

## Case study summary

# Ministry of Agriculture and Rural Development (MARD), Vietnam and Netherlands Development Organisation (SNV)

The Ashden Award to MARD and SNV recognises their successful partnership which has enabled the large scale dissemination of domestic biogas technology to improve the quality of life for farmers in Vietnam.

In Vietnam over two million families have piggeries that create a huge odour and waste problem. The Ministry of Agriculture and Rural Development (MARD) has partnered with the Netherlands Development Organisation (SNV) to develop a nation wide biogas programme, which is turning Vietnam's waste problem into a source of clean energy.

- MARD uses two models of Vietnamese-designed fixed dome biogas plant, with sizes ranging from 4 m<sup>3</sup> to 50 m<sup>3</sup>.
- Plants decompose pig manure, toilet waste and poultry manure to produce biogas, which replaces LPG, coal, wood and agricultural residues for cooking.
- A typical 10 m<sup>3</sup> household system costs about US\$550. Cost paid up front, and a government subsidy of US\$67 can be claimed when the plant has been certified as operating correctly.
- Between 2003 and 2009 the programme directly facilitated the installation of over 78,000 biogas systems, which are benefitting more than 390,000 people. The trained masons also build significant numbers of plants outside the programme.
- According to CDM methodologies, each biogas system saves the equivalent of 2.14 tonnes/year of CO<sub>2</sub> emissions by replacing the use of fossil fuels. The programme was cutting around 167,000 tonnes/year of CO<sub>2</sub> equivalent by the end of 2009.
- Households with biogas systems greatly appreciate the reduced smell and easier management of manure.
- Survey showed that women save an average of 1.75 hours/day from not collecting fuel, tending cooking fires and collecting LPG cylinders.
- Health benefits include reduced indoor air pollution from cooking fires and stoves, and improved hygiene and sanitation.
- Survey showed average saving of US\$ 120/year on cooking fuel, so biogas plant pays for itself in four or five years.
- Slurry from biogas systems used as fertiliser on crops. Families enjoy increased income from better crop yields and can sell surplus slurry to neighbours.
- Biogas programme provides over 1,800 masons with work.

The programme began in 2003 and is coordinated by the MARD, through the establishment of a formal Biogas Programme Division, with guidance and advice from SNV. The programme works with 360 local staff from MARD's offices, acting as managers and technicians on a part-time basis.

2010 Ashden Award

### Vietnam statistics 2006/7

(UNDP/WRI)

GDP: US\$1,041/year per person

CO<sub>2</sub> emission: 1.2 tonnes/year per person

48% of people live on less than US\$2/day

16% of people lack grid electricity

### Location



**"The two big plus points for us are the slurry for the tea and the free cooking gas. It's enough for all the household and for the pig feed too."**

Mrs Do Thi Lap, Soc Son District, Vietnam



Nguyen Van Vach cooking on a biogas stove, Kim Thanh District, Vietnam

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# Case study

## MARD and SNV, Vietnam

### Background

In Vietnam over two million families raise pigs, and this creates a huge waste problem. Many people are put off owning pigs because of the bad smell and general problems associated with the waste they produce. At the same time, women spend significant time and money collecting wood or other fuels, and then cook on smoky, unimproved stoves.

The Vietnamese Ministry of Agriculture and Rural Development (MARD) has partnered with the Netherlands Development Organisation (SNV), to deliver a major biogas programme. The programme is turning Vietnam's waste problem into a source of clean energy, demonstrating that household biogas has the potential to be rolled out across the country on a large scale.

### The organisation

The programme began in 2003 and is managed by MARD through its Biogas Programme Division. The programme has a goal to facilitate the construction of 168,000 biogas systems by the end of 2012. This is done through the provision of training to masons to construct biogas systems and business training on marketing and selling skills. SNV has provided advice and support throughout the programme, and this will continue until the end of 2012, when the whole programme will be transferred to MARD.

Finance for the programme comes from the Dutch Ministry of Development Cooperation (DGIS), SNV, and the Vietnamese central and provincial governments.

### The technology

#### How does it work?

Biogas systems take organic material such as animal dung into an air-tight tank, where bacteria break down the material and release biogas – a mixture of mainly methane with some carbon dioxide. The biogas can be burned as a fuel, for cooking or other purposes, and the nutrient-rich slurry which is left can be used as organic compost.

MARD promotes fixed-dome biogas systems, designed and developed in Vietnam, which range in size from 4 m<sup>3</sup> to 50 m<sup>3</sup>. The larger ones are used for semi commercial scale piggeries and poultry farms. The smaller plants for individual families require dung from a minimum of six pigs or two cows, and many have the household toilet connected as well. A family-sized plant provides enough gas for all cooking needs and in some cases for lighting as well, with a small number of households also using the biogas as fuel for an electric generator. The slurry from digester is spread on fields as a fertiliser or sold to neighbours.

#### How much does it cost and how do users pay?

US\$1 = VND 18,000 (Vietnamese Dong) [May 2010]

Householders pay cash up front for a biogas system. A typical 10 m<sup>3</sup> system costs about US\$550 (VND 10 million), typically 70% for materials and 30% for labour. A government subsidy of US\$67 (VND 1.2 million) can be reclaimed by the family once the system has been checked and confirmed to be working properly by a MARD technician.

The costs of plants vary, because masons can set their own charges for labour, and some householders provide part of the labour themselves to bring down the cost. There is also a variation in the price of materials.

### The technology in more detail

MARD domestic biogas systems have a cylindrical, domed digester vessel built from brick. They are designed principally to work with pig manure, but some also use chicken, duck or cattle manure. Two basic plant designs are used. The KT1 has a standard, fixed-dome shape. The KT2 is designed for the higher water tables of Southern Vietnam, and has a shallower and flatter shape.

The plant is built so that the manure from the pigsty can be sluiced with water directly into the biogas inlet tank, from where it flows under gravity into the digester. Household toilets are similarly flushed with a bucket down a pipe into the digester.

Bacteria decompose the slurry under anaerobic (oxygen-free) conditions, and the biogas which is produced collects under the dome and pushes the digested slurry into an outlet tank. A pipe takes the gas to the kitchen stove and lamp, each of which has a pressure gauge. Adapted LPG burners, or specially-designed biogas stoves, are used.

**"It's so much cleaner indoors and out. I got one in 2008 after I saw a neighbour's – I was really impressed. It's free energy! And it's so much quicker to cook a meal for the family – and you don't get smoke in your eyes the whole time."**

Nguyen Van Vach, 65, Thuong Do hamlet, Hai Duong province, Vietnam

Most families use their own savings to pay for a biogas plant, and typically have to save up for about 18 months. If this is not possible, some may borrow from relatives. There are not many microfinance institutions (MFIs) in Vietnam, so MARD and SNV are exploring micro credit facilities via local development banks as possible sources of customer finance.

### How is it manufactured, promoted and maintained?

The materials and design of the systems are all local to Vietnam. Biogas systems are built by a team that includes on average five masons. All technicians and masons have been trained by the programme, but masons are self employed. Each digester lid has a unique serial number which allows the masons to be traced.

The programme is promoted through general advertising, loudspeaker vans, brochures, promotional workshops and, most importantly, word of mouth. Masons also wear promotional caps and shirts. Householders interested in purchasing a biogas system are invited to a meeting where the technology is explained and demonstrated.

Households that sign up for the programme are put on a waiting list to be approved for a subsidised plant. After the installation is completed, the customer is given a half-day training in basic operation and maintenance by the local technician, working under MARD. The new owner receives a handbook of instructions, with a postcard for reporting problems and contact numbers.

All plants have a one year warranty, and householders can contact masons or district technicians directly if problems occur. The MARD quality control system includes district, provincial and national level technicians visiting all plants installed through the programme. Plants should last at least 20 years, but can carry on working for much longer if properly maintained.

### Benefits

By the end of 2009, the programme had supported the installation of over 78,000 biogas systems in 37 provinces of Vietnam. With an average of five people per household, this has benefited more than 390,000 people. A further 29,000 plants are scheduled to be installed during 2010. These figures do not include plants which are installed privately by masons trained under the programme. Research is in progress to estimate how many this might be.

#### Environmental benefits

Biogas digesters cut greenhouse gas emissions by replacing fossil fuels (LPG and coal) for cooking, and by reducing the production of methane from poorly managed manure. They also replace biomass (wood and agricultural residues) for cooking, although this does not contribute significantly to greenhouse gas savings, because the biomass is usually re-grown. MARD and SNV have considered a number of different CDM methodologies to assess carbon savings, and estimate that each biogas system saves the equivalent of 2.14 tonnes/year of CO<sub>2</sub> emissions by replacing fossil fuels. On this basis, the programme was reducing CO<sub>2</sub> emissions by the equivalent of around 167,000 tonnes/year by the end of 2009.

#### Social benefits

What families appreciate most about biogas systems is having a simple means of managing pig manure, and thus keeping their homes clean and odour-free, with fewer flies. Odourless slurry is more pleasant to spread on crops than raw manure, displacing some use of chemical fertilisers and increasing crop yields. Around 60% of farmers use the slurry for their own crops and the rest may sell it to neighbours, increasing the family income, or sometimes give it away.

Families with biogas plants save time from not having to collect firewood and residues, light and tend cooking fires, or exchange LPG canisters. MARD surveys suggest that most of this time is saved by women, and that the amount is significant – about 1.75 hours/day on average. Women use this time for work, childcare and leisure.

Health benefits of the MARD biogas plants include reduced indoor air pollution from wood and coal stoves, improved hygiene and sanitation, and less smell from piggeries and poultry farms.



Do Thi Lap lights her biogas stove, Bac Son Commune, Soc Son Province, Vietnam.

**“I’ve had my first business training last year – training in marketing and so on. Because now we need to expand our area. A lot of houses round here already have digesters, so we’re looking to go further afield – maybe up to 40km away.”**

Tran Van Nam, Mason, Thanh Tam commune, Thanh Hoa province, Vietnam

#### Benefits

Free Market: Biogas plants have proved so popular that many families directly commission a trained mason to build one, rather than going on the waiting list to be approved for a subsidised plant under the MARD programme. This shows that a real commercial market for biogas has developed in Vietnam, at least among more affluent farming families. Some masons say that they have built as many systems outside the MARD programme as they have within it.

### Economic and employment benefits

The biogas programme is providing over 1,800 local masons with training and work. Team leaders of each mason group are also given additional business training to help them operate more independently. On a national level there are 15 full time staff, and 360 employed on a part-time basis including technicians, managers and masons.

MARD surveys show that the household expenditure on all types of energy decreases from about US\$200 to US\$80/year (VND 3.6 million to 1.4 million/year) after installation of a biogas plant. Thus a typical US\$550 plant pays for itself in between four and five years from savings in fuel, and even more quickly if the savings on purchased fertiliser are included. Most of the remaining energy cost is electricity, since nearly all cooking fuel is replaced by biogas.

Owners of piggeries often buy more pigs after they have installed a biogas system, because the elimination of odour and easy management of the pig manure make it attractive to expand their business. This demonstrates the success of biogas, but sometimes leads to problems if the plant is too small to handle the increased volume of manure. This is now discussed in initial meetings with potential biogas users, who are encouraged to install a somewhat larger plant if they are keen to expand their herd.

### Potential for growth and replication

There is still a huge potential market for biogas in Vietnam, with over two million families raising pigs, about half of whom could technically make use of a biogas plant. MARD and SNV aim to have directly facilitated the installation of a total of 107,000 biogas systems by the end of 2010, and 168,000 in 55 provinces by the end of 2012.

The success of the programme to date has shown that relatively small amounts of external funding (for training, management and subsidy) can leverage substantial private investment in biogas plants. MARD and SNV are now looking into ways of making the programme self-sustaining in the longer term, including introducing carbon finance as one source of funding.

MARD and SNV are also exploring the market for medium and larger scale biogas plants to keep pace with Vietnam's rural development. The biogas from such plants could be used for electricity generation. The programme is looking to partner with organisations such as the Asian Development Bank for future finance and to stimulate the accessibility of micro credit biogas customers.

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This report is based on information provided to the Ashden Awards judges by MARD, and findings from visits by members of the judging team to see its work in Vietnam.

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Pouring slurry on cabbage garden, Dong Xuan, Soc Son Province, Vietnam.

**“The slurry is really good for the tea, and my son sprays the bushes with it regularly; we get a lot better growth as a result and people say it tastes better, too. Our income’s gone up by about a fifth.”**

Mrs Do Thi Lap, Tea planter and pig farmer, Bac Son commune, Soc Son District.



Spraying slurry on tea, Soc Son Province, Vietnam.

**“Where did we get the cooking fuel from before? Look around you! There’s wood everywhere [meaning his trees]. But it took a lot of work cutting the wood, and then you had to store it so it seasoned.”**

Nguyen Van Vach, 65, Thuong Do hamlet, Hai Duong province.

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