

The Feasibility Study Summary Report for CDM/JI in Year 2008

Title

The feasibility study for CDM project to utilize effectively the biogas at the swine farms in Thailand

Entity

Chuo Fukken Consultants Co., Ltd.

1. Description of Project

(1) Host country, region

The northern part of Thailand

(2) The outline

The project sites are eleven swine farms (five existing and six new farms) owned by ‘Project Owner’, Charoen Pokphand Northeastern Public Co., Ltd. and other three companies as shown Table 1.3.1. It is producing the methane gas CH₄ that is released into the atmosphere at the project sites – swine farms under the current situation where the swine manure is treated by the anaerobic digestion system in the open lagoon.

Since there is a concern about the air (odor) pollution to the nearby communities by the emission of the CH₄ from open lagoon, it is in great demand to review the present open lagoon system at on-site.

In consideration of the current condition, the project is to recover methane gas by installation of the bio digester without the emission into the atmosphere. It is also to utilize the methane gas recovered as fuel for generation by installation of the biogas power generator and the sludge after fermentation of methane gas as the organic fertilizer.

Since the project cannot be secured economically without revenue from trading of CERs, it can be demonstrated the additionality based on the investment barrier.

2. Description of Study

(1) The subject

The main subjects are shown the followings as for the feasibility study of the proposed project. The below No.1 the suitability of the starting of the project activity was materialized of the process for project owner to decide its starting as CDM project based on the investment barrier.

1. The suitability of the starting of the project activity
2. The accuracy for reduction calculation of GHG emission
3. The examination of cost reduction for the project profitability
4. The agreement with the swine farm’s managers and employees regarding the project
5. The understanding of nearby communities regarding the project
6. The study / examination for the approval by DNA in host country

(2) The organization

1. The cooperative entity in host country and the role

(a) Charoen Pokphand Northeastern Public Co., Ltd. and other three companies (hereafter, 'CP')

CP is supposed to be the project owner who possesses the project sites as well as the project investor who bears in a part of project cost.

(b) A.T.Tri Co., Ltd. (hereafter, 'A.T.Tri')

A.T.Tri shall gather basic information about host country, measure at on-site study, examine the on-site manufacturers regarding the construction and management of the facilities and instruments, support hearings (stakeholders' comments) and collect the basic information at the preparation of PDD.

2. The cooperative entity in Japan and the role

(a) Sumitomo Mitsui Banking Corporation (hereafter, 'SMBC')

SMBC shall entirely arrange the entire project, support the operation on-site (for example, support of consultation/arrangement with the project owner) and examine the fund plan (for example, negotiation with the investor of project fund).

(b) The Japan Research Institute, Limited.

The Japan Research Institute, Limited shall advise technically and confirm the content and format of PDD regarding the on-site study, examination of baseline and monitoring plan in order to review the plan and findings of study.

(3) The description

1. The outline for implementation to study on-site

The first on-site study was implemented on September 22-26, the second on November 11-14. On-site study was consulted the meeting with the project owner, CP and the DNA in host country, TGO and the project site visit etc.

2. The outline for the result to examine the subject of study

(a) The suitability of the starting of the project activity

The project at both existing and under-construction farms cannot be secured economically without revenue from trading of CERs, it can be demonstrated the additionality based on the investment barrier. Specifically, it cannot be returned the investment without revenue from trading of CERs because the expense shall exceed the revenue annually. It is required to sell the credit with over US\$13.00 per ton during ten years (from 2010 to 2019) in order for IRR to be over 10%.

At the demonstration of additionality for the project, in compliance with Executive Board Annex 46 the evidences can be considered the following data made and issued before the start date of the project.

<<The Evidences for the demonstration of additionality>>

1. Memo for investment barrier that CFK presented at the meeting on 22nd of September 2008.
2. The meeting of minutes described the decision to proceed the project as CDM framework in the meeting among concerned parties at CP.
* It was already confirmed among them that it couldn't be realized itself without CER based on the meeting and memo on Sep. 22nd, 2008.
3. Memorandum of understanding among CP, SMBC and CFK
*It was concluded MOU among three parties under the above common recognition.
4. The Letter which had presented for TGO at the start of project

(b) The accuracy for reduction calculation of GHG emission

The formula for calculation of VS (Volatile solids) under AMS-III.D is shown three as below. The project shall be applied 3. Default value in consideration of the restriction on implementation for monitoring. For the purpose of accuracy for calculation, it was conducted the comparison by the means of 2. The Feed Intake and 3. The default value. As the result, the default value shall be applied the value of Western Europe and the reduction of GHG emission shall be approximately 24,000 (t-CO₂e/year).

<<The Formula for calculation of VS (Volatile solids) under AMS-III.D>>

1. The calculation used the data from nationally published sources in host country
2. The calculation estimated from feed intake levels)
3. The calculation used IPCC default values

(c) The examination of cost reduction for the project profitability

It is required to sell the credit with over US\$13.00 per ton during ten years (from 2010 to 2019) in order for IRR to be over 10%. Due to the success of project even with the lower price of credit, it is under examination for cost reduction by comparing of purchase, installation and maintenance for the power generators with various manufacturers.

(d) The agreement with the Swine farm's managers and employees regarding the project

The project is required to be conducted the maintenance and monitoring of bio digesters or generators etc at each swine farm. Accordingly it is under examination to alleviate the workload on employees by monitoring automatically as much as possible. These operations of the project are supposed to be agreed by farm's managers and employees with their understanding.

Due to the agreements it was conducted the stakeholders' comments at the existing farms with the site reconnaissance, hearing from owners as well as the explanation of the project and monitoring operation. They were satisfied with the recovery of methane gas by bio digester and the electricity generation from recovered methane gas with their understanding. In addition, some of them also showed interest by cooperating to participate in monitoring operation.

(e) The understanding of nearby communities regarding the project

It is under implementation of stakeholders' comment for nearby communities and local government. The hearings at nearby communities are conducted by two methods, both of door-to-door visiting and meeting. At the moment it was completed at three farms.

The ninety percents of nearby communities were in favor of the project and its implementation from hearing.

(f) The study/examination for the approval by DNA in host country

At the first on-site study (on September 24, 2008), it was conducted the pre-meeting with TGO before the start of the project and the outline was explained. In the meeting they provided us the instruction and the advices for the essential documents at the approval by DNA. There was no indication of problem and trouble for the project itself at the approval by DNA.

Regarding PDD/IEE reports, it is required to be submitted upon enough accuracy and completion in order to avoid turndown by the board. Accordingly CFK asked them if it would be possible or not to be advised or commented by TGO for the interim report before the each completed one and they gave us their consent. In line with this, at the second on-site study (on November 13, 2008) it was provided by TGO the review and advises for the draft of PDD and IEE reports.

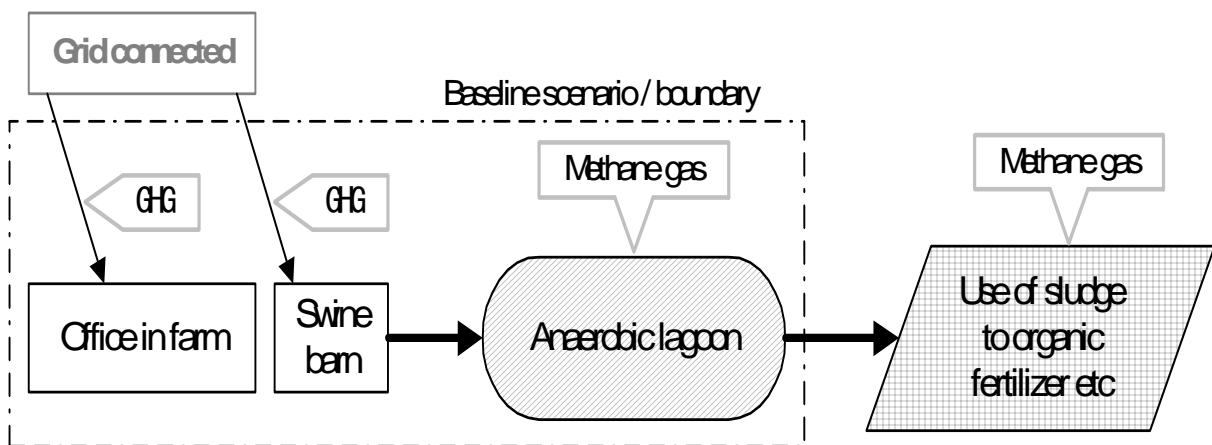
3. The profitability of project

(1) The definition of project boundary and baseline

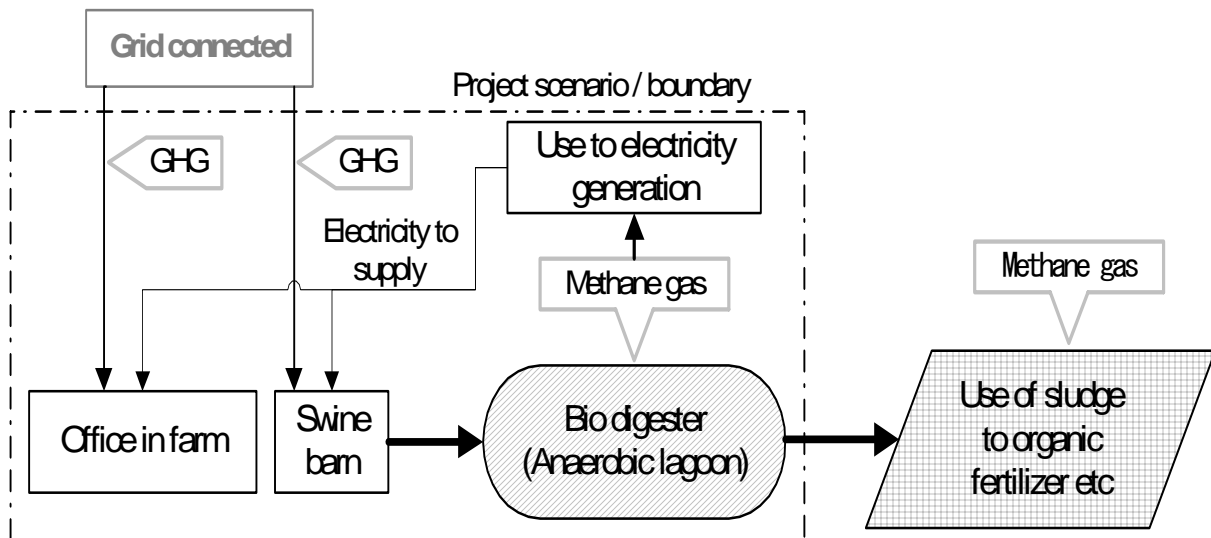
The project boundary is shown in the picture 3.1. The project activities conform to project category approved simplified methodology for small-scale CDM project activities, AMS-III.D “Methane recovery in agricultural and agro industrial activities” since the project will result in emission reductions lower that or equal to 60ktCO₂e annually.

Furthermore, the project activities will be displaced electricity from the renewable energy source a part of consumed at the project site by installation of power generators and the utilization of the methane gas recovered as fuel for generation. Since it shall be estimated the effect to reduce the green house gas emission, the project activities additionally conform to project category approved simplified methodology for small-scale CDM project activities, AMS-I.D “Grid connected renewable electricity generation”.

<Baseline boundary>



<Project boundary>



The picture 3.1 How to think of the project boundary

(2) The monitoring plan

The parameters monitored at the project activities are composed of the biogas amount captured and used as fuel for the generator, the methane concentration level, the number of swine, the average weight, the generator combustion efficiency, the amount of electricity generated at the project activities, the consumption of electricity at project sites and the amount of electricity from the grid connected.

At the monitoring, there are several problems, for example at the farm it cannot comply with the measuring of swine weights without installation of new facilities. It is studied regarding methods to measure, whether or not it could be available for the method to estimate from the relation between weight and actual measurement of body (length, outside of body etc.).

The monitoring of the methane recovered and the electricity generation shall be basically conducted automatic measurement within the limit of possibility and it is studied for which facilities are available.

(3) The amount of GHG emission reduction

The GHG emission reduction shall be approximately 24,000 (t-CO₂e/year) as shown in Table 3.1.

Table 3.1 Calculation of the GHG emission reduction

Methodology	Annual average over 2010-2019	Total for ten years
Methane recovery in agricultural and agro industrial activities (The electricity generation from biogas)	21,131 t -CO ₂ /year	211,310 t -CO ₂
Grid connected renewable electricity generation (The recovery of methane gas)	2,595 t -CO ₂ /year	25,950 t -CO ₂
Total	23,726 t -CO ₂ /year	237,260 t -CO ₂

(4) The duration of the project activity / crediting period

In line with the request from the project owner, the crediting period is scheduled for the starting in 2010. The entire schedule of project activities was invested and constructed from November in 2008, shall be proceeded the validation from April in 2009, operated and monitored from August in 2009. As the starting of project it was placed orders of the facilities and instruments for generator including the installation and so forth after submitting of letter for TGO.

Accordingly the duration of the project activities and crediting period are shown as bellow.

The starting of the project activities : August in 2009/03/17

The crediting period : from 2010 to 2019

(5) The environmental impacts and the other indirect impacts

The implementation of the project activities is conducted the Initial Environmental Evaluation (IEE) that is required by the DNA validation in host country, which shall be studied, predicted and assessed impacts to the global environment and communities of the designed project location.

Since the project activities shall be installed the biogas power generators and utilized the methane gas recovered as fuel for generation, it is required to be studied and predicted the environmental impact to the peripheral area by the installation of gas power generators. The specific matter is to measure on-site the

current noise level (the average for 24 hours) as baseline scenario if the project site is located within 1 kilometer only away from community area where there are houses and hospitals etc.

Regarding the emission control of the generators, it is required to make sure each emission of Sulfur Oxide (SOX), Nitrogen Oxide (NOX), Carbon Oxide (CO), Particulate Matter (PM) based on the specification made by generators' manufacturers.

(6) The stakeholders' comments

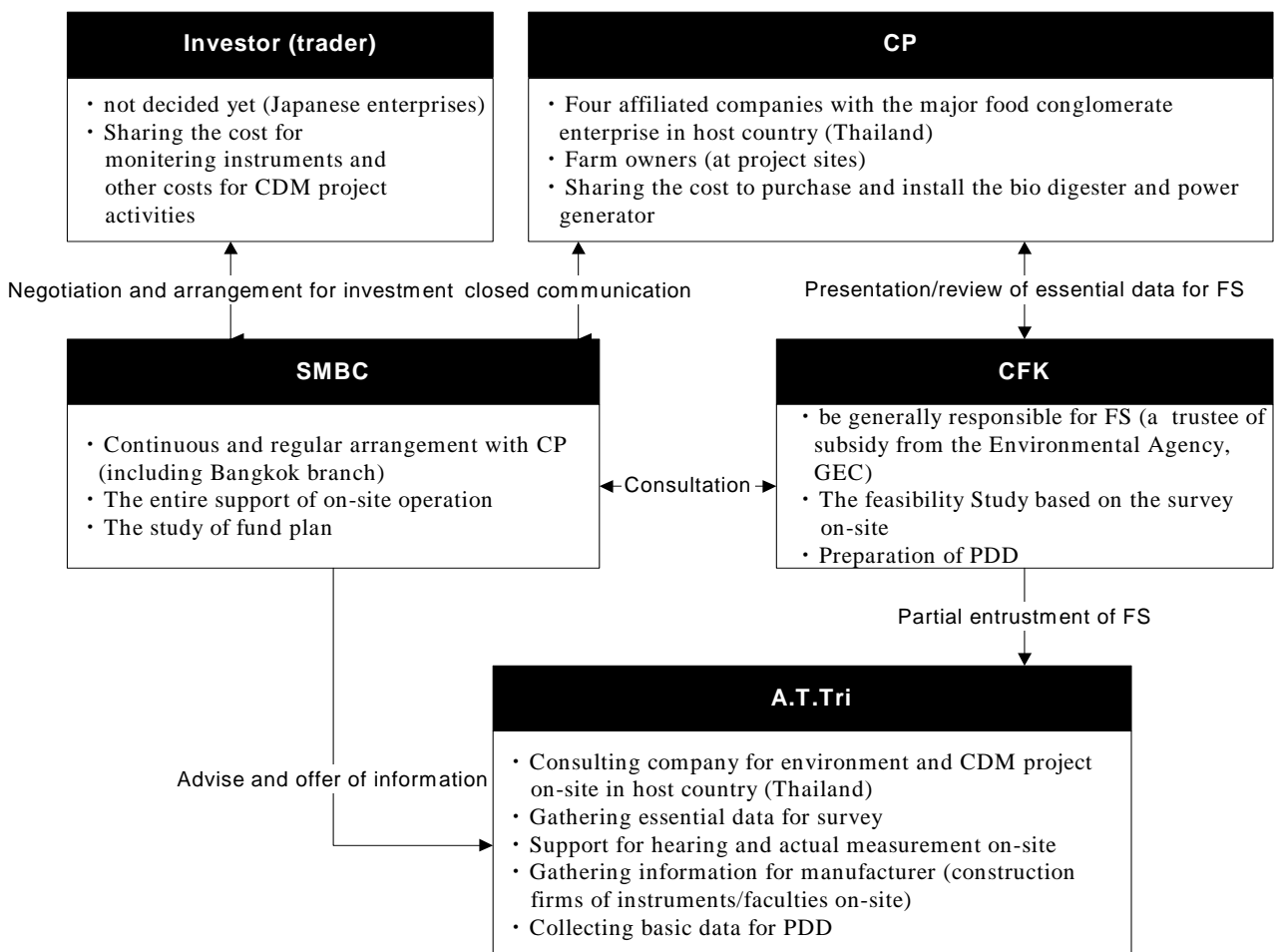
It is conducted the stakeholders' comments including hearing for farm owners, local inhabitant and local government agency. The hearing for local inhabitants is conducted by two methods, both of door-to-door visiting and meeting. At the moment it was completed at three farms.

The participants including employees at the hearing for farm owners agreed with the project, under which it shall be recovered methane gas by bio digester and utilize the methane gas recovered as fuel for generation after their understanding. Furthermore, some of them also showed interest by volunteering to participate in monitoring operation.

The ninety percents of participants were in favor of the project and its implementation from hearing.

(7) The organization of implementation for project activities

The organization of implementation for project activities is shown in the picture 3.2. The investor (the emission trader) is supposed to take a major role of sharing the monitoring instruments, monitoring cost and other CDM project activities.



Picture 3.2 The organization of implementation for project activities

(8) The fund plan

It is scheduled to be borne by the project owner the initial cost for the bio digester and the power generator etc (total amount JPY128 million). On the other hand, it shall be asked the investors (traders of the emission) who will bear the cost for monitoring instruments (JPY42 million) and other CDM project activities (JPY18 million). Furthermore, the initial cost will be added the cost for the further essential generators and facilities to sell the electricity to the grid connected in order to take advantage of all potential biogas energy and then it is required to be examined more to increase the proposed project feasibility.

The essential running cost will be approximately JPY10 million annually, which it is not decided the bearer yet either. This cost is supposed to be asked the investors (traders of the emission) to bear as well as the above.

Regarding the cost for monitoring instruments and other for CDM project activities, it was negotiated the priority to trade emissions with the independent cooperation, The New Energy and Industrial Technology Development Organization (NEDO Technology Development Organization) Kyoto Mechanism Promotion Department. However, this negotiation ended in failure and resulted in closing of future negotiation because the project activities shall not be satisfied with criterion of NEDO regarding the crediting price and project scale (total trading credit amount) etc.

(9) The analysis for profitability

It cannot be returned the investment without revenue from trading of CERs because the expense shall exceed the revenue annually. It is required to sell the credit with over US\$13.00 per ton during ten years (from 2010 to 2019) in order for IRR to be over 10%.

The sensitivity analysis of the Internal Rate of Return (IRR) by trading credits is shown in below Table 3.2.

Table 3.2 The sensitivity analysis of Internal Rate of Return (IRR) by trading credits

Item		The evaluation of project profitability										
PRICE	(US\$)	8	9	10	11	12	13	14	15	16	17	18
IRR	(%)	1.6	4.0	6.1	8.0	9.8	11.5	13.1	14.7	16.1	17.6	18.9

(10) The demonstration of additionality

1. Analysis of Investment Barrier

The method to generate the electricity from biogas recovered by the bio digesters is considered the most advanced operating system for wastewater treatment but it is required to invest more expensive equipments in compared with other methods. Since it is not expected for financing nor subsidy from the third party, for example local bank or government etc. due to lack of knowledge and experience with the technology of the electricity generation from biogas in Thailand, it is highly required that the project concerned parties raise their own funds. The implementation of CDM project will be expected to provide the incentive to the financing or subsidy from the third party.

The proposed project shall be earned an income from the electricity generation (the effect to save the electricity cost), it cannot be realized the project with that revenue only because the expense shall exceed the revenue annually and it shall not be returned the investment. In other words, it can be

demonstrated the additionality based on the investment barrier since the project cannot be secured economically without revenue from trading of CERs.

Specifically, it is required to sell the credit with over US\$13.00 per ton during ten years (from 2010 to 2019) in order for the Internal Rate of Return (IRR) by trading credits to be over 10%.

2. Analysis of technology Barrier

For the method to generate the electricity from biogas recovered by the bio digesters it is essential to monitor in details each parameter in the system and continuously maintain facilities and instruments. However it is actually implemented and managed under unsuitable operation at most other project sites installed. This fact is reflected in what there are few projects with stable operation for a long term worldwide. If it is not appropriately maintained by skilled engineers, as a result, it is supposed to often occur the trouble with instruments or facilities.

Since the electricity generation from biogas is the most advanced technology in Thailand, there are many unknown but essential for system operation, for example the amount of biogas captured and used as fuel for the generator etc. In addition it is estimated the risk that the lack of available knowledge and experience in the technology makes the cost to maintain the facilities and instruments increase. In recent year it is rare and short of the skilled engineers who are well acquainted with biogas in Thailand. It is currently difficult to secure the skilled engineers who maintain and manage the biogas technology.

Accordingly since it is essential for the allocation of skilled engineers as well as regular and continuous maintenance, it shall provide the farm managers a significant burden.

3. Analysis of common practice barrier

In Thailand, there is the national water discharge standard complied with before entering the natural water sources. The swine farms are categorized as one of the polluting industries, whose discharge must be controlled based on the Enhancement & Conservation of National Environment Quality Act. In compliance with the Act, the discharge from swine farms must be treated in accordance with the Industrial Effluent Standard for Industrial Plants and Industrial Estates and the Effluent Standards. On the other hand, there is no law nor regulation required that the methane in the field of swine farms be controlled or calculated.

At most swine farms in Thailand, the common practice shall result in the least cost option, open lagoon-based wastewater treatment system. At present, open lagoon-based treatment is complied with the law and regulation in Thailand as well as the least cost method. In the absence of the registered CDM project activity, there is little expectation to change from the current open lagoon-based wastewater treatment system to bio digester and biogas generator system that is environmentally friendly method.

(11).The feasibility and problem of project

It is not decided yet who will bear the cost for monitoring instruments, monitoring operation and other CDM project activities at the moment, it is required to secure for the profitability urgently. Regarding the cost for monitoring instruments, monitoring operation and other for CDM project activities, it was negotiated the priority to trade emissions with the independent cooperation, The New Energy and

Industrial Technology Development Organization (NEDO Technology Development Organization) Kyoto Mechanism Promotion Department. However, this negotiation ended in failure and resulted in closing of future negotiation because the project activities shall not be satisfied with criterion of NEDO regarding the crediting price and project scale (total trading credit amount) etc.

It is required to sell the credit with over US\$13.00 per ton during ten years (from 2010 to 2019) in order for IRR to be over 10%. In order to secure for the investor and the project feasibility even if the credit price is lower, it is required to examine to reduce the cost in compared with various manufacturers regarding the purchase, installation and maintenance of the power generators.

It is considered that there is no barrier for feasibility of project, if it shall be secured the investor by the cost reduction.

4. The feasibility for co-benefit approach in host country

It is concerned about the air (odor) pollution to nearby communities because the swine manure is treated by the anaerobic digestion system in the open lagoon and methane gas CH₄ is producing at certain amount there then released into the atmosphere at the project sites – swine farms. It is required to cover the current open lagoon (to install the bio digester) and recover the methane gas as the countermeasure for odor pollution.

The method to prevent from pollution with the proposed project is to install the closed lagoon system (bio digester) in order to reduce the emission of the methane gas into the atmosphere in line with the needs of the mitigation measure for the offensive odor problem.

Besides, the method to prevent from pollution was considered by CFK to install the non-permeable layer at the bottom of open lagoon at the initial stage as the countermeasure to modify not to discharge into the natural water sources in order to reduce the ground water pollution by wastewater from open lagoon. However, because it was shown the view by CP that there was neither ground water nor soil pollution at that time based on the survey of well water within farms, the proposal from CFK was not accepted. Accordingly it concluded not to be conducted the countermeasure to reduce the influence of ground water pollution by wastewater.

Data

- The report of on-site study
- The documents regarding the analysis for profitability