

REACTIVATION OF DYSFUNCTIONAL DOMESTIC BIOGAS DIGESTERS AND ESTABLISHMENT OF A POST-INSTALLATION SERVICE BUSINESS MODEL

PROJECT'S AIM: TO DEVELOP A SUSTAINABLE SOLUTION FOR THE REACTIVATION OF DYSFUNCTIONAL BIOGAS DIGESTERS IN YUNNAN, CHINA

Location:

Yunnan province, China

Technology:

Biogas

Costs:

Total: € 40,100

WISIONS financial support: € 40,000

Partners Involved:

Center of Biogas Engineering and Technology,
Yunnan Normal University (CBET-YNNU)

www.ynbiogas.com

Global Environmental Institute (GEI)

www.geichina.org

Rural Energy Stations of Yunnan province

Duration:

12/2011 – 07/2013



Picture: Yunnan University

By the end of 2010 there were an estimated 40 million biogas digesters in China. However, according to some estimates, up to a quarter are significantly underused or do not fulfil their expected lifespans. This project set out to improve the long-term viability of domestic biogas as a sustainable technology for rural households in the Chinese province of Yunnan, by increasing the yields of functioning biogas digesters and reactivating those that are unused. It did so by tackling a range of aspects, which included raising awareness among users, improving the training of technicians, establishing a financially sustainable cooperative to carry out post-installation servicing and promoting additional value creation through the use of digestion residues and bio-slurry in farming.

TECHNOLOGY, OPERATIONS & MAINTENANCE

A survey of 800 households that were using biogas in the Yuxi region revealed

that around 60% of biodigesters were dysfunctional; they were not producing enough biogas to boil at least one litre of water each day. Over half of the problems leading to low performance (or no performance) were related to poor user management. These included poor pre-treatment and delayed loading of input substrates, infrequent unloading of the digestate and residues and the lack of day-to-day maintenance. Moreover, the lack of appropriately trained technicians caused delays in the replacement of aging parts and resulted in a deficient post-installation service in general. Relocation, where a household had moved and had abandoned the biogas digester, was uncovered as a further cause of underuse. Lastly, poor construction quality also contributed to the low performance of some digesters.

Local biogas technicians were also approached as part of the baseline survey and this consultation revealed low incomes, lack of resources to carry out maintenance and varying standards of organisation

across the region.

DELIVERY MODEL & FINANCIAL MANAGEMENT

The establishment of a financially sustainable post-installation service to ensure the development of a strong biogas digester market was one of the most important goals of the project. This service took the shape of three biogas post-installation cooperatives established in three counties: Xinping, Eshan and Jiangchuan. Each cooperative brought together users and biogas technicians and maintained close links with the existing structures set up by local government (Rural Energy Stations).

The aim of the cooperatives was to actively improve the quality of maintenance and the efficiency of technicians, resulting in the re-activation of as many unused digesters as possible. Amongst other things, the cooperative established standards, membership fees and a rewards mechanism for best-practice. Every biogas user paid a

membership fee of between 60 and 200 RMB (depending on services used) to join the cooperative.

Assistance in emptying the digestate from the digesters proved a fundamental way of reactivating unused biogas digesters. Members of the cooperative would pay a reduced price for the emptying service, which was carried out by specialised technicians using a suction truck provided by the local government. Moreover, training and awareness-raising were fundamental to the project.

ENVIRONMENTAL ISSUES

In terms of environmental benefits, the project contributed to the reduction of GHG emissions by replacing traditional fuels with biogas for domestic uses (mainly cooking). Moreover, the carbon footprint related to biogasification has been reduced through improved management practices. For example, lower levels of methane from manure and residues waiting to be fed into the digesters are now emitted into the atmosphere. Lastly, the use of bio-slurry and bio-residues from digesters has replaced chemical fertilisers and pesticides. In this project, the cooperative's assistance led to a higher number of households using biogas digestate for farming.

SOCIAL ISSUES

The benefits of using biogas in poverty alleviation can be significant: the project focused on rural low-income communities where the cost of fuel accounts for a large share of household income. The successful reactivation of over 2,000 dysfunctional digesters can potentially create significant savings for these households.

Outlays for chemical fertiliser and pesticides are also considerable. The project put strong emphasis on comprehensive biogas use, reaping the economic benefits of using bio-slurry and bio-residues as fertiliser and animal feed. Two households were selected to test the effects of residues on improving yields of the main crop in the region (bitter melon) and raising pigs. This practical demonstration enhanced the

effectiveness of awareness-raising workshops.

A group of local biogas technicians also saw a measurable improvement in their income stability. Prior to the project, biogas technicians were employed by the government on temporary contracts. The cooperatives resulted in a larger work load and the training improved their capacity and motivation.

Regarding digester effluents that still remained unused in households, assistance from the cooperatives in their removal allowed for the effluents to be sold to other users, as well as ensuring their proper disposal.

Using biogas instead of traditional fuels for cooking can reduce indoor air pollution. In terms of gender, the respondents to the household survey shifted from a distribution of 90% male and 10% female in the baseline survey to 27% male and 73% female in the post-assessment survey.

RESULTS & IMPACT

As a result of the project, 2003 dysfunctional bio-digesters were reactivated - around 10 times more than originally planned. According to the definition of "dysfunctionality" in this project, the average dysfunctional bio-digester rate was reduced from 60% to around 5% in the pilot region.

The establishment of the three post-installment service cooperatives was another important sign of the project's success. Moreover, over 800 local farmers attended the training and awareness-raising activities. The awareness-raising activities helped to create demand for a quality post-installment service.

The project coordinators have also published the results of their baseline survey in a scientific paper that can be accessed online.

REPLICABILITY

Understanding the reasons why the biogas digesters had become dysfunctional was

central to the project. This experience was shared during the project with government and civil society stakeholders, as well as with international experts.

In particular, the cooperatives can provide a model for the nationwide management of rural biogas. As a first step, this approach could be replicated in other areas of the Yunnan province, where there are an estimated 3 million dysfunctional bio-digesters.

LESSONS LEARNED

Following two decades of emphasis on installing biogas digesters, the Chinese government is currently moving towards a focus on maintenance and management. This project provides important lessons for directing the financial and policy support from government. Key lessons have been learnt in terms of:

- The establishment of co-operatives for post-installation service, and related fees and incentives models
- The creation of demand for a post-installation service, via awareness-raising and demonstration activities
- The definition of a standard of "dysfunctionality" for biodigesters
- An emphasis on the comprehensive use of biogas, including bio-residue and bio-slurry

The project demonstrated that the farming households changed their attitudes once they saw the improvement in their monthly expenditure and farm yields. The reactivation of the digester in itself did not result in a change in attitude towards biogas, but the impacts on their daily life did. Furthermore, it was found that low general education levels were a significant barrier to raising awareness. It is important that future efforts consider the need for innovative communication about biogas.

Source: Final Report submitted to WISIONS by CBET YNNU

