

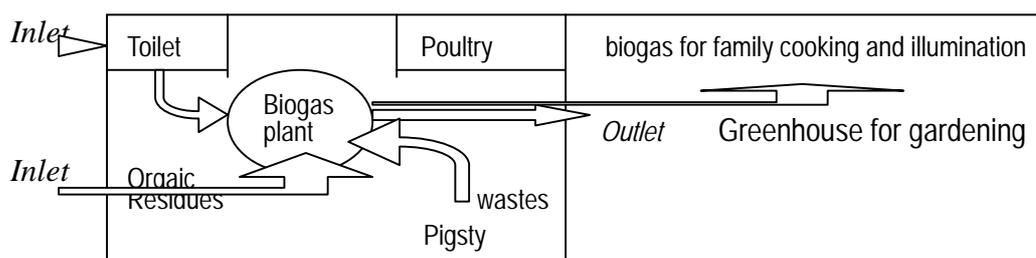
## AN INTEGRATED CROPPING-LIVESTOCK-BIOGAS-DWELLING ECO-AGRO-ENGINEERING (ILBDE) MODEL AND ITS FUNCTIONS FOR ECOLOGICAL SANITATION IMPROVEMENT IN RURAL CHINA

TANG Jianjun<sup>1</sup>, CHEN Xin<sup>2</sup>, WANG Zhaoqian<sup>2</sup>

(<sup>1</sup> Department of Biological Science, Zhejiang University, Hangzhou 310027)

(<sup>2</sup> Agroecology Institute, Zhejiang University, Hangzhou 310029)

The Chinese Ecological Engineering (CEE) is one of living and production system with ecological rationale and conservative harmonization of matter cycling. It was built up in the light of systematical engineering approaches based on well understanding of principals of ecology and economics. The discussion and practice of the CEE, began from late 1970s, have been rapidly developing with a growing scale from scientific experiments to governmental policy. Chinese eco-agriculture (CEA), emerged in 1980s, is the best practice of CEE in China. CEA is commonly understood as an agricultural production and management unit, in which production and management are directed and organized in the light of ecology and economics principles and a system engineering approach. Since the CEA has been studied and practiced in China in early 1980's, it has been developing so fast that there are over 2000 experimental sites of CEA all over the country at late 1990's. The CEA farmland area reaches to 6.67 million ha, which accounts for about 7% of total farmland in China, in the end of 1999. Scientists, agronomists and farmers have been developing diverse models of CEA according to various objective realities in different areas. Among these diverse models, the model which combined cropping, livestock, biogas production and dwelling as a integrated system" (Fig.1) plays an important role in improving rural sanitation. Basing on the principles of ecology, biology and engineering, the model was developed by intensive use of land resource, solar energy and organic residues, and in which biogas as a linkage of cropping and livestock. It was generally accepted to be a comprehensive system of energy use which well meet the demand of environmental sanitation in rural area in China. It also has a huge extension potential in all developing countries.



**Fig.1 Sketch of integrated cropping-livestock-biogas-dwelling eco-engineering (ILBDE) model**

In improving residential sanitation and economical development in rural area, the importance of the ecological agricultural model of "integrated livestock-biogas-cropping-dwelling eco-engineering system" can be described as follows:

- 1) Significantly improve the sanitation situation of dwelling in rural area. The wastes of poultry can be used as part of mixed feed for pigs. Organic residues include crop residue, wastes such as droppings and garbage from human activity and pigs or other livestock are good raw materials for biogas generation. By fermentation in biogas plant, harmful pest egg and bacteria are well controlled,

which results into a much cleaner living conditions for farmers in rural areas. Among vast rural area where the ILBDE has not adopted yet, droppings and garbage will be threw away without any treatment and result into a very serious contamination of food, water resource, soil and environment pollution and frequently arose contagious diseases.

- 2) Successfully achieve a full and perfect utilization of solar energy and organic residues in agricultural production and farmers' everyday life. By linking cropping and livestock through biogas generation, potential energy and organic residues are fully used. Instead of over-consuming the insufficient fuel forest in present countryside in China, using biogas as energy resource in family's everyday life will be greatly helpful to conserve forest and prevent soil erosions. Soil erosion are frequently occurred and very serious because of strong wind blowing in western China and heavy rain washing away in southern China.
- 3) Greatly improve the comfort to live in the countryside by better design of dwelling space. Through this ILBDE system, the living surrounding of peasants in rural area become much comfortable with less waste and disease, lower cost for agricultural production and living expense and more beautiful environment.