



BIOGAS PROJECT DIVISION (BPD)

Bio-slurry utilization under Vietnam Biogas Program

1. Overview

The “Support project to the Biogas Program for the Animal Husbandry Sector in Some Provinces in Vietnam “(Jan-2003 – Jan 2006) and now “Biogas program for the animal husbandry sector of Vietnam bridging phase 2006” is jointly managed by Livestock Production Department (LPD) under Ministry of Agriculture and Rural Development (MARD) and the Netherlands Development Organization Vietnam (SNV-VN), with the BPD as the executive project agency. The Project has covered 24 out of Vietnam’s 64 provinces, supporting the construction of about 28,000 biogas installations.

One of the main objectives of the project is increasing the awareness of involved farmers and extension workers on the full extent of the potential benefits of biogas plants.

A number of activities relating to bio-slurry application in farming have been carried out under the project to reach the above objectives with some positive results and also raised issues/questions to researchers and extension workers.

2. Specific activities

Research - Priorities and how to apply bio-slurry farming activity under Vietnam conditions

Within the limited time of 3 years from 2003 to 2006, a number of priorities in terms of bio-slurry application to farming activities were identified.

- How to process bio-slurry “in liquid form” which is more difficult to transport compared to composted fertilizer,
- Compare bio-slurry with farm yard manure (FYM) in terms of nutrient content,
- What are the application doses of bio-slurry for main crops as rice, vegetable (cabbage) and peanut and,
- How to use bio-slurry as pig food.

Three researches¹ were carried out with the cooperation of national institutes and universities. From the three researches a number of conclusions can be learned:

- Due to containing high amount of cellulose composting bacteria, ammonification bacteria, yeast etc bio-slurry has a high potential for making organic fertilizer.

¹ Research “Using bio-slurry for cabbage” carried out with the cooperation of National Institute for Soils and Fertilizers in 2003; Research “Effect of different levels of liquid slurry in diets on the growing rate, feed efficiency, meat quality and economic efficiency of F1 crossbred fattening pigs” carried out with the cooperation of National Institute of Animal Husbandry in 2003; Research “Study on the usage and processing of bio-slurry as organic fertilizers for paddy rice and peanut on degraded soils” carried out with the cooperation of Department of Microorganism and Agro-chemistry, Hanoi Agricultural University, 2004-2005.

- Compost fertilizer can be made from liquid bio-slurry, rice straw, weed and supephosphate. After two months of composting, compost fertilizer which has the same quality with FYM is ready for use. The composting process is given in the annex 1.
- Bio-slurry from the digester fed with pig and cow dung contains almost all substantial nutrients for agricultural crops. The content of nitrogen, phosphorus and potassium (NPK) in bio-slurry in terms of total content and applicable content is higher than those in FYM.
- Using unprocessed bio-slurry or composted bio-fertilizer for rice/peanut/cabbage with appropriating dose can replace manure and chemical fertilizer as in traditional cultivation while remain the yield and quality of the product. By using bio-slurry to replace chemical fertilizer for summer rice and spring peanut, approximately 12-44 euro/hectare/harvest and 62-122euro/hectare/harvest can be saved respectively.
- Bio-slurry liquid can be used as additional pig food with the dose of 1-2 kg/1kg of foundation food to help increase the food and nutrient intake and the weigh gain of pig².

Demo plots- Bring the theory to the reality

So far 30 demo plots have been set up project-wide concentrating on different purposes of using bio-slurry as fertilizer for vegetable, rice, maize, flower, tea, fruit, and food for pig and fish. After each plot operated a report was made stating outcomes, shortcomings and recommendations.

Four remarkable examples

Tea in Thai Nguyen province

The households used liquid bio-slurry to replace totally chemical fertilizers which used to be indispensable for tea growers. The tea yield was increased by 11%, created net saving of 5.5euro/360m²/harvest (1 sao). Other important norms were improved including good tender tea leave with a increase of 1,45%; leave were greener; better quality tea product leading to better selling prize accordingly.

Fish pond in two provinces of Tien Giang and Hai Duong³

Mature fish in Hai Duong

- Using bio-slurry for fish pond⁴ helped saving 40% fish-food cost; eliminating head floating phenomena which is very common when apply fresh dung; increasing productivity 12% equaling to 1,000euro/ha/harvest. Average two harvests can be carried out per year.

Nursery fish

- Using bio-slurry as fish-pond⁵ improver helped saving 67% fish-food cost equaling to 375 euro/ha/harvest. One harvest lasts for 3 months.

² The material and methods applied is in annex 2.

³ Tien Giang is in the south and Hai Duong is in the north of Vietnam

⁴ African carps were kept in the fish-pond

⁵ Assorted fishes include tench, dory carp and black carp were kept in the fish pond

Vegetable in Hanoi

The below comparison is between an area with bio-slurry treatment and an area in which NPK is used in a tomato demo plot in the suburban of Hanoi

	Treatment (using bio-slurry)	Control (using NPK)
Area	360m ²	360m ²
Productivity	1.2 ton	1 ton
Fruit shape	bigger	smaller
Times of applying pesticide	3 times/harvest	3 times/harvest
Pests appearance	non	Aphis gossypii, Fleas beetle

Pig food in Daklak province

Using liquid bio-slurry as additional pig food helped increasing profits 9-11 euro/pig head/feeding cycle⁶ (through saving foundation food) and eliminating digestive disease of the pigs.

3. Restrictions in applying bio-slurry

Some difficulties were raised when bio-slurry was introduced to the users:

- Bio-slurry is mainly in liquid form making difficult for transportation especially in Vietnam where the place of application is normally far from slurry pit.
- Awareness of farmers/users: Despite a lot of commune promotion workshops have been carried out, the awareness of biogas users is still limited.
- Lack of labour: Some households prefer using chemical fertilizers as using bio-slurry or composting bio-fertilizers take time and cost labour force.
- Traditional habits in farming activity: There are some restrictions when introducing compost method in southern provinces where people do not have habit of making compost fertilizer from on-farm residues and as bio-slurry.

4. General observations regarding bio-slurry from biogas user survey and field trips

Biogas user survey

Out of 100 surveyed households 40% were using bio-slurry in their farming activities. The remaining 60% were non bio-slurry users. There are many reasons for this status including: no need of using; do not know how to use; do not believe in the value of bio-slurry fertilizer and liquid form of slurry is difficult to carry.

The lesson-learned is that more innovative and practical propaganda and training manner should be used in the coming years of the Project.

⁶ One cycle lasts for 2 months; the average initial weight average was 20kg.

From 100 surveyed households in 4 provinces and cities, study team selected 3 households, two from Hoa Binh and one from Tien Giang, who effectively use bio-slurry. The summary of survey results is presented below

+ Bio-slurry use in crop production

- Using bio-slurry to replace chemical fertilizers
- Watering plants and vegetables in order to get safe vegetables

+ Bio-slurry use in husbandry

- Reducing 20% of cost thanks to use of bio-slurry for fish pond (cat fish and African carp)

There are four factor groups for success in bio-slurry use in the biogas project namely i) technical assistance from the project (extension worker); ii) financial assistance from the project; iii) dissemination of information and making propaganda; and iiiii) policies and guidelines of local authorities.

The lesson-learned is when people understand benefits of many aspects of the biogas plant and receive support from extension workers they are willing to use slurry as clean fertilizer, food for animal and fish to increase additional income apart from using gas.

Field trips

During field trips carried out in 2005, 169 households were visited and asked about bio-slurry use as fertilizer and/or as pig-food. The following results were learned:

- 69% use bio-slurry as fertilizers for different crops and for fish-pond. No case of using bio-slurry as pig-food was reported.
- Among 31% do not use bio-slurry 24% households have no need to use while 7% do not use as their biogas plants have just been constructed.

Together with the findings of the biogas survey it is estimated that about 50% of the biogas users of Phase I use bio-slurry.

In 2006, out of 171 households were visited 123 are slurry users.

5. Plan for future

Strategy

Enhance the slurry use among biogas users under Biogas Project Phase II, reaching 100% of biogas users.

Approaches

Promotion: Improve the promotion by

- Develop videos on using bio-slurry
- Develop 3 in 1 demo plot materials⁷
- Combine information with promotion on other subjects

⁷ 3 in 1 model is “Pig, biogas and crops (or flower, fruit tree, fish)” model

Training for users

- Set up demo-plots in project provinces with instruction from BPD;
- Introduce successful demo-plots to biogas users;
- Set up commune/village interest clubs where training/experience exchange can be done by farmers.

Cooperation

- Seek cooperation with (I)NGOs and institutes and universities who interested in bioslurry matter.

Annexes

Annex 1

Composting process

- Dry rice straw and weeds until they get withered. Put them in layers on the hard ground (or in pits) next to the compensating tank with a roof. Add 0.5-0.7 % of lime.
- Apply liquid bio-slurry properly onto whole organic layers and mix these layers so that the liquid imbue well the organic materials. Amount of liquid bio-slurry should be 3 times more than organic materials.
- Then, maintain the humidity of the heap by watering it at 2-3 day interval with the liquid bio-slurry of 15 liters. When the temperature of the heap reaches 40-50⁰C more watering is needed, then compress it well to avoid nutrient losses.
- In 2-3 weeks, mix the heap up down and add supephosphate 2% by volume, then compress it well as before.
- After 1,5-2,0 months the composts have the similar appearance with manure and they are ready for use.

Annex 2

Materials and methods applied for the research “Effect of different levels of liquid slurry in diets on the growing rate, feed efficiency, meat quality and economic efficiency of F1 crossbred fattening pigs”

A total of 36 F1 crossbred fattening pigs (Mong cai local sow x Yorkshire boar) of 21 kg average initial weight were put at a household which was using a biogas system. The pigs were divided into 12 pens (2 males and 1 females in each pen) consist of 4 treatments replicated 3 times following a completely randomized design. There was no significant difference of breeds, age, sex and other conditions of the pigs in all pens.

Pigs in 4 treatments were fed with 4 different diets. Pigs in treatment 1 were fed a basal diet consisting of maize meal, rice bran, soybean meal, cassava meal and fish meal which were formulated to meet requirements according to the recommendations of NIAH (2001) for crossbred fattening pigs from 15-50 kg of weight and 50 kg-slaughter. The samples of the feedstuff were taken to analysis for nutritive values (dry mater, crude protein, ask, fiber, NDF, calcium, phosphorus) before formulating the balance diets. Pigs in treatment 2, 3 and 4 were fed the basal diet mixing with liquid bio-slurry at 3 different levels as 1, 2, 3 liter/kg of feed, respectively. The bio-slurry was being taken out from a 10m³ biogas

container after 2 months of fermentation, which was recharged by pig manure. The samples of bio-slurry were taken every month to analysis for nutritive values, and some heavy elements. The experimental design is shown in Table 1, and the formulation and chemical composition of basal diet is shown in Table 2.

During the experimental period the pigs were fed semi ad-libitum twice per day, at 8.00h and 16.00h, which is the normal practice of the farmers in the village. The semi ad-libitum system is as follows: the amount of feed remaining about 4 hours after every feeding were recorded, then in the next meal, the amount of feed offered were adjusted by this amount, so that the feed refused after around 4 hours were consumed before the next feeding. Feed offered was weighed and recorded daily for calculation of feed intake. The pigs were weighed in the morning before feeding at the beginning and at the end of each period (50 kg of weight and before slaughtering) to determine live weight gain and feed conversion ratio. At the end of experimental period, the samples of liver, kidney, heart, lung and intestine of 3 pigs which were taken randomly from each treatment to analyse for parasites and disease symptoms. Samples of meat from these pigs were also taken to analysis their quality as smell, taste, dry mater and heavy elements.