

Using integrated biogas technology to help poor communities in Baima Snow Mountain Nature Reserve, Yunnan Province, China

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Introduction

Baima Snow Mount Nature Reserve is located in Northwest Yunnan Province, China, where three big rivers, the Nujiang, Lantsang, and Yangtse, flow shoulder by shoulder. Divine Snow Mountain, grand glacier, alpine pasture and lake, dense forest complete its charming landscape. There is a population of more than 8000 people, who cultivate limited lands in this nature reserve – most are Tibetan. Almost every family keeps several yaks, pigs and so on, but only for their own consumption, and not for sale.

The traditional way of raising livestock not only uses large amounts of animal feed, but also substantial quantities of firewood. For a family with ten yaks and ten pigs, between five and six tonnes of natural firewood will be consumed per annum. If heating and cooking are both considered, an average household will consume at least ten tonnes of firewood annually. This consumption has put heavy pressure upon the for-

Le recours à un système intégré à partir du biogas en faveur des communautés pauvres de la province du Yunnan en Chine

La réserve de Baima Snow Mount Nature abrite environ 8,000 personnes cultivant quelques lopins de terre. Traditionnellement l'élevage nécessite une consommation élevée de bois de feu utilisée dans la cuisson lors de la préparation d'aliments pour le bétail. La technologie du biogas a été introduite et intègre dans le même système un biodigesteur, une porcherie, des toilettes et une serre. Les paysans ont pu obtenir un prêt de la banque locale, une subvention du gouvernement ainsi qu'un don octroyé par le projet.

est resources, and also causes painful conflict between the Nature Reserve Conservancy and local residents.

The main income for most families comes from the collection of wild fungi and herbs. However, because of the lack of effective management, income from the collection of fungi and herbs is not stable.

In November 1999, through support from the Shell Foundation, I was able to come to this very special area to carry out a project on commercialization of an integrated biogas technology in Baima Snow Mount Nature Reserve, on behalf of the South-

North Institute for Sustainable Development.

Objectives

Our objectives are to protect the natural forest and to increase the income of local residents, as well as improving family health. So we introduced, to local residents, a highly-developed 4-in-1 and 3-in-1 biogas technology alongside advanced agricultural technology, which included planting vegetables and fruit, and raising livestock. The biogas produced from the digester provides an alternative energy supply for daily use, thus reducing both the consumption of natural firewood and the

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Figure 1: Livestock kept in the family courtyard



Figure 2: Selling fungi – a major source of income

labour spent on collecting firewood. At the same time, planting vegetables or fruit increases the income of local residents. Since biogas is clean and produces less smoke than firewood, it was of great benefit to the health of women, who used to prepare food for the whole family in a smoky environment. In order to make this project more sustainable and replicable, we involved a local bank to extend loan facilities to local residents by using our fund as a loan guarantee.

About the household biogas technology

The biogas technology we chose to introduce to the nature reserve had been fully developed in Pulandian in northeast China. It integrates into one system:

- A biogas digester
- A greenhouse
- A pigpen
- A toilet

From this it gets the name ‘4-in-1’. Where the biogas digester is in the greenhouse, it can even produce biogas in cold winter.

If the greenhouse is excluded, then the system will be smaller and can be constructed in the courtyard of the farmer’s house, and is called ‘3-in-1’. With the 3-in-1 system, it is built with a back and gable wall, with a plastic cover and straw bales to protect it from the cold weather.

Project Activity

Location of project site

Shusong village was selected to be the demonstration site. The average altitude of Shusong is 2800m, and the weather is very cold in winter. A household biogas unit had never been built at such a high altitude in Yunnan.

Training local technicians

We helped the Nature Reserve Conservancy to establish an office for rural energy development. A training programme on 4-in-1 technology for their technicians was carried out in May. Along with the training programme, we supported the Conservancy to construct the first 4-in-1 system in the nature reserve.

Farmers become interested in ‘3-in-1’

Since 4-in-1 and 3-in-1 biogas technology is unfamiliar to both the local people and the local government, we met with a lot of resistance at the beginning.

When it was proved that biogas could be provided for cooking for the Shusong Experimental Station of the Nature Reserve Conservancy, the local residents were deeply impressed and very excited. It was at this point that the local farmers became interested in this technology. However

the relatively high investment and the uncertainty of being able to sell at the local vegetable market limited the farmers’ willingness to choose 4-in-1 technology. In the end, only one family chose to construct the 4-in-1 system, with part of the investment provided by a poverty-alleviation loan from the local bank, part from local government, part was the family’s own investment, and part from a grant made by this project. As a result of these findings, we adjusted our original plans to develop ‘3-in-1’ instead of ‘4-in-1’ biogas units. The investment of 3-in-1 is less than \$250, and farmers were able to get a loan from the local bank, together with a subsidy from the government and a grant from the project. Table 1 shows a breakdown of the investment needed by local residents for the purchase of 3-in-1 digesters.

In October 2000, six families participated in the project. After the construction of the 3-in-1, they were able to reduce their woodfuel consumption to two-thirds of their previous levels.

They were glad to find that pigs raised using the 3-in-1 system grow faster than usual. The residue from the biogas digester can be used as fine fertilizer for

Table 1: Total investment of 3-in-1 is \$250

Loan from local bank: \$120	Grant from the project: \$60	Subsidy from local government \$40	From farmers’own resource \$30
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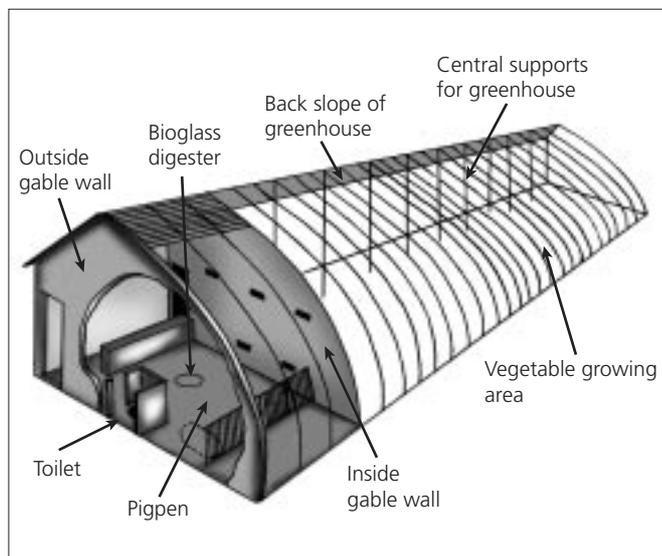


Figure 3: Diagram of 4-in-1 system



Figure 4: Training for technicians



Figure 5: Cooking with biogas

crops and fruit trees. To encourage farmers to plant fruit trees in their courtyards, we brought some peach saplings to local families and taught them how to enrich the soil around the fruit trees with residues from the biogas digester. The units belonging to the six families and the demonstration unit at the Shusong Experimental Station have been frequently visited by local farmers and local and international organizations.

More and more families had requested that they participate in the project, so fifty more families were selected in March 2001. Within each village, the groups were made up of individual families, and for each group a leader was selected by all members. His responsibility was to assist the Nature Reserve Conservancy to organize the construction and assist the local bank to extend loan facilities and collect repayment. As of May 2001, 42 families have successfully constructed 3-in-1 units near their houses.

Conclusions

It is good to see that the 3-in-1 biogas technology can help the local community. Although the 3-in-1 has not been shown to increase family income directly, it does bring many indirect benefits. However, there are still so many households in need of help. Nearly one thousand households live in the Nature Reserve, and only 52 households have benefited from this project to date.

Future plans

The Conservancy are eager to continue this project, since the implementation of the biogas project in the Nature Reserve greatly alleviates the conflict between the Conservancy and local residents. Currently, the question is how to further strengthen the capability of local institutions in providing the relevant services to the local community, and the most important problem is about financing. Since the average annual income per capita of most of the local families is less than \$70, it is still very hard for them to afford the total investment of \$250 without the small grant of \$60 from this project.



Figure 6: Peach sapling growing in soil enriched with residues from biogas digester

First of all, we plan to carry out follow-up activities integrated with community development at the project site.

We intend to support local institutions to establish an independent corporation of rural energy, by strengthening their capability in finance, management and marketing, so that they can better serve the local area in a more sustainable way. The major business of this corporation would include biogas technology, energy-efficiency stoves and solar water heaters, according to the local market demand.

We hope to support the Conservancy in providing eco-tourism in the nature reserve. The income from eco-tourism can be used for the development of household biogas technology.

Once the project ends, the small grant will no longer be available. So we are thinking about launching an activity of 'Preserving the original forest- the habitats of Yunnan Golden Monkey'; by donating \$60, people can choose to donate \$60 to help one family build the 3-in-1 and thus reduce their reliance on biomass.

We have identified rural energy as the key problem restricting rural development and nature conservation in a very poor area in China. Integrated biogas technology, such as 4-in-1 and 3-in-1, could be a very effective technology to help poor communities and preserve the vulnerable environment of this part of North China.

As a large developing country, we value support from the international society, and we sincerely expect to work together with international organizations to protect our Mother Earth.

Yin Chuntao, graduated from Peking University with a Bachelor Degree in Urban & Environment Department in 1997. And has been working for South-North Institute for Sustainable Development, an independent Chinese non-profit organization, as a sustainable energy program officer since March 1999. Her work mainly involves rural energy development and commercialization of renewable electricity. ☘