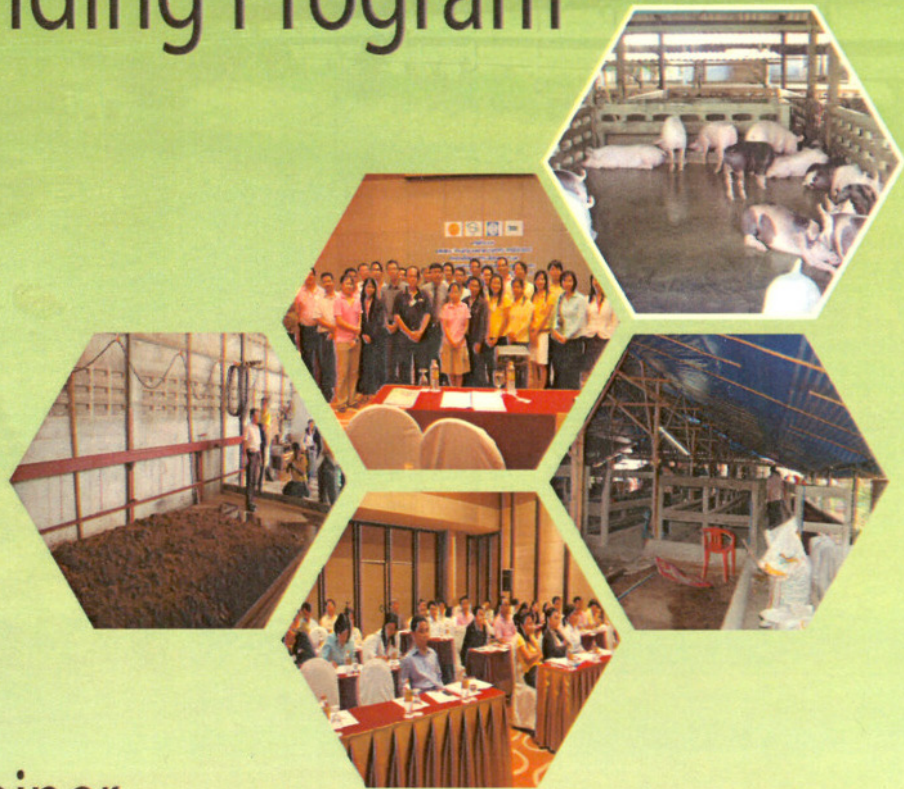


Capacity Building Program



Training of the Trainer

"Pig Waste Utilization for Agriculture Purpose"

By
Department of Livestock Department

Supported by
The World Bank and Global Environment Facility

Project Under
Livestock Waste Management in East Asia Project



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Chapter 1

Introduction

This project was made for the training purpose in order to provide the knowledge of pig waste utilization for agriculture to the DLD central officers who would like to be qualified trainers in the future. After training completion, the experts should be able use and apply the knowledge learned to help solve pig farm problems. The content of training curriculum includes the benefits for agriculture of pig farm waste utilization.

1.1 Objectives

- 1) To demonstrate and disseminate of pig waste utilization technology to central officers
- 2) To give knowledge on fertilization from livestock waste and earth worm cultivation by livestock waste
- 3) To increase skills and capabilities future trainers under Environmental Training Project

1.2 Expected results

- 1) To increase knowledge on fertilization composting and earthworm cultivation
- 2) To increase knowledge and ability of trainers in giving environmental management consultations to pig farmers and related organizations.

1.3 Scope of works

- 1) Prepare overall pictures of training curriculum under the guidelines of project plan by defining the target groups, number of participants, type and training methods, assessments and the result after training.
- 2) Choose suitable curriculum and prepare contents for trainings
- 3) Prepare all necessary materials, equipments and all Medias for training both in forms of textbooks and CD-ROM.
- 4) Organize the trainings under approved guidelines.
- 5) Organize places and hotels to conduct the training

- 6) Provide all facilities needed for the training for example LCD computers and etc.
- 7) Provide assessment test including the reports after the training

1.4 Scope of content for the training

The content of this training course includes the following.

- 1) Fertilization from livestock waste
- 2) Earthworm cultivation by livestock waste

1.5 Detail curriculum of pig farm experts development

Training of trainer for master trainers from relevant government agency

Detail of the training/seminar/workshop content will be;

- 1) Structure and content of the program: Prepared by the consultation company under an approval of board of directors of this project and Food and Agriculture Organization (PMO and FAO)
- 2) Seminar period: 3 days sessions
- 3) Training location: Bangkok
- 4) Participation number: 30 persons

1.6 Guideline of implementation

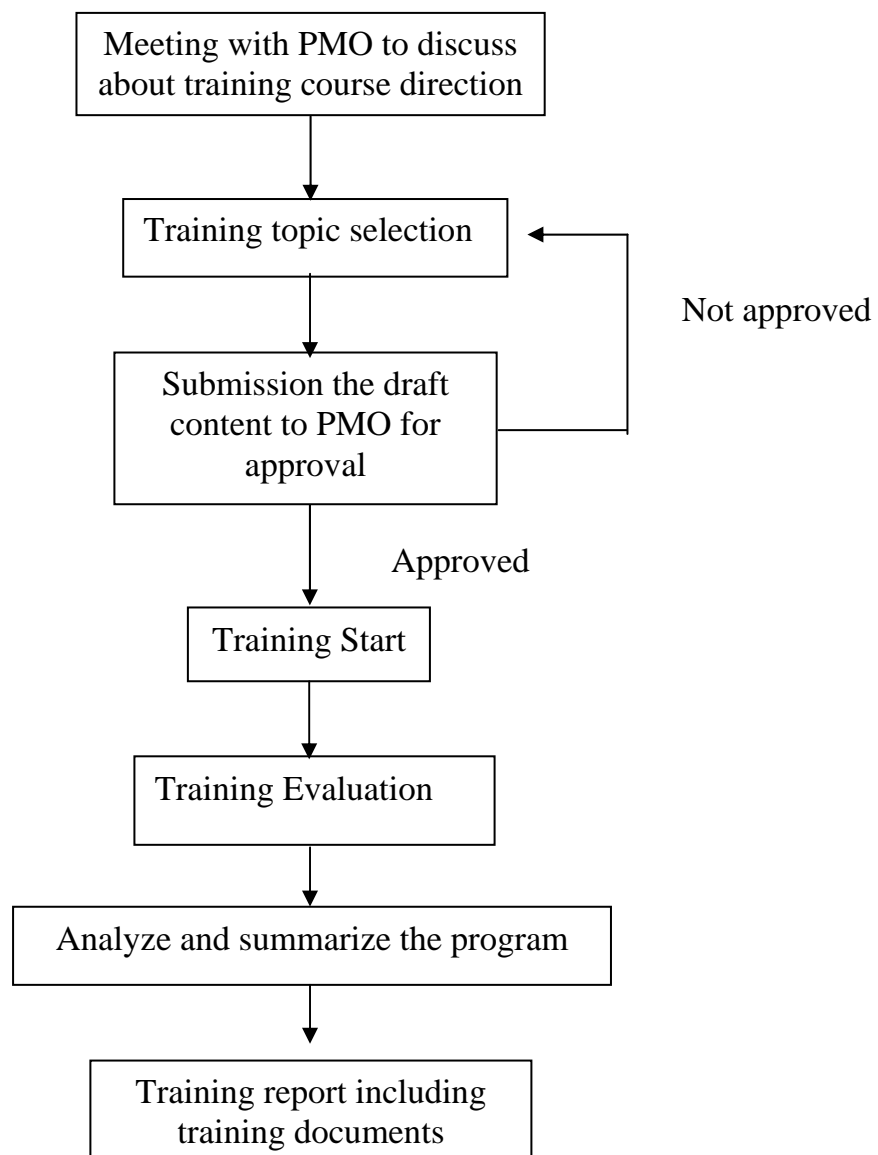
- 1) The plan and details of this initiative submitted to the board of directors of this project for review and primary approval plan include the following.
 - Structure and content of each course
 - Time schedule of each course
 - Training method and evaluation
 - Training tools and materials
 - Training location
- 2) Organize the training process, training place, materials, tools and other necessary facilities for the training
- 3) Prepare before and after assessment

Chapter 2

Implementation Methods

2.1 Training course development

The course selection process is chosen by the consultation company officer. It covers the target group, which the consultant has planned for the method of course development to achieving objectives set. The detail shows in picture 2.1-1.



Picture 2.1-1 Course Development Process

2.2 Training course selection

For training topic selection, the consultant has completed the following process.

- 1) 1st stage: The consultant proposed a summary of course content which includes the training method from chosen experts to the Project Management Officers (PMO) of this project for approval.
- 2) 2nd stage: After PMO approved the training topics from the first stage, the consultant continued to contact chosen experts for further course training preparation.
- 3) 3rd stage: After the 1st stage approval, the consultant searches for training location at the same time as 2nd stage due to time limit. The details of preparation includes:-
 - Submit a draft of training locations for approval
 - Contact the training place and the transportation agency
 - Visit all sites for consideration
- 4) Report to PMO a detail of training plan, schedule and visited site

2.3 Training plan

The methods of training plan for training course trial developed consists of the following.

2.3.1 Preparation

- 1) The consultant arranged the meeting with the organizer team for plan preparation thoroughly
- 2) Contact and invite certified lecturers for the training and send training plan and material for review
- 3) Contact training place organizer and transportation arrangement for the training
- 4) Prepare training materials for participants
- 5) Prepare training schedule and assessment test forms for participants

2.3.2 Participants contact

The consultant contacts the target groups by sending invitation letters issued by the Livestock Waste Management in East Asia Project (LWMEA). This invitation letter contains the training schedule and registration form. The target groups include the different organizations such as Department of Livestock

Development (DLD) provincial office, Pollution Control Department (PCD), Department of Alternative Energy Development and Efficiency (DEDE), and etc.

2.3.3 Training registration

The consulting recruited the participants by following activities.

- 1) Public relation by different medias and inform different related organizations in the field of pig farm waste management such as Department of Livestock Development (DLD) provincial office, Pollution Control Department (PCD) and Department of Alternative Energy Development and Efficiency (DEDE), etc. The participant registered the training course by telephone or fax and defined the interested training date in the reply formula.
- 2) After the participant sent their registration form, the consultant will contact them for reconfirmation a few days before training date.

2.3.4 Training location

Consultants selected hotel, which was convenient to the target group and training course in Bangkok area. Location of the hotel was easy to find and the hotel provided all training facility such as backdrop, welcome labels and room directions.

2.3.5 Training complementary

- 1) Provide snacks, soft drinks, tea and coffee breaks everyday
- 2) Provide lunch

2.3.6 Preparation before the training day

The consultant submitted the planning schedules, documentations and media for this program to PMO committee for approval before the training start.

2.3.7 Organization process during training

- 1) Participant registration for each training day
- 2) Distribute the training documents including additional material for each participant
- 3) Distribute the training evaluation form before and after the seminar
- 4) Site visiting for this training group

2.3.8 Organization process after training

- 1) Summarize the participant list in every training program and verify the names
- 2) Check the evaluation form and summarize questionnaires
- 3) Evaluate the training contents and lecturers
- 4) Report the operation results

Chapter 3

Training Procedure

3.1 Training course need analysis

This training course is a train-to-trainer course for developing the DLD central offers as a future qualified trainer. It is agreed that the content should be advanced with high level knowledge in terms of environmental technology regarding pig farm waste utilization. The participants should have a basic knowledge of environment and should have been in some waste management trainings. Hence, the original training structure should be adjusted to objectives set. The committee agreed that the consultant should invite only experienced experts who have deeply knowledge and performance of waste utilization. The consultant however had proposed the name of experts, their CVs and the summary of the training to PMO and FAO for consideration and approval under the aspect as described below.

- Intensive information for pig farm waste utilization
- Understand working process of each system
- Ability to manage each system
- Specific skills and able to apply to each system suitably by realizing a value of ecology and economy.

3.2 Training content

The working committee proposed to experienced experts to be lecturers for the training to PMO and FAO for selection. The contents focus on waste utilization which is dept in details so that the future trainers can bring knowledge and solve environmental problem productively. The content of curriculum was shown in table 3.2.1.

Table 3.2.1 Topic and training content for training of trainer program

Topic	Training content
Soil Water and Fertilizer	<ul style="list-style-type: none"> ▪ Soil Component ▪ Soil Characteristic and Important Qualification ▪ Soil Examination and Soil Management ▪ Type and Fertilizer Characteristics
Standard pig farm waste utilization	<ul style="list-style-type: none"> ▪ Wastewater utilization form facultative wastewater treatment ▪ Waste and wastewater utilization from biogas system ▪ Making advance pig waste compost ▪ Liquid bio fertilizer from compost ▪ Earthworms cultivation to digest animal manure ▪ Extract of Earthworms bio-juice

Abstract of first day presentation by Assistant Prof. Dr. Suthep Thongpae

In the past, growing crops were not complicated as the present. Growing crops was very simple. The farmers were not need to use many tools. There was no fertilizer used, not pesticide for killing plant insects. At the present, for better productivity, farmers need to learn specific type of crops, climate, type of soil, tools, fertilizer and pesticide products. The reason for this is to supply agricultural goods to increasing demand.

Not only that farmers need to think about the productivity, the quality of agricultural goods is also important, for example, the taste, the color, the size and health benefit. Most importantly, there should not be any toxic remained.

Soil in each area has different character. Some soil is good for rice cultivation but some area should not be used for agriculture purposes. If the soil is repeatedly

used for the same type of plant for a long period of time and is not reused properly, soil in that area would degenerate and cause different problems. In some area, soil is good and suitable for growing plants, but it is used for the other purpose for instance housings, factories and etc. Thus, famers have choices to use unsuitable soil for cultivation. However, before cultivation farmers should know all problems and soil improvement.

Nowadays, lots of farmers manage their soil without knowing the real problem, which could prevent the optimization of the soil. In some cases, instead of solving the problem, the farmer loses money, man power and soil utilization.

Fertilization is one of main condition to increase soil mineral but each fertilizer has its character, mixture and quality. If the farmers do not understand and use it for their land, this could not increase its production but the farmer will lose more money, man power and soil condition. Bio compost from pig manure is one solution to improve their soil quality and save the money.

Water is also important for cultivation including aquatic animals. Water quality will change its character due to soil condition, which might not be suitable for agriculture or aquatic animals' cultivation. Treated wastewater from pig farm can serve as a function as liquid fertilizer for agriculture purpose and can help the plantation farmer save money.

For this reason, learning the fundamentals of soil, fertilizers, and water in term of quality will provide the management methods which is necessary to improve the quality and provide the best way to help the farmer to mitigate their problems.

Abstract of second day presentation by Associate Prof. Dr. Somchai Chansawang

Pig farms cause a lot of environmental problems such as wastewater, odor and solid waste. There are different methods to solve this problem beginning with farm standard system, waste management in the farm, and using an end of pipe system with biogas technology. Wastewater treatment from pig farm can produce biogas. This technology is familiar to many organizations and represented as pig farm solution for environmental problem. From this treatment system bio compost in sludge form and treated wastewater could use as bio fertilizer.

This training provides knowledge of utilization of biogas treated manure and wastewater. Furthermore, the participant will learn more of bio – Fertilization of microorganism treated wastewater, which can persuade the background of waste utilization for agriculture purpose.

Biogas wastewater treatment technology is very effective in term of investment and environmental improvement. Disadvantage of this technology is a time-consuming. It requires long period of time for treating waste and wastewater,

which might not be suitable for some situations. Furthermore, the bio compost, which is a by product of biogas wastewater treatment, is not price effective for the general populous. The farmer should learn more how to value add this product. Cultivation of black soldier fly worm is one alternative to increase the waste value.

Earthworms, by nature, will digest waste from farm or bio waste into bio compost, and it can increase the treatment period. Waste from their waste consumption can use as a bio fertilizer. Beside, worms can be used in fishing or as food for fish, or chicken farms. The training will begin with general information, insect type selection, cultivation conditions, and product and market potential including case studies.

3.3 Training component

1) Training schedule – From the expert references, the propose training topic needs at least 1 day training for each lecturer because there was a lot of information content. Moreover, some topics are not familiar to the participant; therefore, they might need to know more detail and ask more questions. This requires more time for discussions. For this reason, the consultant defines the training time for each topic at 1 day and site visiting 1 day. Totally training day are 3 days as shown in table 3.3-1.

Table 3.3-2 Time schedule for training

Topic	Time (day)
Soil water and fertilizer	1
Standard pig farm waste utilization	1
Site visiting for compost	½
Site visiting for worm cultivation	½
Total	3

2) Training protocol

Training protocol is described as following.

- Open ceremony
- Explain all documents and collect before training evaluation forms
- Presentation from the lecturer

- Site visiting
- Fill the after training evaluation forms
- Close the training

3) Site Visiting: main objective of site visiting is to show real situations. So the participant could understand more after training session. Moreover, the participant interested to ask for practical operation including problem and obstacles during the operation work from compost plant owner and worm farmer. Condition of site visiting is described as follow.

- Location of site visiting should not be far from hotel
- Site visiting should related to the training course
- Real practical work and could utilized the production in the real situation
- Business owner had long operation experience and could explain the whole process work including capable to present advantages and disadvantages of the business.

4) Amount of participant: Amount of participant should be limited to 20 – 30 persons because of the following reasons.

- Different educational background from each participant
- Some training topics focus intensively academic content
- Time for lecturer to answer the questions
- Sufficient time for participant to share their experiences and ideas including asking the lecturer

5) Indoor presentation and site visiting

- Due to the target groups are from Department of Livestock Development (DLD) head officer and related organization such as Pollution Control Department (PCD), Department of Alternative Energy Development and Efficiency (DEDE). Their office locations are in Bangkok. Hence, the training location should be located in Bangkok which is easy for traveling.
- As the training location is in Bangkok; thus, the visiting site should be close to Bangkok area. It is assigned that the place for compost plant is in Saraburi and earthworm cultivation at Nokorn Pratom province. Time for traveling and all activities should not more than 1day. After course analysis and course selection, the consultant begins to organize

the training as shown in table 3.3-2 and detail of training schedule as in appendix a.

Table 3.3-3 Training component definition

Training component	Detail
Total training day	3 days
<ul style="list-style-type: none"> ▪ Indoor training ▪ Site visiting 	2 days 1 day
Amount of participant	30 persons
Location	Bangkok

6) Lecturer: The consultant invites different experts who have a long experience as shown at table 3.3-4.

Table 3.3-4 List of lecturer and presentation topic

No.	Name	Presentation Topic	Time (day)	Experience (Year)	Expertise/Position
1	Ass. Prof. Dr. Suthep Thongpae	Soil water and fertilizer	1	29	Assistant Prof. - Faculty of soil, Kasetsart University, long experience as manager and expert in different project such as soil analysis for agriculture purpose and lots of research such as different type of compost etc.
2	Prof. Dr. Somchai Chansawang	Standard pig farm waste utilization	1	31	Prof. Degree 9 - faculty of veterinary, Kasetsart University, long experience as manager and expert in different project such as clean technology for pig farm and lots of research such as farm waste treatment and waste utilization including biogas system.

7) Participant qualifications

Since this target group was Department of Livestock Development (DLD) central officers and they needed to develop the trainers in the future. Participant qualifications are defined as following.

- Minimum bachelor degree or participated in related training topic
- Must have basic knowledge of livestock, agriculture environment and renewable energy etc.
- Regular work should related to training course

8) Training course evaluation

Questionnaire for this target group was classified into 3 parts following

- Questionnaire regarding to the understanding before and after the training with emphasis to both training topic
- Training satisfaction
- Training recommendation

The consultant distributed evaluation form before and after the training

3.4 Training arrangement

Training arrangement: After PMO approved the training content and condition, the consultant began to organize the training course and invited the participants as describe in chapter 2. The invited organization and registered participant was shown in table 3.4.1.

With the approved schedule, the consultant organize the training from 16 – 18 September 2008 at Eastin and Spa Hotel, Bangkok as shown in appendix a and picture 3.1 to 3.3

Table 3.4-1 Invited organizations and registered participant list

No.	Description	Participant (person)	
		Invited	Registered
1	Animal hygiene and sanitation office - 1	1	1
2	Animal hygiene and sanitation office - 3	1	1

3	Animal hygiene and sanitation office - 4	1	1
4	Animal hygiene and sanitation office – 6	1	1
5	Animal hygiene and sanitation office – 7	1	1
6	Animal hygiene and sanitation office – 8	1	1
7	Animal hygiene and sanitation office – 9	1	1
8	Songklar – provincial livestock office	1	1
9	Nakorn Protom – provincial livestock office	2	1
10	Ratchaburi – provincial livestock office	1	2
11	Chonburi – provincial livestock office	1	1
12	Nakorn Nayok – provincial livestock office	1	1
13	Chachung Sao – provincial livestock office	2	1
14	Supanburi – provincial livestock office	2	2
15	Prachin Buri – provincial livestock office	2	2
16	Lopburi – provincial livestock office	1	1
17	Saraburi – provincial livestock office	1	1
18	Nakorn Sawan – provincial livestock office	1	-
19	Pranakorn Sri Ayuttaya – provincial livestock office	1	1
20	Livestock Environment Division, DLD	5	5
21	Water Management Division, PCD	3	3
22	World Bank	1	1
23	Food and Agriculture Organization	1	1
24	Thailand Environment and Energy Development	2	4
	Total	35	35



(a)



(b)



(c)



(d)

Picture 3.1 (a) – (d) Training of trainer course at Bangkok



**Picture 3.2 Site visiting for training of trainer course
Compost factory at Saraburi province**



Picture 3.3 Site visiting for training of trainer course
Worm cultivation farm at Nakorn Pratom province

Remark during the training

- 1) Participant was from different organization. It showed that this training showed lots of interest
- 2) Interesting during the training:
 - Lot of participants showed their interest during the training
 - They were interest in the training content and intended to apply this information in their organization.

3.5 Training evaluation before and after the event

Evaluation forms before and after the training was distributed with training document. They collected after open ceremony and at the end of training event. The result of training evaluation before and after the event was shown at table 3.5-1 and appendix b.

Table 3.5-1 Training evaluation before and after the event

Description	Level of knowledge	
	Before the training *	After the training **
1. Do you have any idea about reuse/recycle and utilization: similarity – different and advantage - disadvantage?	Middle	High
2. Do you have any idea about pig manure utilization with standard and safety?		
2.1 Wastewater utilization from stabilization pond	High	High
2.2 Sludge and wastewater utilization from biogas system	Middle	High
2.3 Rapid composting of pig manure	Low	High
2.4 Compost tea	Middle	High
2.5 Worm cultivation for animal manure digestion	Low	High
2.6 Worm tea	Low	High
2.7 Insect utilization for animal manure management	Low	High
3. Do you have any idea about soil?		
3.1 Soil component	Low	High
3.2 Important character and condition	Low	High
3.3 Soil quality checking	Low	High
3.4 Soil management	Low	High
4. Do you have any idea about fertilizer?		
4.1 Sort of fertilizer	Low	High
4.2 Character of fertilizer	Low	High

Remark: * Number of reply formula was 31 ; ** Number of reply formula was 28.

1) Training content

From the evaluation result, the training was very successful because the participants understood the topic very much and the result form table 3.5-1 could summarize the following description.

- General Information: From the evaluation result, the participant's knowledge was at middle level at app. 68% before the training. After the training, the participant got higher knowledge for more than 54%.
- Standard pig farm waste utilization: Before the training, the participant's knowledge was at middle level for the topic of manure and wastewater utilization, produce compost from pig manure and making compost tea from compost at 58 – 74%. For worm cultivation, making worm tea and worm for waste management at low level about 77 – 80%. After training, majority of participant increased their knowledge in topic at high level especially pig waste utilization at 46 - 64%. It could be said that this training topic was successful.
- Soil water and fertilizer: Almost all the participants had very low information regarding soil water and fertilizer before training at 45 – 77%. After the training, participant increased this knowledge at high level with 43 – 67%. It would say that almost all of the participants were not familiar with this topic before participate the training even this topic was related to pig farm waste management because pig manure was a good compost material. Related officer should understand compost character and how to apply it in the proper way. By the result of the analysis, this training could increase participant's knowledge which was the main project objective.

2) Training satisfaction

The participant was very satisfied in every aspect such as training location, training schedule and detail of document. The result was at high level with 57 – 89% from total reply forms.

3) Training recommendation

From the analysis result, the participant needed to continue this training, required to adjusted/improved the training content and increased time schedule for the training by 50 - 75%.

4) Training content, which need to adjust/improve was shown following.

- Require to add Biogas system
- Require more information for waste utilization in different method

- Require documents in from of soft copy
- Require economic analysis which related to waste utilization

3.6 Summary of training evaluation before and after the event

Result of this training defined as average to good level and was successfully under the objective aspect even through there were lots of different recommendations but it was a kind intention to complete the training content. PMO should consider this comment for future training.

Chapter 4

Project Summary

4.1 Summarize overall project operation

4.1.1 Amount of participant

This target group was participating in the training and received environmental knowledge. Furthermore they could develop their intensive technical know-how, which increased their capability as a future trainer. At the same time, this training enhanced their environmental awareness for sustainable development. Total participant number was 35 and higher than expect and for site visiting, there were 28 persons joining this activities. It showed that the participant's interest in this training event.

4.1.2 Result of training

This training meets project objectives and receive good cooperation from every target organization in term of cooperation and training.

4.1.3 Work procedure

The consultant preceded the work under PMO recommendation as followed.

- Selected training topic
- Proceeded training
- Evaluated training course from participant

4.2 Recommendation for future training.

This training course is an important mechanism in developing human resource for environment technology. Department of Livestock Development (DLD) is the key organization to support this project and is intended to increase capability of environmental technology to their personnel which could disseminate the information to pig farmers and others related to the organization. Hence to the training are not being familiar to the Department of Livestock Development (DLD) officer, this kind of training should continue for future training, which could open Department of Livestock Development (DLD) staff to access more various information.



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