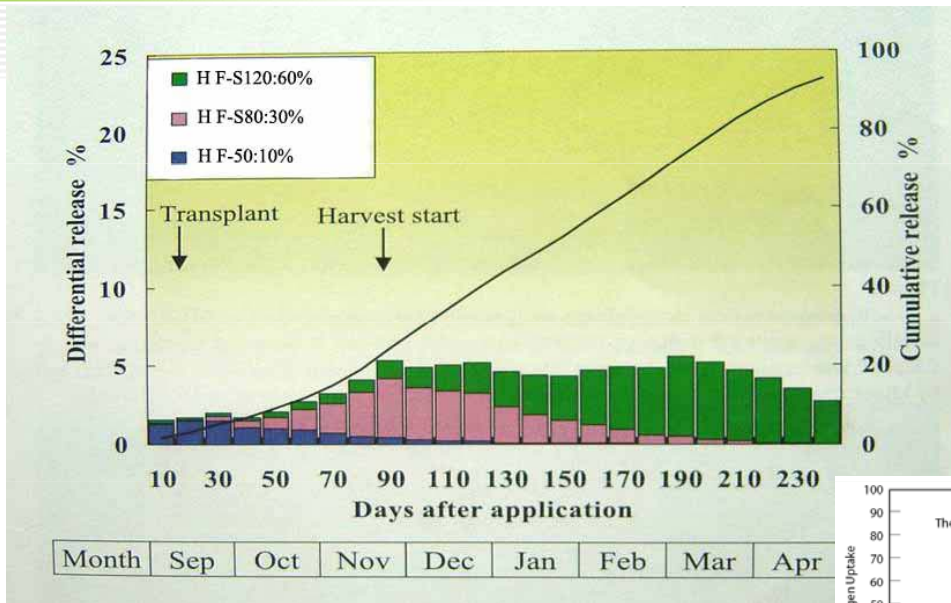


## Slow release Bulk Blend Fertilizer

Blend controlled-release nitrogen fertilizer (such as SCU), P and K granules, and trace elements, to produce a fertilizer synergist based on scientific formulation and analysis. This product can provide fast release and long- release and periods so that plants receive the nutrients required during their growing cycle.

Special fertilizer for all kinds of crops





Assemble the controlled-release fertilizer by releasing period, and simulate plants' nutrients absorbing curve



## Water Soluble Fertilizer



- The product is featured as high purity; trace elements including Fe, Mn, Cu and Zn are added in the form of chelation to prevent any deposit or antagonism; no salt cumulation in soil and burning risk; contains active substance like amino acid and plant acid which can enhance the nutrient absorption of plant; Unique formulas with plenty field and container plant testing.
- Application scope: Flower, plant, turf, vegetable and soilless planting.



# Hanfeng Market



**High value crops**



**High end turf**

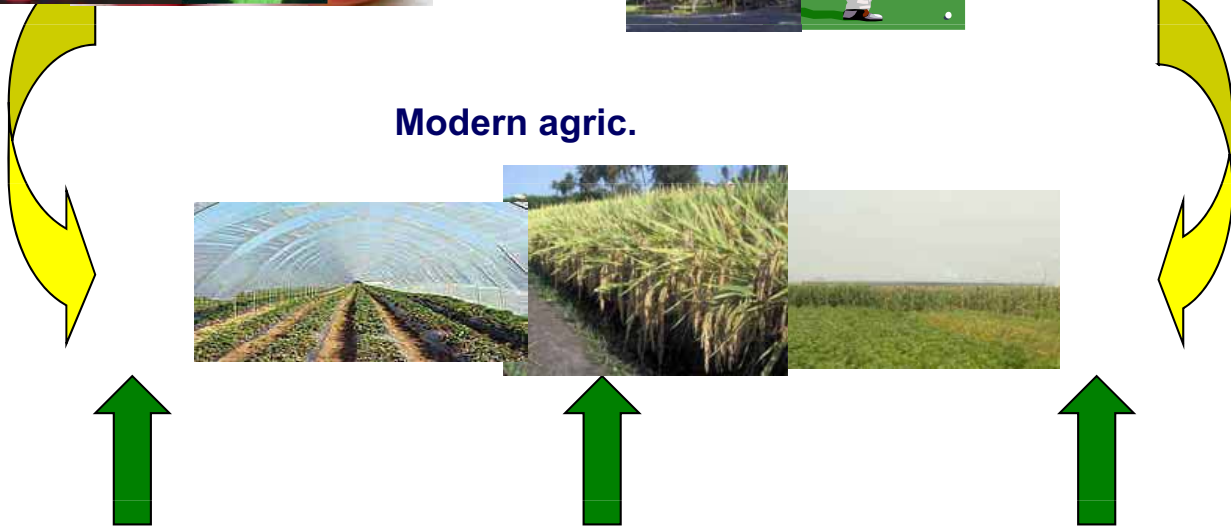


**horticulture**

**Modern agric.**



**Hanfeng specialty fertilizer**





**Strong result in the field trial with the super hybrid rice of Dr.Yuan longping  
“Father of Hybrid Rice in the world”. Our SCU product are promoted  
throughout the rice growing regions of China.**



**汉枫 SCU 用于超级杂交稻节氮高效栽培技术  
研究与示范（阶段小结）**

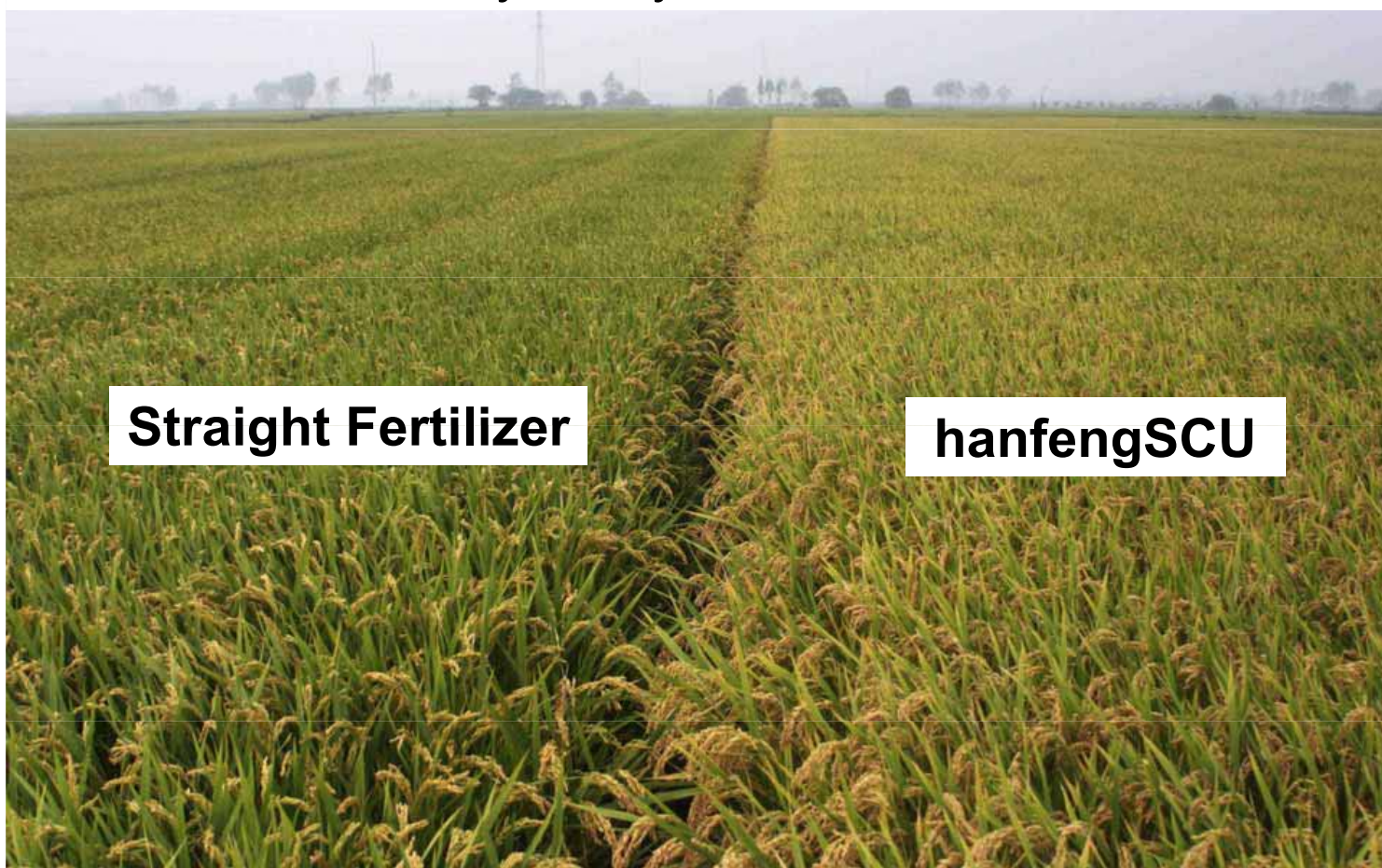
主持单位：国家杂交水稻工程技术研究中心  
合作单位：汉枫缓释肥料有限公司

发展缓释肥料  
促进粮食增产

袁隆平 2016.9.1.



Use 70% of Urea application rate with 1 application,  
SCU increases rice yield by 10-15%



**Straight Fertilizer**

**hanfengSCU**



XAT.COM





Hanfeng  
scu

urea







Thank you!