

China Rural Renewable Energy Development

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China is the largest developing agricultural country in the world and enjoys abundant renewable energy resources. During the past 20 years, China has achieved great success in renewable energy technology development, industrialization and commercialization. It has accumulated useful and practical experience which other developing countries can learn from and use for reference. Moreover, China has a huge market for renewable energy technologies and products, so that China will introduce advanced foreign technologies and products as well as experiences on policy formulation, human resource training and marketing services.

Due to high pressure from population, environment and resource management, the Chinese government has started rural renewable energy construction as early as 1960. Great importance has been attributed to this activity, and rural biogas projects have been listed as key priority with the objective to build a comparatively well-off Xiaokang society and to improve farmers' living and productive conditions. In the Chinese *Agriculture Law* and *Energy-saving Law*, it has been clearly stipulated that governments at various levels should encourage and support the development of rural energy and increase investment steadily.

Since China's reform and opening up, rural economy has achieved a historic breakthrough. Energy supply and consumption patterns in rural China have changed dramatically from the past overall energy shortage to a current pursuit for high-quality energy. After 20 years of efforts, integrated development and utilization of rural renewable energy has achieved notable environmental, economic and social benefits. It contributed greatly to the alleviation of global climatic change, to rural economic development, to an improvement of farmers' living standards as well as to environmental protection. The accelerating development of rural renewable energy has reached a new phase and the time has come when rural renewable energy is utilized on a large scale.

By the end of 2002, there are 11 million household digesters in China, 1560 large- and medium-scale biogas plants, 115 thousand biogas plants for municipal sanitary sewage purification, 190 million improved household stoves, 390 thousand solar stoves, 55 thousand household PV systems, 91 thousand micro-hydro power generation systems, 121 thousand small wind power generation systems and more than 500 straw gasification systems. Based on past experience, the Ministry of Agriculture has launched a "Bio-household Program". Since 2001, a 1.4 billion fund has been invested by the central government to implement the Bio-household Program and 1000 counties, 8826 villages and 1.7 million households have benefited from the program.

Although China enjoys a long agriculture development history, the large population, scarce per capita resources and the backward agricultural infrastructure have posted severe problems and challenges for agricultural sustainable development. There are still 20 million people living in poverty and the same number has no access to power. An additional 0.2 billion people are threatened by desertification.

Nevertheless, the Chinese "grain for green" policy has shown an important impact on rural community's traditional living and productive style. The utilization of renewable energies such as biomass, solar energy, wind energy, geothermal energy and the extension of various wood & coal saving technologies has brought satisfactory results. Integrated renewable energy utilization technologies and models (with biogas as the link) have been applied on a large scale. In northern China, the "Four-in-one" model, which integrates biogas digester, pig pen, water closet and a greenhouse (see figure 1), has developed rapidly and became one of the major measures to implement the "Vegetable Basket Project" and to help farmers cast-off poverty. In southern China, biogas, fruit and grain planting and livestock raising has been integrated within the so-called "Pig-biogas-fruit" model (see figure 2). Both models have served to increase the income of farmers significantly.

In addition, straw gasification technology, which converts straws and stalks into gas, has been widely used in grain production dominated areas and the aim of "two men light a fire and supply gas to the whole village" has been realized. This practical application of rural renewable technologies has promoted the development of small towns and avoided the phenomenon of "bringing firewood to storied buildings" and it has improved the villages' sanitary conditions and helped many farmers to become rich. Therefore, it can be said that rural renewable energy development has played an irreplaceable part in poverty alleviation in rural China.

Finally, the farmers' consciousness and enthusiasm has increased, since rural RE development has brought benefits to rural economic development, agricultural production, environmental protection and farmers' income generation. A variety of stakeholders have been encouraged to participate in RE development due to its apparent economic and social benefits, and a growing number of investors from home and abroad, including investors from private sectors and nongovernmental business, has been attracted to invest in rural renewable energy construction. All these factors have created a favorable environment for the industrialization and commercialization of rural renewable energy development in China.

In the future, China's rural renewable energy will be further developed from the current small-scale to a large-scale and intensive pattern. The energy consumption pattern will no longer be dominated by cooking and lighting, but by power generation and central heat supply systems. Technologies and products will be in conformity with international standards. At the same time, China is ready to provide practical renewable energy technologies and products as well as human resource training for other developing countries.



Figure 1: 'Four-in-one' biogas model for Northern China

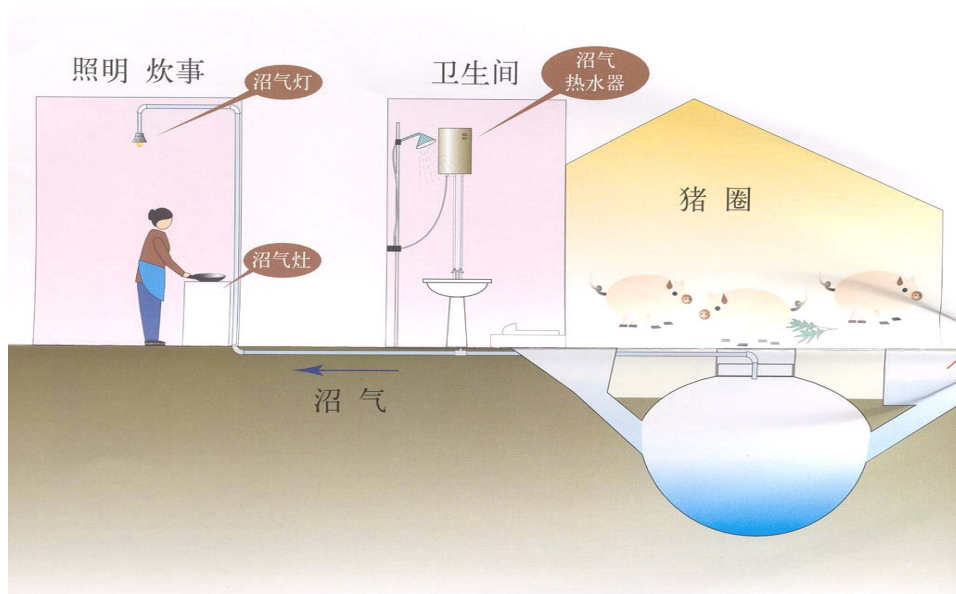


Figure 2: 'Pig-biogas-fruit' biogas model for Southern China