Rural Renewable Energy Development in China

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Contents:

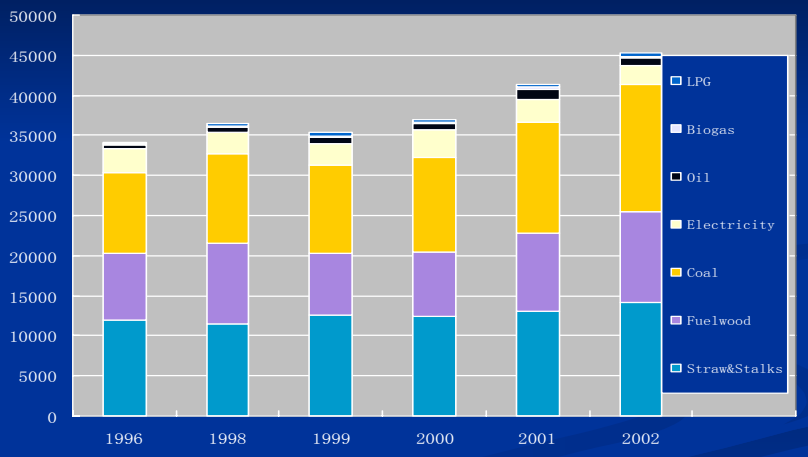
Why do we develop rural energy?

- **Problems and pressure China has been confronted with:** Population, development of TVE, higher energy demand and lower efficient utilization;
- **The need of political and state security:** China has signed international conventions such as Rio Declaration and Climatic Change Protocol and made clear to the international community its commitments and responsibilities to ensure energy security;
- **The need of social and economic sustainable development:** It is closely relevant to poverty alleviation, health, education and gender issues.

Why do we develop rural energy?

- **The need of resource and environmental protection:** It contributes to GHG emission reduction for regional and global environment protection.
- **The function of Ministry of Agriculture** is to improve agricultural productivity and to promote the sustainable development of agriculture and rural economy as well as to increase farmers' real income.

Why do we develop rural energy?



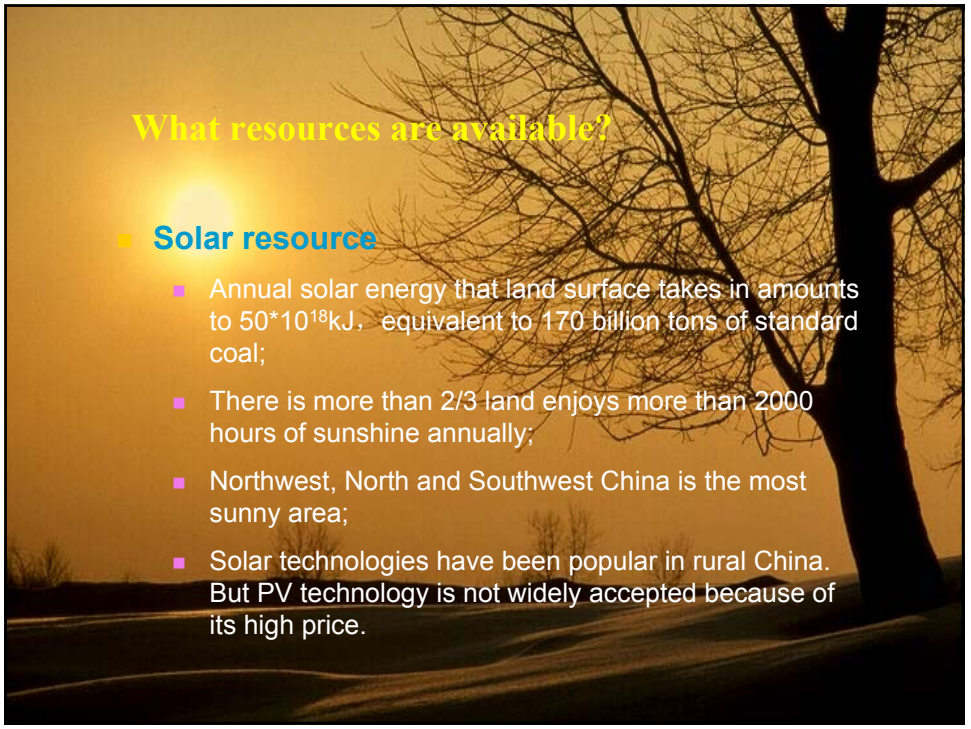
Living energy consumption in rural China from 1996 to 2001

What resources are available?

- **Biomass resource**
  - China's biomass resource ranks first in the world;
  - Biomass resource includes crop straws and stalks, animal wastes, living garbage, industrial solid or liquid organic wastes, etc. Crops annually produce 700 million tons of biomass;
  - Biomass's greenhouse gas emission is zero;
  - The traditional way of biomass utilization has been inefficient.

What resources are available?

- **Wind resource**
  - Total exploitable wind energy is 253GW;
  - Grasslands and deserts in Northwest, North and Northeast China and islands in East and Southeast China have rich wind resource;
  - Because of special landforms, some inland areas such as Po Yang Lake in Jiangxi Province and Tongshan area in Hubei Province, also enjoy high wind speed;
  - The distribution is variable and instable.



What resources are available?

- **Solar resource**
  - Annual solar energy that land surface takes in amounts to $50*10^{18}$kJ，equivalent to 170 billion tons of standard coal;
  - There is more than 2/3 land enjoys more than 2000 hours of sunshine annually;
  - Northwest, North and Southwest China is the most sunny area;
  - Solar technologies have been popular in rural China. But PV technology is not widely accepted because of its high price.

What resources are available?

- **Hydraulic resource**
  - Technically, the exploitable resource reaches 100GW;
  - More than 1500 counties in mountainous areas in China enjoy rich hydraulic resource;
  - Small hydropower and micro-hydropowe shall be developed according to regional realities.

What is our development history?

- **The first phase: before 1980s**
  - The traditional way of energy utilization was inefficient, less than 10%. There were many areas lack of fuel wood for 3 to 4 months every year;
  - Deforestation was prevalent and soil erosion had become quite serious;
  - Rural energy products such as wood-saving stoves had been popularized in 729 counties and household biogas in 101 counties.
  - It was a supporting project to meet farmers' basic energy and life needs.

What is our development history?

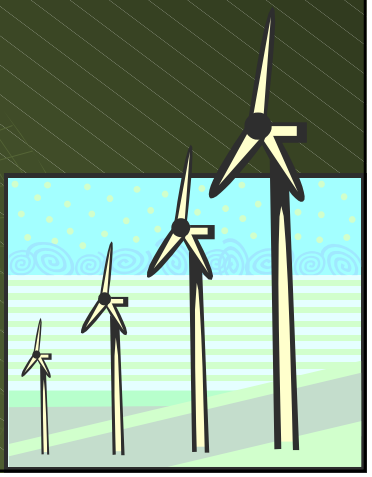
- **The second phase: in 1990s**
  - "Four-in-one" model had been popularized in north China and "pigs-biogas-fruits" model in south China;
  - The integrated utilization had been encouraged and social, economic and environmental benefits been pursued;
  - It had supported the general goal of increasing agricultural productivity and farmers' income.

What is our development history?

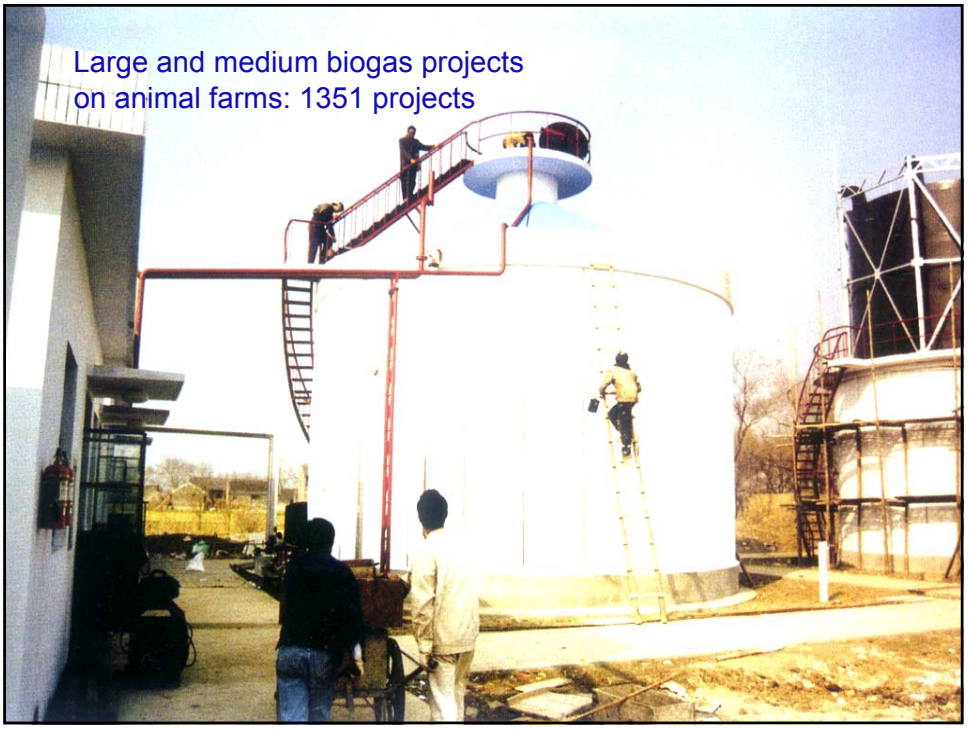
- **The third phase: in the 21century**
  - "Biohousehold project" was initiated in 2000;
  - Clean energy and energy efficiency technologies have been popularized and various resources integrated to achieve three goals: warm and clean household, highly efficient courtyard economy and green production;
  - It supports the construction of Xiaokang society in rural China.

What are we doing?

- **Rural renewable energy includes:**
  - Biomass – biogas, biomass gasification;
  - Solar energy – water heater, solar cooker, solar house and solar home system (SHS);
  - Micro-hydropower;
  - improved stoves and Kang; and
  - Small wind power.

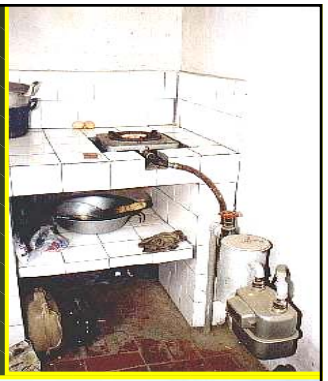


Biogas digesters: 11.10 million farmer households

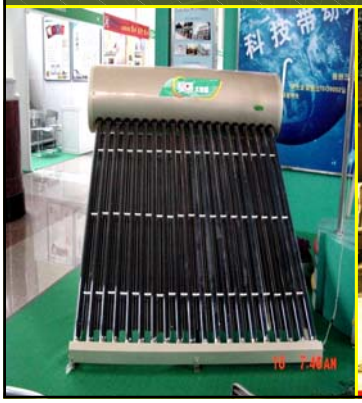


- Improved stoves: 189.09 million households;
- Energy-efficient Kang: 19.24 million units

Central gas supply systems from biomass gasification: 488 projects and 105,214 households benefited.



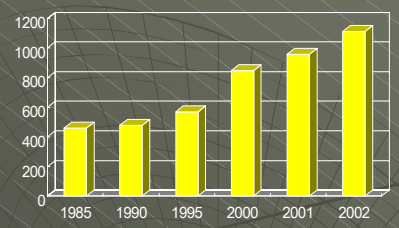
- Solar water heaters: more than 20 million square meters;
- Passive solar houses: 11.94 million square meters;
- Solar cookers: 478,430 units.



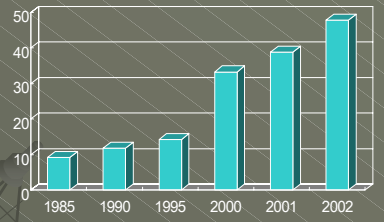
Small wind power: 33.5MW

Solar home system (PV): ~15MW

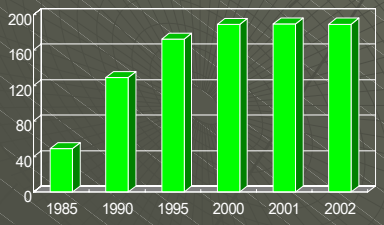
Micro hydro-power: 174 MW



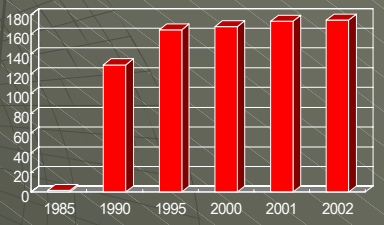
Household biogas (10,000 households)



Solar cookers (10,000 units)



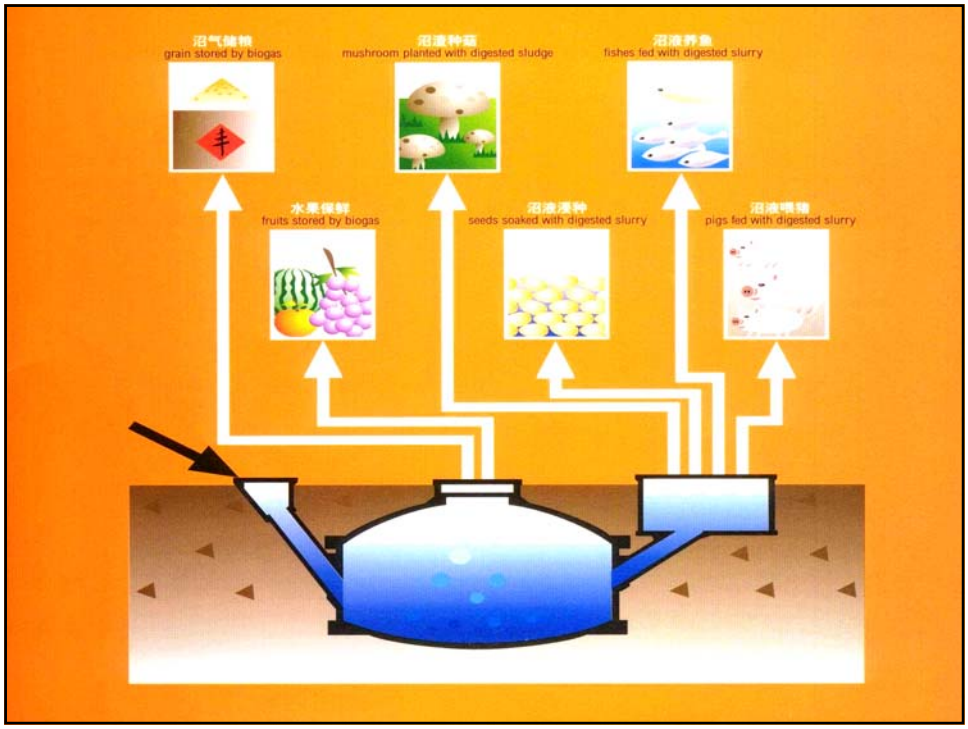
Improved stoves (100,000 households)



Micro-hydro and small wind power (MW)

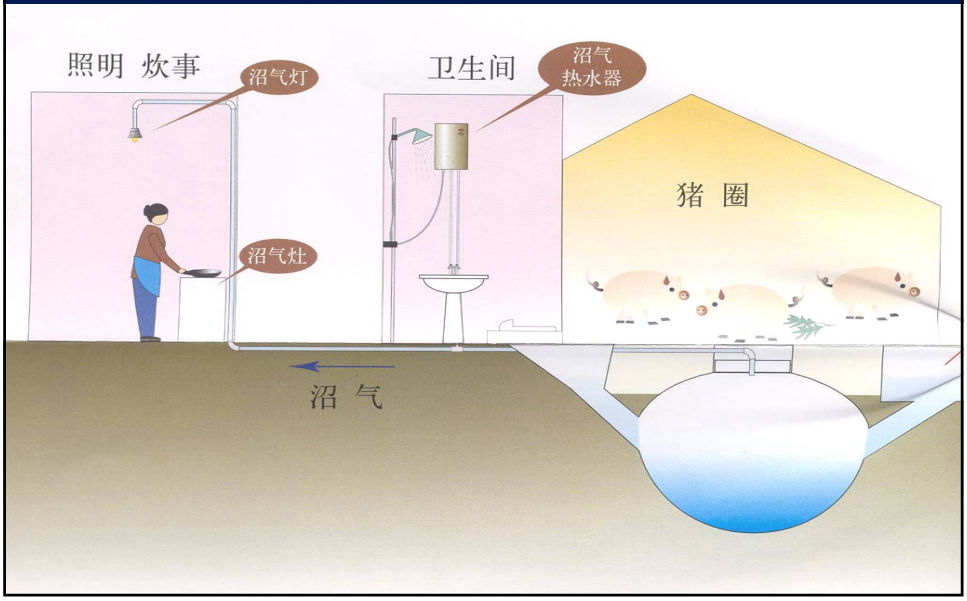
What benefits do we get?

- **Integrated utilization can directly increase farmers' income**
  - Integrated biogas utilization technologies: "Four-in-one" and "pigs-biogas-fruits" models have effectively increased outputs and improved products' quality ;
  - Agricultural and sideline product processing powered by "three small powers": rice milling, wheat grinding and wool cutting as well as lighting and cooking ;
  - Environmental protection can indirectly increase farmers' income: forest protection can reduce soil erosion and add to soil fertility, so that agricultural productivity and farmers' income can be maintained.



The north model: four-in-one (368,900 households)

The south model: pigs-biogas-fruits (3,132,900 households)



Models	Annual net benefits
Household biogas digester	300 RMB
"Four-in-one" model in North	3000 RMB
"Pig-biogas-fruit" model in South	2000 RMB

Note: 8.25 RMB = 1.00 US$

What benefits do we get?

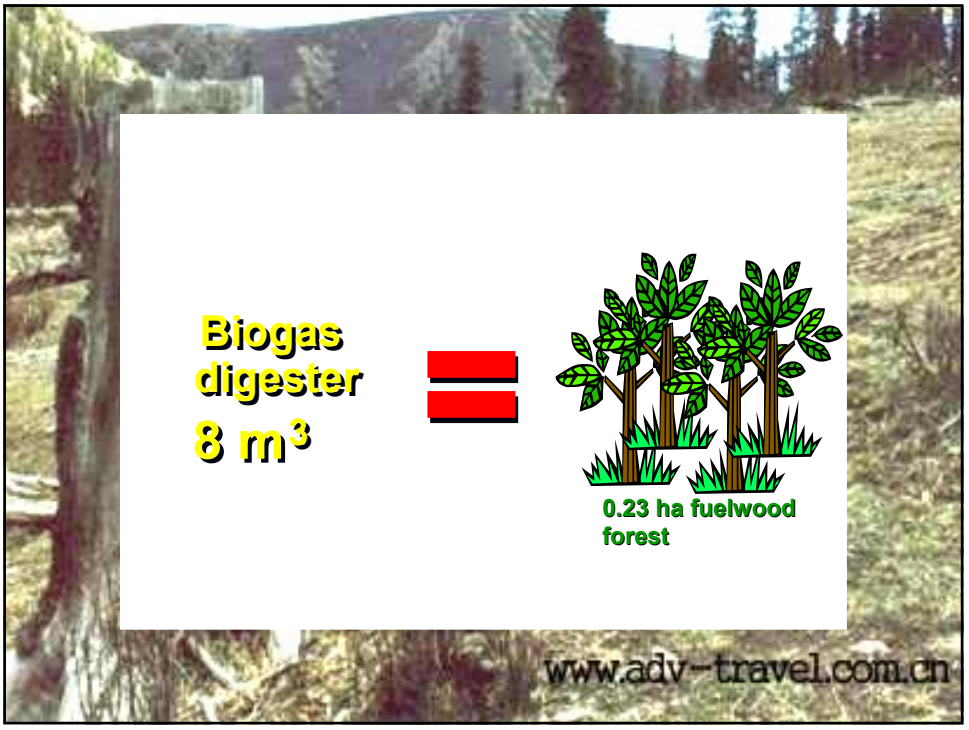
- **Rural renewable energy technologies can improve farmers' living standards**
  - Reduce in-door air pollution and negative impacts caused by illnesses such as eye and pulmonary disease;
  - Reduce energy costs: a new improved stove can save 35~50% firewood and costs can be recovered within 1 year;
  - Improve living standards: farmers can watch TV, listen to the radio and make their living rooms cleaner;
  - Free women from heavy work such as wood cutting, cooking and livestock raising and they can do housework or study in bright lights.

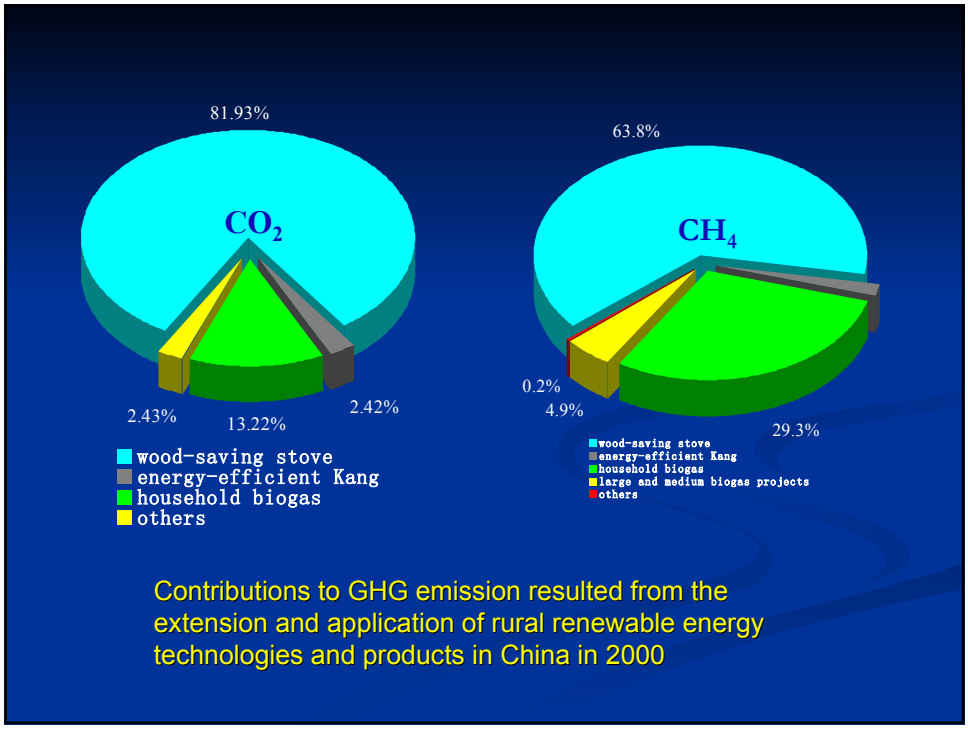
Pigsty and toilet remodeling


Kitchen
remodeling

What benefits do we get?

- **Improve environment and reduce the emission of greenhouse gas**
  - A $8m^3$ biogas digester can annually save wood more than 2000kg, equivalent to the total wood production of 0.23 ha firewood forest or 0.4 ha timberland;
  - Compared with 1990, total CO_2 and CH_4 emission reduced in 2000, resulted from the extension of renewable energy products and technologies, mounted to 158,727,500 tons and 249,500 tons respectively. The biggest contributor was wood-saving stoves and the second contributor household biogas digesters.





Contributions to GHG emission resulted from the extension and application of rural renewable energy technologies and products in China in 2000

What is our policy framework?

- Rural renewable energy development has been included in *China's 21 Century Agenda* and the *Fifteenth National Economy Development Plan* and *Program on Long-term Goals in 2010*;
- In 1995, the State Council approved *Report on the Development of New Energy and Renewable Energy*;
- In January 2002, the National Working Meeting on Agriculture stated that small infrastructure in rural areas should be strengthened and issues such as water-saving irrigation, human and livestock drinking water, biogas, water and electricity, roads and grassland fencing, shall be supported.

What is our policy framework?

- On 11 April, 2002, the State Council issued *Some Suggestions on Further Improving the Policy of Returning Land for Farming to Forestry*. It was pointed out that in order to protect existing forests and vegetations and in order to strengthen environmental protection achievements, rural energy construction should be actively conducted during the implementation of policies on returning land for farming to forestry and protecting wild wood resource. Projects involving biogas, small hydropower, solar energy, wind energy and fuel wood forest shall be supported. Biogas digester should be built according to standards and industrialization shall be encouraged. The central government shall give some appropriate subsidy to rural energy development.

What is our policy framework?

- On December 28, 2002, the National People's Congress revised the *Agricultural Law of People's Republic of China*. In Chapter 8, Agricultural resource and environment protection, it points out that the development of agriculture and rural economy must be based on reasonable utilization and protection of natural resources such as land, water, forest, grassland and wildlife, must be based on reasonable development and utilization of renewable energy and clean energy such as water energy, biogas, solar energy and wind energy. Ecological agriculture shall be developed and environment shall be protected and improved.

What is our policy framework?

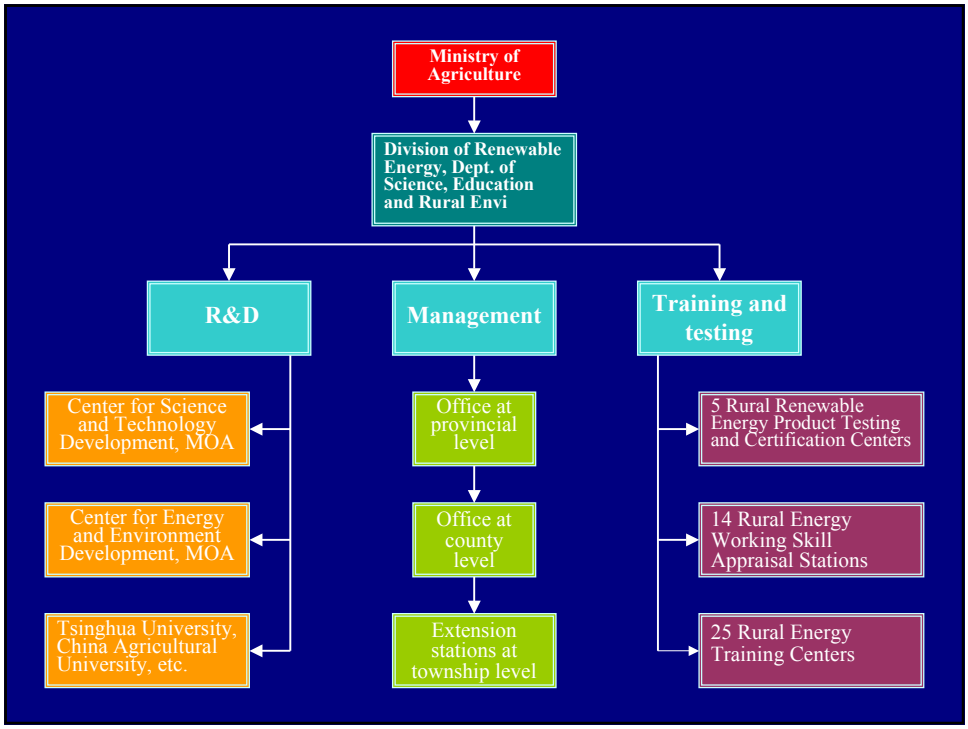
- In 2002, Ministry of Agriculture formulated the National Plan on Biogas Development in Rural China. It suggested that by the end of 2005, biogas technology shall be popularized to 20 million households and by the end of 2010, to 50 million households;
- Since 2001, with the support of national finance, the fund designated by Ministry of Agriculture to support biogas development has jumped from 100 million RMB Yuan to 350 RMB Yuan. In 2003, the central government is going to support 1 billion RMB by the national debt for household biogas development.

How do we practice?

- **Functions have been specified and effectively implemented**
  - To work out policies, measures, laws and regulations;
  - To formulate medium and long term development program and annual plan;
  - To organize research and development;
  - To conduct technical and product extension and demonstration;
  - To organize training and technical exchanges;
  - To provide information services.

How do we practice?

- **A complete and efficient network has been formed**
  - Under Department of Science, Education and Rural Environment, Ministry of Agriculture, Division of Renewable Energy has been established;
  - There are 34 administrative departments and technical extension institutes at provincial level;
  - There are 2499 agencies at county level;
  - 7671 agencies at township level.



How do we practice?

- **The development rural renewable energy is closely integrated with rural communities' social and economic development**
  - Integrated with farmers' income increase;
  - Integrated with farmers' economic activities;
  - The benefits have attracted farmers and communities to participate in the development renewable energy and its technical extension.

How do we practice?

- **Various mature technologies have been optimized and integrated**
  - The separate technologies have been integrated and recommended to farmers' according to their resource and economic development realities;
  - Farmers have learnt the integrated utilization of these technologies and have achieved overall benefits.

How do we practice?

- **Scale development based on units of villages**
  - The approach of accessing villages and farmers has been adopted. In every targeted village, it has been required that renewable energy technologies and products be publicized and utilized in at least 70% households;
  - Extension and utilization of mature technologies and products on a large scale can effectively reduce operational costs and achieve greatest benefits.

How do we practice?

- **Strict management has been required to ensure construction quality**
  - Strict supervision has been required to guarantee quality and qualified construction;
  - After receiving working skill training and passing examinations, the technicians are qualified to guide project construction. In this way, construction quality and benefits have been ensured and 100% projects meet standard requirements;
  - Procurement system and public bidding has been introduce, in order to provide farmers with best products and services and to support leading enterprises and famous brand products.

What are our problems and barriers?

- Inadequate technical extension caused by factors such as short of qualified staff, poor and limited testing equipments.
- The significance and contributions of rural renewable energy technologies have not been fully recognized. They have effectively increased farmers' income and improved their living standards, but most social, environmental benefits and contributions to community development and to global climatic changes alleviations are external. It can not benefit farmers in terms of cash income;
- Insufficient investment. The majority of farmers in China can not afford the technologies and products.

Conclusions

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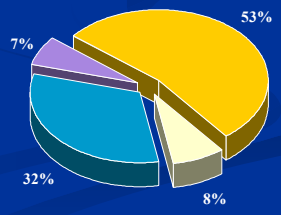
- The general guideline of energy development is "centered on improving energy utilization efficiency and benefits", renewable energy development and utilization shall be included in government's long-term development goals;
- As an important part of energy construction, rural renewable energy development has become a major element for China's rural social and economic sustainable development strategy;
- Rural China enjoys rich renewable energy resource and potential markets and users. It shall make considerable contribution to global GHG emission reduction.

Potential users of household biogas

Regions	Total households (10,000)	Suitable households (10,000)
Southwest	5186	4500
Northwest	1844	950
Central	13078	7550
East	4040	1100
Total	**24148**	**14100**



Conclusions

- Ministry of Agriculture used to focus on energy efficiency and resource protection. Its attention has been shifted to poverty alleviation, heath and economic development. It has been realized that rural energy development must be integrated with the construction of small cities and towns and with environment protection and economic development. Rural energy development should attract communities and farmers' participation.
- As a developing country, China has a large population living in remote and poverty-stricken areas and they are in urgent need of renewable energy technologies. Welcome international communities expand their cooperation with China in terms of capacity building, technical exchanges, pilot demonstration and research and development.


Thanks
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