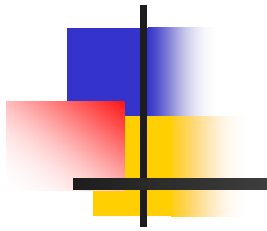


CHINA BIOGAS



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Ministry of Agriculture, P.R.China

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CONTENTS

- Achievements
- Standards
- Case Study
- Capital Input
- Plan
- CDM Projects



I. Achievements

- ✓ The construction of biogas in rural areas has become an important measure to promote the building of a new countryside, it has shown outstanding economic, ecological and social benefits and is welcomed by the peasants.



1.1 The Household Biogas digester

The household biogas has developed steadily. By the end of 2007, there are 26.5 million households biogas digesters, producing 10.2 billion m³ biogas every year, equal to 13.6 million tce. Farmers' increased income and reduced expenditure reached 13 billion RMB Yuan and 90 million farmers have been directly benefited .



Development of household biogas

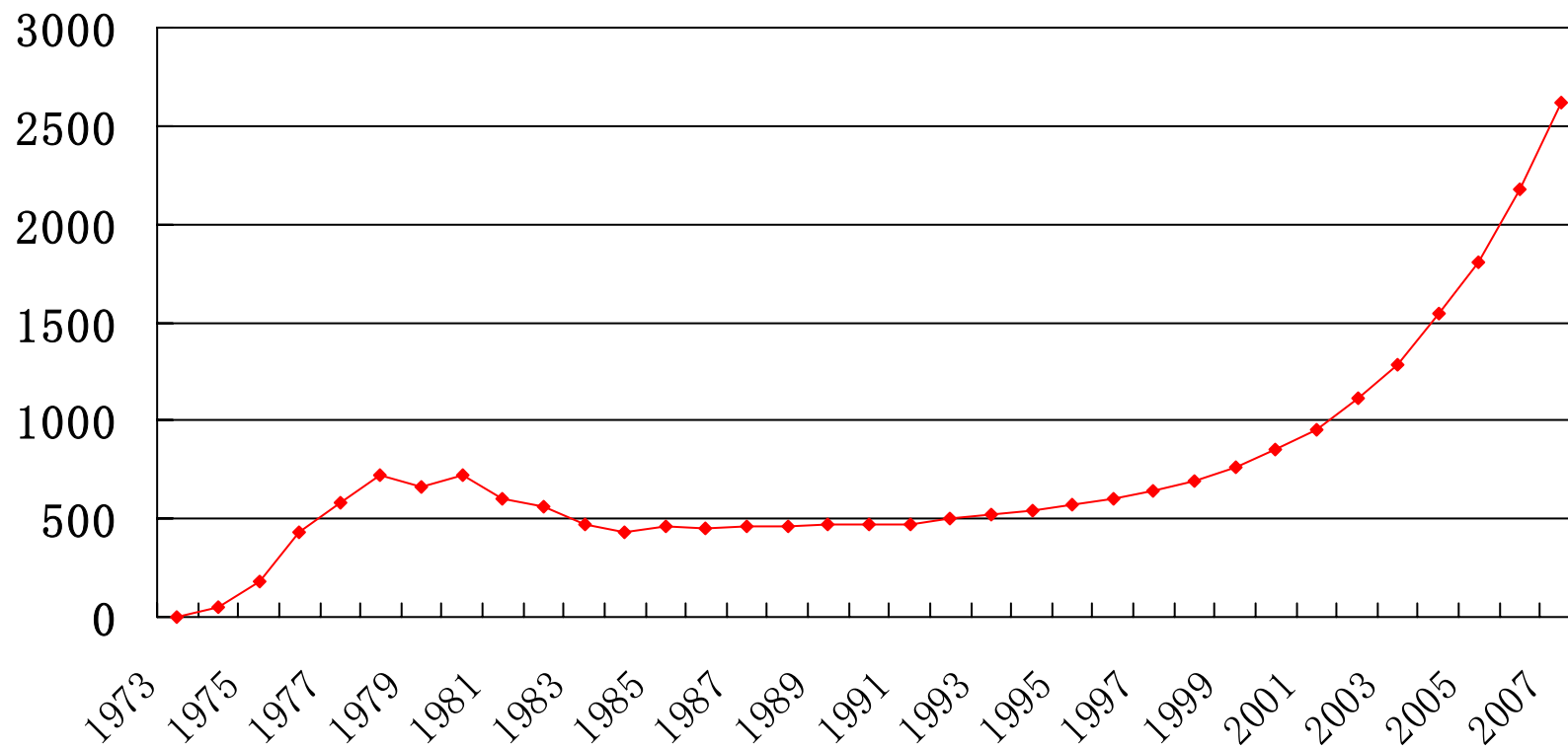
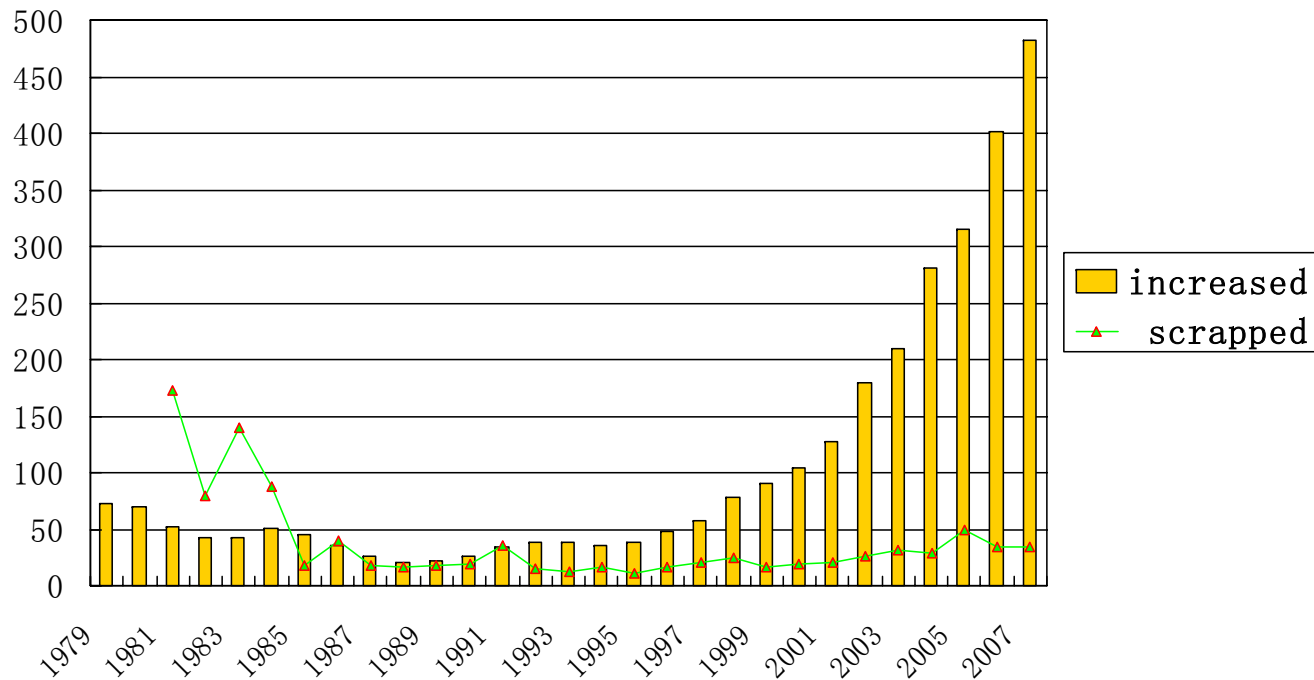


Fig. of

increased and scrapped biogas



Training & Identification



Training Materials





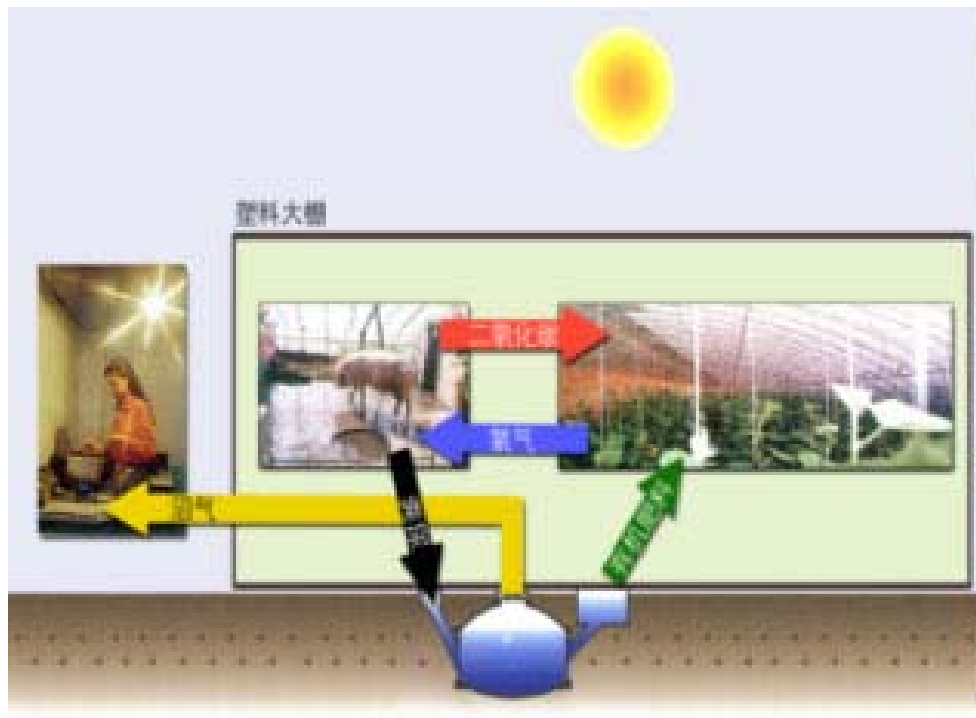
The main biogas models

- ✓ “four in one” energy & ecology model
- ✓ “pig-biogas-fruit” energy & ecology model



“Four in one” energy & ecology model

- To build the solar greenhouse in the yard, to build the biogas at one side of the greenhouse, to build the pigpen and toilet above the biogas pool and to plant vegetables or fruits in the greenhouse.
- This model takes the solar energy as the power, the biogas as the bond, the planting and livestock husbandry combined, The formation of a virtuous circle of ecological and increase the income of the peasants.







改厨



沼气灯



生态家园



改厕



改圈



猪-沼-果



沼气池



新农村



2.2 Biogas Plant

- Small-scale biogas plant
- Large-Middle scale biogas plant



Small-scale biogas plant

- A biogas plant is defined as a small-scale one if the individual installation volume: $50 \text{ m}^3 > V \geq 20 \text{ m}^3$. By the end of 2007, there are 18,000 small biogas plants with total volume $700,000 \text{ m}^3$.

Large-Middle scale biogas plant

- A biogas plant is defined as a large-scale one if the individual installation volume $> 50 \text{ m}^3$. By the end of 2007, there are 8576 large-middle biogas plants built on husbandry farms



北京蟹岛厌氧发酵
生态综合利用工程



Large-scale biogas plant

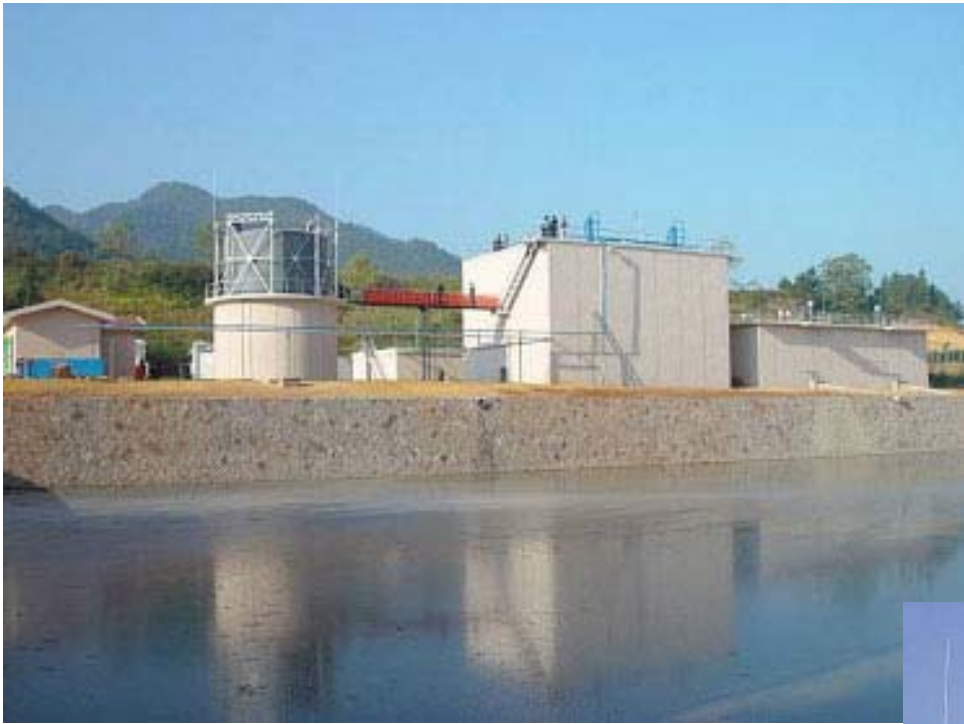
北京房山区周口店镇 周口村大型沼气工程



Large-scale biogas plant



浙江加华有限公司猪 场废弃物综合利用与 沼气工程



Large-scale biogas plant



江苏宜兴兴望 养殖场沼气工程



Large-scale biogas plant





II. Standards

24 standards were made in total

■ Including:

- ✓ 16 on household biogas digester
- ✓ 8 on biogas plant

National & industrial standards on household biogas

- GB/T 3606-2001 Domestic biogas stove
- GB/T 4750-2002 Collection of standard design drawings for household anaerobic digesters
- GB/T 4751-2002 Specification for check and acceptance of the quality for household anaerobic digesters
- GB/T 4752-2002 Operation rules for construction of household anaerobic digesters
- GB 7636—87 Technology criterion of design and operation of biogas pipelines for peasant household
- NY/T 90-1988 Technology rules of biogas fermentation for the use of family in the countryside
- NY/T 344-1998 Household biogas lamp
- NY/T 465-2001 Household-scale biogas & integrated farming system
 - — Specification on design, construction and use for southern model
- NY/T 466-2001 Household-scale biogas & integrated farming system
 - — Specification on design, construction and use for northern model
- NY/T 858-2004 Biogas pressure meter
- NY/T 859-2004 Desulfurizer of household biogas
- NY/T 860-2004 Digester sealing coatings
- NY/T 1496.1-2007 Biogas transmission system for rural household — Part 1: Thermoplastics pipes
- NY/T 1496.2-2007 Biogas transmission system for rural household — Part 2: Thermoplastics pipes fittings
- NY/T 1496.3-2007 Biogas transmission system for rural household — Part 3: Thermoplastics valves





Industrial standards on biogas plant

- NY/T 667-2003 Classification of scale for biogas engineering
- NY/T 1220.1-2006 Technical code for biogas engineering
 - Part 1: Process design
- NY/T 1220.2-2006 Technical code for biogas engineering
 - Part 2: design of biogas supply
- NY/T 1220.3-2006 Technical code for biogas engineering
 - Part 3: Construction and acceptance
- NY/T 1220.4-2006 Technical code for biogas engineering
 - Part 4: Operation and maintenance
- NY/T 1220.5-2006 Technical code for biogas engineering
 - Part 5: Evaluation and quality
- NY/T 1221-2006 Technical specification for operation maintenance and safety of biogas plant in scale livestock and poultry farms
- NY/T 1222-2006 Criteria for designing of biogas plant in scale livestock and poultry farms
- NY/T 1223-2006 Biogas-powered generating sets

Training institutions of household biogas digesters standardized





III. Case Study

1. **The biogas plant in Fujingda agriculture Ltd. in Shaoxing county, Zhejiang Province**
2. **Large Biogas Plant for Power Generation and Comprehensive Utilization in Mengniu Aoya Demonstrative Dairy Farm, Neimeng Province**
3. **Centralized Biogas Supply Station for Households in Hongzhuang Village, Huaibei City, Anhui Province**



The first example

**The biogas plant in Fujingda
agriculture Ltd.**

**in Shaoxing county,
Zhejiang Province**



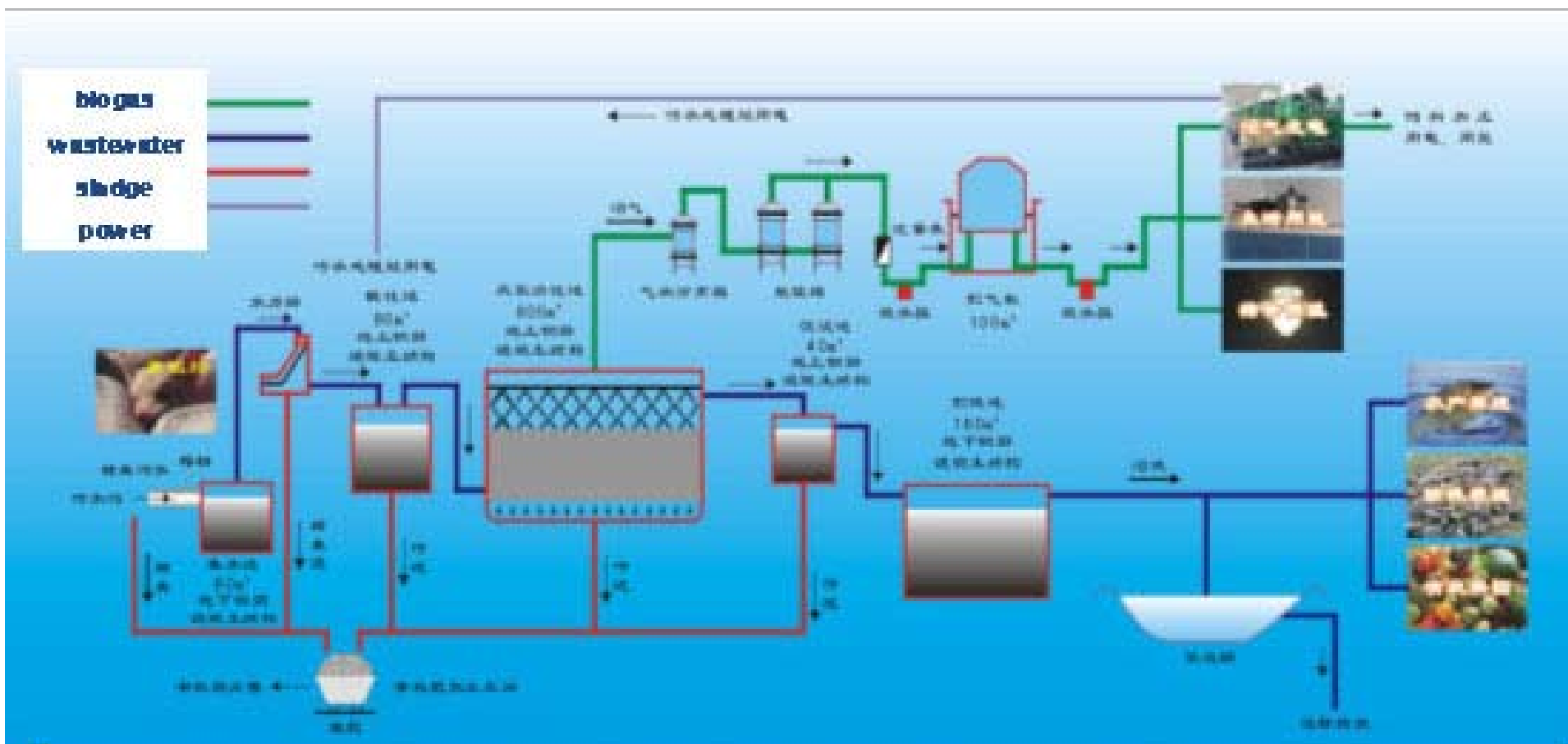


- ✿ Located in the Rongshan village, Fuquan town, Shaoxing county, Zhejiang province, Fujingda agriculture Ltd. is a large scale agriculture company.
- ✿ The company occupies around **2,000,100 m²**, and breeds **5000 pigs** and **2000 sows**, being the unique production base of pig for Hang Kong and Macao in Shaoxing county.
- ✿ The **biogas** from anaerobic digester is supplied to 360 families around the company after being treated, while the **effluent and solid wastes** are used as the organic fertilizer in the nearby farm.
- ✿ As a result, nutrients in the swine wastewater are utilized in a comprehensive way, and “**zero discharge**” of swine wastes is realized in the swine feed lot.
- ✿ An **eco-agriculture economy mode** is established basing on the biogas engineering.



Modified UASB tanks

- Modified UASB tank volume:
 $300\text{m}^3 \times 2$
- Biogas storage tank:
 200m^3
- Digestion temperature :
around 35°C
- Hydraulic retention time:
(HRT) 6 day
- Biogas production:
 $600\text{m}^3/\text{d}$



Energy generation and ecological utilization of swine wastewater



Removal efficiency of pollutants by the biogas plant

Items	COD _{cr} (mg/l)	BOD ₅ (mg/l)	SS (mg/l)	NH ₃ -N (mg/l)
Raw wastewater	15000	7500	6500	1100
Effluent from fermentation tank	13500	6800	1500	1050
Effluent from anaerobic digester	1050	350	600	1120
Overall removal efficiency	93%	95%	90%	–

- ✿ In the biogas engineering, COD removal efficiency reaches 93%, volumetric gas production rate is $1\text{m}^3/(\text{m}^3\cdot\text{d})$, mortality rate of roundworm eggs is up to 100%, and mortality rate of colon bacillus is over 98%.



☀ **Effluent and solid wastes from the anaerobic digester of swine wastewater in Fujingda Ltd. are all applied into its own 2,000,100 m² economic plant yard and another 3,333,500 m² yard nearby the company.**

☀ **In this way, a combined mode of breeding industry and plantation is established through the biogas engineering.**

☀ **Eco-agriculture park is formed by ecological treatment and utilization of swine wastes.**



- ✿ 600m³ biogas is produced per day from the biogas plant, among which 400m³ biogas is supplied to households for heating, and 200m³ biogas is used for power generation.
- ✿ For the biogas power generation, the **daily output of electricity** reaches **400KW·h**, which can meet the requirement of running of biogas engineering and fertilizer production in Fujingda Ltd..
- ✿ As pollutants in the swine wastewater are effectively controlled by the biogas engineering, the **dispute** between residents and company is solved , the **fees paid for wastewater discharging** is reduced, and the risk of **swine epidemic disease** decreases .



Economic analysis and maintenance of the biogas plant in Fujingda Ltd.

■ Investment

The total invested fund is **1.8** million yuan, including **1.1** million for building investment and **0.7** million yuan for equipment investment.

And, this investment is consisted of **0.3** million yuan of governmental inputs and **1.5** million yuan of self-faised funds from company.

Economic analysis and maintenance of the biogas plant in Fujingda Ltd.



■ Running cost

The company owner pay for the overall engineering running cost.

The annual income from villagers biogas usage will be **129,600 yuan**, as each household pays **30 yuan per month**. The daily power generation is **400KW·h**, it can reduce **70,000 yuan** every year.



Economic analysis and maintenance of the biogas plant in Fujingda Ltd.

■ Maintenance

The effluent and solid wastes from anaerobic digester are used as **fertilizer** by the other farmers who are dealing with plantation. With use of these by-products from biogas digester, the vegetables production could increase by **15%** and **plant diseases** and **insect pests** are restrained effectively. And so, pesticide expenditures is reduced, and the quality of agricultural products is improved.

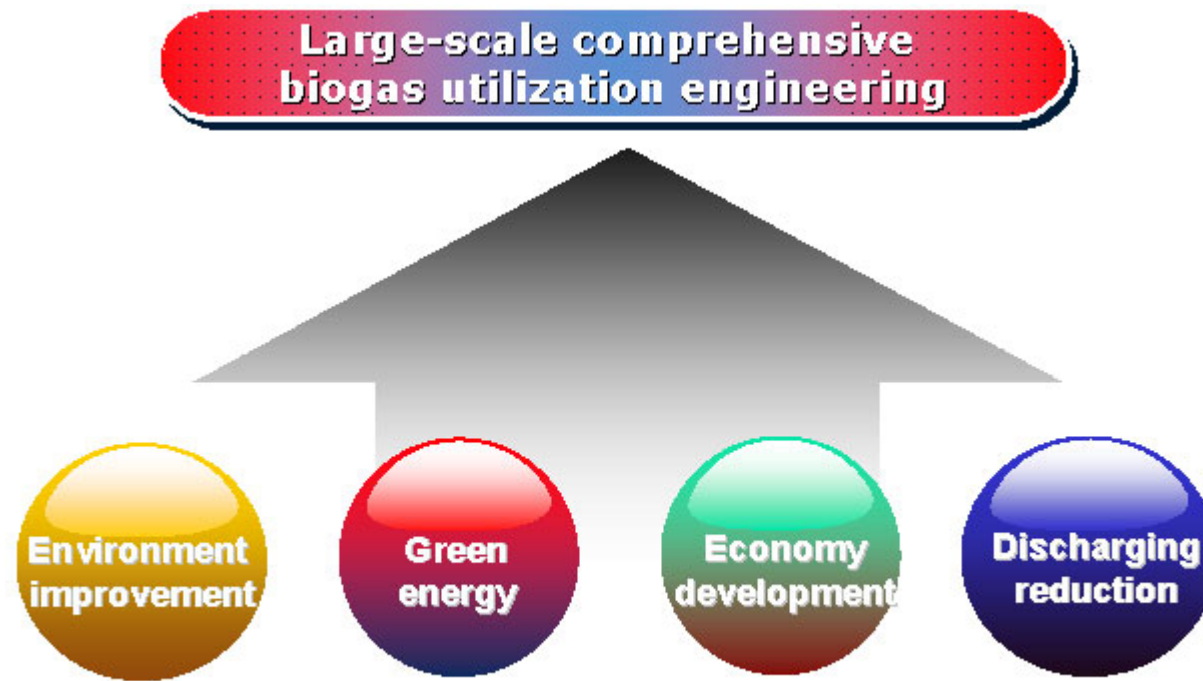
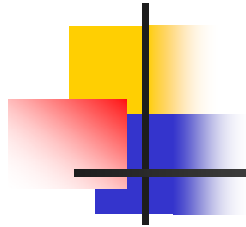


Economic analysis and maintenance of the biogas plant in Fujingda Ltd.

■ Owner's attitude

The company owner takes active interest in the biogas engineering for the income resulted from biogas usage and pollution control.

Construction of rural ecological energy projects





The second example

**Large Biogas Plant for Power Generation and
Comprehensive Utilization
in Mengniu Aoya Demonstrative Dairy Farm
Neimeng Province**



BIOMA

Biogas Institute of Ministry of Agriculture

4 × 2500m³ Anaerobic Digesters, 1000m³ bifilms Gas Holder



1.26MW Biogas Power Gen-set





Large Biogas Plant for Power Generation and Comprehensive Utilization on Mengniu Aoya Demonstrative Dairy Farm is located in Shengle Economic Zone, Hologol County, Huhhot City, Inner Mongolia Autonomous Region (headquarter of Mengniu Group), **established in October, 2007**, composed of four 2500m³ Anaerobic Digesters and a 1000m³ bifilms Gas Holder for biogas power generation and comprehensive utilization with the installation capacity of biogas power generation 1.26MW and a production line of daily output of organic compound fertilizer 35t. The electricity generated by biogas began formally connected to North China Power Grid on 18 Jan., 2008.



The operation of the designed full load of the plant can annually treat fresh cow dung 102,200t (10,000 cows on feed) and wastewater 150,000t; annual biogas yield reaches over 36.5 million m³, annual biogas power generation 6.5 million kWh (connected to state grid), annual surplus heat of power generation about 400MW (mainly for temperature increase and insulation of the biogas production system by mesophilic fermentation without any extra energy consumption); annual production of solid organic fertilizer about 12,800t, liquid organic fertilizer 170,500t. It is the first biogas power generation project supplying electricity to state grid and introduced into CDM mechanism.

This plant is mainly designed by Biogas Institute of Ministry of Agriculture.



The third example

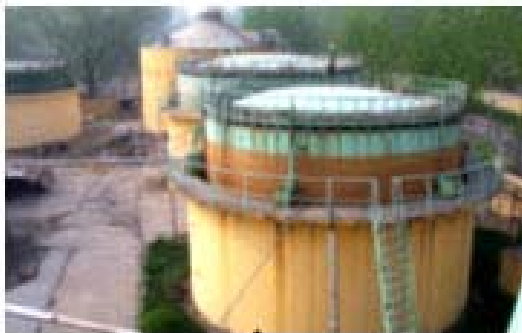
**Centralized Biogas Supply Station for
Households of Hongzhuang Village,
Huaibei City, Anhui Province**



BIOMA

Biogas Institute of Ministry of Agriculture

**New Countryside
of Hongzhuang
Village**



Biogas Plant



**Biogas Supply to
Households**



**Household Biogas
Facilities**



Centralized Biogas Supply Station for Households of Hongzhuang Village, Huaibei City is the first large household biogas supply station designed by our institute in Anhui Province, **supplying biogas for 1,000 households. It is an important part of new countryside construction and ecological agricultural system.** It plays a great role in the improvement of the quality of villagers' life, farmer's income and infrastructure of the village, and acts as an excellent technical demonstration for resource utilization of agricultural waste in new countryside construction and ecological agriculture development.



The Construction of Biogas Station of Hongzhuang Village started in March 2000. **The first phase was invested 2.6 million yuan for a 600m³ Anaerobic Digester and a 200m³ Gas Holder; the second phase was invested 1 million yuan for a 800m³ Anaerobic Digester and a 400m³ Gas Holder**, put in use at the end of 2004. At present, the daily biogas production of the Biogas Station reaches 1,500m³/day for 1,000 households for normal consumption.



The feedstock of the Biogas Station comes from wastewater and animal manure of livestock farms nearby such as Hongfa Dove Farm, Shunfa Pig Farm and Jiabao Pig Farm. The problem of disorderly wastewater and manure discharge has been solved by the roots, clean air, pleasant environment and free gas supply for life and production consumption come out instead. The village enjoys great convenience and saves money.

The Biogas Station produces 200m³ quality biogas sludge and slurry everyday supplied as fertilizer to plant vegetables of 500 greenhouses at Hongzhuang Village, affirmed as non-harmful green vegetables. The sound combination and cycle of planting-animal raising-biogas production-planting work as an enhancement to ecological construction of Hongzhuang Village.



IV. Capital Input

**The State has input 14.5 billion Yuan since 1995,
in which:**

- ✓ **A total of 55,410 thousand Yuan input from 1995 to 2000**
- ✓ **A total of 3,534 million Yuan input from 2001 to 2005**
 - 131 million Yuan input in 2001
 - 310 million Yuan input in 2002
 - 1,030,500 thousand Yuan input in 2003
 - 1,032,500 thousand Yuan input in 2004
 - 1,030 million Yuan input in 2005
- ✓ **A total of 11 billion Yuan input since 2006**
 - 2.5 billion yuan input in 2006
 - 2.5 billion yuan input in 2007
 - 6 billion yuan input in 2008



V. Plan

- Large-scale rural household biogas dissemination
- Increase biogas plants on husbandry farms

Large-scale rural household biogas dissemination



According to the national plan, by the end of 2010, there will be 40 million households with biogas digesters and the annual biogas output shall reach 15.5 billion m³, about 24.2 tce. Among the 146 million households that are suitable for biogas development, the dissemination rate shall reach 30% and in 2020, the rate shall be 70%.



Increase biogas plants on husbandry farms

According to the national plan, by the end of 2010, 4000 large biogas plants shall be built on husbandry farms and the total number of large biogas plants shall be 4700



VI. CDM Projects

- ◆ The large biogas plant CDM project,
Minghe husbandry farms, Shandong province
Anaerobic Digester: $3300 * 8$
Biogas: 10.95million(m^3/y)
- ◆ The household biogas digester CDM project,
Enshi city, Hubei province

山东民和沼气工程—CDM 项目



- 总投资：4077万元—6000万
- 日产沼气 30000立方米
- 年上网电量：21900MWh
- 售电收入：700万/年
- CDM计入期：10年
- 年减排量：86,781tCO₂-e
- CERs价格：\$14.7/t CO₂-e
- CERs收入：700万、年

厌氧发酵罐（8×3300m³）

Hubei:

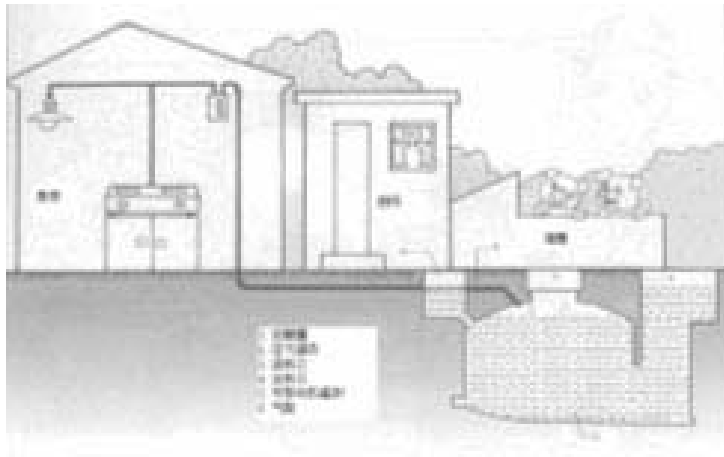
Distribution of farmers



33,000
households,
8 county

Hubei:

Reduce GHG Emission Ways



- ✓ Change manure management to reduce CH₄ emissions;
- ✓ Biogas to replace coal & reduce CO₂ emissions



Policy Environment

- Leaders of the Central Government always attach importance to the biogas development in the rural areas

Mao Zedong



- ✓ In 1958, Comrade Mao Zedong pointed out when inspecting the biogas in the rural areas of Wuhan and Anhui:
- Biogas can light lamps, cook food and act as fertilizer, it should be well developed and promoted.

Deng Xiaoping



Comrade Deng Xiaoping inspected the biogas in the rural areas of Sichuan for two times on July 10, 1980 and September 21, 1982, he pointed out:

- ✓ the biogas development is very good and should be a direction
- ✓ the biogas development should have a planning
- ✓ the scientific research should be emphasized and the biogas should also be standardized, systematized and universalized
- ✓ this is a very good thing, everybody should pay attention to it
- ✓ the biogas can also improve the environment and sanitation, improve the efficiency of the fertilizer and can solve the big problems in the rural areas

Jiang Zemin



- In March 1991, when comrade Jiang Zemin inspecting the peasant households with the biogas in Hunan, he pointed out:
- ✓ it is very important to develop the biogas in the rural areas, on the one hand, it can provide convenience to the life of the peasants, on the other hand, it can protect the ecological environment.

Hu Jintao



since 2003, comrade Hu Jintao has separately inspected the Liangyuan District of Henan, Ganzhou of Jiangxi and Zhangjiakou of Hebei, got to know the biogas construction in the rural areas and granted sufficient affirmation.

Premier Wen Jiabao talked with the farmers about biogas





**Thank you very
much!**

6 30 PM