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Guangdong Agricultural Non-point Source Pollution Control Project Loaned by World Bank

Environmental Management Plan

Department of Agriculture of Guangdong Province

Institute of Pearl River Water Resources Protection

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Project name: Guangdong Agricultural Non-point Source Pollution control Project Loaned by World Bank

Entrusting party: Department of Agriculture of Guangdong Province

Evaluation institution: Institute of Pearl River Water Resources Protection

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ABBREVIATIONS

CNP	Construction Noise Permit
CPO	City Project Office
CSO	Consultation Services Organization
DPO	District Project Office
EA	Environmental Assessment
EAO	Environmental Assessment Organization
ECOP	Environmental Codes of Practice
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
EMT	Environment Management Task
EP	Environmental Protection
EPAD	Environmental Protection administrative department
EPD	Environmental Protection Department
ES	Environmental Supervision
FS	Feasibility Study
LWMP	Livestock Waste Management Plan
MO	Management Organazation
PO	Project Owner
PMO	Project Management Office
PRC	The People's Republic of China
PS	project supervisor
SO	Supervision Organazation
WB	World Bank

CONTENTS

Chapter 1 Project profile

1.1Project background

Agricultural non-point source pollution in China mainly shows in water, atmosphere, soil, etc. Generally speaking, agricultural non-point source pollution refers to pollution caused by nutrient substance such as Nitrogen and Phosphate, pesticide, and other organic or inorganic pollution via farmland surface runoff, leakage or volatilization in the process of agriculture production, including pesticide pollution, chemical fertilizer pollution, agricultural film pollution, straw pollution, intensive livestock farm pollution as well as pollution caused by wastewater irrigation.

Guangdong Province is a major agriculture province where agriculture playing a significant economic role. In recent years, as population increases and rural economy develops rapidly, agriculture non-point source pollution is severe. It not only impacts soil quality, water body and atmosphere directly but also inhibits enhancement of agriculture efficiency and rural residents' income. Food safety and human health are also affected. As indicated by the first national general survey of pollution sources, primary sources of agricultural non-point source pollution in Guangdong Province are agricultural wastes such as chemical fertilizer, pesticide, straw, livestock excrement, domestic garbage, domestic sewage, farmland tail water, etc. It is estimated that agriculture COD contribution in the province takes up 40% of its total pollution discharge. Ammonia nitrogen discharge accounts for 42% of gross discharge in the province.

Current situation of agriculture non-point source pollution in Guangdong Province is that, water body function is impacted as well as water supply safety in major river basin and sustainability of water resources. In 2008, Guangdong water resources bulletin pointed out that, some tributaries of major river basins such as Pearl River Delta, Dong River, Han River as well as rivers in east and west of Guangdong suffer severe

eutrophication. Major pollutants in water body are total nitrogen, total phosphorus and ammonia nitrogen. Agriculture non-point source pollution is the major cause. Second, pollution endangers farmland soil environment and affects land capability and sustainability, which is mainly reflected in excessive harmful substance in soil and destruction to soil structure. Third, it damages rural ecological environment and quality of rural residents' living environment. Livestock excrement, domestic garbage and sewage are discharged without treatment, resulting in dirty, messy and inferior countryside. The rural environment deteriorates day by day. Fourth, it endangers rural drink water and rural product safety. Underground water nitrate pollution caused by agriculture non-point source pollution has imposed threaten to drinking water safety of millions of urban and rural residents. Excessive and improper nutrient input causes more severe physiological diseases and insect damage. Pesticides increase and excessive pesticide residue in agriculture products affect global market competitiveness, pose threaten to human health and restrict sustainable development of agriculture.

According to the Guangdong 12th Five-Year" Energy Saving and Emission Reduction Comprehensive Work Program, by 2015, chemical oxygen demand and gross sulfide dioxide emission in this province will be controlled at 1,701,000 ton and 715,000 ton respectively, fall by 12.0% and 14.8% accordingly compared to that of 2010; total ammonia nitrogen and nitric oxide emission are controlled at 203,900 ton and 1,099,000ton respectively, fall 13.3% and 16.9% compared to that of 2010. The 12th Five-Year" Agriculture Source Total Pollution Reduction Implementation Plan put forward that, by 2015, the province will scale up livestock and poultry farm and breeding area supporting, construct solid waste and sewage storage treatment facilities; complete statistics and monitoring of agriculture source pollution emission reduction as well as evaluation system construction; agriculture source chemical oxygen demand and ammonia nitrogen discharge in the province are controlled at 563,200ton and 52,600 ton, decreasing 8% and 10% respectively compared to 612,000 ton and 58,500ton in 2010.

In order to reduce agriculture source pollution as required by the twelfth “Five-Year” energy saving and emission reduction program of Guangdong province, push forward water body pollution prevention in south China, make sure water resources are sustainable, transform agricultural production mode, develop ecological cycle agriculture and improve production and living conditions in countryside, this project applies for USD100million world bank (WB) loan (which is RMB 630million), USD 5,100,000 GEF donation (which is RMB 32,130,000), Guangdong government finance RMB463,463,500, enterprise self-raised funds RMB278,680,000, RMB1,404,273,500 in total for constructing Guangdong Agricultural Non-point Source Pollution control Project loaned by WB.

The priorities of this project are pesticides pollution, chemical fertilizer pollution and breeding waste pollution. Pesticide and chemical fertilizer Pollution control is mainly implemented in Huizhou and Jiangmen, with over 30 towns and 500,000 mu farmland involved in. Livestock waste treatment focuses on Huizhou, Jiangmen and Heyuan, other districts are also taken into consideration. It is planned to govern 300 livestock farms (100 in the first stage), implementation places are as below:

Huicheng District, Huizhou City, Guangdong province (Ruhu Town, Luzhou Town, Hengli Town, Ma’an Town, Shuikou Street Office)

Huiyang District (Pingtan Town, Liangjing Town, Yonghu Town, Shatin Town, Zhenlong Town)

Boluo County (Shiwan Town, Futian Town, Changning Town, Yangcun Town, Longhua Town)

Taishan City, Jiangmen City, Guangdong Province (Chonglou Town, Doushan Town, Duhu Town, Chixi Town, Haiyan Town)

Kaiping City (Cangcheng Town, Chishui Town, Longsheng Town, Magang Town, Dasha Town)

Enping City (Encheng Street Office, Naji Town, Niujiang Town, Shahu Town, Liangxi Town)

300 large-scale livestock farm in the above mentioned two cities and the province (150 are in Huizhou, Jiangmen and Heyuan).

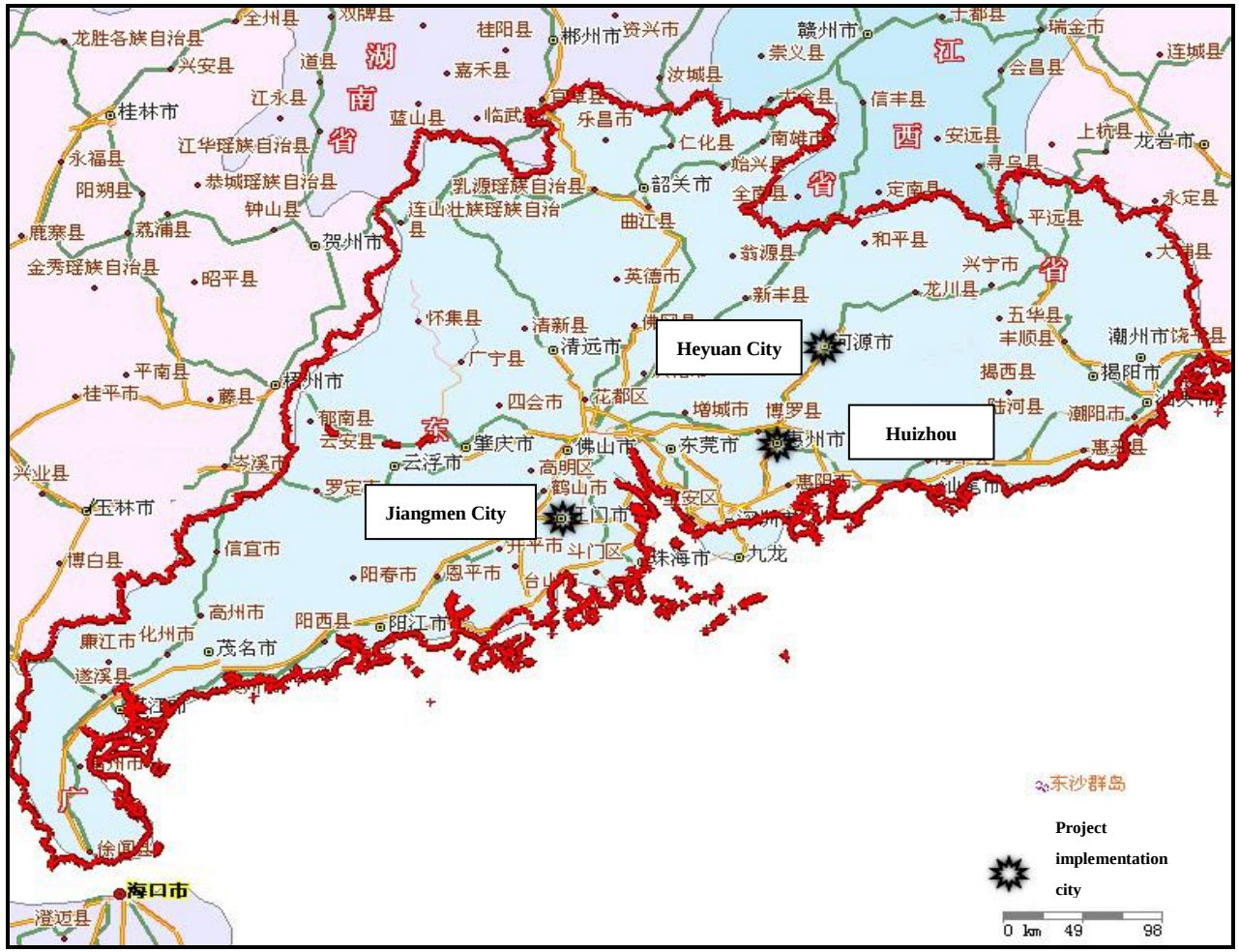


Figure 1-1 Project implementation layout at city level

Figure 1-2 Huizhou City Project implementation layout at town level

Figure 1-3 Jiangmen City Project implementation layout at town level

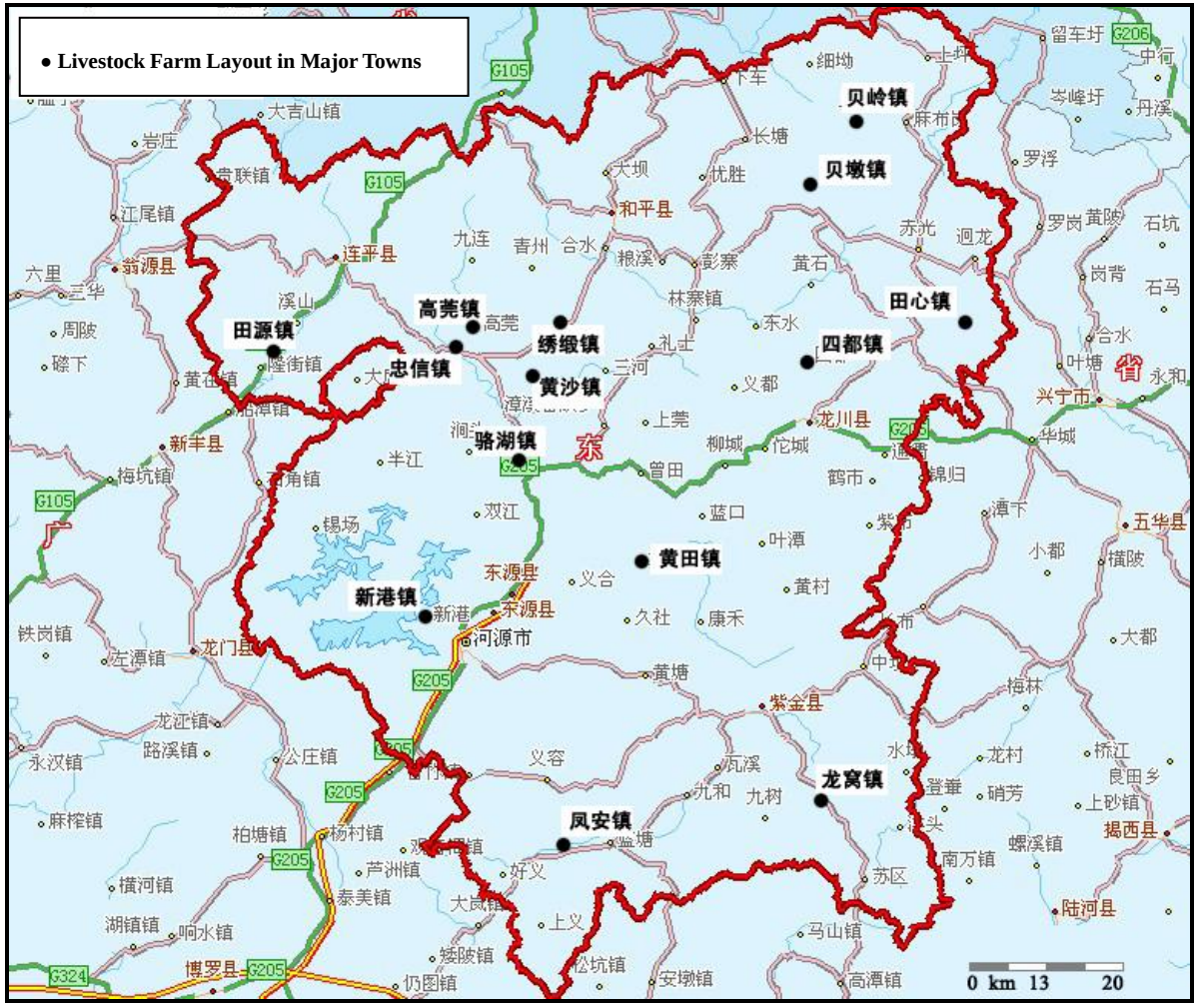


Figure 1-4 Heyuan City Map (major large-scale livestock farm)

1.2 Lessons learned from previous GEF project

In order to reduce non-point source pollution caused by livestock, GEF livestock waste management project participated by three major livestock production countries in East Asia, China, Thailand and Vietnam, sponsored by GEF was launched in 2006. Implementation period of this project is five years. In China, the project implementation site is in Boluo County of Huizhou City, Dongyuan and Lianping County of Heyuan City in Guangdong Province. The project has obtained USD 2million from GEF, RMB 29,380,000 from Chinese government, among which RMB16,470,000 from government at provincial level, RMB12,907,500 from pig farms in this project. This project has improved livestock farm and its surroundings, facilitated development of cultivation industry, and obtained great ecological, economical and social benefits.

GEF livestock waste management project's success in China mainly attributes to the following: 1, correct selection of project content and implementation site; 2, absorption of international advanced technology, local experience and careful formulation of technical proposal; 3, attach importance to pilot test site construction, demonstration result summary and reproduction works; 4, work experience in implementation, improvement and management of international projects; 5, leaders and government officials have been rigorous and responsible which is very important for completing project and ensure its quality; 6, an efficient and pragmatic project office is not only key to project success but also vital for improving overall project efficiency; 7, technical experts' support and cooperation.

Besides, previous GEF project has carried out long-term and comprehensive environment monitoring on implementation effect by each breeding mode, inspection on pollution reduction after environmental protection measures, which is very helpful for us to design project alternatives and predict project implementation effect.

There are some issues and shortages in the process of previous GEF project

implementation. Funds arrangement has affected project implementation to certain extent. Livestock production has substantial social benefits, meanwhile, it is livelihood project, so the amount of supporting funds for livestock waste management should fit in such background as well as local social and economical development level. It should not ask for too much supporting funds, otherwise, it could impact project implementation.

Therefore, in the process of carrying out Guangdong Agricultural Non-point Source Pollution Control Project Loaned by WB, we should learn lessons and experience from the previous GEF project, select project site, formulate technical proposal, strengthen fund raising and fund management, design supporting fund proportion rationally and guarantee smooth implementation of the project.

1.3 Purpose of Environmental management plan (EMP)

As this project focuses on improving agricultural non-point source pollution infrastructure and environmental management in Guangdong Province, based on agreement WB loan preparation team and Agriculture Department of Guangdong Province reached, this project requires no all-sided environmental effect evaluation, WB needs a comprehensive and practical Environment Management Plan (EMP).

In order to eliminate or offset adverse effects on environment and society during project implementation and reduce it to an acceptable level, before launching the project, we need to put forward a relief program which is reliable technically, workable economically and applies to project design period, construction period and operation period, a monitor plan and an institution construction measures and implementation plan (that is EMP) as a part of the whole project management.

The purpose of developing EMP is to improve project screen, site selection, planning, design and implementation by formulating workable measures which will prevent,

reduce or offset unfavorable environmental effects and increase favorable ones, take measures during project implementation to relief and manage those unfavorable environmental effects, evaluate actual results of relief measures by environment monitoring plan, and propose further relief measures according to the monitor result.

Therefore, the purposes of this project EMP mainly are:

1. Make qualitative analysis and evaluation on current natural environment and social economic conditions in project area, and determine scope and extent which affect evaluation, review design and implementation of project environment protection plan;
2. Make comments on positive environmental effect caused by this project, identify, screen and predict possible negative influences;
3. Come up with targeted and effective control measures on unavoidable negative environmental effect;
4. Formulate relevant requirement to make sure these measures will be implemented timely and efficiently;
5. Evaluate actual effect of relief measures by implementing environmental monitoring plan.

1.4 Formation of EMP

According to WB Operation Manual-Environmental Assessment OP4.01, degree and scope of influence on environment caused by proposed project and environment sensibility in project area, evaluation falls into three classes, see Table 1-1.

Table 1-1 Project Environmental Impact Assessment（EIA）Classification

Evaluation category	Environmental effect	Evaluation content
Category A	Project that may exert negative influence on the environment.	This project requires comprehensive EIA.
Category B	Project that has limited negative influence on the environment	This project requires no all-sided EIA, but special environmental

Evaluation category	Environmental effect	Evaluation content
	and the influence can be reduced by adopting advanced technologies and mature preventive measures as regulated.	impact evaluation or analysis should be conducted based on characteristics of project and environment.
Category C	Project that has no or little negative influence on the environment.	Such project does not need environmental impact evaluation or analysis, only environment protection management records are required.

As this is a waste treatment and environmental protection (EP) project, according to on-the-spot investigation carried out by WB environment expert, provincial project office and project environment assessment team, the project coverage area has no ecological sensitive zone or fragile zone, or zones that require special protection or social concern. Based on nature, scale and impact of this project as well as environmental features in local area, this project has short-term, non-distinctive and reversible environmental influence on the surroundings, it falls to category B. This is consistent with WB's relevant documents.

This report is composed of Environmental Codes of Practice (ECOP), Environmental Management Framework (EMF) and Livestock Waste Management Plan (LWMP).

Chapter 2 Policies, Laws and Regulations and Basis of Compilation

In accordance with Notice on Strengthening EIA on International Finance Corporation Loan Project, Guangdong Agricultural Non-point Source Pollution Control Project Loaned by WB must observe EP laws, regulations and standards in China and carry out environment impact assessment system. Based on the premise that environment impact assessment in China is conducted, IFC technical requirement must also be taken into consideration.

2.1Policies and regulations on environment

2.1.1National laws and regulations

(1) Environmental Protection Law of the People's Republic of China (December 26, 1989);

(2) PRC Environmental Impact Assessment Law (September 1, 2003);

(3) Water Law of the People's Republic of China (October 1, 2002);

(4) Water Pollution Prevention and Control Law of the People’s Republic of China (PRC) (June 1, 2008);

(5) Detailed Rules for the Implementation of the Water Pollution Prevention and Control Law of PRC (March 20, 2000);

(6) Law of the Peoples Republic of China on the Prevention and Control of Atmospheric Pollution (September 1, 2000);

(7) Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste (April 1, 2005);

(8) Law of the Peoples Republic of China on the Prevention and Control of Environmental Noise (March 1, 1997);

(9) Law of the Peoples Republic of China on the Prevention and Treatment of Infectious Diseases (December 1, 2004)

(10) Law of the People's Republic of China on Water and Soil Conservation (March 1, 2011);

(11) Land Administration Law of the Peoples Republic of China (August 28, 2004);

(12) Cleaner Production Promotion Law of the People's Republic of China (Revised on February 29, 2012);

(13) Law of the People's Republic of China on the Protection of Wildlife (March 1998);

(14) Law of the Peoples Republic of China on Protection of Cultural Relics (October 2002);

(15) Law of the People's Republic of China on Quality and Safety of Agricultural Products (November 2006);

(16) Regulations on the Protection of Basic Farmland (December 1998);

(17) Regulations on the nature protection regions of the People's Republic of China (October 1994);

(18) Regulations of the People's Republic of China on Wild Plants Protection (January 1997);

(19) City and Country Planning Law of the People's Republic of China (October 2007);

(20) Regulations on the Administration of Construction Project Environmental Protection of the People's Republic of China (November 1998);

(21) Regulation on the Implementation of the Land Administration Law of the Peoples Republic of China (August 28, 2004);

(22) Regulations on the Protection of Basic Farmland (the State Council (1998), Directive 257);

(23) Decision of the State Council on Several Issues Concerning Environmental Protection (GF [96] No. 31, August 3, 1996);

(24) Notice of the State Council on Issuing National Ecological Environment Construction Plan (2010);

(25) State Council Issued Notice about “The 12th Five-Year” Energy Saving and Emission Reduction Comprehensive Work Program (GF [2011] No. 26)

(26) Regulations on the Administration of Construction Project Environmental

Protection (the State Council directive 253, November 29, 1998).

2.1.2 Department regulations

(1) Temporary Act of Environmental Impact Assessment of Public Participating (HF [2006], February 14, 2006);

(2) Regulations on the Administration of Construction Project Environmental Protection (GH (1987) No. 002);

(3) Hazardous Waste Pollution Prevention Technology Policy (State Environmental Protection Administration, HF [2001] 199);

(4) National Catalogue of Hazardous Wastes (Environmental Protection Department (EPD), Directive 1);

(5) Statement about Further Deeping Environment Influence Evaluation of Biomass Power Generation Project (HF [2008] 82).

2.1.3 Local government act

(1) The Comprehensive Working Program for Energy Saving and Emission Reduction for Guangdong Province in "the Twelfth Five-Year Plan" (YFB [2012] No. 14);

(2) Department Labor Division for the Comprehensive Working Program for Energy Saving and Emission Reduction for Guangdong Province in "the Twelfth Five-Year Plan" (YFB [2012] No. 42);

(3) Guidelines for major pollutants emission reduction technology for large-scale livestock and poultry farm (community) in Guangdong (YN [2012], No.140);

(4) Review files on application for Guangdong "Twelfth Five-Year Plan" agriculture source pollution emission reduction implementation plan by Agriculture Department of Guangdong Province and Provincial Environmental Protection Office (YNH [2012] No.999);

(5) The Twelfth Five Year Plan for Agriculture and Rural Economic Development in Guangdong Province (YN [2011], No. 205);

(6) Guidelines for Large-scale Livestock and Poultry Farm Building in Guangdong

Province (YN [2008], No. 137).

2.1.4 Normative documents

(1) National Ecological Environmental Protection Program (November 28, 2005);

(2) Noise limits for Construction Site（GB12523-90）;

(3) Integrated wastewater discharge standard （GB8978-1996）;

(4) Regulations on Administration of Breeding Livestock and Poultry (July 1994);

(5) Regulation on Handling Major Animal Epidemic Emergencies (November 2005);

(6) Regulations on Administration of Feeds and Feed Additives (December 2001);

(7) Procedural regulations regarding the environment quality monitoring of water for agricultural use（NYT 396-2000）

(8) Technical Specifications Requirements for Monitoring of Surface Water and Waste Water (HJ/T91-2002)

(9) Technical Specifications for Pollution Treatment Projects of Livestock and Poultry Farms. （HJ497-2009）;

(10) Criteria for designing of biogas plant in scale livestock and poultry breeding Farms （NY/T 1222-2006）;

(11) Farmland environmental quality evaluation standards for livestock and poultry production （HJ 568-2010）;

(12) Technical standard of preventing pollution for livestock and poultry breeding （HJ/T81-2001）;

(13) Code for the bio-safety disposal of carcasses and by-products from diseased livestock and poultry (GB16548-1996);

(14) Technical requirement for non-hazardous treatment of animal manure （NY/T 1168-2006）;

(15) Technical standard of preventing pollution for livestock and poultry breeding (HF[2010]151);

(16) Design code for wastewater stabilization ponds （CJJ/T54-93）

(17) Technical specification for operation maintenance and safety of biogas plant in

scale animal and poultry farms （NY/T1221-2006）

(18) Guangdong Province Discharge standard of pollutants for livestock and poultry breeding （DB44/613-2009）;

(19) Guangdong Province Discharge limits of water pollutants （DB44/26-2001）;

(20) Overall Plan and area layout for Guangdong live pig production (2008-2020);

(21) The Twelfth Five Year Plan for Huizhou Agricultural and Rural Economic Development;

(22) Jiangmen Modern Agriculture Industry Development Plan (2011-2020)

(23) Overall Plan and District Layout for Heyuan Modern Modern Ecological Animal Husbandry (2008-2020).

2.1.5 Technical guidelines

(1) Technical guidelines for EIA General program （HJ2.1-2011）;

(2) Guidelines for Environmental Impact Assessment Atmospheric Environment （HJ2.2-2008）;

(3) Technical guidelines for EIA Surface water environment （HJ/T2.3-1993）;

(4) Technical Guidelines for Environmental Impact Assessment. Groundwater Environment （HJ610-2011）;

(5) Technical Guidelines for Noise Impact Assessment （HJ2.4-2009）;

(6) Technical Guidelines for Environmental Impact Assessment, ecological impact （HJ19-2011）;

(7) Technical Specifications for Environmental Monitoring (the fourth edition).

2.1.6 Relevant standards

(1) Environmental quality standards for surface water (GB3838-2002);

(2) Ambient air quality standards (GB3095-2012);

(3) Environmental quality standard for noise (GB3096-2008);

(4) Standards for irrigation water quality (GB5084-2005);

(5) Integrated wastewater discharge standard (GB8978-1996);

(6) Emission standard for odor pollutants (GB14554-93)；

(7) Environmental quality standard for the livestock and poultry farm（NY/388-1999）；

(8) Integrated emission standard of air pollutants (GB16297-1996)；

(9) Measurement method of smoke and dust emission from boilers (GB5468-91)；

(10) Emission standard of air pollutants for coal-burning oil-burning gas-fired boiler (GB13271-2001)；

(11) Emission standard of environment noise for boundary of construction site (GB12523-2011)；

(12) Standards for pollution control on the storage and disposal site for general industrial solid wastes (GB18599-2001);

(13) The determination of particulates and sampling methods of gaseous pollutants from exhaust gas of stationary source (GB/T 16157-1996)

2.1.7 World Bank safety control policy, environment, health and safety guidelines

WB safety insurance policy is to give consideration to social and environmental impact brought by projects invested by WB, including analysis of possible impact and measures to slow down negative influences. It can not only avoid damage to environment or human, but also complete project design, improve work efficiency as well as protect reputation of WB and borrower.

Safety insurance policies relevant with this project are shown as below:

(1) World Bank Operation Manual –Environmental Assessment OP 4.01；

(2) Management of Disease and Pests OP 4.09；

(3) Environment, Health and Safety Guidelines for Mammal Livestock Breeding (IFC);

(4) Environment, Health and Safety Guidelines for Water and Hygienic Conditions (IFC);

(5) Environment, Health and Safety Guidelines for Waste Management Facilities (IFC).

2.1.8 Document related to this project

(1) Proposal for Guangdong Agricultural Non-point Source Pollution control Project loaned by WB;

(2) Instruction Request for Utilization of World Bank Loan 2012-2014 Financial Year as Alternative Plan (FGWZ [20118] No.1915);

(3) Memorandum of Identification Group for P.R.C Guangdong Agriculture Non-point Pollution control Project （P127775/P127815）(From March 19 to 30 of 2012);

(4) Memorandum of Technology Investigation Group for P.R.C Guangdong Agriculture Non-point Pollution control Project （P127775/P127815）(June, 2012);

2.2 Evaluation criteria

2.2.1 Environmental quality standard

2.2.1.1 Ambient air quality standard

Environmental quality standard adopts Ambient air quality standard （GB3095-2012）, see Figure 2-1.

Table 2-1 Concentration Limits of Elementary Items in Ambient Air Pollutants

Serial No.	Pollutant name	Concentration limit（μg/m^3）			Standard source
		Average for 1h	Average for 24h	Annual average	
1	SO_2	500	150	60	Secondary standard in GB3095-2012
2	TSP	/	300	200	
3	PM_{10}	/	150	70	
4	NO_2	200	80	40	

2.2.1.2 Environmental quality standard for surface water

Water area within the evaluation scope applies to category II and category III in Environmental quality standard for Surface Water (GB3838-2002), refers to Table 2-2 for specific standard limit.

Table 2-2 Standard Value of Surface Water Environmental Quality (unit: mg/L，exclusive of pH)

Item	Category Ⅱ standard	Category Ⅲ standard	Standard source
pH	6~9	6~9	GB3838-2002
Dissolved oxygen	6	5	
Permanganate index	4	6	
Chemical oxygen demand(COD)	15	20	
(BOD5)	3	4	
(NH3-N)	0.5	1.0	
Total phosphorus (count P)	0.1	0.2(lake,pool0.05)	
Petroleum	0.05	0.05	

2.2.1.3 Environment quality standard for sound

Acoustic environment applies to category III standard in Acoustic environment quality standard (GB3096-2008), refers to Table 2-4 for specific standard limit.

Table 2-4 Category 2 standard value in Acoustic environment quality standard (unit: dB(A))

Category	Daytime	Night time	Standard source
Category 3	65	55	GB3096-2008

2.2.1.4 Environmental quality standard for soil

Apply to secondary standard in Environmental quality standard for soils（GB15618－1995）, refers to Table 2-5 for details.

Table 2-5 Standards for soil assessment

Environmental elements	Standard and category	Item	Standard value(mg/kg)
Soil environment	《Environmental quality standard for soils》GB15618-1995） category II （Soil pH value<6.5）	Cd	≤0.30
		Hg	≤0.30
		As（paddy field）	≤30
		Cu（farmland, etc.）	≤50
		Lead	≤250
		Cr	≤250
		Zn	≤200
		Ni	≤40

2.2.2 Pollution discharge standard

(1) Standard for water pollutant discharge

Water pollutants from sub-program of environmental friendly crop farming applies to Standards for Irrigation Water Quality, refer to Table 2-6. Sub-program of livestock waste management discharges in accordance with Guangdong Province Discharge standard of pollutants for livestock and poultry breeding. Pearl River Delta in this standard refers to Guangzhou, Shenzhen, Zhuhai, Dongguan, Zhongshan, Jiangmen, Foshan, Huicheng District, Huiyang, Huidong and Boluo District of Huizhou City, Duanzhou District, Dinghu District, Gaoyao and Sihui of Zhaoqing City, subjected to standard values in Pearl River Delta; other areas in Guangdong Province apply to other standard value. Refer to Table2-7 for details.

Table 2-6 Limiting Value specified in Standards for Irrigation Water Quality

Item category	Unit	Crop categories			Standard source
		Water	Dry	Vegetabl	
BOD_5	mg/L	60	100	40[a],15[b]	GB5084-2005
COD_{cr}	mg/L	150	200	100[a],60[b]	
SS	mg/L	80	100	60[a],15[b]	
Water temperature	℃	≤35℃			
pH	/	5.5~8.5			
Salt content	mg/L	1000（non saline-alkali soil），2000（saline-alkali soil）			
Chloride	mg/L	350			
Sulfide	mg/L	1			
Total mercury	mg/L	0.001			
Cadmium	mg/L	0.01			
Total arsenic	mg/L	0.05	0.1	0.05	
Chromium	mg/L	0.1			
Lead	mg/L	0.2			
Number of faecal coliform bacteria	Per 100mL	4000	4000	2000[a],1000[b]	
Number of roundworm ovum	Per L	2		2[a],1[b]	

Note: category with superscript a applies to processed, cooked and peeled fruits; category with superscript b applies to uncooked vegetables, melons and Herbaceous fruit.

Table 2-7 Limiting value specified in Guangdong Province Discharge standard of pollutants for livestock and poultry breeding

Item	Unit	PRD standard value	Standard value in other districts	Standard source
BOD_5	mg/L	140	150	DB44/613-2009
COD_{cr}	mg/L	380	400	
SS	mg/L	160	200	
Ammonia nitrogen	mg/L	70	80	
Total phosphorus	mg/L	7	8	
Number of faecal coliform bacteria	Per 100mL	1000	1000	
Number of roundworm ovum	Per L	2	2	
Water discharge of water-washed process	m^3/（hundred·day）	Winter：2.0	Winter：2.5	
		Summer：3.0	Summer：3.5	
Water discharge of dry excrement cleaning process	m^3/（hundred·day）	1.2	1.8	

Note: Water discharge index is for live pig.

In addition, liquid organic fertilizer for returning to field shall meet with Technical requirement for non-hazardous treatment of animal manure（NY/T1168-2006）, refers to Table 2-8 for details.

Table 2-8 Anaerobic hazard free hygiene requirement for liquid excrement

Control items	**Hygiene standard**	**Standard source**
Parasitic ovum	Death rate≥95%	NY/T1168-2006
Schistosome ovum	No live Schistosome ovum detected in liquid excrement being used	
Number of faecal coliform bacteria	Fermenting methane at room temperature $\leq 10^5$/L Fermenting methane at high temperature ≤100/L	
Flies	No wiggler in liquid excrement and no live maggot, pupa or flies around the pile.	

(2) Standard for air pollutants discharge

In sub-program of livestock waste management, atmosphere in livestock farming area shall meet with odor concentration standard specified in Guangdong Province Discharge standard of pollutants for livestock and poultry breeding （DB44/613-2009） and category II standard in Emission standard for odor pollutants (GB14554-93). Refer to Table 2-9 for specific standard value.

Table 2-9 Limiting value specified in Discharge standard of pollutants for livestock and poultry breeding

Control item	**Concentration restriction**	**Standard source**
Odor concentration	60(non-dimensional)	DB44/613-2009
Ammonia	Emission limit：1.5mg/m^3 Rate of emission：4.9kg/h	GB14554-93
Hydrogen sulfide	Emission limit：0.06mg/m^3 Rate of emission：0.33kg/h	

Livestock farm listed in the project will utilize methane energy after running methane

project, waste gas discharged from methane boiler shall meet with Emission standard of air pollutants for coal-burning oil-burning gas-fired boiler (GB13271-2001), refer to Table 2-10 for specific values.

Table 2-10 Limiting value specified in Emission standard of air pollutants for coal-burning oil-burning gas-fired boiler

Control item	**Concentration restriction(mg/m^3)**	**Standard source**
Smoke dust	50	GB13271-2001
SO_2	100	
NO_x	400	

(4) Standard for solid waste control

In sub-program of livestock waste management, solid organic fertilizer for returning to field shall meet with Technical requirement for non-hazardous treatment of animal manure（NY/T1168-2006）, refer to Table 2-11. Other solid waste applies to Standards for pollution control on the storage and disposal site for general industrial solid wastes（GB18599-2001）.

Table 2-11 Requirements for excrement hazard-free hygiene

Control item	**Hygiene standard**	**Standard source**
Roundworm ovum	Death rate≥95%	NY/T1168-2006
Number of faecal coliform bacteria	≤10^5/kg	
Flies	No live maggot, pupa or flies around the pile	

Chapter 3 Project content

3.1Project area overview

3.1.1Guangdong province overview

Guangdong Province is located in the east end of mainland China, with Fujian on its east, Jiangxi and Hunan on its north, Guangxin on its west and the South China Sea on its south. The east side and west side of Pearl River mouth borders Hong Kong and Macao special administration district respectively, while the Leizhou Peninsula on the southwest across the Qiongzhou Strait from Hainan Province. Land area of Guangdong Province is 179,800 hm2, taking up about 1.87% of land area of China. Guangdong is in monsoon region in East Asia, with mid-subtropical area, south-subtropical area and tropical climate area from north to south. It has the most abundant light, heat and water resources in China. This province has average sunshine duration of 1745.8h with annual average temperature of 22.3℃. It has abundant rainfall, mean annual precipitation is between 1300~2500 mm, 1777mm average in the province. Spatial distribution of rainfall is high in the north and low in the south. Rainfall distribution within the year is uneven. Flood season rainfall during April to September takes up over 80% of that of a whole year; interannual change is also significant, annual precipitation in rainy year is two times than in less-rainfall-year. Flood and drought are quite normal and typhoon is frequent. Low-temperature rain in Spring, cold wind in Autumn, cold wave and frost in Autumn end and Spring beginning are also disastrous weather commonly seen in Guangdong.

Guangdong has complicated geomorphic types including mountainous region, hill, platform and plain, taking up 33.7%, 24.9%, 14.2% and 21.7% of land in this province respectively. Rivers and lakes only account for 5.5%. The terrain is generally high in the north and low in the south. The north region is mainly mountainous area and crick while the south is mainly plain and platform. Mountain range is consistent with

geological structure, mostly northeast-southwest trend. The Pearl River Delta plain is the largest plain in Guangdong, Chaoshan plain is the second.

In 2011, Guangdong Province has achieved GDP of RMB5267.359 billion, increasing 10.0% compared to the previous year, with rate of increase falling 2.4%. Economic increase speed is slow but steady. Gross GDP of Guangdong still ranked first in China, with GDP per capita of RMB50,500, ranking in the seventh place in the country.

In 2011, added value of agriculture in Guangdong is RMB2380.846 billion, increasing 9.1%. Sowing area of food crop is 2530.42 thousand hectare, decreasing 0.1% than last year, output 11,159,500 ton, increasing 3.4%; vegetable plant area is 1208.50 thousand hectare, increasing 2.4%, with output 28,599,600 ton, increasing 5.2%. Annual total output of meat is 4,345,800 ton, decreasing 1.5%, among which pork output is 2,709,700ton, decreasing 1.6%.

At the end of 2011, Guangdong has permanent resident population of 105,050,000, 69,860,000 are urban population, 35,190,000 are rural population. Annual net income per capita in rural area is RMB9371.73, increasing 18.8% than previous year; regardless of price factor, the actual growth is 11.9%.

3.1.2 Huizhou overview

3.1.2.1 General information

Huizhou is situated in the southeast of Guangdong province, the northeast end of the Pearl River Delta, and it is within the Pearl River Delta economic zone. Huizhou has Daya Bay on its south, adjacent to Shenzhen and Hong Kong, with Heyuan on its north, Shanwei on its east, Dongguan and Guangzhou city on its west. It is known as “the door of east Guangdong”. Huizhou is in subtropical monsoon climate area with the Tropic of Cancer going through. It has abundant rainfall throughout the year, sufficient sunshine, moderate climate, annual average rainfall capacity of 2000mm and average

temperature of 22℃. It has Dong River, one of the three major tributaries in Guangdong, and Xizhi River throughout the city. The north part is mountainous, the middle and coastal area have plenty flatlands, and the east and west region is mainly hills.

In 2011, GDP in Huizhou exceeded RMB 200billion and reached RMB209.73bilion. Huizhou GDP increase rate ranks second in Guangdong, second in Pearl River Delta, total GDP of Huizhou ranks sixth in the province, the 70th in China. The increase is stable and fast. Added value of the first industry is RMB11.77billion, the secondary industry RMB124.54 billion, the service industry RMB 73.42billion. Net income per capita in rural area is RMB10,938, increasing 20.5% than previous year, the actual growth is 14.9% regardless of price factors; per capita disposable income in urban is RMB 26,609, increasing 12.9%, the actual growth is 7.6% regardless of price factors. Huizhou is an important agriculture production zone in Guangdong Province. In 2011, its food crop sowing area was 1,800,600mu, about 4.74% of plant area in the province; total crop output is 609,800 ton, accounted for 4.48% in the province; total vegetable output 2,145,500 ton, accounted for 7.5% in the province; total fruit tree (citrus, lychee and longan)output 588,800 ton. Total meat output is 189,400 ton, among which pork output is 138,600 ton, accounted for 5.12% in the province.

In 2011, rice plant area in Huizhou was 1,269,000mu, falling 0.8%. Vegetable multiple-cropping area is 1,473,400mu, increasing 6.19%. Huizhou has 1,286,000 mu of fruit trees, with majority of trees (citrus, lychee and longan) increasing output, among which fruit-bearing lychee is 365,700mu, output 90,500ton; fruit-bearing longan is 206,000mu, output 39000ton. Banana plant area is 87,800mu, total output 89200 ton; fruit trees area (citrus, lychee and longan) is 337,200mu, total output 382,900 ton. Therefore, this project selects rice, corn, vegetable and fruit trees (citrus, lychee and longan) as priorities for reducing agricultural non-point source pollution.

Table 3-1 2007-2011 Huizhou main crop plant area

Year	Rice （ten thousand mu）	Corn （ten thousand mu）	Vegetable（ten thousand mu）	Fruit tree（ten thousand mu）
2007	126.03	50.00	121.96	130.05
2008	127.02	58.00	125.21	129.76
2009	128.08	65.02	126.49	130.40
2010	128.03	73.20	138.75	131.75
2011	126.90	75.00	147.34	128.60

3.1.2.2 Agriculture non-point source pollution status

In 2010, water quality of 5 out of 6 rivers in the city was good (Huizhou section of Dong River, Xizhi River, Gongzhuang River, Sha River and Zeng River), taking up 83.3% of the total rivers; 1 river section (Danshui River) was polluted and graded as severe pollution, taking up 16.75 of the total rivers.

Agriculture pollution source is mainly plantation, livestock and poultry industry. Plantation pollution source is surface runoff and subrosion caused by fertilizer and pesticide application. In 2011, nitrogen, phosphorus and potassium used by Huizhou is 104,500 ton, 49200 ton, and 49000ton respectively, loss is 67,800ton, 41,200ton and 28,300ton respectively, the use ratio is only 35.1%, 16.1% and 42.1%. Pesticide application amount is 5,872ton, loss 4,110ton.

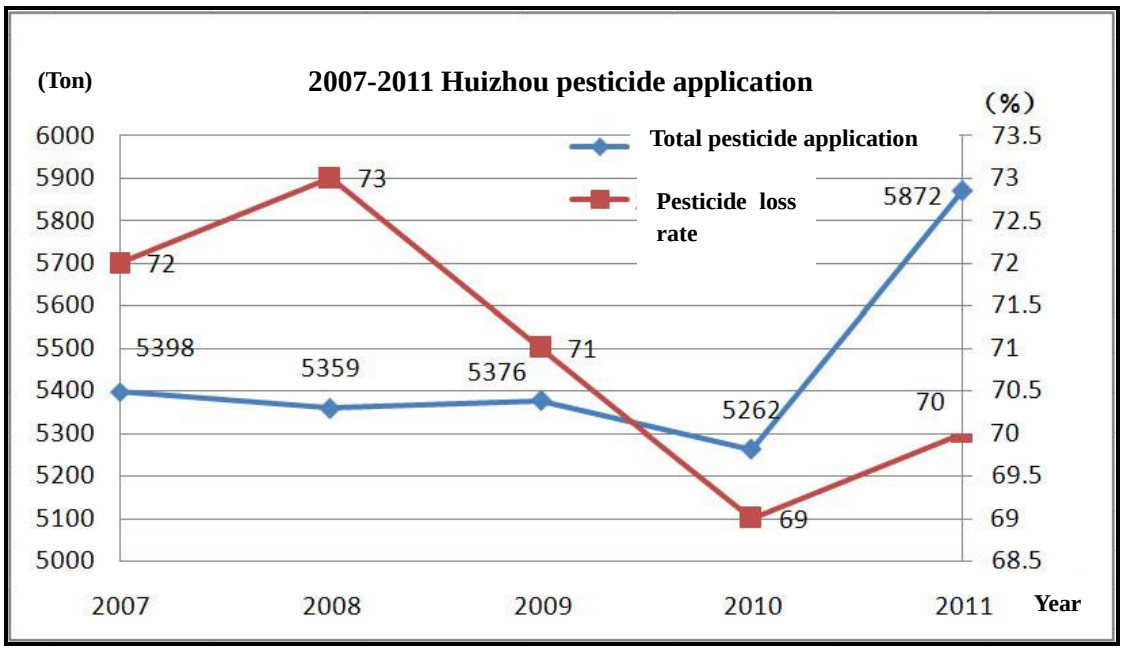
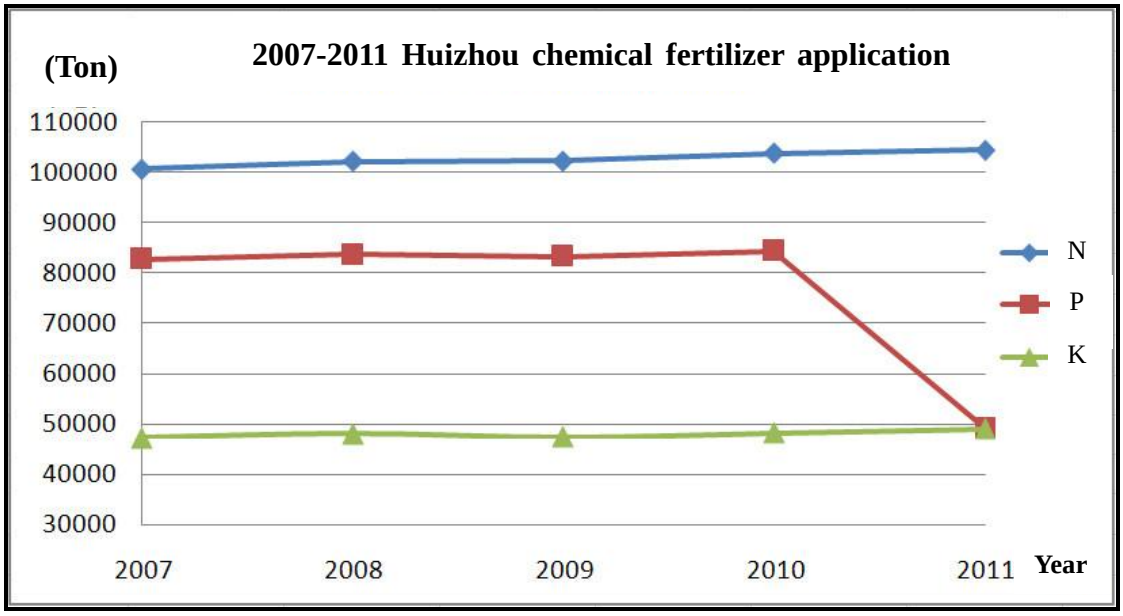


Figure 3-1 2007-2011 Huizhou pesticide application

Since 2005, Boluo County, Huidong County, Longmen County, Huiyang District and Huicheng District of Huizhou City has been listed as national model county for soil testing and formulated fertilization subsidy project. Under the guidance and support of provincial clay fertilizer station, hardware and software of Huizhou clay fertilizer promotion department reached a new level. The counties have set up standard soil testing labs, allocated professional lab technicians, promote and apply soil testing and formulated fertilization as regular application technology. Huizhou has set up 208 soil testing and formulated fertilization demonstration zones, with demonstration area of 340,000 mu, among which 2 are ten thousand mu demonstration zones at province level, 23 are thousand mu demonstration zones at city and county level, 68 are hundred mu demonstration area at town level and 75 are demonstration spots at village level. In 2011, 2,446,900mu of soil testing and formulated fertilization area was developed, saving 3903 ton of fertilizer.



N-Nitrogen P-Phosphorus K-Potassium

Figure 3-2 2007-2011 Huizhou chemical fertilizer application amount

Since 2008, strongly supported by clay fertilizer station of the province, Huizhou has established "water-fertilizer" demonstration base for special crops such as potato, orange, sweet corn and Chinese yam at department, province and city level in Tiechong Town of Huidong County, Yuanzhou Town of Boluo County, Zuotan Town of Longmen County, Ruhu Town of Huicheng District and Pingtan Town of Huiyang District successively and achieved results, average output increase is 20% and saves 17%-25% of chemical fertilizer. Driven by demonstration area at different levels, leading agricultural enterprises, professional cooperation and large-scale grower in Huizhou participated in "water-fertilizer" scientific research and demonstration. For example, Huizhou Sijilv Agriculture Development Co., Ltd. has successfully developed "rail-type large area automatic rainmaker", realized comprehensive utilization of "water-fertilizer" technology in large area, obtain national patent certification and won recognition of leaders, experts and customers. So far, crops that utilize "water-fertilizer" technology in Huizhou include: fruit trees (citrus, lychee and longan), vegetables in greenhouse, sweet corn, Chinese yam, potato, etc, covering an area of nearly 10,000mu.

3.1.3 Jiangmen City overview

3.1.3.1 General information

Jiangmen city is located in middle south of Guangdong Province, on the west of the Pearl River Delta, 111°59′~113°15′E, 21°27′~22°51′N. It runs from Lishui of Gulao Town, Heshan City on the north to Weijia Island of Xiachun Town, Taishan City, 142.2km apart; from Daaowei of Xinhui District on the east to Hakengwei of Naji Town, Enping City on the west, 130.68km apart. Land area of the city is 9541 square kilometers. It has Shunde District of Foshan City, Zhongshan City, and Doumen District of Zhuhai City on its east; Yangdong County of Yangjiang City and Yangchun City on its west; Xinxing County of Yunfu City, Gaoming District and Nanhai District of Foshan City on its north and the South China Sea on its south.

Terrain of Jiangmen is high on northwest and low on southeast. Mountains and hills are numerous on the north and the northwest part. The east, middle and south parts have wide river valley, alluvial plain and deltaic plain. Hills and platforms are scattered and developed along coastal sand reef to formulate complicated and diversified geomorphologic landscape. It is situated at west bank of the Pearl River, and the coastal line is as long as 285km. Water resources within this area are abundant.

Jiangmen is in low latitude subtropics zone. As impacted by maritime monsoon, it is warm and rainy. Average sunlight is over 1700h, and annual average rainfall is 2146mm. Yearly temperature change is not significant. Annual average temperature 21.3～22.9℃, frost-free season is over 360days. It is snowless all year round.

In 2011, the city achieved GDP of RMB183.064 billion, among which added value of agriculture is RMB 13.769 billion. Its GDP ranks seventh in the province, 75th in China. Its GDP per capita is RMB 41,200, ranks 8 in Guangdong. Food crop plant area is 2,896,600mu, taking up 7.63% in the province, crop output 917,800 ton, 6.74% in the

province; meat output is 284,600ton, among which pork output is 184,200ton, accounted for 6.80% in the province. Plant species in Jiangmen are mainly rice, corn, vegetables and fruit tree. In 2011, the city planted 2,618,400 mu of rice, 42900mu of corn, 858,100mu of vegetables and 297,500mu of fruit trees. It has 1,050 large scale livestock farm.

Table 3-2 2007-2011 Jiangmen main crop plant area

Item / Year	Rice（ten thousand mu）	Corn（ten thousand mu）	Vegetable（ten thousand mu）	Fruit tree（ten thousand mu）
2007	252.96	4.94	69.95	28.83
2008	258.48	4.52	81.03	33.70
2009	261.90	4.58	84.04	32.38
2010	261.78	4.71	87.60	31.08
2011	261.84	4.29	85.81	29.75

3.1.3.2 Agriculture non-point source pollution status

Since 2007, pesticide application amount in Jiangmen increases from 3943ton in 2007 to 6315ton in 2011.

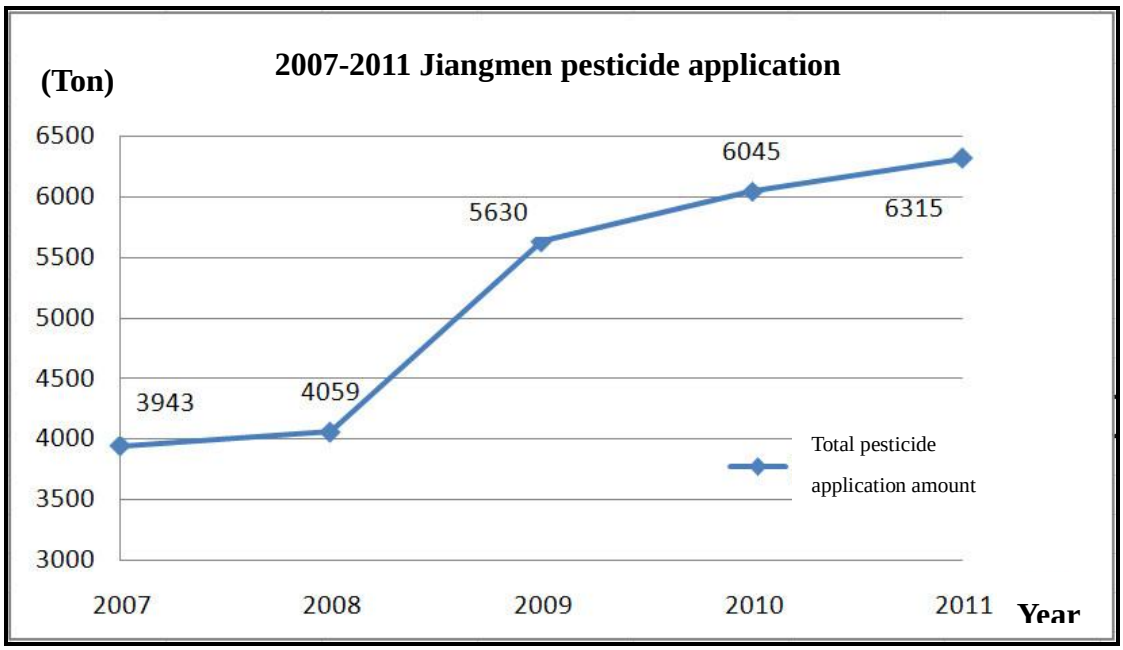
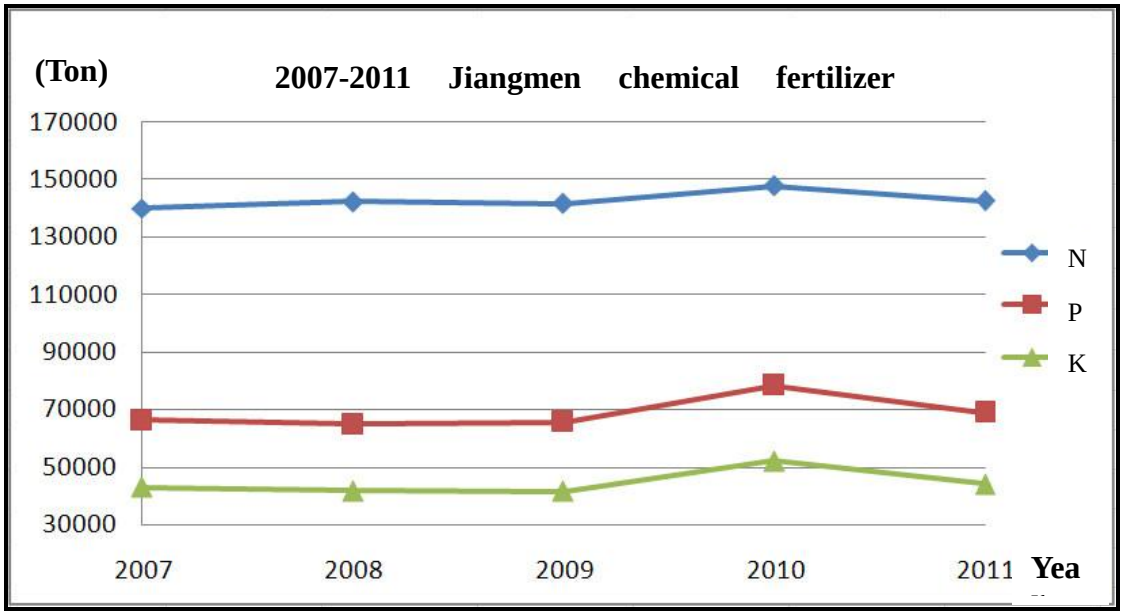


Figure 3-3 2007-2011 Jiangmen pesticide application

In 2011, total chemical fertilizer application amount in Jiangmen City was 375,400 ton, among which 142,700 ton were nitrogenous fertilizer, 69,000 ton were phosphatic fertilizer, 44,200 ton were potash fertilizer and 119,400ton were compound fertilizer.



N-Nitrogen P-Phosphorus K-Potassium

Figure 3-4 2007-2011 Jiangmen chemical fertilizer application

3.1.4 Overview of large-scale livestock farms in Heyuan City

3.1.4.1 General information

Heyuan City is located on the northeast of Guangdong, middle and upper stream of Dong River, with Meizhou City, Shanwei City on its east, Huizhou City on its south, Shaoguan City and Huizhou City on its west and Jiangxi Province on its north. The city covers an area of 15,800 square meters. Heyuan is the first station of Beijing-Kowloon railway in Guangdong and also a Guangdong city that has the longest railway; Beijing-Kowloon railway, 205 national road, Guang-mei-shan railway, 105 national road and Heyuan-Huizhou expressway construct highly accessible communication network in Heyuan. It is a very important traffic hub in north part of Guangdong. Heyuan City is situated on the upstream of Dong River, one of the three rivers in the Pearl River system. Its water quality will affect 40million people's drinking water quality downstream. Meanwhile, it flows to Hong Kong via Dong River-Shenzhen water supply project.

Heyuan City has subtropical monsoon climate, warm and wet all year round, sunlight is sufficient, annual average temperature is 20～21℃， average rainfall is 1881.8 mm, relative humidity is 77%, and average sunlight is 2051.1h.

In 2011, GDP of the city reached RMB 57.194billion, added value of the first industry is RMB7.354 billion, the second industry is RMB30.592 billion and the service industry is RMB19.248billion. Structure proportion of these three industries are converted from 12.7：51.5：35.8 in the previous year to 12.8：53.5：33.7.

In 2011, crop plant area was 164,000 hectare and vegetable plant area is 30,100 hectare. Total crop output is 909,800 ton, among which rice was 809,900ton. Total meat output was 116,900ton. Live pigs to be sold were 974,900 and livestock on hand were 805,900.

3.1.4.2 Livestock farm waste pollution

According to some statistics, in 2011, Heyuan City had 1,090,000 live pigs to be sold and 32,080,000 live poultry to be sold. Total meat output was 124,700 ton, animal husbandry production value was RMB 3.018billion, increasing 27.5%, 6.06%, 20.13% and 5.23% respectively compared to that of 2007.

Agriculture pollution sources are mainly from planting industry, livestock and poultry industry and aquaculture industry.

3.2 Non-point source pollution in project area

3.2.1 Problems existed in Huizhou planting industry

The following problems are found in this area by field research and interview:
Huizhou City has promoted soil testing and formulated fertilization technology for 4 to 5 years. Some farmers have adjusted fertilizer application habit according to soil testing result provided by Ministry of Agriculture. In terms of fertilizer selection, about one third of farmers choose slow release fertilizer, others mainly choose compound fertilizer. The traditional simple substance fertilizer is used seldom. “Three controls” fertilization technology of rice was once promoted, however, since it is difficult to change farmers’ habit, some farmers can’t master this technology well which in turn affect its efficiency.

In terms of pest control for crops, farmers apply pesticide by referring to disease-pest prediction provided by ministry of agriculture. They also tried physical prevention measures, however, since these facilities were not maintained well, they were prone to be destroyed.

For rice plantation, machinery is used when preparing the land and cropping. Some farmers buy walking tractors. Harvesters are mainly rented. Knapsack sprayer is the

major pesticide appliance.

For plant enterprises and cooperation, as area of the rented land is large, exceeding 1000mu normally, they attach great importance on agriculture technology promotion and training as well as agriculture production efficiency. Fertilizer is applied mainly by broadcasting. It is easy to wash away chemical fertilizer.

For large-scale grower with plantation area exceeding 100mu, agriculture production should consider cost and benefit. Fertilizer can be applied shallow or integrate water and fertilizer. However, fertilizer application technology is determined by agriculture plantation habit and lacks of scientific evidence.

Many farmers have relatively small plantation area, 5-20mu generally. They apply fertilizer mainly by broadcast which makes fertilizer easy to wash away, reduce its utilization ratio and increase cost. Burning straws is likely to pollute farmland.

3.2.2 Problems existed in crop farming in Jiangmen City

The following problems are found in this area after field research and interview:

Currently, farmers in Jiangmen City mainly utilize compound fertilizer, their fertilizer practices are learned from experience or local agriculture technology department, agriculture supplies store and agriculture technology seminar. Some large-scale growers adopt slow release fertilizer supported by agriculture supplies or agriculture technology department. It is relatively difficult to popularize “three control” fertilizer practice due to farmers’ plant habit and time differences between traditional planting patterns. Fertilizing is by broadcast mainly.

In terms of straw turnover, when previous quarter rice is harvested, straw is easy to rot due to temperature and sufficient water. Famers smash straw by tractor and turn up the soil. When last quarter rice is harvested, as weather is dry, straw is hard to rot, farmers

will burn the straw.

Techniques of pest control are implemented according to pest forecast and suggestions provided by local agriculture technology department. Traditional pest control is subject to pesticide application habit, price and cost.

Agriculture machinery, rice transplanter and harvester in particular, are rented. Few farmers own agriculture machinery. Pesticide application is done by backpack hand sprayer. Agriculture machinery is backward, mechanization level is low.

3.2.3 Problems existed in livestock farm waste disposal

1. Waste disposal facilities cannot adapt to productivity

So far, due to EP concerns, large-scale livestock farms in Guangdong Province have laid foundation for waste disposal facilities. However, scale of some livestock farms is so large that the original waste disposal facilities cannot adapt to productivity. These facilities should be expanded or reconstructed.

2. Generally low waste disposal technology and facility performance

Livestock farm waste has acidic property and slight corrosivity. After long-term running, it can damage machines. Mechanical equipment failure occurs frequently in farms that have long history. On the other hand, livestock waste disposal technology in China develops with each passing day. Therefore, we can utilize WB project to reform waste disposal facilities in livestock farm, reduce operation management and daily maintenance cost and enhance service efficiency of facilities.

3. Early stage investment is huge, farmers are not so voluntary

Agriculture features big investment and long payback period, therefore many farmers are not so enthusiastic about investing huge money on waste disposal facilities. They equip some simple disposal facilities at design stage which produces unsatisfactory treatment effect. Expand and reform original waste disposal facilities by WB loan,

Guangdong Province supporting fund and self-raised fund rise farmers' enthusiasm about this project. Besides, based on donation and loan project experience, when waste disposal facilities are built, they have low management cost and no significant influence on livestock farm profit.

3.3 Project objective

Guided by scientific outlook on development, focusing on speeding up agriculture transition and upgrading and constructing "Happy Guangdong", demonstrating non-point source Pollution control and livestock waste management for environmental friendly plantation by selecting project demonstration sites in Guangdong, in PRD particular, the purpose of this project is to explore new approach, new model for agriculture non-point source Pollution control, reduce pollution to water body caused by target agriculture pollution source, put Guangdong "the Twelfth Five Year" energy saving and emission reduction task into practice, innovate agriculture energy saving and emission reduction promotion mode, change production mode, save agriculture production cost, improve efficiency and development condition, and accumulate experience for agriculture non-point source Pollution control.

When carrying out non-point source Pollution control for environmental friendly plantation, the purpose of this project is to expand promotion area of scientific fertilizer practice in project area by fertilizer decrement and waste control project, improve fertilizer application structure and mode, enhance staff quality and fertilizer level, reform agriculture production mode, reduce pollution, save energy and reduce emission, increase agriculture efficiency and rural residents' income. The purpose of pesticide decrement and hazard control project is to improve farmers' skills in pesticide control and actual operation, reduce pollution and destruction to agroecological system caused by chemical pesticide on the basis of effective control of crop pesticide. By returning straw to field, minimal tillage, no tillage, straw coverage and mechanical work, protective farming increases soil organic matter and soil fertility, reduces fertilizer

application and consumption of fertilizer, pesticide and machinery oil, reduces chemical fertilizer taken away by surface runoff and running water, reduce production cost, increase crop output, reduce soil wind erosion, water erosion and protect the ecological environment.

For demonstration of livestock waste disposal management, we select 300 (150 in total in Heyuan, Huizhou and Jiangmen) large-scale livestock farm in this province. According to pollution control, energy production and ecological agriculture development requirement, we construct large and medium methane project for large scale livestock and poultry farm. Guided by developing agriculture circular economy, and integrated planning for breeding industry, methane project, farmland and fishpond nearby, we provide clean fuel for livestock and poultry farm or nearby residents, utilize biogas slurry and residues comprehensively, develop ecological agriculture and facilitate nuisance free agricultural product, dispose livestock farm waste by standard, and achieve the goal of recycling poultry excrement and environmental management.

3.4 Project construction content

3.4.1 Project construction content and scale

Please refer to Table 3-3 for project construction content:

Table 3-3 Project construction content and scale list

Serial No.	Project category	Construction content and scale
1	***Environmental friendly plantation***	
1.1	**Chemical fertilizer decrement**	

Serial No.	Project category	Construction content and scale
	waste control demonstration project	
1.1.1	Public supportive project	1. Purchase of soil element detection equipment and construction of supporting facilities for clay fertilizer detection center at province level; 2. Purchase of soil nutrient element detection equipment for clay fertilizer detection center at city level; 3. Purchase of soil nutrient element detection equipment for clay fertilizer lab at county level; 4. Soil sample detection and data research expenses at designated soil nutrient monitoring sites (100 designated soil nutrient monitoring sites per town, 30towns, collect one soil sample per year)
1.1.2	Formula fertilizer promotion	Promote 212, 000 mu (96,000 mu in Huizhou, 116,000 mu in Jiangmen)
1.1.3	Slow/controlled fertilizer application project	Promote 16, 100 mu (8,800 mu in Huizhou, 7,300 mu in Jiangmen)
1.1.4	Water-fertilizer demonstration base project	Water-fertilizer technical demonstration of vegetable and fruits, subsidize relevant facilities, promote 38, 200 mu (35,700 mu in Huizhou, 2,500 mu in Jiangmen)
1.1.5	Rice “three controls” fertilizer	Promote 17, 700 mu (6,700 mu in Huizhou, 11,000 mu in Jiangmen)

Serial No.	Project category	Construction content and scale
	application project	
1.2	**Pesticide decrement and control project**	
1.2.1	Public supportive project	1. Pest monitoring and pre-warning system （1）Set up monitoring and pre-warning system; （2）Equip with long-distance video real time monitoring terminal equipment; （3）Equip with automatic electron measurement equipment. 2. Harmless treatment of pesticide packing waste, subsidize pesticide packing waste company.
1.2.2	PMP prevention for main crops	Conduct comprehensive prevention and treatment on pests and diseases on rice, corn, vegetable, lychee, banana and potato inside the project area; agricultural products obtain pollution-free and green agriculture product certification after project implementation will be rewarded by province supporting fund.
1.3	**Protective farming**	Select rice and corn as pilot projects. Two protective farming pilots for rice (one for Huizhou and Jiangmen each). Two for corn (one in Huizhou and one in Heyuan), approx.400mu per pilot.
2	***Livestock waste disposal management***	
2.1	**Energy**	40 for biogas system and sewage purification project for

Serial No.	Project category	Construction content and scale
	environmental friendly	3000-5000 breeding stock 40 for biogas system and sewage purification project for 5000-1000 breeding stock 20 for biogas system and sewage purification project for 10000-15000 breeding stock
2.2	**Energy ecotype**	100 for biogas system and sewage purification project for 3000-5000 breeding stock 60 for biogas system and sewage purification project for 5000-1000 breeding stock 40 for biogas system and sewage purification project for 10000-15000 breeding stock
2.3	**New technology demonstration site**	High-bed fermentation ecological breeding show-how
3	***Monitoring and assessment, capacity building and knowledge management***	
3.1	**Monitor and assessment**	
3.1.1	Performance monitoring assessment	1. Chemical fertilizer decrement monitoring and assessment; 2. Pesticides decrement monitoring and assessment; 3. Livestock waste pollution monitoring and assessment;
3.1.2	Daily	Supervise project progress and implementation of security

Serial No.	Project category	Construction content and scale
	monitoring assessment	policies.
3.2	**Capacity building**	
3.2.1	Executive capacity construction	1. Construct agricultural environment monitoring labs in Jiangmen City and buy instrument; 2. Purchase 10 environmental monitoring vehicles for agriculture non-point source pollution.
3.2.2	Technology and policy research	（1）Soil fertilizer （2）Select new demonstrative pesticide and plant machinery （3）Livestock waste management （4）Policies
3.2.3	Technical training	（1）Project executor training （2）Project manager training （3）Other stakeholders training
3.2.4	Project research	1. Seminar for agriculture non-point source pollution comprehensive treatment at province level; 2. Organize agriculture technicians to visit and learn abroad or in other provinces and cities.
3.2.5	Others	1. Improvement of promotion and training facilities for agriculture non-point source Pollution control; 2. Monitoring of quality and safety of agriculture products in demonstration area; 3. Brand promotion for agriculture products in demonstration area.
3.3	**Knowledge**	

Serial No.	Project category	Construction content and scale
	management	
3.3.1	Database construction for agriculture non-point source pollution	1. Formulation of Guangdong agriculture non-point source Pollution control standard; 2. Formulation of Guangdong protective farming technique standard; 3. Formulation of various crops pests prevention; 4. Books collection of agriculture non-point source pollution control;
3.3.2	Knowledge communication	1. Popularization of typical agriculture non-point source Pollution control demonstration area (five in total); 2. Guangdong agriculture non-point source Pollution control website and information management system construction; 3. Information service for agriculture non-point source Pollution control.
4	***Project management***	1. Daily management, including increment operation expense; 2. Follow-up research; 3. Meetings.

3.4.2 Identification of construction project content

Environmental management plan is for the purpose of eliminating or compensating negative influence on environment and society during project implementation, therefore, we should focus on construction project content in this project. As WB loan Guangdong agriculture non-point source control has wide coverage and complicated content, in order to analyze project's influences on environment in a better way and put forward effective control measures, it is necessary to identify construction project

content from numerous projects and conclude as below:

3.4.2.1 Public supportive project

In order to maintain normal implementation of this project and ensure normal scientific research carried out by clay fertilizer detection center lab at province level, modifications works are to be done for this lab (with floor area of 1100square meters), mainly include decoration and transformation of lab structure, roof, exterior decoration, indoor decoration, doors and windows, water supply and sewage, central heating, ventilation and fume cupboard, air conditioner, electricity, telephone, network, surveillance, alarm, gas line, etc.

3.4.2.2 Water-fertilizer integration demonstration project

Water-fertilizer integration technology is agriculture non-point source pollution method combining source control and process control. It utilizes water soluble fertilizer according to crop's fertilizer demand, increases fertilizer use ratio and reduces fertilizer application amount, and then reduces risk of fertilizer loss and pollution. Based on the theory of "fertilizer comes and goes with water", dissolve fertilizer in water, utilize various water-fertilizer integration equipment to bring water and fertilizer to crop rhizosphere soil and make them absorb by crop. Reduce chemical fertilizer amount significantly by technical measures such as supply frequently with small amount, supply at fixed time in fixed quantity, or supply by demand, improve utilization efficiency of fertilizer and achieve the goal of energy conservation and emission reduction.

Water-fertilizer demonstration base project means selecting vegetables and fruit trees in Huizhou City to carry out water-fertilizer technology, with promotion area of 38,200mu. Construction content includes drip irrigation system and organic fertilizer storage pool construction.

3.4.2.3 Protective farming

Protective farming refers to an advanced agriculture technology which sows by no-tillage or minimal tillage under circumstances that there is straw or stubble on ground surface.

The purpose of protective farming is to, first improve soil structure, fertility, water storage ability and drought resisting ability, as well as grain yield; second, improve soil anti-erosion ability and reduce soil drifting and water erosion, protect ecological environment; third, reduce operation chains, consumption of fertilizer, pesticide and agricultural implements fuel, pollution and production cost, improve economic benefit of agriculture production. Basic characteristics of protective farming are: no need to plough land and there is straw or stubble on ground surface.

In subproject of protective farming, there is no specific construction content, but there are some good EP measures, therefore, we have special environment analysis on this subproject.

3.4.2.4 Livestock waste management

Large and medium biogas project is launched for large scale livestock and poultry breeding farm according to function requirements for pollution control, energy production and ecological agricultural development. Guided by the principle of developing agriculture circular economy, this project makes unified and systematic arrangement for breeding industry, biogas project and nearby farmland and pools, utilize biogas slurry and residues, develops ecological agriculture, facilitates pollution-free agricultural product production, discharges livestock farm excrement by standard, achieves the goal of recycling livestock and poultry excrement and protecting environment. Due to differences in terms of plantation and aquaculture industry environment and natural conditions nearby livestock farm, three construction modes are considered, which are energy environmental friendly mode, energy ecological

mode and new “high-bed fermentation” breeding mode.

Construction content of livestock waste management mainly includes pretreatment facilities of raw fermentation material, anaerobic digestion system and pretreatment facilities, biogas and biogas fertilizer utilization facilities. Pretreatment facility of raw fermentation material includes grating, solid-separation device, aggregation pool, regulating reservoir, grit chamber, etc; anaerobic digestion system includes anaerobic digestion device, warming device, dehydration device, sweetener, gasometer, detecting instrument, etc; biogas utilization facilities include liquid storage pool, biogas fertilizer process equipment, conveying equipment, etc; other supporting facilities include fire control, lighting, water supply and drainage, marks, etc.

3.5 Environment instrument identification

Guangdong Agricultural Non-point Source Pollution control Project loaned by WB is divided into lab, drip irrigation system and biogas project according to construction content. According to WB requirement, different environment management instruments are used for different project mode and scale. This report is made up of ECOP, EMF and LWMP. Environment management instruments used for each subproject are shown in Table3-4.

Environmental friendly plantation: for this subproject, lab decoration transformation, construction of reservoir and drip irrigation network in water-fertilizer demonstration base should have corresponding ECOP. Construction content of others, such as formula fertilizer promotion project, controlled release fertilizer application project and rice “three controls” fertilizer application, is mainly agricultural machinery purchase and agriculture technology promotion. No specific engineering construction content is involved, therefore, no special analysis is made on environment management plan. Besides, for major crop pest PMP prevention, pest and dieases management plan is developed by Guangdong agriculture scientific institute. Although no specific

construction content is defined in subproject of protective farming, there are some good environment management measures, ECOP is made accordingly.

Table 3-4 List of environment management instrument for each subproject

Item description			Project type			Remarks
			Lab	Drip irrigation system	Biogas project	
1Environmental friendly plantation	1.1Demonstrative project for chemical fertilizer decrement and pollution control	1.1.1 Public supportive project	ECOP			
		1.1.2 Formula fertilizer promotion project				
		1.1.3 Slow/control release fertilizer application project				
		1.1.4 Water-fertilizer integration demonstration		ECOP		
		1.1.5 Rice “three controls” fertilizer application project				
	1.2Pesticide decrement and hazard control project	1.2.1Public supportive project	ECOP			
		1.2.2 PMP prevention for major crop pest				PMP
	1.3 Protective farming					ECOP
2 Livestock waste management	2.1 Energy environmental friendly type				EMF LWMP	
	2.2Energy ecological type				EMF LWMP	
	2.3 New “high-bed fermentation” breeding mode				EMF LWMP	

Livestock waste management: its subproject under three modes will construct a series of EP facilities such as biogas project for livestock farms at early stage of the project, corresponding LWMP should be made. Since at current stage of livestock waste management subproject, only 150 livestock farms are put into practice, construction period is relatively long, site selection may vary during project preparation and implementation process. In order to regulate project implementation and operation of livestock farms newly added to this project, EMPF shall be developed accordingly.

3.6 Screening for environmental evaluation factors

Schedule method is adopted based on project features, source of pollution and influence during construction period and operation period as well as environmental status in project area. Refer to Table 3-5 for environmental influence factors of each environment element.

Table 3-5 Screening schedule for project environmental factors

Project type	**Environmental elements**	**Environmental factors during construction period**	**Environmental factors during operation period**
Public supportive project	Water environment	Waste water from engineering construction, constructors' activity	
	Sound environment	Construction machinery noise, construction transportation vehicle noise	

Project type	Environmental elements	Environmental factors during construction period	Environmental factors during operation period
	Ambient air	Raise dust from construction, piles and vehicles	
	Solid waste	Construction waste slag, construction material, domestic garbage	
Water-fertilizer integration project	Sound environment	Construction machinery noise, construction transportation vehicle noise	
	Surface water environment	Water seepage from excavation of foundation pit and machinery oil stain	
	Ambient air	Raise dust from construction, piles and vehicles	
	Solid waste	Engineering spoil, waste slag and construction material	
	Ecological environment	Earth excavation, farmland occupation	

Project type	Environmental elements	Environmental factors during construction period	Environmental factors during operation period
Livestock waste management	Water environment	Construction sewage, constructors' activity	Waste water, fecaluria
	Sound environment	Construction machinery noise, construction transportation vehicle noise	Noise from operational machinery such as water pump and motor
	Ambient air	Raise dust from construction, piles and vehicles	Odor from livestock farm
	Solid waste	Engineering spoil, waste slag and construction material	Excrement residues, feed, domestic garbage

Chapter 4 Project environment analysis

4.1Environmental friendly plantation

4.1.1 Analysis of main environmental impacts

By identification of construction content, major influences exerted on environment by plantation are from public supportive project and water-fertilizer integration demonstration base. The key point is influence on environment by construction period, mainly include:

1. Atmospheric environment: raise dust from vehicle moving, construction material and earthwork piling during construction, raise dust from concrete and mortar mixing as well as transportation of earthwork, muck and construction garbage. Besides, after cropping last quarter rice, the left straw is hard to rot due to dry weather. It is eliminated by burning. Burning straw pose huge threat to atmospheric environment.
2. Water environment: water body pollution caused by industrial waste water, domestic wastewater, excavation water seepage and machinery greasy dirt.
3. Sound environment: noise is made during construction period by construction machinery and transportation vehicles. Water pump operation may disturb sound environment around project area.
4. Solid waste: solid waste during construction period refers to construction garbage, wasted oil, chemical solvent, domestic garbage, deserted pipeline, etc.

Besides, subproject implementation of environmental friendly plantation brings more positive influence on local environment: by popularization of scientific fertilizer application technology, fertilization structure and method are improved, fertilizer application amount is reduced; improve pests and disease prevention and control level and rural residents' actual operating skills, reduce pollution and destruction to

agriculture ecological system caused by chemical pesticides; reduce pesticides packing waste by recycling pesticide wrappage; by returning straw to field, minimal tillage, no tillage, straw coverage and mechanical work, protective farming increases soil organic matter and soil fertility, reduces fertilizer application and consumption of fertilizer, pesticide and machinery oil, reduces chemical fertilizer taken away by surface runoff and running water and reduce pollution to water body caused by pesticide.

4.1.2 Main pollution control measures

Based on negative influences on atmospheric environment, water environment, sound environment and solid wastes caused by environmental friendly plantation, the following prevention and mitigation measures are put forward:

1. Necessary site hardening and dust suppression; discrete material shall be stored and sealed, take shelter measures when handling, residual dust material after removing stockpile should be eliminated timely; strengthen transportation vehicle control, slow down speed when vehicles move closer to construction site, reduce dust caused by vehicle moving, take sealing measures on transport vehicles handling earthwork, muck and construction garbage.
2. Build settling pond in construction site to subside industrial wastewater. The settled sewage can be recycled for construction site or reducing dust; when lay out irrigation network, ensure its tightness; do not set machine, vehicle maintenance point or cleaning point in construction site. Repair in professional maintenance place so as to avoid oily sewage in construction site; inspect for oil leak or water leakage before using equipment.
3. Machinery equipment which generates loud noises must have basic damping or vibration attenuation support, including damping material; adopt low-noise equipment and control construction time strictly, put noisy equipment indoor. Make proper arrangement for construction period, avoid simultaneous operation of multiple large scale noisy machine in one construction site; contractor should maintain construction equipment regularly, control it at the best operation mode and lowest noise level; idle equipment in the construction site should be turned off

or set in vibration attenuation state; construction transportation vehicles should slow down and do not use horn near construction site.

4. Classify waste generated by construction, dismantle and site clearing, recycle materials that can be used directly or reproducible. Entrust clearance companies to handle the rest. Clearance company must have environmental service quality certificate approved by corresponding department; during construction, if there is oil leakage, clean contaminated soil timely; clear stopper in drainage ditch regularly; when project is over, solid waste from construction should cleared.

For specific mitigation measures, refer to attachment 1 (ECOP for public supportive project) and attachment 2 (ECOP for water-fertilizer demonstration base).

4.2Livestock waste management

4.2.1Analysis of major environmental factors

Environmental factors analysis of livestock waste management project is about environmental influences caused by pretreatment facilities for fermentation raw material, anaerobic digestion system and raw material pretreatment facility, biogas and fertilizer utilization construction under energy environmental protection mode, energy ecological mode and “high-bed fermentation” from the perspective of construction period and operation period. As this is similar to that of environmental friendly plantation, to avoid repetition, we will focus on introducing environmental problems during livestock waste management operation period, including:

1. Atmospheric environment: foul gas generated from combustion emission, livestock odor and biogas disposal system.
2. Sound environment: generator set and pump station operation
3. Water environment: biogas slurry from biogas disposal system and staff’s domestic sewage.

4. Solid waste: discarded feed, animal waste, animal body, packing material, medicine, cleaning material and domestic garbage.
5. Animal epidemic prevention and safety management: safety operation and epidemic situation of biogas project.

Besides, subproject of livestock waste management constructs large and medium biogas project for large scale livestock and poultry farm, makes unified planning for breeding industry, biogas project and nearby farm and fish pond according to demand by pollution control, energy production and ecological agriculture development, achieves goal of recycling livestock and poultry excrement as well as environmental control. By a series measures such as solid-liquid separation, anaerobic digestion and oxygen consumption, pollutant concentration in livestock waste is decreased significantly. It is estimated that pretreatment effect may shown as in Table 4-1 and Table 4-2. Therefore, EP facilities will be strengthened to improve project area environment.

Table 4-1 Treatment effect of energy environmental friendly breeding mode at each stage (concentration mg/L)

Pollutant index / **Processing element**		**CODcr**		**BOD_5**		**NH_3-N**		**SS**	
		Concentration	**Removal rate**	**Concentration**	**Removal rate**	**Concentration**	**Removal rate**	**Concentration**	**Removal rate**
Sewage collection pool Solid-liquid separator	Inflow	8000	20%	4000	20%	1500	30%	2000	30%
	Outflow	6400		3200		1050		1400	
Acidize regulating reservoir	Inflow	6400	10%	3200	10%	1050		1400	50%
	Outflow	5760		2880		1050		700	
Biogas digester	Inflow	5760	80%	2880	80%	1050		700	60%
	Outflow	1152		576		1050		280	
Biogas	Inflow	1152		576		1050	10%	280	60%

Pollutant index / Processing element		CODcr		BOD_5		NH_3-N		SS	
		Concentration	Removal rate	Concentration	Removal rate	Concentration	Removal rate	Concentration	Removal rate
residue filter tank	Outflow	1152		576		945		112	
Hydrolyzation pool (Integrate aquatic plant)	Inflow	1152	70%	576	70%	945	50%	112	20%
	Outflow	345.6		172.8		472.5		89.6	
Oxygen consumption tank	Inflow	345.6	10%	172.8	10%	472.5	85%	89.6	
	Outflow	311.04		155.52		70.875		89.6	
Purifying pool	Inflow	311.04	10%	155.52	10%	70.875	5%	89.6	10%
	Outflow	279.94		139.97		67.331		80.64	
Discharge reference value		279.94		139.97		67.331		80.64	

Table 4-2 Treatment effect of energy ecological breeding mode at each stage (concentration mg/L)

Pollutant index / Processing element		CODcr		BOD_5		NH_3-N		SS	
		Concentration	Removal rate	Concentration	Removal rate	Concentration	Removal rate	Concentration	Removal rate
Sewage collection pool Solid-liquid separator	Inflow	8000	20%	4000	20%	1500	30%	2000	30%
	Outflow	6400		3200		1050		1400	
Acidize regulating reservoir	Inflow	6400	10%	3200	10%	1050		1400	50%
	Outflow	5760		2880		1050		700	
Biogas digester	Inflow	5760	80%	2880	80%	1050		700	60%
	Outflow	1152		576		1050		280	

Pollutant index Processing element		CODcr		BOD_5		NH_3-N		SS	
		Concentration	Removal rate	Concentration	Removal rate	Concentration	Removal rate	Concentration	Removal rate
Biogas residue filter tank	Inflow	1152		576		1050	5%	280	60%
	Outflow	1152		576		945		112	
Biogas slurry storage pool	Inflow	1152	10%	576	10%	945	5%	112	
	Outflow	1036.8		518.4		897.75		112	
Discharge reference value		1036.8		518.4		897.75		112	

4.2.2 Major pollution control measures

The following prevention and mitigation measures are put forward based on livestock waste management sub-project's influence on atmospheric environment, water environment, sound environment, solid waste and animal epidemic prevention and safety management:

4.2.2.1Atmospheric environment

1. Plant trees and grass around project site, build ring greenbelt to absorb and dilute foul gas and enlarge digestion space for livestock farm.
2. Equip devulcanizer for biogas disposal system. Before biogas entering boiler room or generator set, remove H_2S in devulcanizer, desulphurization rate is 85%. Biogas is clean energy, after sulfur removal, discharge concentration of smoke and sulfur dioxide in exhaust gas meets with standard. If it is gas-fired boiler, a chimney higher than 15m is required.
3. Livestock farm should inhibit or reduce odor by controlling stocking density, enhancing indoor ventilation, adopting water saving drinker and timely excrement cleaning.

4. Biogas generated from anaerobic treatment should be made full use of, do not discharge to environment directly. After purification treatment, it can be used for domestic gas, boiler and biogas generation through transmission and distribution system.
5. Each process of waste treatment should be designed as closed type to reduce pollution to environment caused by foul smell.
6. Spray biochemistry deodorant on waste unload port and solid-waste separation device.
7. Put adsorbent in excrement or indoor to reduce odor diffusion. The applicable adsorbent is zeolite, saw dust, bentonite and materials that have cellulose and numerous lignin, such as straw and peat.
8. Put or spray chemical deodorant in livestock farm or compost to eliminate or reduce odor. The applicable chemical oxidants are potassium permanganate, potassium dichromate, hydrogen peroxide, hydrogen peroxide, sodium hypochlorite, ozone, etc. Deodorize by biofiltration process and bioscrubber.

4.2.2.2 Sound environment

1. Adopt low-noise equipment. Noise-making equipment such as water pump and motor should be placed in confined room.
2. Mechanical equipment which generates noises must have basic damping or vibration attenuation support, including damping material.
3. Idle facilities must be turned off or in vibration attenuation state.

4.2.2.3 Water environment

1. Set rain-sewage separation system in livestock farm and biogas station. Dispose rain water and sewage separately. Discharge rain water off-site through rain gutter.
2. Sewage collection and transportation system set in and outside of project site should not be open trench.
3. Domestic sewage should be disposes in biogas treatment system together with

livestock sewage through blow-off line.

4. Livestock and poultry farm waste water should be pretreated before disposal. Pretreatment facilities include grating, grit chamber, solid-liquid separation system, hydrolyze acidize pool, etc.
5. Grating must be set before sewage entering collecting tank. When there is huge amount of sewage, use mechanical grating. Grating residue must be transported to excrement compost or other pollution-free places and be disposed.
6. Clean collecting basin, regulating reservoir and pipelines regularly to avoid pipeline stoppage, excrement pile up and floater. Operators should check collecting basin regularly and clear scum, dispose spoil according to normal operation condition.
7. Reduce water amount used for cleaning (for example, adopt high-pressure and low discharge sprayer).
8. Livestock and poultry sewage discharged to water body or recycled after treatment should be disinfected. Achloride disinfection measures such as ultraviolet rays, ozone and hydrogen peroxide are recommended. Secondary pollution is forbidden.

4.2.2.4 Solid waste

1. Classify and dispose livestock farm domestic garbage, packing material, and cleaning material, recycle materials that can be directly used or recycled, clean residues regularly.
2. Livestock breeding waste such as poultry excrement and padding should be cleaned regularly. Hygiene and EP measures such as reliable hermetic and leakage proof measure shall be taken for storage and transportation vehicles for livestock breeding waste; special storage yard should be set for temporary storage of livestock waste, fence should be set up to prevent penetration, leakage, erosion and drain.
3. Use feed facilities that have cover or protective device to prevent feed from erosion by wind and rain, keep feed system at good operation status, and prevent feed from

overflow or contacting ground.

4. Keep waste dry, do not wash by water or strike off, or combine water wash and strike off.
5. Keep surface temperature of livestock excrement at 15℃ or below (for example, cool livestock excrement by fan), so as to decrease ammonia emission.
6. Storage place of livestock excrement must be away from environment such as water body, alluvial plain and water supply source, reduce surface area of livestock excrement storage.
7. Make sure collect solid waste regularly (such as bedding and manure), do not left them on ground for a long time. Clean them up daily. Put dry animal waste or garbage in places with capping or ceiling to reduce rain water in storage system.
8. Bodies of animals die from disease must be disposed timely. Do not discard at will, sell or recycle them as feed. Store animal bodies during collection period, and freeze them to avoid decay if necessary;
9. Areas for burying animal body should be accessible for excavating equipment, have stable soil, low permeability, and sufficient isolation layer to separate houses and water source, so as to avoid pollution caused by smell or filters from the buried decaying substances.
10. Livestock and poultry excrement must be treated pollution-freely. For solid waste composting, adopt high temperature aerobiotic fermentation or other applicable techniques or method to kill pathogenic bacteria and roundworm egg inside, shorten composting time and be pollution-free. Land can only be utilized when it meets with Pollution-free Hygienic Standard for Excrement. The untreated livestock and poultry excrement is forbidden to apply to farmland directly.
11. Excrement subject to treatment, which may serve as land fertilizer or soil conditioner for crop growth, should not be applied with amount exceeding that required by the crop growth in the current year.
12. It is forbidden to apply or required to cease applying manure in the high rainfall area, slope and the land with sandiness prone to generate runoff and the soil with strong permeability since the application of manure or excessive application

amount in such places may cause surface or ground water pollution due to manure loss.

13. Organic fertilizer plant or treatment organism should be prepared for centralized treatment of livestock and poultry excrement if no sufficient lands to consume and utilize manure are provided for medium and large livestock and poultry farm and breeding area**.**

4.2.2.5 Animal epidemic prevention and safety management

Requirement for animal epidemic prevention is shown below:

1. Animal house should be designed and constructed as per the animal epidemic prevention requirements, provided with natural light, ventilation, waste and sewage discharge facilities as well as the separate clean and contamination path.
2. It is required to equip with separation house for sick animals, non-hazardous treatment facility and equipment for animals died of disease, sewage and wastes.
3. The personnel responsible for prevention and treatment should be specially assigned.
4. Separation and disinfection facility and equipment shall be provided at the entry and exit.
5. The personnel responsible for feeding, epidemic prevention and treatment should be free of any zoonosis.
6. It is necessary to establish the complete epidemic prevention system.

General regulations for safety management of livestock “biogas project” during operation period:

1. Operation managers must be familiar with “biogas project” treatment technology and facilities, equipment operation requirement and technical index, have professional certificate (biogas production), and know this project treatment process, job facilities, equipment operation requirement and technical index.
2. Each post shall have process system chart, post responsibility, work chart and

operation instruction of this project and mark on obvious position.

3. Operators at each post should follow requirements specified in this post operation instruction and fill up operation record timely and accurately.
4. Before starting the equipment, do complete inspection and make preparation. Machine can only be started after confirmation of no error. If operators find abnormal operation, take measures accordingly and report to the person in charge timely.
5. Facilities and equipment must be clean and avoid water, mud or gas leakage.
6. “Biogas project”shall establish three-level maintenance system: daily maintenance, regular maintenance and overhaul.
7. Key components of equipment such as boiler and pressure vessel should be inspected and maintained by maintenance unit approved by safety and labor department.
8. The lightning-protection and explosion-proof equipment installed on the building and structure should be maintained as per the regulations specified by the meteorological department and fire department, and also the application to relevant department for regular testing is required.
9. Maintenance personnel should, as per the equipment operation requirements, regularly check and replace the safety and fire-fighting protection facilities. It is required to keep detection records as per relevant regulations for the protective safety appliances.
10. Inspect and fasten equipment adapting pieces regularly, and inspect control element, manual and electric interlocking devices of electrically operated valve.
11. Open ditch among structures should be regularly cleared.
12. It is required to conduct systematic safety education for staff and establish regular safety study system. The personnel engaged in special type of work like the electricity, boiler and chemical analysis should receive training in occupational skill and safety techniques, and is not permitted to engage in such works until meeting the qualification and getting the related professional certificate.
13. It is required to make the emergency warning plan for accidents such as the fire,

combustion, explosion and natural disaster; markers regarding smoke restriction and fire fighting should be prepared at clear positions in the factory.

14. It is required to take safety protection measures for facilities for the production, transportation and storage of biogas, as well as prevent biogas leakage or keep air away from the anaerobic reactor and the biogas storage and distribution system. No working with naked fire is permitted. Do not discharge water in reservoir in gas storage cabinet without authorization, so as to avoid damage to tank caused by negative pressure inside the tank.
15. When drainage, cleaning and maintenance is required for structures or container relating to harmful or inflammable gas, it is necessary to open manhole and head cover, after 24h forced ventilation and replacement, and then maintenance personnel may be permitted to enter under safety protection and close watch of the specially assigned person outside the reactor.
16. Electromechanical devices shall be started up and shut down by the personnel-in-charge only
17. If maintenance is required, all equipments should be powered off and the maintenance warning board should be hung beside the control cabinet.
18. It is forbidden to wipe moving parts and required to keep flushing water away from cable head and motor while cleaning electromechanical device and surroundings.
19. Ventilation is necessary for the site exposure to harmful gas, inflammable gas, odor, dust and moisture. Safety protection and monitoring measures should be taken when removing sundries, scums and cleaning weir.
20. It is necessary to look out for safety when inspecting and operating on the structures or along the open-type tank and well, particularly in the rainy or snowy days.
21. Formulate emergency response and necessary measures for accident prevention.

For specific mitigation protection measures, please refer to Chapter 6 LWMP in Environmental Management Plan.

4.3 Social impact assessment

Guangdong Agricultural Non-point Source Pollution Control Project Loaned by World Bank involves in three prefecture-level cities, six counties and 30 towns. It has wide social influence, with each implementation all link with each other. Whether this project can be carried out successfully is largely determined by participation willingness and attitude of subjects of implementation (farmers). In order to facilitate optimization design and effective implementation of this project, Department of Agriculture of Guangdong Province entrusts Guangdong Urban Management Committee to compile socal impact assessment report. In accordance with World Bank safty insurance policy, this environment management plan has to make social impact assessment analysis based on social evaluation.

4.3.1 Positive social impact

As a large scale comprehensive environment administration project, most socal impacts brought by Guangdong Agricultural Non-point Source Pollution Control Project Loaned by World Bank are positive. By project preliminary design and research, it will bring huge ecological, social and economic benefit to project implementation area, which mainly reflects in the following aspects:

1. Improve living conditions in rural area: local residents' living comdition will be improved significantly and drinking water resources and agriculture production environment will be guaranteed by reasonable application of pesticides and chemical fertilizer, collecting and disposing of pesticides and chemical fertilizer waste, and implementation of livestock waste management project.

2. Save agriculture production cost and increase income: this project reduces agriculture input by reasonable application of effective fertilizer and pesticide. Meanwhile, the project has relevant subsidy and facilities, which increases agriculture income.

3. Reduce work strength: this project has fundamentally reduced work strength by technical instruction, usage regulation, rehandling reduction and advanced machine.

4. Reduce diseases: this project utilizes qualified fertilizer and pesticides and rational application method which reduces harmful residues and guarantees food safety; livestock waste discharge meets with requirement, reduces pollution to surroundings and good for livestock staff and local residents' health.

5. Improve the quality of farmers: various trainings in this project not only improve production skills but also help farmers to be close to market, focus on communication with experts, improve network technique, which in turn improves the quality of farmers.

6. Enhance agriculture comprehensive service level: in the process of project implementation, each link of comprehensive agriculture service is involved in, such as farmers' professional cooperative, supplier, agriculture technique promotion center, agriculture materials company, etc. By project instruction and training, it will improve agriculture comprehensive service level fundamentally.

7. Participate in project benefit and prject technique promotion: this project focuses on popularization and application of amount-decreasing and efficiency-increasing fertilizers and pesticides, resource utilization and harmless treatment technique of livestock and poultry excrement. Utilizing traditional agriculture essence and modern technology, it coordinates conflict between development and environment, resources utilization and protection by manual design ecological project. It facilitates project area R&D, advanced ecological agricultural technology introduction, and foundation of local sustainable ecological agriculture technology system.

8. Enhance awareness of agriculture non-point pollution: by promotion in early stage and approved by distinctive project, it attracts more farmers to take part in the project, realize the importance of environment protection, and enhance awareness of agriculture non-point pollution.

4.3.2 Negative social impact

As this is an environment administration project, basically it has no negative influence on the society. This article puts forward impact analysis of potential land acquisition. Although at project design statge, no land acquisition issues are involved, however, in

the process of project implementation, such as livestock farm and machinery cultivation expansion, there may be land acquisition issues. Land acquisition must be reasonable and lawful, focus on communication with original land users, conclude and sign corresponding contract by rule, come up with relevant indemnifying measures, so as to basically eliminate negative social impact brought by land acquisition.

4.3.3 Summary of Social Impact

Generally speaking, Guangdong Agricultural Non-point Source Pollution Control Project Loaned by World Bank has positive impact on the society. It improves living conditions in rural area, saves agriculture production cost, increases income, reduces labor strength, decreases diseases, improves quality of farmers, enhances agricultural comprehensive service level, facilitates agriculture technology promotion and enhances awareness of agricultural non-point pollution. Its main negative social impact is potential land acquisition. As long as land acquisition is reasonable and lawful, its negative social impact can be eliminated.

Chapter 5 Management system of environment management plan

This project involves 300 livestock farms selected from 30 towns in 6 counties (cities and districts) of 3 provincial city of Guangdong. This project covers a large range and has complicated construction content. In order to minimize negative influences on environment caused by project implementation and put environmental management into practice. As required by regulations and actual project demand, in order to achieve demonstration effect, this project is not only supervised by EPD but also assign designated personnel from project management office (PMO) at each level to be in charge of environment management, and establish environmental management system consisting of supervision institution, enforcement body and consultation service agency.

5.1 Setup of environmental management organization

For setup of environmental management organization, please refer to Figure 5-1 and Table 5-1.

Table 5-1 Constitution of environmental management system

Nature of organization	Name of organization	Organization task
Administrative organization	Provincial project office	Assign specialized environmental manager to be in charge of EP works at project planning, design and implementation stage, make sure work procedure meet with environmental assessment (EA) and management requirement by China and WB, coordinate with implementation of environmental management plan. For details, please refer to “5.2 Responsibilities and personnel allocation for environmental management system organizations”.

Nature of organization	Name of organization	Organization task
	City project office (CPO) and district project office (DPO)	Appoint specialized EP personnel to be in charge of environment supervision and management during project construction and operation period, daily supervision when project is completed, so as to minimize negative influences on environment caused by this project or reduce it to an acceptable level, meanwhile give full play to its environmental benefit; make arrangement for funds required by EP works and be in charge of regulating and filing relevant documents. Refer to "5.2 Responsibilities and personnel allocation for environmental management system organizations" for details.
Supervisory organization	Environmental protection administrative department (EPAD) at different levels	Government monitoring and management organization is responsible for supervising and checking work procedures for compliance with environment management in China, pollution prevention measures shall meet with this requirement. Refer to "5.2 Responsibilities and personnel allocation for environmental management system organizations" for details.
	WB	Dispatch environment technique expert to supervise and check implementation of EP regulations. Refer to "5.2 Responsibilities and personnel allocation for environmental management system organizations" for details.
Environmental assessment organization（EAO）	Environmental assessment unit	Accept commission, compile project environment report. Refer to "5.2 Responsibilities and personnel allocation for environmental management system organizations" for details.
Consultation	Environmental	Accept commission, supervise and manage daily production

Nature of organization	Name of organization	Organization task
services organization	supervision (ES) unit	activities of construction units. Refer to “5.2 Responsibilities and personnel allocation for environmental management system organizations” for details.
	Environmental monitoring unit	Qualified environmental monitoring organization is responsible for monitoring works at project construction stage and operation stage. Refer to “5.2 Responsibilities and personnel allocation for environmental management system organizations” for details.
	External environment expert group of provincial project office	Assist provincial project office in checking EP works of each subproject and guide environment assessment unit and implementation unit to design and put EP measures into practice. Refer to “5.2 Responsibilities and personnel allocation for environmental management system organizations” for details.
Implementation organization	Civil work contractor and breeding farm owner	Assign site environment engineer, put contract conditions and terms as well as EP measures specified in bidding document into practice, satisfy demand on environment protection by WB, local EPD, submit construction checkup list (attached list 1 and attached list 2). Refer to “5.2 Responsibilities and personnel allocation for environmental management system organizations” for details.

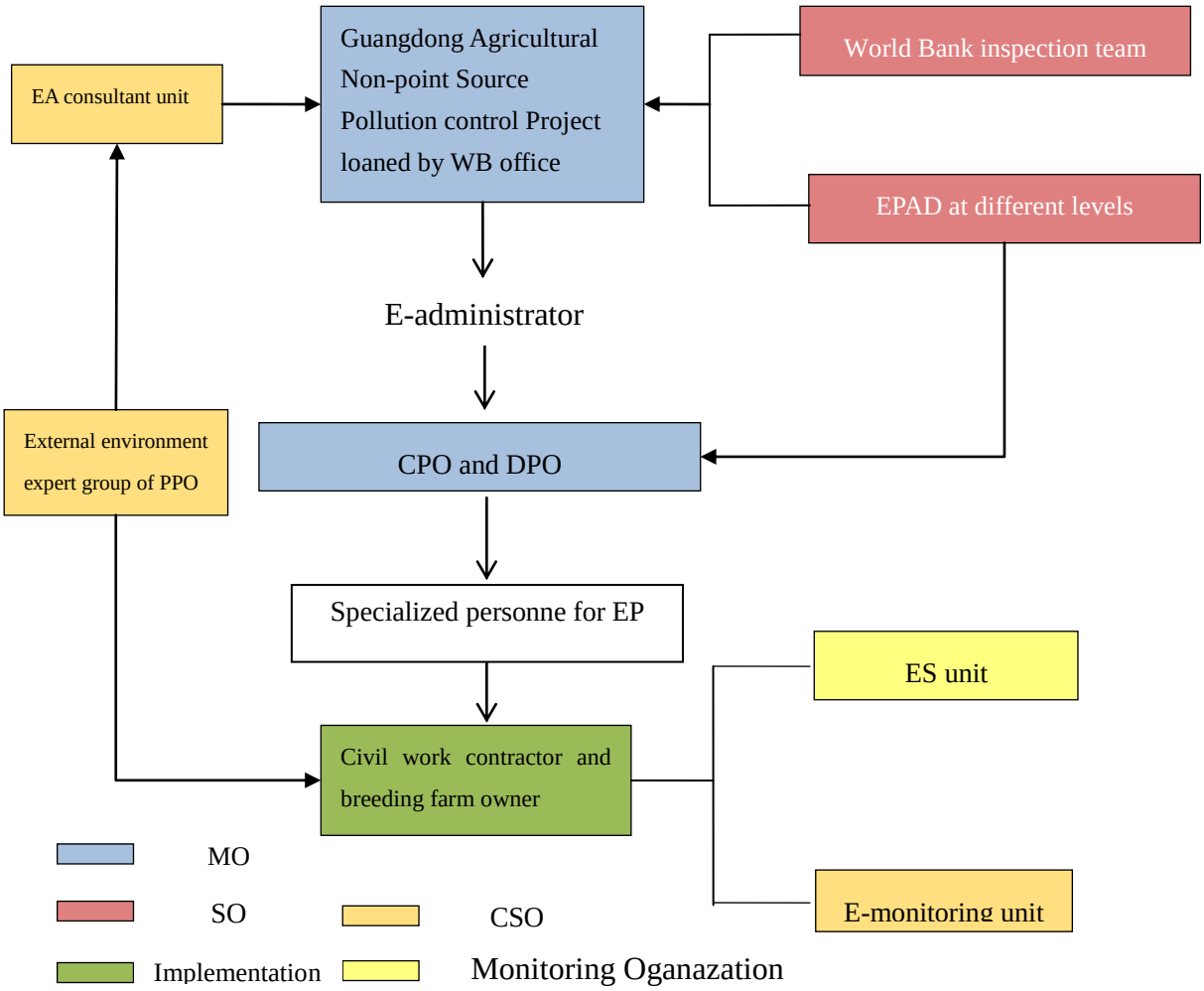


Figure 5-1 Frame diagram of project environmental management organization

5.2 Responsibilities and personnel allocation for environmental management system organizations

Environment management system of Guangdong Agricultural Non-point Source Pollution control Project loaned by WB includes project management organization, supervision organization, implementation organization, and consultation service organization (CSO). These organizations constitute a complete project environment management system, but each organization has its own work and responsibilities. This

project is carried out under the guidance of provincial project office and organizations of counties (cities) government taking part in the project, make sure project construction satisfies with requirement by China and WB in terms of work procedure and pollution control measures. Responsibilities and personnel allocation for environmental management system organizations is shown in Table 5-2.

Table 5-2 Responsibilities of environmental management system organizations

Name of organization	Type of organization	Personnel allocation	Organization responsibility
① EPD at different levels	Supervision organization	1 person	1. Supervise environment throughout project according to law, including: approval of project environment evaluation report (EA of subproject), project construction and operation.
②Provincial project leader team and management office	Management organization	1 person	1. Compile and supervise implementation of Environment Management Plan; 2. Monitor, coordinate and put China and WB environment management requirement into practice; 3. Submit relevant report to WB every half year; 4. Check environmental management works in project offices at each level; 5. Coordinate with other department about major environment problems; 6. Entrust invited environment expert team to check this project.
③CPO and DPO	Management organization	1-2persons	1. Compile and supervise implementation of subproject environment management system; 2. Compile and submit EA document in China for approval; 3. Make project design meet with EA requirement;

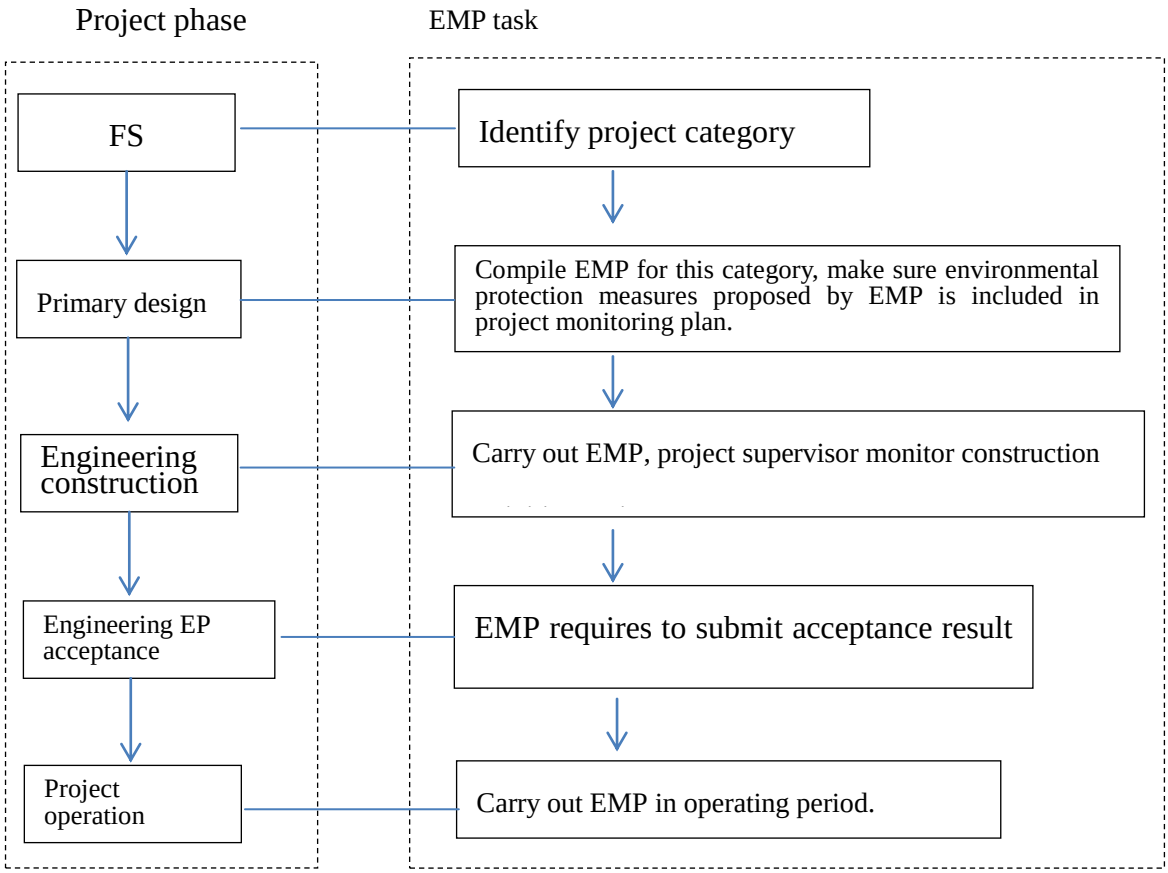
Name of organization	Type of organization	Personnel allocation	Organization responsibility
			4. Include EP measures of this EMP in project construction contract; 5. Hire, monitor and coordinate with project supervision (qualification, responsibility and management); 6. Implement environment management training plan; 7. Organize monographic study or relevant research; 8. Record and clear up complaint occur during project construction and operation, explain results to the public and solve public complaints; 9. Review environment supervision and environment consulting report; 10. Submit report to provincial project office every quarter (statement); 11. Sign site verification form submitted by construction unit and supervision unit, verify environmental problems and file up. 12. Receive daily environmental check (including WB project check).
④World Bank	Supervision organization	1person	1. World Bank send inspection team to check project implementation every year; 2. Check implementation status of this project loan agreement and Environment Management Plan.
⑤Unit that has Class A certification of construction project	Environment assessment	3persons	1. Have field visit to each project and evaluate its environment; 2. Compile Environment Management Plan.

Name of organization	Type of organization	Personnel allocation	Organization responsibility
influence evaluation	organization		
⑥External environment expert group of provincial project office	CSO	1-2persons	1. On-site inspection of construction site and contractor, assist provincial project office in environment protection of each subproject; 2. Guide environment assessment unit and implementation unit to design and implement EP measures, submit draft report to provincial project office and put forward suggestions and comments on EP measures. 3. Recognize newly added subproject of livestock waste management, fill up newly added project selection list, determine which mode to choose and come up with suggestions.
⑦ Engineering project supervisor (PS) (in charge of environment supervision)	CSO	1-2persons	1. Engineering PS is entrusted by provincial project office or local project office; 2. Monitor domestic sewage disposal, industrial wastewater treatment, water loss and soil erosion prevention measures, waste gas, dust, noise control measures, production, domestic garbage and bottom mud disposal, epidemic prevention in construction area; 3. Fill up checkup list in Environment Management Plan attachments (attachment 1 and attachment 2); 4. Come up with rectification and solution to EP problems occur during construction and follow-up, including issuing rectification notice (attachment 3), rectification form, and file inspection documents;

Name of organization	Type of organization	Personnel allocation	Organization responsibility
			5. Make sure construction unit compile and submit project construction status to DPO every week.
⑧Environment supervision institution	CSO	1-2	1. Monitor environment in accordance with Environment Monitoring Plan during project construction period and operation period, file up and report to DPO.
⑨Civil work contractor and breeding farm owner	Implementation organization	Several	1. Formulate EP measures for each construction period; 2. Receive supervision and inspection for environment protection carried out engineering PS, WB and environment protection at each level; 3. Establish feedback mechanism, finish rectification within 3 work days after receiving rectification notice (for those require management organization coordination, finish rectification within 10 work days); 4. Finish construction checkup list before completing construction with engineering PS (attachment 1 and attachment 2), report to DPO; 5. Construction unit should report project implementation status to engineering PS every week.

5.3 Environmental management tasks at different stages of this project

Environment management task (EMT) varies from project implementation stages, as shown in Figure 5-2. The most important work of environment management plan is to make sure all EP measures are put into practice, including ① measures incorporated into environment management plan during project design and contract stage; ② check



efficiency and implementation status of EP measures by monitoring construction unit's work; ③project acceptance, daily supervision during operation period, check mechanism, report mechanism and file mechanism of environment management plan. Timeliness is reflected by checking daily work.

5.4 Environmental supervision (ES)

5.4.1Supervision purpose

During project construction period, PS (also environment supervisor) should monitor environment, supervise and check implementation and efficiency of EP measures in accordance with environment protection design, handle and solve temporary contamination accident timely. Supervision result during construction period is served

as foundation for project acceptance and necessary special report for acceptance report.

5.4.2 Supervision content

In accordance with guideline, policy, decree and regulations of national and local government and WB, supervise contractors to follow EP clauses in contract for a construction project. Major responsibilities include:

1. Compile environment supervision plan and determine supervision items and content.
2. Review EP content in bid and tender documents for construction.
3. Supervise contractor, avoid and lighten environmental pollution and damage to farmland, wild animals and plants caused by construction works, meanwhile avoid fire.
4. Supervise and check EP works and efficiency based on survey and supervision data, and handle and solve environment pollution accidents timely.
5. Have an overall check on slag disposal pit, construction slash disposal and recovery in construction unit's charge, including slope stabilization, slash recovery, afforestation and landscaping ratio, etc.
6. Put environment supervision into practice, review relevant environment statement, make requirement on channel construction management based on monitoring results of water quality, environment air and noise, reduce negative influences on environment caused by construction.
7. Record and report daily supervision, take part in completion acceptance.

5.4.3 Work procedure of EMP implementation during construction period

ES is an important component of environment management which has relative independence, therefore, independent environment supervision organization is established. Qualified unit is responsible for supervising, reviewing and evaluating EP measures implementation in accordance with contract terms, national EP laws, regulations and policies, monitoring data and inspection results; discover and correct construction behavior which violates contract terms and national EP requirement. Environment supervisor should at least check construction site once a week, fill up

construction management checklist (attached list 1 and attached list 2) and file up, come up with rectification plan for environmental problems existed in construction activities and follow up, report to environment person in charge of project office and WB expert half year. Workflow of construction environment supervision is shown in Figure 5-3.

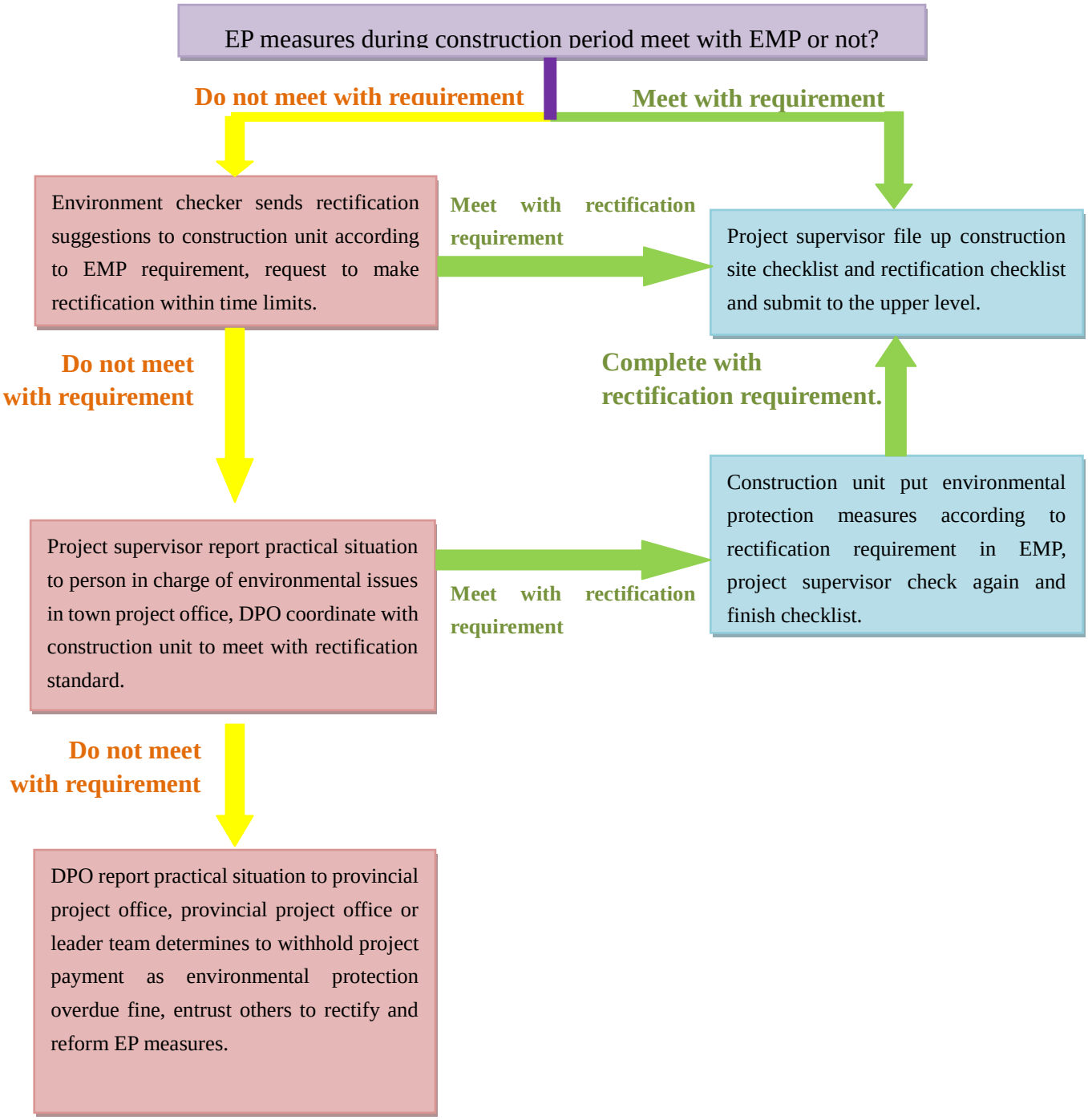


Figure 5-3 Environment supervision workflow during construction period

5.4.4 Project acceptance content

Completion acceptance of livestock and poultry waste management project should

follow Construction Project (Program) Completion Acceptance Measures, EP acceptance of livestock and poultry pollution control project should follow Environmental Protection Acceptance Measures for Construction Project.

Besides acceptance documents specified in Environmental Protection Acceptance Measures for Construction Project, application unit should provide system performance test report of pollution control project. Performance test report should include:

1. When structures are running at full load as designed, whether their elevation layout is proper or not;
2. Calculate and test technological parameters of each structure;
3. Sand volume in grit basin, moisture content of sand setting;
4. Slag quantity and excrement moisture content of solid-liquid separator;
5. Inflow and outflow water quality in hydrolysis acidize tank, spoil disposal amount and frequency;
6. Inflow and outflow water quality in anaerobic response unit, alkalinity, sludge properties and sludge concentration in reactor;
7. For standard emission mode, inflow and outflow water quality, sludge properties and sludge concentration in aerobic treatment system;
8. Hazard-free hygiene index of biogas slurry and residue used for returning to field; inflow and outflow water volume and quality in the whole wastewater treatment system under standard discharge mode;
9. Compost detection of solid excrement;
10. Technical-economic indicator of excrement treatment project, including labor cost, electric charge and medicine charge, etc.

When livestock and poultry waste management project is completed, construction unit should file up relevant design and acceptance files such as completion acceptance expertise report. If acceptance is failed, reapply after project rectification.

Table 5-3 Preparation material and data for large-scale livestock and poultry farm project acceptance

<table>
<tr><td rowspan="6">Basic information</td><td>Name of livestock farm</td><td colspan="4"></td></tr>
<tr><td>Address of livestock farm</td><td colspan="4"></td></tr>
<tr><td>Owner of livestock farm</td><td colspan="2"></td><td>Contact number</td><td></td></tr>
<tr><td rowspan="2">Breeding scale</td><td>Breeding stock</td><td></td><td>Livestock production</td><td></td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>Pigsty area</td><td colspan="4"></td></tr>
<tr><td>Facilities for waste treatment technology</td><td colspan="5">☐ Energy environmental protection type (standard emission mode)
☐ Energy ecological type (organic fertilizer returning to field)
☐ High-bed breeding type</td></tr>
<tr><td>Acceptance data and content</td><td colspan="5">1. Technological parameters of each structure;
2. Sand volume in grit basin, moisture content of sand setting;
2. Slag quantity and excrement moisture content of solid-liquid separator;
4. Inflow and outflow water quality in hydrolysis acidize tank, spoil disposal amount and frequency;
5. Inflow and outflow water quality in anaerobic response unit, alkalinity, sludge properties and sludge concentration in reactor;
6. For standard emission mode, inflow and outflow water quality, sludge properties and sludge concentration in aerobic treatment system;</td></tr>
</table>

	7. Hazard-free hygiene index of biogas slurry and residue used for returning to field; 8. Compost detection of solid excrement; 9. Technical-economic indicator of excrement treatment project, including labor cost, electric charge and medicine charge, etc.
New pollution control project	1. Design data 2. Construction contract 3. Construction material purchase note 4. Government subsidy material
Waste storage facilities	1. Excrement yard, area m^2 2. Sewage/urine storage pool, volume m^3 3. Biogas digester, volume m^3 4. Anaerobic tank, volume m^3 5. Aerobic tank, volume m^3 6. Land and fishpond for waste treatment, area, mu 7. Electricity consumption receipts of sewage treatment facility 8. Operation record of sewage treatment facility 9. Photos of waste storage and treatment facilities
Waste whereabouts	1. Excrement warehouse warrant 2. Organic fertilizer delivered note 3. Sale certificate of organic fertilizer 4. Excrement sales contract or sales ticket 5. Excrement transportation record
Supporting funds	Construction of pollutant storage and treatment facilities has total investment of ten thousand yuan Among which, fiscal subsidies ten thousand yuan Self-raised fund ten thousand yuan
Environment	Project environment assessment report

assessment report of new project	

5.4.5 EMP implementation workflow of environment supervisor during operation period

When subproject of livestock waste management passes project acceptance, the project enters normal operation period. In order to carry out environment management works in sustainable and effective manner, there is specialized environment supervision works during project operation period. EMP implementation workflow of environment supervisor during operation period is shown in Figure 5-4.

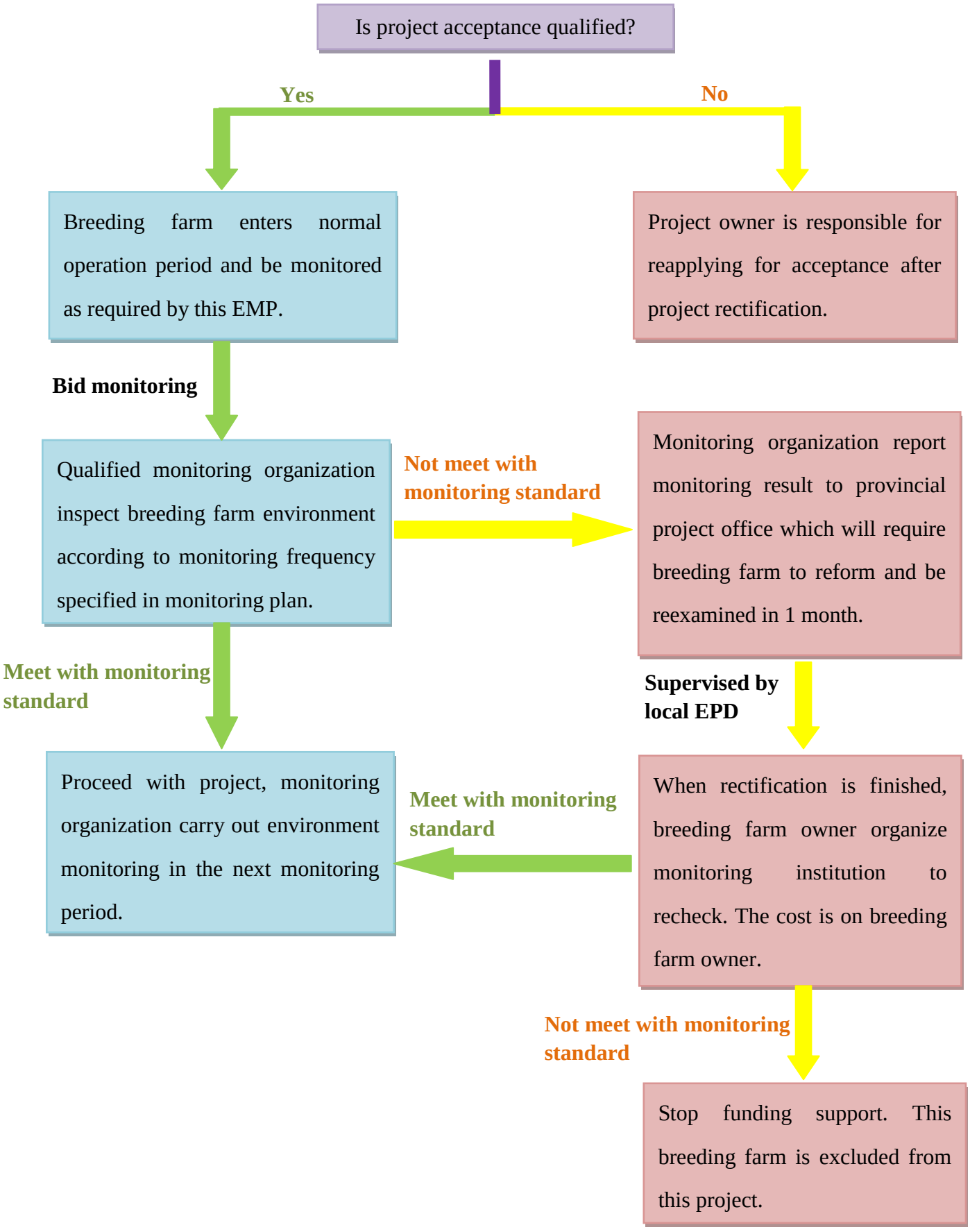


Figure 5-4 Environment Supervisor's workflow during operation period

5.5 Environment management training

5.5.1 Training purpose

The purpose of Environment management training is to ensure smooth and effective launch of environment management works, to familiarize relevant personnel with environment management content and procedure, to improve personnel ability and to ensure effective practice of EP measures. Major target of environment capacity building is environment manager and supervisor. Their training is a constituent part of this project's technical support. During project implementation, the training courses are also accessible to construction party and workers. Before starting construction, all construction unit, operation unit and construction supervisor should participate in compulsory environment, health and safety training.

5.5.2 Training target

Targets of this training are: staff in environment management office at province, city and county level, project owner (PO), environment supervisors, representatives of environment monitoring organization and contractors.

5.5.3 Training content

1、Understanding and application of WB environment policies, EP laws and regulations as well as environment standard at home and abroad;

2、Environmental management mode of WB loan project and environment terms in loan agreement;

3、Environment management plan of each project;

4、Environment management regulations of each project;

5、Responsibilities of environment managers, supervisors, monitors and their relationships;

6、Environment management report, environment supervision report, environment monitoring report

5.5.4 Training funds

Training funds of Guangdong Agricultural Non-point Source Pollution control Project loaned by WB during EMP construction period is included in project budget, training funds during operation period is included in operation and maintenance cost.

Table 5-3 Capacity building and training schedule

Training theme	**Training target**	**Training content**	**Number of times**	**Day/ time**	**Number of people in this project/time**	**Budget（ten thousand yuan）**
Construction period						
EP regulations and policies	PO, construction unit	Ⅰ EP laws and regulations	4	0.5	3	3.5
		Ⅱ Environmental policies and plans	4	0.5	3	
		Ⅲ WB environment management	4	0.5	3	
Implementation of environment management plan	construction unit 、PO	Ⅰ EP responsibilities during project construction period	1	0.5	4	15
		Ⅱ Major EP tasks during project construction period	1	0.5	4	
		Ⅲ Major EP content during project construction period	3	0.5	4	

Training theme	Training target	Training content	Number of times	Day/ time	Number of people in this project/time	Budget（ten thousand yuan）
		Ⅳ EMP (including environment management regulations)	2	0.5	4	
		Ⅴ Correction or amendment of EMP	1	0.5	4	
		Ⅵ Interior monitoring method, data collection and treatment	1	0.5	4	
		Ⅶ Construction security	1	0.5	2	
Crisis management	PO 、construction unit	Biogas operation safety	1	0.5	4	0.5
Subtotal in construction period						19
Operation period						
Environment monitoring inspection, report	PO	EP facilities check, environmental quality monitoring and report compiling.	2	0.5	1	1.5

Training theme	Training target	Training content	Number of times	Day/ time	Number of people in this project/time	Budget（ten thousand yuan）
Environment protection facilities and measures	PO	Ⅰ Regulations and rules for environmental safety.	2	0.5	1	3.5
		Ⅱ Emergency plan for biogas operation	2	0.5	1	
Subtotal in operation period						5
Total						24

5.6 Public complain and feedback mechanism

5.6.1 Public complain

Residents' comments and opinions are collected by seminars or questionnaire during evaluation period of project environmental influence. The public can put forward their comments in seminars or fill up questionnaire sent by evaluation unit or ask for questionnaires; they can also express their opinion to construction unit or evaluation unit by letters, phone calls, fax, or emails; or visit county (city) environment protection bureau or complaints office of each project.

During project construction or operation, the public can put forward their comments to construction unit or evaluation unit by letters, phone calls, fax, or emails; or visit county

(city) environment protection bureau or complaints office of each project.

When environment evaluation unit, construction unit or constructors receive complaints or rectification notice sent by administrative department, they should visit and investigate with relevant department such as design department, rectify according to actual situation, display rectification plan publicly to solve environment protection issues.

5.6.2 Feedback mechanism

EMP will adjust mitigation measures and improve environment management activities according to environment monitoring report and supervision organization inspection.
If significant deviation from EMP is discovered, or project change has caused huge negative influence on environment or increased number of people be influenced, the project office will consult environment organization immediately, WB will establish environment assessment team to carry out extra assessment. If necessary, additional public consultation is required. The modified EMP should be known to implementation organization and contractors and be implemented accordingly.

Chapter 6 Environment Management Plan

Identify result according to construction project content, analyze negative influences on environment caused by construction activities, come up with engineering measures and management measures taken to prevent or mitigate negative environmental influences caused by project, which is formulation of Environment Management Plan. Specific measures of this environment management plan consist of the following three subprojects: Environmental Codes of Practice (ECOP), Livestock Waste Environment Management Framework (EMF) and Livestock Waste Management Plan.

6.1 ECOP Public supportive project ECOP

By screening environment influence evaluation factors mentioned before, mitigation measures on public supportive project construction activities are put forward in terms of construction design period, construction period and operation period, refer to Attachment 1 for more details.

6.2 Water-fertilizer integration demonstration base project ECOP

Water-fertilizer integration demonstration base project is about constructing drip irrigation system and organic fertilizer storage tank. Mitigation measures are put forward in terms of site selection, water environment, ecological environment, sound environment and solid waste in construction design period, construction period and operation period. Refer to Attachment 2 for details.

6.3 Protective farming ECOP

In this project, Protective farming refers to an advanced agriculture technology which sows by no-tillage or minimal tillage under circumstances that there is straw or stubble on ground surface. Its main activities are purchase of advanced farm tools and promotion of agriculture skills. There is no specific construction content, but there are some good EP

measures, therefore, we have special environment analysis on this subproject. Refer to Attachment 3 for details.

6.4 EMF Livestock waste management EMF

Since at current stage of livestock waste management subproject, only some livestock farms are put into practice, construction period is relatively long, site selection may vary during project preparation and implementation process. In order to regulate project implementation and operation of livestock farms newly added to this project, EMF shall be developed accordingly.

6.5 Livestock waste management

Livestock waste management has three breed types which are energy environmental friendly type, energy ecological type and “high-bed fermentation” type. We discuss common mitigation measures shared by construction design period, construction period and operation period first, and then discuss individual mitigation measures under three different breeding types.

6.5.1 Common environmental effect mitigation measures

6.5.1.1 Environment effect mitigation measures at design period

I. Site selection requirement

(1)Breeding farm site selection

Breeding farms included in this project are existed project. Before building pollution control project, it is required to check whether current breeding farm site selection is proper. Reference conditions are as below:

1. Places that are not allowed to construct breeding farms include: domestic drinking water protection zone, scenic spot, core area and buffer area of natural protection zone; urban and rural residential area, population concentration areas such as district of education and scientific research, medical treatment district, business area,

industrial area and sightseeing district; forbidden area designated by people's government at county level; other special protection areas specified by national or local laws and regulations.

2. The livestock and poultry farm constructed, if necessary, nearby the forbidden area should be located at the downwind or crosswind area relative to the predominant wind direction in ordinary year with a distance no less than 500m;
3. No pig farms are allowed near (less than 2,000m from) the heavily polluted area, high prevalence area of animal epidemic disease or market and trading market;
4. Pigsty should be located at a dry and flat place with higher topography, occupying no or less cultivated lands; when construct pigsty on hills, select sunny slope less than 20^{o} to the largest extent.
5. Distance from pigsty to road and railroad should be no less than 1000m, distance to residential area and other breeding farms should be no less than 2000m; distance from pigsty to sewage outlet in residential area should exceed 500m, distance to other large-scale pigsty should be no less than 1000m; distance to drinking water source should be no less than 1000m.

(2)Site selection for livestock waste management project

Construction of livestock waste management project should comply with local overall planning, combine with local actual conditions, handle relationships between concentration and decentralization, dispose and utilization, short term and long term properly. Main principles include:

1. Plane arrangement is dominated by sewage disposal system, solid excrement disposal system and odor centralized processing system, other facilities should be properly arranged in accordance with sewage process, make sure relevant equipment is made full use of, ensure stable facility operation, easy maintenance, economic rationality, health and safety.
2. Livestock waste management project should keep certain protection distance from production area and residential area of livestock farm, and be located at the downwind or crosswind area relative to the predominant wind area.

3. The location of livestock waste management project should be favorable to emission, recycling utilization and transportation, and allow for extension, facilitate construction, operation and maintenance.
4. Site of livestock waste management project should have good engineering geological condition and meet with epidemic prevention requirement.
5. Site of supporting generator set and pump station should be away from production area and residential area.

II. Design requirements for compost yard

1. Compost site is generally made up of excrement storage tank, compost yard and finished compost yard;
2. Storage pool for collecting compost leachate should be prepared inside the composting farm.
3. Anti-seepage measures should be taken for composting farm to prevent ground water pollution.
4. Composting farm should be provided with rain-proof facility and rainwater drainage system.

III. Design requirements for colleting basin and hydrolysis-acidification tank

1、 Build collecting basin before anaerobic treatment system;
2、 The water collection tank should have the volume no less than 50% of the maximum daily discharge.
3、 The water collection tank should be located at a place accessible for removal of floating residue and sediment.
4、 When inflow has gone through solid-liquid separation and is to enter anaerobic treatment system, it is recommended to build hydrolysis-acidification tank according to technology requirement;
5、 Capacity of hydrolysis-acidification tank is determined by technological requirement.

IV. Design requirement for anaerobic reactor

1. Anaerobic reactor should be equipped with safety devices for the prevention of exceeding positive and negative pressure. Safety range should meet with requirement on technology design pressure and tank safety;
2. Anaerobic reactor should be designed with standard water tightness, made of water-proof materials and its internal wall and pipelines should also be subject to

antiseptic treatment.

3. There should be sample connection and temperature measuring point in anaerobic reactor;
4. Equip with metering equipment and instrument which measures air flow, air pressure, temperature, pH value and excrement amount as required by technology;
5. Anaerobic reactor should be equipped manhole and sludge pipe.

V. Other design requirement

1. Design sewage collection tank and septic tank with sufficient capacity according to livestock and poultry farm scale and sewage output;
2. Electrical equipment should not be installed in places which have high temperature, moisture, dust and risk of fire and corrosion. Installation places should be accessible for inspection, maintenance and removal.

6.5.1.2 Environmental effect mitigation measures during construction period

Construction unit of livestock and poultry Pollution control project should have national engineering construction qualification. Construction and installation project should comply with construction design document and equipment technical document requirement. Changes to project should be implemented after obtaining change file issued by design unit.

I. Dust contamination control

Primary source of construction dust: dust from driving vehicles on roads on construction site, from piled building decoration materials and earthworks, from earthwork, muck and construction garbage in transit and from mortar mixing.

For above sources of dust pollution, following dust pollution control measures are provided by the code:

1. Regular watering for dust suppression is necessary for the road prone to cause dust.
2. The material storage area, machining area and large template storage place in the construction site should be flat and solid. Materials should be piled up in compactness

to reduce land occupation.

3. The granular materials with fine particle should be kept tightly, and shelters should be equipped during loading and transporting. The remaining dusty materials after removal of composting should be timely cleaned.
4. The exposed area in the construction site should be properly watered for dust suppression.
5. Strengthen the management of transport vehicle. Vehicles entering the construction site should slow down to reduce dust. In addition, the loading space for the vehicles transporting earthworks, mucks and construction wastes should be properly sealed.

II. Water pollution control

Waste water from livestock waste management construction mainly include the waste water from construction, mainly including the waste water from mortar mixing and washing water, and production and the domestic sewage. Following discharge control measures are provided by the code for above waste water:

1. The water from pit excavation and the waste water for mortar mixing can be recycled after sedimentation treatment for construction or watering to reduce dust.
2. Domestic sewage is discharged to ditches near livestock farm after treatment.
3. Construction waste water should not be discharged at will, and the waste water from mechanical cleaning can be reused. Make sure no pollution on ground surface water is caused nor sewage discharges into farmland or fishpond directly.
4. Regular dredging is necessary for drainage channel.
5. Do not set machine, vehicle maintenance point or cleaning point in construction site. Repair in professional maintenance place so as to avoid oily sewage in construction site
6. It is necessary to inspect mechanical equipment for oil or water leakage prior to its use.
7. To avoid pollution to underground water, anti-seepage cement should be applied for the foundation of sewage pool and fermentation tank and the geo-textile should be selected for the storage pool for seepage proof.
8. For the underground and semi-underground structures, it is necessary to keep surface

water away from the foundation ditch; anti-floating measures should be taken when there is high underground water level.

III. Noise pollution control

Noise pollution during the construction period mainly comes from the construction machinery and transport vehicles. Based on the features of noise pollution of public supportive engineering, following control measures are provided by the code:

1. Noise laws and regulations must be observed during construction.
2. Construction time should be strictly kept within 8: 00～20: 00, during lunch break (12:00～14:00) among which, construction shall be ceased. The access time for construction vehicles shall be compliant with requirements of local government.
3. Residents leaving nearby should be informed of continuous construction at night. Go through relevant procedures and take measures to reduce disturbance to residents. Within the noise limit period, construction unit shall receive the effective construction noise permit (CNP).
4. Night construction, if necessary, should be performed within the specified period after getting approval from the competent department. No unauthorized operation of noisy mechanical equipment is allowed.
5. The equipment with noise shall be operated in a closed room.
6. During construction, it is required to ensure there is no abnormal noise and abrasion from the moving gear drives.
7. It is required to use low-noise equipment and close windows and doors as much as possible during construction to reduce influences on people nearby.
8. Contractors should regularly maintain the construction equipment and allow it as much as possible under optimum working condition.
9. Facilities left used have to be shut down or controlled under energy-saving and vibration reduction state.
10. Construction and transportation vehicles are required to slow down and forbidden to toot near the construction site.

IV. Waste control

Solid wastes produced during construction period mainly include the construction

garbage, dumped oil, chemical solvents and household garbage, among which, the construction garbage is the major solid wastes, mainly containing soil, muck, scattering mortar and concrete, masonry and broken concrete, and the wastes from decoration, sorts of packing materials and other wastes. For those solid wastes from project construction, following waste control measures are provided by the code:

1、Construction and domestic wastes should be separately collected, stored and timely removed as per regulations.

2、Construction wastes should be cleaned daily and forbidden to throw from high.

3、Classify waste generated by construction, dismantle and site clearing, recycle materials that can be used directly or reproducible. Entrust clearance companies to handle the rest. Clearance company must have environmental service quality certificate approved by corresponding department.

4、The dumped oil and chemical solvent should be stored in centralization and treated by the qualified entrusted unit. Do not dump without authorization.

5、Construction equipment should be maintained to prevent oil spillage.

6、All solid wastes produced during construction shall be completely removed upon the completion of engineering project.

V. Key construction issues

1、Anaerobic reactor construction

（1）When working on cement mortar waterproof layer, its basic level should be smooth, clean, solid, rough, wet but free from ponding.

（2）The coating selected for sealing layer should be less corrosive, irritating, non-toxic and excellent in sealing performance. Its resistance to elevated temperature should be no less than 80℃. Cardinal plane of the sealing layer should be free from scum, water drop, and be clean and dry.

（3）Construction material for insulating layer should meet with design requirement. Water proofing measures should be available between insulating layer and enclosure wall.

2、Storage tank construction

Storage tanks must be built for livestock waste management project, including aggregate

tank, regulating tank, sand setting tank, liquid storage tank, etc. The following requirement must be meet with during construction:

（1）For storage tank construction, besides work in accordance with structure design drawing, construction quality must meet with water tightness, corrosion resistance and freezing resistance requirement.

（2）Use vibrator to cast concrete to ensure compact texture. Bottom and wall of storage tank should be casted continuously to avoid leakage.

（3）When volume of storage tank is too large, to avoid crack in concrete structure caused by temperature change, design expansion joint as required and add water stop strip.

When underground water level of storage under construction is too high, carry out site drainage continuously.

（3）When there is pipeline goes through storage tank body, take water stop measures such as pre-burying casing pipe.

（4）When storage tank concrete is defective, take repair measures immediately to avoid leakage.

VI. Construction safety and others

1. During engineering construction period, the publicity about engineering construction information should be posted at the construction site and surrounding areas so as to inform the public of specific construction activity and time, contact and contact phone number of construction unit as well as get to know the public complaint and suggestion on the construction activity.
2. During structure construction, work closely with professional works involving technology, equipment, pipeline, electricity and instrument, make detailed construction schedule, define responsibilities and construct based on procedure.
3. The constructors working in the dusty site should wear respirator. Personnel engaged in drilling or electric welding shall be equipped with earplug and arc protection goggles.
4. For painting and chemical solvent, it is necessary to select the eco-friendly and non-toxic materials.

6.5.1.3 Environmental impact mitigation measures to be taken during operation life cycle

I. Water pollution control

For the project, the waste water to be treated during the operation life cycle of livestock and poultry waste management engineering mainly includes the biogas slurry produced by biogas treatment system and the domestic sewage from working personnel. Following common water pollution control measures are to be adopted under three breeding modes:

1. The purification treatment of waste water should be subject to the breeding type, breeding size, the method of excrement removal as well as local natural geological condition. It is necessary to adopt reasonable and proper treatment technology and technical route for waste water purification. It is required, whenever possible, to perform natural biological treatment until the waste water is compliant with the recycling or discharge standard.
2. The drainage system in livestock and poultry farm should be designed with separate rainwater and sewage collection & transport system, with sewage collection & transport system designed inside and outside the farm and free of open drains.
3. Domestic sewage should be delivered with that from farm via sewage pipes to the biogas treatment system.
4. Intensive pretreatment should be performed for the waste water from livestock and poultry farm prior to its treatment, mainly including the bar screen, grit chamber, solid-liquid separation system and hydrolysis acidification tank.
5. The bar screen should be equipped and used before waste water entering the tank. Mechanical bar screen is recommended in case of large quantity of sewage, and the sediment should be timely transported to the excrement compost or other non-hazardous treatment places for further treatment.
6. It is required to regularly flush and clean the water collecting tank, regulating tank and other pipelines to prevent pipeline obstruction, accumulation of excrement and drifters. Operators should regularly check the water collecting tank, remove scums

timely and remove mud as appropriate according to the operation condition.

7. Reduce water consumption for cleaning (for instance, by using high-pressure and low-flow nozzle).

8. Waste water from livestock and poultry farm should be disinfected before discharging or recycling. It is required to take non-chlorination treatment measures like the ultraviolet rays, ozone and hydrogen peroxide as well as produce no secondary pollution.

II. Air pollution control

The exhaust gas pollutants during the operation life cycle mainly include the combustion emission and the odor gases produced by biogas treatment system. Following common air pollution control measures are to be adopted under three breeding modes:

1. Control measures for combustion emissions from biogas boiler and generator set

Before entering boiler room or generator set, biogas will be removed of H_2S after desulfurization (with desulfurization rate of 85%) in the devulcanizer provided in the biogas treatment system. Biogas is a clean energy, after desulfurization, its exhaust gas meets the discharge standard for soot and sulfur dioxide. For gas-fired boiler, the chimney with height no less than 15m should be erected to discharge boiler combustion emissions, which should meet the requirements specified in Emission Standard for Air Pollutants from Boilers (GB13271-2001).

2. Storage of biogas

Biogas storage system is composed of the air storage tank and flowmeter. Generally, the low-pressure wet-type or dry-type air storage tank and high-pressure air storage tank is adopted. The volume of tank is dependent on the usage of biogas:

(1) For the biogas mainly for cooking, the air storage tank should be designed with volume about 50% to 60% of daily output.

(2) For the biogas equally for both cooking and power generation (or heating the boiler), the air storage tank should be designed with volume about 40% of daily output.

(3) For the biogas mainly for heating the boiler and power generation, the volume of air storage tank can be confirmed by using the gas supply and demand equilibrium curve.

In addition, for the safety use of biogas, the deployment of air storage tank is required to meet following requirements during the operation life cycle:

(1) Air storage tank should be deployed near the air source.

(2) Air storage tank must be equipped with safety devices to prevent the excess of air charging and exhaust; blow-down pipe should be provided with fire barrier and measures should be taken to prevent the invasion of rainwater and snow as well as sundry jam.

(3) It is recommended to use overground wet-type air storage tank, refrain from using the underground ones; if it is necessary to use the underground ones, the drainage and exhaust facility should be prepared.

(4) Antiseptics such as the epoxy asphalt, chlorinated polyethylene coating and PB latex asphalt coating should be used for antiseptic treatment if the wet-type air storage tank bell and water seal tank are made of steel plate.

3. Odor control measures

(1) To restrict or reduce the odor generated by livestock and poultry farm, it is required to control the stocking density, strengthen ventilation, use water-saving waterer and remove excretion without delay.

(2) Biogas from anaerobic treatment, which should be completely utilized, is not allowed to directly release into the environment. The biogas after purification treatment should be transmitted via the gas transmission and distribution system for domestic use, boiler combustion and biogas power generation.

(3) To reduce the impact of odor on the environment, it is necessary to plant high and ever-green arbors as well as build green belt separation to absorb odor and clean the air.

(4) Each of excretion treatment unit should be designed as the closed type to reduce odor pollution to surroundings.

(5) Biochemical deodorant should be sprayed at the excretion outlet of the centralized

excretion treatment plant and the solid-liquid separation equipment.

(6) To prevent the diffusion of odor, it is necessary to spray (spread) on the excretion or inside the shed with applicable absorbents like the zeolite, saw dust and bentonite as well as such materials containing much cellulose and lignin as the straw, peat and so on.

(7) It is required to drop or sprinkle chemical deodorants inside livestock and poultry farm and excretion treatment plant to prevent the occurrence of odor. The applicable chemical oxidants are potassium permanganate, potassium dichromate, hydrogen peroxide, sodium hypochlorite and ozone.

(8) Biological deodorization methods, like the biofiltration process and bioscrubber, are recommended for deodorization.

III. Noise pollution control

Major noises during the operation life cycle of the project are derived from mechanical operations such as the operation of generator set and pump station. Following major pollution control measures will be taken for the project:

1. The equipment with noise shall be operated in a closed room.

2. Shock absorption foundation or support as well as damping materials should be prepared for mechanical equipments with big noise.

3. By performing regular maintenance, to keep the construction equipment under the optimum working condition and lowest level of noise as much as possible.

4. Facilities left used have to be shut down or controlled under energy-saving and vibration reduction state.

IV. Solid waste management

Major solid wastes from the livestock and poultry farm include: dumped feed, animal waste and carcass; other wastes include: sorts of packing materials (such as the feed and pesticide package), used ventilation and filtering materials, unused/obsolete drugs, used cleaning materials and the ooze from waste water treatment (may containing something dangerous, for instance, the growth promoter and antibiotics). According to the characteristics of wastes from livestock and poultry farm, following solid waste

management measures will be taken.

1. Dumped feed

Livestock and poultry feed includes the hay, grain (sometimes, supplemented with proteins, amino acids, enzymes, vitamin and mineral supplements, hormones, heavy metals, and antibiotics) and silage. The feed spilled during storage, loading & unloading and feeding may be considered as the unusable wastes. The dumped feed (including additive), mainly the organic elements contained, may cause pollution to rainfall runoff. It is recommended to take following measures to improve breeding efficiency and reduce waste feeds:

(1) To keep the feed purchase and usage records, improve efficiency in storage, transportation and usage of feeds;

(2) To use the feeding facility with cover or protection device to keep feeds away from wind and rainfall;

(3) To keep feeding system under sound working condition to prevent feed spillage and contact with ground;

(4) To confirm if recycle the dumped feeds and other recyclable materials as fertilizer on the basis of the degree of impact by each method on the air, soil, surface water and ground water.

2. Animal waste

Large amount of animal wastes may be produced by livestock and poultry breeding, mainly the indigested nutrients contained in the animal excretion, for example, an average of 67% proteins in feed eaten by a mature pig will be excreted along with urine and faeces. The excreted matters such as nitrogen and phosphorus contained in the livestock and poultry excrement will give off ammonia and other gases in the air, may pollute surface water and ground water resources by means of filtration and runoff. In addition, animal excrement contains many pathogenic elements, such as bacteria, pathogens, virus, parasite and viroid, which may cause adverse impact on the soil, water and plant resources (those plants may be the food source for human, livestock and poultry and wild animals). Most of animal wastes are possibly found inside the colony

house, livestock and poultry farm and watering place. Animal wastes can be classified into the liquid, mud and solid (depending on the content of solid) by its form. The animal waste management system can be utilized to reduce above adverse impacts by following functions: collect, transport, store, treat and utilize (but discard) the wastes.

Livestock and poultry excrement collection system: for the ground designed with groove, the livestock and poultry excrement should be pushed falling into the underground storage zone; for the ground designed without groove, it is necessary to scrape and wipe the floor and flush with water. For the livestock and poultry excrement used for farmland fertilizer, since it contains dangerous chemical and biological elements, it is necessary to make careful analysis of potential impact beforehand. Based on the analysis result, some treatments to some extent and preparations as well as proper application ratio may be required before utilizing the excrement as fertilizer.

To reduce the pollution of livestock and poultry excrement to the surface water, ground water and air as much as possible, it is recommended to take following management measures:

(1) For feeds: select proper feeds according to the nutrient requirement in different production and growth stage of animal; select the feeds low in protein and amino acid (for example, every one percent of protein reduction in pig feed represents 10% of reduction in the output of nitrogen); by grinding feeds, to improve absorptivity and reduce the consumption of feed, thus less livestock and poultry excretion will be produced (while increasing the livestock and poultry yield); select the high-quality and pollution-free feeds (for instance, the content of pesticide and dioxin must be known or not exceed the standard requirement) with content of additives like copper and zinc not exceeding the required amount for animal's healthy growth.

(2) Livestock and poultry wastes like the livestock and poultry excretion and bedding should be regularly cleaned, and the storage and Transport container for livestock and poultry wastes should be reliably sealed to prevent leakage and provided with EP means; for temporary storage of livestock and poultry wastes, a specific storage yard with

fences should be established with reliable seepage, leakage-proof and protection against erosion and loss.

(3) To keep the wastes dry, scraping or the combination of water flush and scraping is recommended instead of water flush.

(4) To reduce the surface area of storage places for livestock and poultry excretion.

(5) To reduce the emission of ammonia, it is recommended to allow the surface temperature of livestock and poultry excretion at 15℃ or below (by using fan cooling).

(6) The storage place should be away from sensitive environment like water, alluvial plain and water source.

(7) It is necessary to regularly collect solid wastes (such as the bedding and excrement) and refrain from leaving the wastes overnight.

(8) To reduce the storm runoff in the storage system, the dry livestock and poultry excrement or garbage from the farm should be stored in a place with cover or ceiling.

3. Carcass

To prevent infectious illness and odor as well as the generation of vector, it is required to take proper measures to manage and rapidly disposal of carcass. The operator should implement the actual management and disposition system and not recycle carcass as animal feed. It is recommended to take following measures:

(1) To reduce mortality by taking proper animal-care and prophylactic measures;

(2) Livestock and poultry died of disease shall be timely disposed of and not allowed to be casually discarded, sold or reused as feed.

(3) While collecting carcass, proper storage is required, if necessary, refrigeration should be taken to prevent decomposition.

(4) The carcass should be handed over to the reliable carcass collection company approved by local authority to dispose of by means of landfill or combustion (depending on the cause of death).

(5) It is feasible to bury carcass at the site if no other carcass disposal methods are issued by local authority. Landfill site, regardless of its location, should be accessible for excavating equipment. The site with soil stability and low permeability should be

equipped with insulation layer strong enough to separate the area from houses and water sources so as to prevent pollution caused by odor from buried decaying matters or filtered matters. At least two concrete structured landfill wells, with depth more than 2m and 1m in diameter, should be prepared and sealed with cover. After each placement of carcass, it is required to apply a layer of slaked lime more than 10cm thickness. The well should be pressed and sealed with clay after it is filled.

4. Biogas residue disposal and compost

It is required to make proper adjustment and control of major technical parameters for each stage according to the technical requirement and the actual condition of excrement.

(1) Biogas residue should be timely transported to the excrement compost or other non-hazardous treatment places for further treatment.

(2) Livestock and poultry excrement from the farm should be specifically stored, and the odor and pollutant emission should be controlled in compliant with the discharge limit specified in Discharge Standard of Pollutants for Livestock and Poultry Breeding for odor concentration, ammonia, hydrogen sulfide, fecal coliform, CODcr, BOD, total phosphorus and ammonia nitrogen.

(3) The storage facility should be kept away from each kind of surface water body (with a distance no less than 400m), and should be at the downwind or crosswind area relative to the predominant wind direction in ordinary year of the farm's production and living quarter.

(4) The storage facility should be equipped effective seepage control to prevent ground water contamination from livestock and poultry excrement; in addition, the cover should be equipped to keep the facility from rainwater

(5) For composting, it is required to stack materials evenly to prevent uneven thickness and moisture content of material layer.

(6) Pay special attention to the odor change during fermentation, and it is required to make timely adjustment by regulating oxygen supply or moisture content in case of the odor of decay. In addition, it is allowed to regulate the moisture content of compost material by back ejection of sewage, adding of material or ventilation for heat

elimination.

(7) During fermentation and compost maturity period, it is necessary to keep proper height and ventilation and turn heaps to meet the suitable condition for further fermentation.

(8) No fresh compost raw materials like the sludge and excrement should be added during fermentation and compost maturity period.

5. Disposal and utilization of solid manure

(1) Livestock and poultry excrement is not allowed to fertilize the land until it has been subject to non-hazardous treatment and meets requirements specified in Sanitary Standard for the Non-Hazardous Treatment of Excrement for Ascaris eggs and fecal coliform, nor be allowed for direct application in farmland without treatment.

(2) Excrement subject to treatment, which may serve as land fertilizer or soil conditioner for crop growth, should not be applied with amount exceeding that required by the crop growth in the current year. The optimum application amount of manure should be subject to the testing and evaluation of soil fertility and the fertilizer efficiency of manure as well as to the capacity of local environment.

(3) It is forbidden to apply or required to cease applying manure in the high rainfall area, slope and the land with sandiness prone to generate runoff and the soil with strong permeability since the application of manure or excessive application amount in such places may cause surface or ground water pollution due to manure loss.

(4) Organic fertilizer plant or treatment organism should be prepared for centralized treatment of livestock and poultry excrement if no sufficient lands to consume and utilize manure are provided for medium and large livestock and poultry farm and breeding area**.**

(5) Solid manure should be composted by high-temperature aerobic fermentation or other applicable techniques and means to kill pathogenic bacteria and Ascaris eggs, reduce stacking time and achieve non-hazardous treatment.

(6) High-temperature aerobic composting method can be classified into the natural composting fermentation and mechanical reinforced fermentation, which is optional in

accordance with specific conditions.

In addition, sorts of packing materials (such as the feed and pesticide package), used ventilation and filtering materials, unused/obsolete drugs, used cleaning materials and the ooze from waste water treatment should be separately collected, and then timely removed by the entrusted collection and cleaning unit with relevant certificate of qualification for environmental service approved by the competent department.

V. Precautions for the operation of anaerobic reactor

As anaerobic reactor plays an important role in the livestock and poultry waste control engineering, following operation requirements should be met during its operation:

1. The water inflow for anaerobic reactor should be performed as per specific technological design requirement to prevent excessive high or low organic loading and temperature surge.

2. It is required to make daily monitoring of pH value and temperature of liquid inside anaerobic reactor, the internal biogas pressure, gas output and composition of biogas and so on, and based on such monitoring data, make timely adjustment of working condition for anaerobic reactor or take measures accordingly.

3. pH value of feed liquid inside anaerobic reactor should be maintained at 6.8～7.6.

4. The content of methane (CH_4) in the biogas inside anaerobic reactor should be 50%～80%.

5. A stable slaking temperature should be maintained for the anaerobic reactor. Daily temperature measurement is required for reactor heated by heat exchanger.

6. The overflow tube for anaerobic reactor should be kept clear to maintain the water seal height. It is necessary to make daily inspection in winter to prevent water seal from freezing when the ambient temperature is lower than 0℃.

7. When drainage, cleaning and maintenance is required for anaerobic reactor, it is necessary to open manhole and head cover, after 24h forced ventilation, put living animals (chicken and dog, etc.) inside for harmful gas detection, and then maintenance personnel may be permitted to enter under safety protection and close watch of the

specially assigned person outside the reactor. Generally, the time for maintenance once should not exceed 2h.

8. It is required to take safety protection measures for facilities for the production, transportation and storage of biogas, as well as prevent biogas leakage or keep air away from the anaerobic reactor and the biogas storage and distribution system. No working with naked fire is permitted.

VI. Animal epidemic prevention condition and requirement

Animal epidemic prevention condition for livestock and poultry farm should be subject to the special provisions of national and provincial laws and administrative regulations. Livestock and poultry farm should meet animal epidemic prevention condition and get the Animal Epidemic Prevention Certificate. The livestock and poultry farm engaged in selling or transporting animals or animal products in large amount shall, 1 to 2 days in advance, apply to the animal epidemic prevention supervisory organization for quarantine inspection, and the supervisory organization will send quarantine officer to make quarantine inspection on scene two hours prior to the selling or transportation of animal or animal products; those not engaged in selling or transporting animals or animal products in large amount shall send animals or animal products to the quarantine point established by the animal epidemic prevention supervisory organization. Sanitary requirements for livestock quarantine include:

1. Animal house should be designed and constructed as per the animal epidemic prevention requirements, provided with natural light, ventilation, waste and sewage discharge facilities as well as the separate clean and contamination path.

2. It is required to equip with separation house for sick animals, non-hazardous treatment facility and equipment for animals died of disease, sewage and wastes.

3. The personnel responsible for prevention and treatment should be specially assigned.

4. Separation and disinfection facility and equipment shall be provided at the entry and exit.

5. The personnel responsible for feeding, epidemic prevention and treatment should be free of any zoonosis.

6. It is necessary to establish the complete epidemic prevention system.

VII. Safety operation and operation management

For the livestock and poultry farm, it is required to establish the complete operation & management system and operating instructions for pollution treatment facility as well as to equip with specific managerial personnel and detection means; operators are required to receive professional technical training and related certificate; in addition, it is necessary to formulate the complete operation & management and maintenance system, safety operation instructions and specific system of post responsibility. All facilities and equipments shall be operated as per the designed technical requirement.

1. Safety operation measures

(1) The personnel engaged in special type of work like the electricity, boiler and chemical analysis should receive training in occupational skill and safety techniques, and is not permitted to engage in such works until meeting the qualification and getting the related professional certificate.

(2) It is required to conduct systematic safety education for staff, allow them be acquainted with the relationship between adverse factors relating to biogas and the operation and maintenance; issue learning materials on safety and regularly make survey over the phone.

(3) Before working, operators have to wear the proper appliances for labor protection and make well safety and sanitary preparations.

(4) Operators should take cautious steps for slippery and falling to prevent personal injury while inspecting or operating on structures in rainy or snowy days.

(5) Maintenance personnel should, as per the equipment operation requirement, regularly check and replace protection facility and equipment relating to safety and fire fighting.

(6) The maintenance for pressure vessel and key part should be performed by the maintenance unit certified by the labor and safety authority.

(7) The lightning-protection and explosion-proof equipment installed on the building

and structure should be maintained as per the regulations specified by the meteorological department and fire department, and also the application to relevant department for regular testing is required.

(8) It is required to make the emergency warning plan for accidents such as the fire, combustion, explosion and natural disaster; fire fighting appliances should be provided in the production and operating area; markers regarding smoke restriction, fire fighting and speed limiting should be prepared at clear positions in the factory.

(9) Ventilation is necessary for the site exposure to harmful gas, inflammable gas, odor, dust and moisture.

(10) It is required to equip with labor safety facilities, take proper measures for protective barrier, anti-slippery ladder and life buoy according to relevant regulations, and provide necessary labor protective equipments for staff.

(11) Gas replacement is necessary for biogas storage tank for the first test run. When drainage, cleaning and maintenance is required for structures or container relating to harmful or inflammable gas, it is necessary to open manhole and head cover, after 24h forced ventilation and replacement, and then maintenance personnel may be permitted to enter under safety protection and close watch of the specially assigned person outside the reactor.

(12) Smoking and lighting fires are strictly forbidden in the biogas production area during the operation period of biogas station. Fire-banning marks, which should be posted at the conspicuous position, have to be checked and replaced for completeness. Fire equipments and safety protection appliances such as the hydrant and fire extinguisher should be equipped in the biogas station. Operators should be familiar with the operation, and properly use fire equipments necessary for escape. Maintenance personnel should, as per the equipment operation requirements, regularly check and replace the safety and fire-fighting protection facilities. It is required to keep detection records as per relevant regulations for the protective safety appliances.

(13) Preparations relating to the gas leakage, fire and negative pressure shall be completed for facilities used for the production, transportation and storage of biogas.

(14) To strengthen the management of electrical equipment. Electromechanical devices

shall be started up and shut down by the personnel-in-charge only, and the electrical equipment should be fitted with a reliable grounding. If maintenance is required, all equipments should be powered off and the maintenance warning board should be hung beside the control cabinet.

(15) Ventilation is necessary for the site exposure to harmful gas, odor, dust and moisture.

(16) Safety protection and monitoring measures should be taken when removing sundries, scums and cleaning weir. It is necessary to look out for safety when inspecting and operating on the structures or along the open-type tank and well, particularly in the rainy or snowy days.

(17) Methane leakage warning devices should be provided for the condensation tank, purification room, power generation room and boiler. The device, which is connected to the automatic ventilation device, will automatically alarm in case of excessive amount of methane, and will, once biogas leakage is detected, turn on the ventilation device immediately.

(18) It is forbidden to wipe moving parts and required to keep flushing water away from cable head and motor while cleaning electromechanical device and surroundings.

(19) To prevent biogas purification system fault, quick-wear equipments are designed with two sets, one for use and the other for standby, mainly including the charge pump, circulating pump, devulcanizer, dusting tube and the valve between desulfurization & purification tank and anaerobic jar.

(20) Antiseptic measures should be taken for some equipment. Desulfurization jar body should be made of the glass reinforced plastics which is corrosion resistant; while the pipelines should be galvanized pipes for anticorrosion.

(21) Regular inspection per shift and records should be made for the biogas input, output and pressure of biogas storage tank. For the wet-type air storage tank, water seal should be kept at the designed water height and fresh water should be duly replenished; in addition, anti-freezing measures must be taken in winter when below 0℃. The water inside the water seal tank of air storage tank is forbidden to be discharged at will.

(22) Fire-protection distance for air storage stank: the fire-protection distance between

dry-type air storage tanks should be more than 2/3 of diameter of the larger tank, while the distance between wet-type ones should be more than 1/2 of diameter of the larger one. The distance from air storage tank to the chimney, aerial cable and civil buildings or warehouse should be more than 20m, 15m and 25m respectively.

(23) In winter, it is required to pay special attention to the operation condition of electric heating tracing inside the biogas station, especially to which installed on the biogas and steam pipelines. Perform strict observation of the operation condition of electric heating tracing, power off immediately in case of any fault, and ask professionals for maintenance and repair.

(24) Regular drainage is necessary for non-self draining condensation pipes.

2. Emergency measures for biogas leakage

In case of leakage accident, evacuate all personnel in the contaminated area until being upward, switch off air supply and the area should be restricted access. If possible, the exhaust blower for leaked gas should be place in the open area or installed with proper nozzle before burning, or place the leaked container in the open area. Keep ventilation, and the leaked container may not be reused until it is properly treated and qualified after repair inspection.

3. Emergency plan for safety accident

Preventive measures are critical to the prevention of accidents, while emergency measures should also be taken against accidents, which may concern the scope of spread and scale of loss. It is required to establish the accident emergency plan for the project, and once an accident occurs, the accident may be treated in readiness and the accident damage and environmental pollution may be minimized with following emergency plans:

(1) To confirm the rescue group, team and their contact information;

(2) To equip with necessary gas defense appliances and protective equipments for disaster relief;

(3) To carry out post training, prepare the learning manual, report, record and evaluation

relating to the emergency treatment;

(4) To formulate regional disaster prevention and rescue plan, strengthen contact with local government, the fire, EP and medical aid department so as to get timely rescue in case of accident.

(5) To prepare risk accident funds so as to make compensation for the loss and damage in case of risk accident.

6.5.2 Specific environmental impact mitigation measures

6.5.2.1 Environmentally friendly energy mode

I. Technological process

Environmentally friendly energy mode is mainly designed for the livestock and poultry farms without farmlands of a certain size, or vacant lots for constructing fish pond and aquatic plant pond. The effluent at the end of project for such farms shall meet the requirements of national EP standards. The waste water from livestock and poultry, after anaerobic digestion and sedimentation, should be subject to proper aerobic treatment like aeration and physicochemical management.

Under the mode, when sewage from the farm flows via pipelines to the regulating tank, the bar screen installed in front of regulating tank will help removing sundries of large size in the sewage. The lift pump installed inside the regulating tank will pump sewage to the separator, and the separated excrement residue will be manually taken away as the raw material of organic fertilizer, while the separated sewage flows to the sedimentation tank. The supernatant liquor inside sedimentation tank will flow to the collection tank, and the sewage will be pumped by the lift pump installed inside the tank to the spreading device of anaerobic digester and evenly distributed in the tank. The effluent from anaerobic digester will flow to the post-treatment system. Aerobic treatment will be taken as the major technical means for post-treatment and the effluent after treatment may reach discharge standard or may be recycled, with its technological process charge

as shown in Figure 6-1:

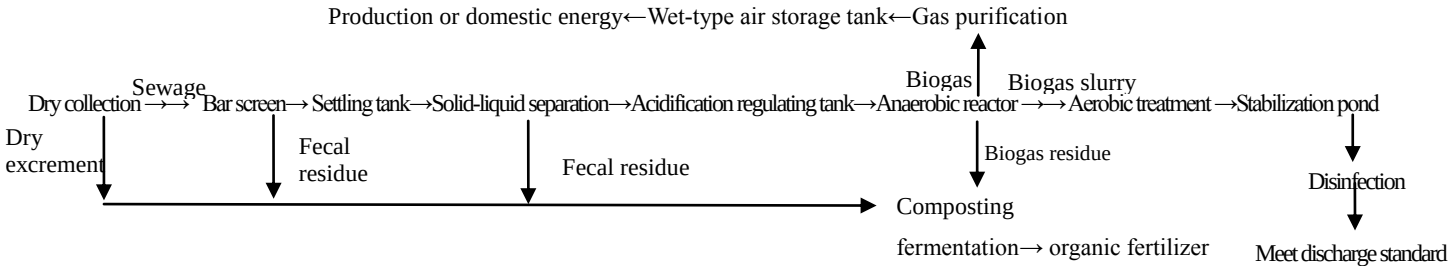


Figure 6-1 Flow schematic diagram for environmentally friendly energy mode

Major construction content under environmentally friendly energy breeding mode includes:

① Bar screen: Bar screen with an interval of 20～40 mm between bars is installed in front of settling tank to remove large-size sundries, which should be easy for removal of sundries and cleaning; when passing the bar screen with inclination of 45°～75°, the sewage flows at the speed of 0.5 m/s～0.8 m/s; the working platform with height 0.5m higher than the maximum water level in front of bar screen should be equipped at the bar screen. Operate the grille machine in accordance with the equipment specification.

② Settling tank: hydraulic retention time should be more than 1h.

③ Solid-liquid separation: it is performed by hydraulic power screen or the solid-liquid separator.

④ Acidification regulating tank: hydraulic retention time should be more than 1d.

⑤ Anaerobic reactor: the upflow anaerobic sludge blanket (UASB) with at least 5d of hydraulic retention time is recommended.

⑥ Aerobic treatment: service reservoir (with at least 1d of hydraulic retention time) →Aeration pond (Sequencing Batch Reactor Activated Sludge Process (SBR) is recommended, with at least 12h of hydraulic retention time).

⑦ Advanced treatment: settling tank (with at least 1d of hydraulic retention time) →stabilization pond(mainly for removal of nitrogen and phosphorus in water). At present, two kinds of stabilization ponds are available: aerobic stabilization pond

(generally with water depth of 0.5～0.6 m) and anoxic stabilization pond (generally with water depth of 1.2～1.5 m), the later can also be classified into the common pond and biological pond, and both should be designed with multistage series, generally 3-4 stages are preferable.

100 livestock and poultry farms are designed in the environmentally friendly energy mode: 40 farms with 3000～5000 breeding stocks, 40 farms with 5000～10000 breeding stocks and 20 with 10000～15000 breeding stocks.

II. Feature of pretreatment

1. Manure cleaning

Manure cleaning in livestock and poultry farms can be performed in three ways: manure cleaning by rinsing, manure cleaning by water submerging and day collection, any of them is available for the environmentally friendly energy breeding mode.

Manure cleaning by rinsing is a major manure cleaning mode during 1980s when large-scale pig production technology and management method were introduced from abroad. It is mainly used for timely and effectively cleaning the excrement and urine inside livestock house, keep things hygienic, reduce labor investment in manure cleaning and improve the level of automatic management in farms. Following management measures are recommended to take to reduce environmental impact:

(1) Discharge water several times a day by turning sprinkler at the end of groove to keep cleanness and prevent odor pollution;

(2) Save water by controlling the rinsing frequency;

(3) Be sure the liquid manure flows into the main manure ditch via the manure groove, and then to the underground manure storage tank or the liquid manure is pumped to the ground manure storage tank.

Manure cleaning by water submerging is mainly used for timely and effectively cleaning the excrement and urine inside livestock house, reduce labor investment in manure

cleaning and water consumption and improve the level of automatic management in farms. Manure cleaning by water submerging derives from the manure cleaning by rinsing, during which, a certain amount of water is added to the manure ditch inside pig house, the excrement, urine, flushing water and the water for feeding and breeding are discharged to the ditch beneath floorboards, after a certain period of storage (about 1-2 months), when the manure ditch is filled, open the outlet gate and discharge manure liquid, which will flow into the main manure ditch via the manure groove, and then to the underground manure storage tank or will be pumped to the ground manure storage tank. Following management measures are recommended to take to reduce environmental impact:

(1) Since long-time storage of excrement inside pig house will result in anaerobic fermentation and produce large amounts of harmful gas, such as H_2S (hydrogen sulfide) and CH_4 (methane), etc., which may pollute the air inside pig house and endanger the health of animals and feeders, prior to work, worker are required to ensure the safety of working environment;

(2) Ensure the sound sealing of manure ditch to prevent leakage of large amounts of harmful gas;

(3) Be sure the liquid manure flows into the main manure ditch via the manure groove, and then to the underground manure storage tank or will be pumped to the ground manure storage tank.

Dry collection is mainly used for timely and effectively cleaning the excrement and urine inside livestock house, keep things clean, fully utilize the rich labor resources to reduce water and power consumption in manure cleaning, maintain the nutrient contained in the solid excrement, improve the efficiency of organic fertilizer and reduce the cost of excrement and urine follow-up treatment. Major operation procedures for dry collection are as follows: the excrement, once being generated, is separated, meanwhile the dry excrement is mechanically or manually collected, cleaned and transported, while urine and flushing water is discharged via the sewer and separately treated. Dry collection can be classified into two types: the manual manure cleaning and mechanical

manure cleaning. Following management measures are recommended to take to reduce environmental impact:

(1) Timely maintenance for mechanical manure cleaning is necessary since it has higher malfunction occurrence rate.

(2) Since big noise from the operating manure cleaner will cause adverse impact on the growth of livestock and poultry, it is necessary to select the low-noise equipment and take noise reduction measures.

2. Solid-liquid separation system

Under the environmentally friendly energy breeding mode, the pretreatment is mainly used to remove solid contents in the manure as much as possible in a physical method, among which, the solid-liquid separation system is the core part. Hydraulic power screen and spiral extrusion separator may be selected as the solid-liquid separation equipment, for the selection of equipment, overall consideration and attention should be paid to the water quantity to be treated, water quality, site, economic condition as well as the storage and transportation of waste residue.

(1) Solid-liquid separation for sewage should be carried out within 3h after collection when the spiral extrusion separator is selected.

(2) It is required to regulate the operation parameters of equipment as per the technical requirement according to the moisture content of solid matter separated by the solid-liquid separator.

(3) Trial run is necessary for solid-liquid separation equipment prior to operation with load.

(4) After starting up the equipment, it is required to make regular inspection of solid-liquid separation equipment for operation condition, and timely regulate sewage flow into separator based on the sewage quality and the sewage quantity after separation.

(5) The isolated solid fecal residue should be transported timely to the composting site for further treatment or to other sites for non-hazardous treatment rather than deposited in the livestock and poultry farm.

(6) The joint between separator housing and the feeding port, discharge port for solids

and the outlet bucket for liquid should be secured.

III. Features of anaerobic reactor

Under the environmentally friendly energy mode, the upflow anaerobic sludge blanket (UASB) and combined anaerobic reactor (upflow blanket filters) (UBF) are recommended to select as the anaerobic reactor, with its major design parameters as shown in Form 6-1.

Figure 6-1 Major design parameters for environmentally friendly energy anaerobic reactor

No.	Item	Dimension	UASB parameters	UBF parameters
1	Temperature	℃	25	15
2	Hydraulic detention time	D	1.5~3	2~4
3	TS concentration	%	<1	<1
4	CODcr removal rate	%	70~85	70~85
5	CODcr load	$kg/m^3 \cdot d$	3~5	1~2

UASB should be designed in accordance with following regulations:

(1) The plane shape of reactor, round or rectangular shape is recommended, should be confirmed based on the cost and site condition.

(2) The height of reactor, not more than 10m, should be confirmed according to the operation and economic conditions. The reactor should have the effective height (depth) of 7～9 m.

(3) It is required to prepare at least two anaerobic jars with maximum volume each not exceeding 2000 m^3; multiple mono-reactor should be prepared for parallel operation in case of larger thruput.

(4) Intake system should be designed with uniform water distribution and no short-circuit.

(5) Three-phase separator should be designed to ensure efficient separation among water, gas and mud with less silt content.

IV. Features of post-treatment

Post-treatment facility for environmentally friendly energy mode includes the aerobic treatment system, stabilization pond and disinfection means. Since the liquid manure from livestock and poultry is high in N and P, it is recommended to achieve nitrogen and phosphorus removal by service reservoir (with at least 1d of hydraulic retention time) +aeration pond (Sequencing Batch Reactor Activated Sludge Process (SBR) is recommended, with at least 12h of hydraulic retention time). Further advanced treatment is required for the waste water under aerobic treatment system: settling tank (with at least 1d of hydraulic retention time) →stabilization pond(mainly for removal of nitrogen and phosphorus in water). At present, two kinds of stabilization ponds are available: aerobic stabilization pond (generally with water depth of 0.5～0.6 m) and anoxic stabilization pond (generally with water depth of 1.2～1.5 m), the later can also be classified into the common pond and biological pond, and both should be designed with multistage series, generally 3-4 stages are preferable.

1. Design of aerobic treatment system

According to the relevant requirements specified in the Code for Design of Wastewater Stabilization Ponds (GJJ/T54-93), aeration pond should be designed in accordance with following requirements:

(1) Aeration pond system should consist of a complete aeration pond and 2-3 partial aeration ponds.

(2) The specific aeration power for complete aeration pond should be 5~6W/m^3.

(3) Aeration oxygen supply for the partial aeration pond should be calculated on the basis of organic biological oxidative degradation loading, with specific aeration power of 1~2W/m^3 (Volume of pond).

2. Design of stabilization pond

Stabilization pond is applicable to the area with available lakes, ponds and depressions as well as optimum climate and sunlight. For the area with evaporation larger than precipitation, flowing water resources are required to ensure the operation efficiency. For post-treatment, the stabilization pond is mainly used to remove N and P contained in water, with technical parameters as shown in Form 6-2:

Form 6-2 Technical design parameters of stabilization pond

(Environmentally friendly energy type)

Pond type	BOD_5 surface loading ($kg\ BOD_5/10^4m^2 \cdot d$)			Available water depth (m)	Treatment efficiency (%)	Incoming BOD_5 concentration
	Ⅰ	Ⅱ	Ⅲ			
Facultative pond	30~50	50~70	70~100	1.2~1.5	60%~80%	＜300
Aerobic pond	10~20	15~25	20~30	0.5~0.6	40%~60%	＜100
Note 1: I means the area with annual average temperature below 8 °C. Note 2: II means the area with annual average temperature ranging 8 °C~16 °C. Note 3: III means the area with annual average temperature below 16 °C.						

The stabilization pond should be designed in compliance with following requirements:

(1) The site of stabilization pond should be subject to the planning of livestock and poultry farm; idle lands such as the unused river way, pond, gully, marsh, wetland, wasteland, saline-alkali land and mud flat should be utilized in line with local condition.

(2) The pond should be located at the downstream of waterhead, ideally at the weather side with minimum wind frequency in summer as well as health protective distance from residential houses.

(3) Engineering geological and hydrogeological survey is necessary for site selection. Seepage control is required for the site with soil permeability coefficient (K) higher than 0.2 m/d.

(4) Protective measures should be taken for the embankment of pond. It is necessary to plant trees outside the pond embankment, with the width of green belt surrounding the stabilization pond system no less than 10m.

(5) Stabilization pond system may be designed with multiple ponds, or multistage series or parallel operation of ponds of same stage. For the multistage pond system, the area of each pond should not be more than $4\times10^4m^2$, and guide wall should be prepared when the area exceeds $8\times10^4m^2$.

(6) Local resources and materials should be used for the stabilization pond. The rectangle pond should have the length-width ratio no less than 3:1~4:1.

(7) Guide wall should be equipped inside the pond when the old river ways and depressions with unfavorable hydraulic conditions are used to construct stabilization pond.

(8) Pond bottom should be flat and slightly inclined to the outlet.

(9) Inlet and outlet should be designed in the diffusion type or multi-point type, equipped with baffle and down-hole.

(10) The flow direction of water from the inlet to outlet should be vertical to the predominant wind direction, not allowed to be against the wind direction.

(11) When the height of water is above 0.5m between two ponds in the multiple pond system, the communicating port should be equipped with rough slope or the stepwise hydraulic drop for aeration and oxygenation.

(12) Stabilization pond should be equipped with barrier to keep away wild animals and citizens nearby.

(13) The stabilization pond designed to directly discharge waste water to the environment after final treatment should prepare the standard sewage draining exit as per relevant national regulations.

The stabilization ponds under the subproject of livestock and poultry waste management are primarily aquatic plant pond based. The floating plant, emergent aquatic plant and submerged plant selected for aquatic plant pond should have excellent purification effects, strong durability against pollution, harvest convenience and high value in use.

(1) 20%~30% of water surface should be dispersedly reserved for floating plant pond. The collection, utilization and treatment of aquatic plant should be taken into account in designing pond.

(2) The available water depth of pond should be 0.4~1.5m, 0.4~1.0m and 1.0~2.0m for floating plant, emergent aquatic plant and submerged plant respectively.

(3) Temperature may have significant influence on the treatment efficiency of purification pond, therefore the retention time for water to some extent of quality will increase when the water temperature is decreased. To ensure the normal operation in cold days, we achieve heat preservation for purification pond with agricultural plastic

green house, make the most use of waste heat from sewage for thermal insulation and minimize the hydraulic retention time.

(4) Water lettuce is commonly planted in most of aquatic plant ponds in Guangdong province. About 3.5kg of water lettuce per square meter pond per time (about 15-20d) may be collected as feeds.

3. Sludge treatment:

Siltation is commonly found in domestic purification ponds and has also been the primary cause of aged ponds. For saving the cost of coagulating sedimentation, some farms fail to perform primary treatment but directly discharge sewage to the purification pond. Due to the siltation of bottom mud, the available volume of purification pond has been reduced, sewage retention time is shortened and the removal rate dropped. If effective measures are not adopted, some purification ponds may be out of service within a short time. To maintain the volume of ponds for post-treatment system and guarantee its normal operation, the sludge at pond bottom should be regularly removed and dehydrated as farmland fertilizer.

4. Disinfection

Waste water from livestock and poultry farm should be disinfected before discharging or recycling. It is required to take non-chlorination treatment measures like the ultraviolet rays, ozone and hydrogen peroxide as well as produce no secondary pollution.

6.5.2.2 Ecological energy mode

I. Technological process

Ecological energy mode is applicable to farms with farmlands, fish ponds and aquatic plant ponds nearby. It is designed to make overall planning and systematic arrangement based on ecological farming for the purpose of forming an ecological agriculture park, after systematic excrement treatment and resource utilization, composed of the nearby farmland, fish pond or aquatic plant pond which may completely absorb and digest the

pretreated waste water. By using ecological energy mode, multilevel resource utilization of excrement will be achieved by discharging the livestock wastewater subject to anaerobic digestion and sedimentation to the farmland, fish pond or aquatic plant pond.

Under the mode, when sewage from the farm flows via drainage ditch to the regulating tank, the bar screen installed in front of regulating tank will help removing sundries of large size in the sewage. While the liquid excrement flows to measuring tank after complete mixture in the regulating tank, the pump installed in the measuring tank will pump the feed liquid at regular period and in a fixed quantity to anaerobic digester. To keep the temperature of anaerobic digester around 35℃, a steam heating system with steam provided by the boiler room is equipped in the measuring tank, other heating methods are also permitted. Both measuring tank and anaerobic digester are provided with temperature sensor to regulate the quantity of steam entering regulating tank. The biogas produced may enter the air storage tank after desulfurization, dehydration and purification and then serve as production and domestic energy; biogas residue may be regularly discharged, depending on the condition, and then dried as organic fertilizer; and the biogas slurry may enter the slurry storage pool and serve as liquid organic fertilizer for farmlands. Its technological process flow is as shown in Chart 6-2:

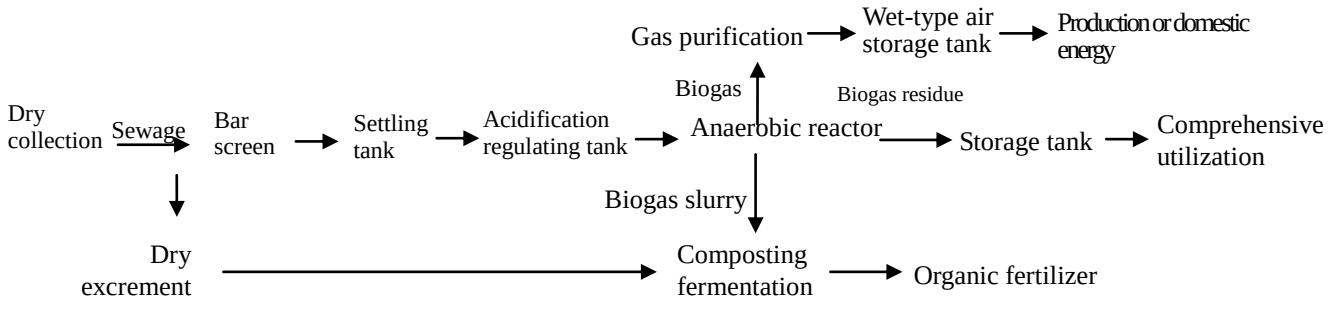


Figure 6-2 Flow schematic diagram for ecological energy mode

Major contents of ecological energy breeding mode:

①Settling tank: Hydraulic retention time should be more than 1h.

②Acidification regulating tank: Hydraulic retention time should be more than 1d.

③Anaerobic reactor: Upflow Solid Reactor (USR), Plug Flow Reactor (PFR) and Continuous Stirred Tank Reactor (CSTR) is recommended, with at least 8d of hydraulic retention time is recommended.

④Biogas slurry storage pool: Capable of sustaining at least two months of biogas slurry quantity 200 livestock and poultry farms are designed as the ecological energy mode: 100 farms with 3000～5000 breeding stocks, 60 farms with 5000～10000 breeding stocks and 40 with 10000～15000 breeding stocks.

II. Features of pretreatment

The pretreatment for ecological energy mode consists of manure collection, solid-liquid separation and acidification regulation, with the same manure treatment process as the environmentally friendly energy mode described above.

In terms of technological process, the solid-liquid separation system under ecological energy mode differs greatly from that under environmentally friendly energy mode. With the exception that dry manure and compost may be produced in the dry collection stage of pretreatment, no solid-liquid separation can be found in other stages, the liquid manure, after passing through bar screen, directly flows into the anaerobic reactor. The mode is mainly used to improve energy utilization and comprehensive utilization as well as fully utilize biogas in some areas with large energy demand, enough lands to consume biogas slurry and residue and more than one doubled area of land for crop rotation.

Under such circumstances as the area has weak demand for energy and certain lands around farms for crop rotation, mainly for the purpose of performing non-hazardous treatment of pollutants, reducing the concentration of organics and the land areas for biogas slurry and residue digestion, solid-liquid separation equipment can be used after the treatment in settling tank and collection tank to compost the separated solid excrement residue, reduce the quantity of biogas slurry, relief consumption pressure for lands and prevent potential secondary pollution in recycling livestock and poultry waste

in farmland. In such case, the solid-liquid separation system is basically identical to that under environmentally friendly energy mode.

III. Features of anaerobic reactor

The anaerobic reactor for ecological energy mode should be Continuous Stirred Tank Reactor (CSTR), Upflow Solid Reactor (USR), and Plug Flow Reactor (PFR), with major design parameters for each as shown in Form 6-3. Major technical features are as follows:

1. it is preferable to adopt mesophilic (around 35℃) or near mesophilic digestion; thermophilic digestion (around 55℃) should be adopted when other heat sources are available.

2. When total solids W(TS) is ＜3% at the middle temperature, the hydraulic retention time (HRT) for anaerobic reactor should not be less than 5 d; when it is ≥3%, HRT should not be less than 8d.

3. It is preferable to adopt one-stage anaerobic digestion, and based on different technical process, two-stage anaerobic digestion may also be selected.

4. CSTR should be designed as the round plane shape, equipped with the continuous or intermittent mode mixing system.

5. USR should be designed as a vertical cylinder with effective height of 6～12 m; a rational water distribution method should be adopted to ensure the uniform rising of liquid and prevent short-circuit.

6. For PFR, the semi-underground or above-ground building should be adopted.

Form 6-3 Major design parameters of anaerobic reactor for ecological energy mode

No.	Project	Dimension	USR parameters	CSTR parameters	PFR parameters
1	Temperature	℃	Around 35℃	Around 35℃	Around 35℃
2	Hydraulic retention time	d	8~15	10~20	15~20

No.	Project	Dimension	USR parameters	CSTR parameters	PFR parameters
3	TS concentration	%	3~5	3~6	7~10
4	CODcr removal rate	%	60~80	55~75	50~70
5	CODcr loading	$kg/m^3 \cdot d$	5~10	3~8	2~5
6	Dosing rate	%	7~12	5~10	5~7

IV. Features of post-treatment

Different discharge standard and final discharge point may lead to different post-treatment procedures for ecological energy mode and environmentally friendly energy mode. For ecological energy mode, it can achieve standard discharge of waste by composting the biogas residue in anaerobic reactor and storing biogas slurry in storage pool as liquid organic fertilizer instead of aerobic treatment and purification in stabilization pond. Therefore, following special requirements for post-treatment under ecological energy mode, especially for the design, operation and management of storage tank must be met:

1. It is required to test fertilizer efficiency of farmland soil and, based on the nutrient amount and environmental capacity required by farmland soil and plant growth, confirm the recycled amount of livestock and poultry waste so as to effectively utilize biogas slurry, residue and organic fertilizer, achieve rational application of fertilizer and prevent non-point source pollution.

2. The storage pool should be kept away from each kind of surface water body (with a distance no less than 400m), and should be at the downwind or crosswind area relative to the predominant wind direction in ordinary year of the farm’s production and living quarter.

3. The total effective volume of storage pool should depend on the storage period. For the farms engaged in both planting and breeding, the storage period for storage tank should not be less than the maximum interval of fertilizer applications for local crops and the freezing period or the maximum flush period in rainy season, generally not be

less than the discharge amount in 30d..

4. Anti-seepage measures should be taken for storage pool to prevent ground water pollution. Relevant anti-corrosion measures should also be taken for the erodible parts.

5. Storage pool should be equipped with devices to keep rain water away and sewage pump.

6. To prevent overflow, the storage pool should be of sufficient capacity and regularly cleaned, normally once every 15-20d.

7. To effectively prevent the possibility of accident, it is required to install a 1.5m high protective fence around the storage pool.

8. Effective sewage transmission network should be established between the livestock and poultry farm and the farmland. The treated sewage transported to farmland by vehicles or pipelines should be under strict management and control, be sure no overflow, sprinkling, leakage is found in transit.

9. The livestock and poultry excrement for farmland may only be applied at the proper time as the plant nutrient (generally not long before the planting season).

6.5.2.3 New "High-bed fermentation" pig breeding mode

I. Process description

The new "high-bed fermentation" pig breeding mode is designed to achieve innovative design of pig house to realize 100% utilization of pig excrement as organic fertilizer.

For the pig house designed as the new "high-bed fermentation" mode (as shown in Figure 6-3), rinse water is not necessary for manure cleaning since the pig house is laid with complete slatted floors 2.3m above the ground through which pig manure and urine will fall into the bedding. The pig house is fully-enclosed, designed with breeding density of 0.875m^2/per pig. Automatic temperature control is adopted for the whole pig breeding process. The fermentation bed beneath slatted floor is applied with a 60～80 cm layer of bedding, for instance the saw dust, to receive pig manure and urine for fermentation. Heap turning for bedding is mechanically operated. After the composting maturity, regularly take some materials as organic fertilizer for testing, and accordingly

add some fresh beddings to the fermentation bed. Its major technological process is shown in the flow chart 6-4:

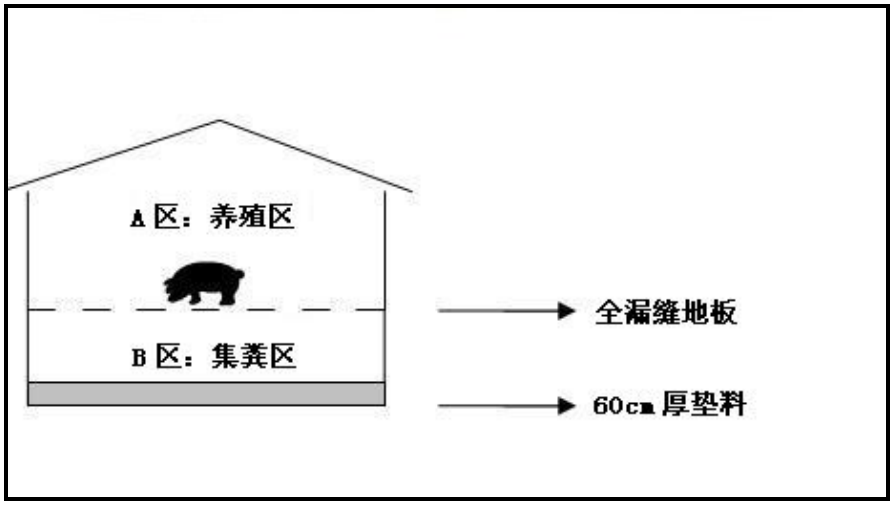


Figure 6-3 New "High-bed fermentation" pig breeding mode

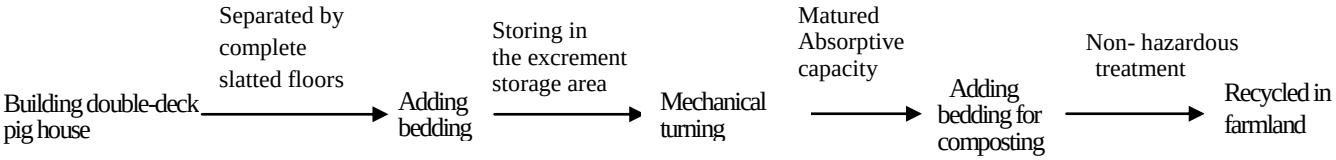


Figure 6-4 Simple flow chart for new "high-bed fermentation" pig breeding mode

Design sketch for for new "high-bed fermentation" pig breeding mode:

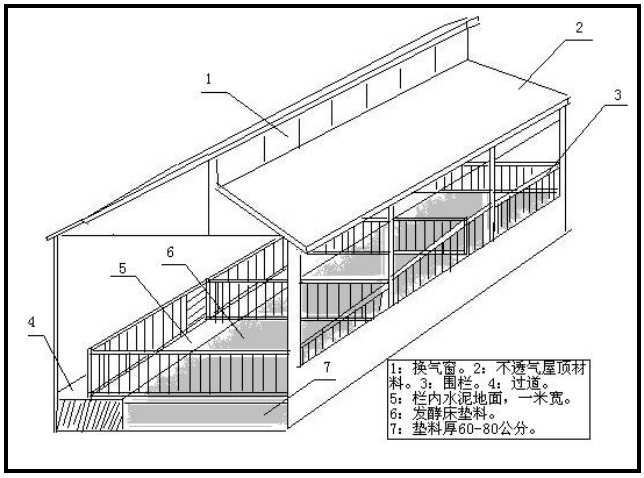


Figure 6-5 Design sketch for for new "high-bed fermentation" pig breeding mode:

The mode has following features: ① No rinsing is required in the breeding process; regular heap turning for excrement and urine and bedding; direct production of organic

fertilizer; achieve eco-friendly breeding and provide solution to the wastes; ② Save water and EP costs; since the pigs are separated from excrement by slatted floors, it keeps high degree of cleanliness without rinsing while saving large quantity of water and cost in waste water treatment; ③Improve animal health and production efficiency; the pig house is designed with thermal control to improve indoor air quality and reduce diseases as well as feed efficiency by 5%～10%. ④ Significantly reduce the labor strength of feeder. ⑤ Effectively degrade the excrement and urine and achieve high-efficient cyclic utilization. ⑥ Project achievements may be promoted.

II. Features of pretreatment

Compared with the traditional breeding modes, new "high-bed fermentation" pig breeding mode evidently requires no rinsing in the whole process. For the traditional manure cleaning, large quantity of liquid manure mixture must be subject to solid-liquid separation and acidification regulation in the pretreatment stage before entering anaerobic reactor, while for the "high-bed fermentation" pig breeding mode, by using the slatted floors, livestock excrement and urine is collected on the bedding, saving the solid-liquid separation and acidification regulation. Major measures for pretreatment under "high-bed fermentation" pig breeding mode include:

1. The gap width of slatted floor should be properly designed to allow for both natural falling of excrement on the bedding layer and normal living and movement of pigs.
2. Properly utilize local agricultural wastes (such as wheat chaff, rice hull, caving, straw, saw dust and lime soil, etc.) as the pig house bedding, or use the biological fermentation bedding compliant with animal epidemic prevention requirement.
3. Bedding should be loosely piled to effectively absorb pig excrement, designed with uniform thickness ranging 60~80cm, proper thickening is required in the area with large breeding density.
4. The beddings out of service due to saturation should be timely cleaned and replaced with new ones.
5. Anti-seepage treatment is necessary for the ground (with bedding layer) beneath pig

house to prevent the unabsorbed excrement from contaminating soil and ground water.

III. Anaerobic treatment

For the farms with large scale that produce large quantity of excrement or have strong demand for energy utilization, the beddings for excrement collection can be put in the anaerobic reactor for fermentation and gas production, with reference to the anaerobic treatment under ecological energy mode for its technical process; for the farms with small size that produce less excrement, it is recommended to produce organic fertilizer by directly composting the beddings for excrement collection.

IV. Features of post-treatment

The major treatment under “high-bed fermentation” pig breeding mode involves the bedding treatment. Beddings should be composted by high-temperature aerobic fermentation or other applicable techniques and means to kill pathogenic bacteria and Ascaris eggs, reduce stacking time and achieve non-hazardous treatment. For its principle, refer to the part regarding the composting technological process and the utilization of solid fertilizer in the operation life cycle.

6.5.3 Summary of environmental impact mitigation measures

For the summary of common mitigation measures for the subproject- livestock and poultry waste management, please see the Form 6-4. Refer to the mitigation measures for the special environmental impact.

Form 6-4 Summary of common mitigation measures for the subproject- livestock and poultry waste management

Project Phase	Environmental problem	Mitigation and protective measures
Design	Site selection	1. Site selection for livestock and poultry farm: 1.1 No establishment of livestock and poultry farm in the forbidden area is allowed; 1.2 The livestock and poultry farm constructed, , if necessary, nearby the forbidden area should be located at the downwind or crosswind area relative to the predominant wind direction in ordinary year with a distance no less than 500m; 1.3 No pig farms are allowed near (less than 2,000m from) the heavily polluted area, high prevalence area of animal epidemic disease or market and trading market; 1.4 Livestock and poultry farms should be located at a dry and flat place with higher topography, occupying no or less cultivated lands; 1.5 The livestock and poultry farm should be kept a certain distance from major traffic routes, residential community, sewage outlet, source of drinking water and other farms in accordance with relevant regulations. 2. Site selection for livestock and poultry waste management engineering: 2.1 The site should be properly planed according to the excrement treatment procedure so as to ensure full utilization of equipments and stable operation of facility; 2.2 The site should be located at the at the downwind or crosswind area relative to the production area and living quarter.

Project Phase	Environmental problem	Mitigation and protective measures
		2.3 The site should be advantageous to discharge, resource utilization and transportation, leaving room for further construction; 2.4 The site selected for livestock and poultry waste management engineering should enjoy ideal engineering geological condition and meet the epidemic prevention requirements.
	Water pollution	1. Storage pool for collecting compost leachate should be prepared inside the composting farm. 2. Anti-seepage measures should be taken for composting farm to prevent ground water pollution. 3. Composting farm should be provided with rain-proof facility and rainwater drainage system. 4. The water collection tank should have the volume no less than 50% of the maximum daily discharge. 5. Anaerobic reactor should be designed with standard water tightness, made of water-proof materials and its internal wall and pipelines should also be subject to antiseptic treatment. 6. The waste storage facility should be kept away (at least 400m) from sorts of surface water body.
	Solid waste pollution	1. The water collection tank should be located at a place accessible for removal of floating residue and sediment.
	Air pollution	1. Anaerobic reactor should be designed with standard air tightness, made of airtight materials and its internal wall and pipelines should also be subject to antiseptic treatment.
	Safety and health	1. Anaerobic reactor should be equipped with safety devices for the prevention of exceeding positive and negative pressure. 2. Anaerobic reactor should be equipped manhole and sludge pipe. 3. Electrical equipment should be kept away from the place with high temperature, moisture, dust, fire and corrosion.
Construction	Water pollution	1. The water from pit excavation and the waste water for mortar mixing can be recycled after sedimentation treatment for construction or watering to reduce dust. 2. Construction waste water should not be discharged at will, and the waste water from mechanical

Project Phase	Environmental problem	Mitigation and protective measures
		cleaning can be reused. 3. It is required to regularly dredge the drainage channel. 4. To prevent oily sewage in the construction site from maintenance, the construction machine and vehicle should be maintained at the professional maintenance point. 5. Mechanical equipment before using should be inspected for oil or water leakage. 6. Anti-seepage cement should be applied for the foundation of sewage pool and the geo-textile should be selected for the storage pool for seepage proof. 7. For the underground and semi-underground structures, it is necessary to keep surface water away from the foundation ditch; anti-floating measures should be taken when there is high underground water level. 8. Water stop measures, such as embedding the sleeve, is necessary for the storage tank with pipelines passing through. 9. When the storage tank is designed with large size, it is required to provide expansion joint and water stop piece.
	Air pollution	1. Regular watering for dust suppression is necessary for the road prone to cause dust. 2. The material storage area, machining area and large template storage place in the construction site should be flat and solid. 3. The granular materials with fine particle should be kept tightly, and shelters should be equipped during loading and transporting. 4. The exposed area in the construction site should be properly watered for dust suppression. 5. Vehicles entering construction site should slow down. 6. The loading space for the vehicles transporting earthworks, mucks and construction wastes should be properly sealed.
	Noise pollution	1. It is required to carry out construction within the specified period. 2. Residents leaving nearby should be informed of continuous construction at night.

Project Phase	Environmental problem	Mitigation and protective measures
		3. Within the noise limit period, construction unit shall receive the effective CNP. 4. During construction, it is required to ensure there is no abnormal noise and abrasion from the moving gear drives. 5. It is required to use low-noise equipment and close windows and doors as much as possible during construction. 6. Regularly maintain the construction equipment and allow it as much as possible under optimum working condition. 7. Facilities left used have to be shut down or controlled under energy-saving and vibration reduction state. 8. Construction and transportation vehicles are required to slow down and forbidden to toot near the construction site.
	Solid waste pollution	1. Construction and domestic wastes should be separately collected, stored and timely removed as per regulations. 2. Construction wastes should be cleaned daily and forbidden to throw from high. 3. Garbage collection unit shall hold the environmental service certificate issued by relevant department. 4. The dumped oil and chemical solvent should be stored in centralization and treated by the qualified entrusted unit. 5. All solid wastes produced during construction shall be completely removed upon the completion of engineering project.
	Construction safety and others	1. The coating selected for sealing layer should be less corrosive, irritating, non-toxic and excellent in sealing performance. 2. The publicity about engineering construction information should be posted at the construction site and surrounding areas. 3. The constructors working in the dusty site should wear respirator.

Project Phase	Environmental problem	Mitigation and protective measures
		4. Personnel engaged in drilling or electric welding shall be equipped with earplug and arc protection goggles. 5. For painting and chemical solvent, it is necessary to select the eco-friendly and non-toxic materials.
Operation period	Water pollution	1. The drainage system should be designed with separate rainwater and sewage collection & transport system. 2. Domestic sewage should be delivered with that from farm via sewage pipes to the biogas treatment system. 3. The bar screen should be equipped and used before waste water entering the collection tank. 4. It is required to regularly flush and clean the water collecting tank, regulating tank and other pipelines. 5. Reduce water consumption for cleaning by using high-pressure and low-flow nozzle. 6. Waste water from livestock and poultry farm should be disinfected before discharging or recycling. 7. Composting should be completed in a place with cover or ceiling.
	Air pollution	1. Before entering boiler room or generator set, biogas shall be subject to desulfurization. 2. Biogas from anaerobic treatment, which should be completely utilized, is not allowed to directly release into the environment. 3. The volume of tank is dependent on the usage of biogas. 4. To reduce the impact of odor on the environment, it is necessary to plant high and ever-green arbors as well as build green belt separation to absorb odor and clean the air. 5. Each of excretion treatment unit should be designed as the closed type 6. Biochemical deodorant should be sprayed at the excretion outlet of the composting place and the solid-liquid separation equipment. 7. To prevent the diffusion of odor, it is necessary to spray (spread) on the excretion or inside the shed with applicable absorbents. 8. It is required to drop or sprinkle chemical deodorants inside livestock and poultry farm and excretion

Project Phase	Environmental problem	Mitigation and protective measures
		treatment plant to prevent the occurrence of odor. 9. Biological deodorization methods, like the biofiltration process and bioscrubber, are recommended for deodorization. 10. To reduce the emission of ammonia, it is necessary to allow the surface temperature of livestock and poultry excretion cooling at 15℃ or below.
	Noise pollution	1. The equipment with noise has to be operated in a closed room. 2. Shock absorption foundation or support as well as damping materials should be prepared for mechanical equipments with big noise. 3. By performing regular maintenance, to keep the construction equipment under the optimum working condition and lowest level of noise as much as possible. 4. Facilities left used have to be shut down or controlled under energy-saving and vibration reduction state.
	Solid waste pollution	1. To use the feeding facility with cover or protection device to keep feeds away from wind and rainfall 2. To keep feeding system under sound working condition to prevent feed spillage and contact with ground. 3. To select the feeds low in protein and amino acid. 4. The storage and Transport container for livestock and poultry wastes should be reliably sealed to prevent leakage 5. To keep the wastes as dry as possible, scraping instead of rinsing is recommended. 6. Livestock and poultry died of disease shall be timely disposed of and not allowed to be casually discarded, sold or reused as feed. 7. The area for burying livestock should be of soil stability and low permeability. 8. Livestock and poultry excrement may not be used for farmland until subject to non-hazardous treatment.

Project Phase	Environmental problem	Mitigation and protective measures
		9. Excrement subject to treatment, which may serve as land fertilizer or soil conditioner for crop growth, should not be applied with amount exceeding that required by the crop growth in the current year. 10. Solid manure should be composted by high-temperature aerobic fermentation or other applicable techniques and means to kill pathogenic bacteria and Ascaris eggs.
	Animal epidemic prevention	1. The livestock and poultry farm is required to equip with separation house for sick animals, non-hazardous treatment facility and equipment for animals died of disease, sewage and wastes. 2. The personnel responsible for prevention and treatment should be specially assigned. 3. Separation and disinfection facility and equipment shall be provided at the entry and exit. 4. The personnel responsible for feeding, epidemic prevention and treatment should be free of any zoonosis. 5. It is necessary to establish the complete epidemic prevention system.
	Safety operation and operation management	1. Air storage tank must be equipped with safety devices to prevent the excess of air charging and exhaust; blow-down pipe should be provided with fire barrier. 2. When drainage, cleaning and maintenance is required for anaerobic reactor, it is necessary to perform harmful gas detection in advance. 3. The personnel engaged in special type of works should receive training in occupational skill and safety techniques, and is not permitted to engage in such works until getting the related professional certificate. 4. Before working, operators have to wear the proper appliances for labor protection and make well safety and sanitary preparations. 5. Operators should take cautious steps for slippery and falling to prevent personal injury while inspecting or operating on structures in rainy or snowy days. 6. Maintenance personnel should, as per the equipment operation requirement, regularly check and replace protection facility and equipment relating to safety and fire fighting. 7. The lightning-protection and explosion-proof equipment installed on the building and structure should

Project Phase	Environmental problem	Mitigation and protective measures
		be maintained as per the regulations specified by the meteorological department and fire department. 8. It is required to make the emergency warning plan for accidents such as the fire, combustion, explosion and natural disaster. 9. Ventilation is necessary for the site exposure to harmful gas, inflammable gas, odor, dust and moisture. 10. Preparations relating to the gas leakage, fire and negative pressure shall be completed for facilities used for the production, transportation and storage of biogas. 11. It is forbidden to wipe moving parts and required to keep flushing water away from cable head and motor while cleaning electromechanical device and surroundings. 12. A safety fire-protection distance should be kept for air storage tanks.

Form 6-5 Summary of special mitigation measures for the subproject- livestock and poultry waste management

Project Phase	Environmental problem	Breeding mode	Mitigation and protective measures
Design	Water pollution	Environmental friendly energy mode	1. The specific aeration power for complete aeration pond should be 5~6W/m^3. 2. Aeration oxygen supply for the partial aeration pond should be calculated on the basis of organic biological oxidative degradation loading. 3. Seepage control is required for the site with soil permeability coefficient (K) higher than 0.2 m/d. 4. It is necessary to plant trees outside the pond embankment, with the width of green belt surrounding the stabilization pond system no less than 10m. 5. For the multistage pond system, the area of each pond should not be more than $4\times10^4m^2$, and guide wall should be prepared when the area exceeds $8\times10^4m^2$. 6. Local resources and materials should be used for the stabilization pond. The rectangle pond should have the length-width ratio no less than 3:1~4:1. 7. The collection, utilization and treatment of aquatic plant should be taken into account in designing pond. 8. The available water depth of pond should be subject to the plant types.
		Ecological energy mode	1. Sufficient lands around the farms for the consumption of fertilizer are required to prevent secondary pollution. 2. The volume of storage pool, generally, should not be less than the discharge amount in 30d. 3. Storage pool should be equipped with devices to keep rain water away and sewage pump.
		High-bed breeding	1. No rinsing is required in the breeding process as the pig house is divided into two layers by the complete slatted floors.
	Solid waste	Environmental	1. Both the solid-liquid separator and low-temperature anaerobic reactors is equipped.

Project Phase	Environmental problem	Breeding mode	Mitigation and protective measures
	pollution	friendly energy mode	
		Ecological energy mode	1. It should be designed with high-temperature anaerobic reactor; and sufficient lands around the farms for the consumption of fertilizer are required to prevent secondary pollution.
		High-bed breeding	1. None
Operation	Water pollution	Environmental friendly energy mode	1. Manure cleaning by rinsing: 1.1 Discharge water several times a day by turning sprinkler at the end of groove to keep cleanness and prevent odor pollution; 1.2 Save water by controlling the rinsing frequency; 1.3 Be sure the liquid manure flows into the main manure ditch via the manure groove, and then to the underground manure storage tank or the liquid manure is pumped to the ground manure storage tank. 2. Manure cleaning by water submerging: 2.1 Ensure the sound sealing of manure ditch to prevent leakage of large amounts of harmful gas; 2.2 Be sure the liquid manure flows into the main manure ditch via the manure groove, and then to the underground manure storage tank or will be pumped to the ground manure storage tank. 3. Dry collection: Timely maintenance for mechanical manure cleaning is necessary since it has higher malfunction occurrence rate. 4. Stabilization pond should be equipped with barrier to keep away wild animals and citizens nearby.

Project Phase	Environmental problem	Breeding mode	Mitigation and protective measures
			5. The stabilization pond designed to directly discharge waste water to the environment after final treatment should prepare the standard sewage draining exit as per relevant national regulations.
		Ecological energy mode	1. The storage pool should be kept away from each kind of surface water body (with a distance no less than 400m), 2. To prevent overflow, the storage pool should be of sufficient capacity and regularly cleaned, normally once every 15-20d. 3. To effectively prevent the possibility of accident, it is required to install a 1.5m high protective fence around the storage pool. 4. Effective sewage transmission network should be established between the livestock and poultry farm and the farmland. 5. The livestock and poultry excrement for farmland may only be applied at the proper time as the plant nutrient
		High-bed breeding	1. The fermentation bed beneath slatted floor is applied with a 60～80 cm layer of bedding, for instance the saw dust, to receive pig manure and urine for fermentation. No rinsing is required during breeding. 2. Anti-seepage treatment is necessary for the ground with bedding layer to prevent the unabsorbed excrement from contaminating soil and ground water.
	Solid waste pollution	Environmental friendly energy mode	3. Solid-liquid separation for sewage should be carried out within 3h after collection when the spiral extrusion separator is selected. 4. It is required to regulate the operation parameters of equipment as per the technical requirement according to the moisture content of solid matter separated by the solid-liquid separator. 5. Trial run is necessary for solid-liquid separation equipment prior to operation with load.

Project Phase	Environmental problem	Breeding mode	Mitigation and protective measures
			6. After starting up the equipment, it is required to make regular inspection of solid-liquid separation equipment for operation condition, and timely regulate sewage flow into separator based on the sewage quality and the sewage quantity after separation. 7. The isolated solid fecal residue should be transported timely to the composting site for further treatment and for non-hazardous treatment 8. The joint between separator housing and the feeding port, discharge port for solids and the outlet bucket for liquid should be secured. 9. The sludge at each pond bottom should be regularly removed, and then dried and dehydrated as farmland fertilizer.
		Ecological energy mode	1. Water pollution characteristics under ecological energy mode in the same operation life cycle.
		High-bed breeding	1. After the composting maturity, regularly test some bedding materials and take them as organic fertilizer.

Chapter 7 Environmental Monitoring Plan

The environmental monitoring is performed in the construction and operation period for the purpose of implementing EP plan, verifying the forecast evaluation result of environmental impact, preventing sudden environmental hazards and formulating detailed implementation plan for EP. Environmental monitoring may also provide the scientific basis for environmental pollution control, engineering environment management and regional EP in the construction and operation period.

7.1 Monitoring plan for project acceptance

The construction project, once completed, shall be subject to the project acceptance by the competent EP authority. As the environmentally friendly farming subproject contains less construction activities, the project acceptance is only for the livestock and poultry waste management, and in addition, different monitoring contents of project acceptance may be required by different breeding modes, with the monitoring plan for project acceptance under each breeding mode as shown in Form 7-1 to 7-3, corresponding monitoring point location diagram in Figure 7-1 to 7-3, and the numbers labeled in the figure are corresponding to the sequence number of monitoring item. Among which, 3-5 samples will be taken every time for water quality monitoring; stratified sampling will be performed from the upper, middle and lower layer for the composting and the further detection will be made when an average sample made with a mix of them weighing about 500g is completed.

Form 7-1 Monitoring plan for the acceptance of environmental friendly energy farms

No.	Monitoring item	Monitoring point	Monitoring (observing) index	Monitoring frequency	Cost (yuan)	Enforcement body	Responsible Organization	Supervisory organization
1	Sand content in the settling tank and the moisture content of sand	Settling tank	Sand content and moisture content	1	100	Municipal environmental monitoring station	Owner	Environment protection agency of city and county level
2	Slag yield and moisture content of solid-liquid separation equipment	Solid-liquid separation equipment	Slag yield and moisture content		100			
3	Quality of water coming from and to hydrolysis acidification tank	water coming from and to hydrolysis acidification tank	CODcr, BOD_5, NH_3-N, SS		900			
4	Sludge removal quantity and frequency for hydrolysis acidification tank	Hydrolysis acidification tank	Sludge removal quantity and frequency		100			
5	Quality of water coming from and to anaerobic reactor	Water coming from and to anaerobic reactor	CODcr, BOD_5, NH_3-N, SS		900			

No.	Monitoring item	Monitoring point	Monitoring (observing) index	Monitoring frequency	Cost (yuan)	Enforcement body	Responsible Organization	Supervisory organization
6	Alkalinity, sludge property and concentration in the anaerobic reactor	Anaerobic reactor	Alkalinity, sludge property and concentration		100			
7	Quality of water coming from and to aerobic treatment system	The inlet and outlet of aerobic treatment system	CODcr, BOD_5, NH_3-N, SS		900			
8	Sludge property and concentration in aerobic treatment system	Aerobic treatment system	Sludge property and concentration		100			
9	Water quantity and quality in the whole sewage treatment system	The outlet at the front and rear end of bar screen	pH, fecal coliform, COD_{Cr}, BOD_5, total phosphorus, ammonia nitrogen, SS		1800			
10	Compost detection	Composting area	Ascaris suum eggs, fecal coliforms, flies		1000			
Total sum for 100 farms (yuan)					100× 6,000 yuan/each=600,000			

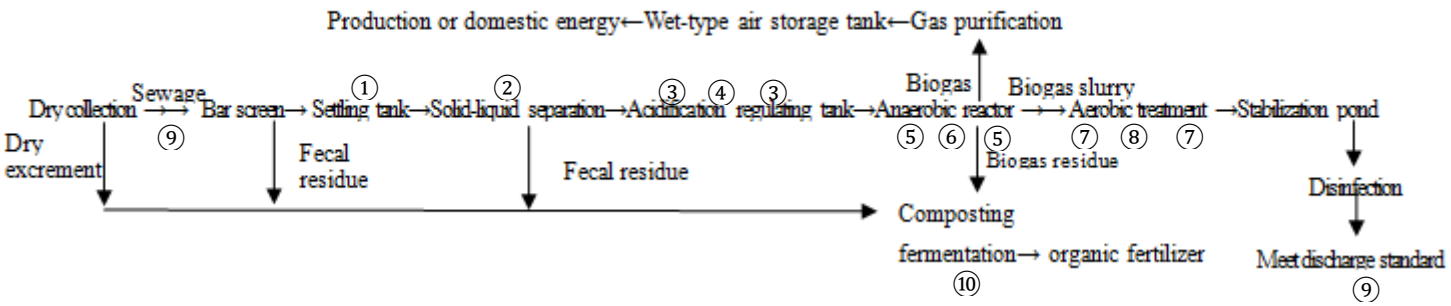


Figure 7-1 Monitoring point distribution diagram for environmentally friendly energy mode

Form 7-2 Monitoring plan for the acceptance of ecological energy farms

No.	Monitoring item	Monitoring point	Monitoring (observing) index	Monitoring frequency	Cost (yuan)	Enforcement body	Responsible Organization	Supervisory organization
1	Sand content in the settling tank and the moisture content of sand	Settling tank	Sand content and moisture content	1	100	Municipal environmental monitoring station	Owner	Environment protection agency of city and county level
2	Quality of water coming from and to hydrolysis acidification tank	water coming from and to hydrolysis acidification tank	CODcr, BOD_5, NH_3-N, SS		900			
3	Sludge removal quantity and frequency for hydrolysis acidification tank	Hydrolysis acidification tank	Sludge removal quantity and frequency		100			
4	Quality of water coming from and to anaerobic reactor	Water coming from and to anaerobic reactor	CODcr, BOD_5, NH_3-N, SS		900			
5	Alkalinity, sludge property and concentration in the anaerobic reactor	Anaerobic reactor	Alkalinity, sludge property and concentration		100			

No.	Monitoring item	Monitoring point	Monitoring (observing) index	Monitoring frequency	Cost (yuan)	Enforcement body	Responsible Organization	Supervisory organization
6	Hazard-free hygienic index of biogas residue and slurry	Water outlet of composting area and storage pool	Ascaris suum eggs, fecal coliforms, flies		1000			
Total sum for 200 farms (yuan)					200×3200 yuan/each =640,000			

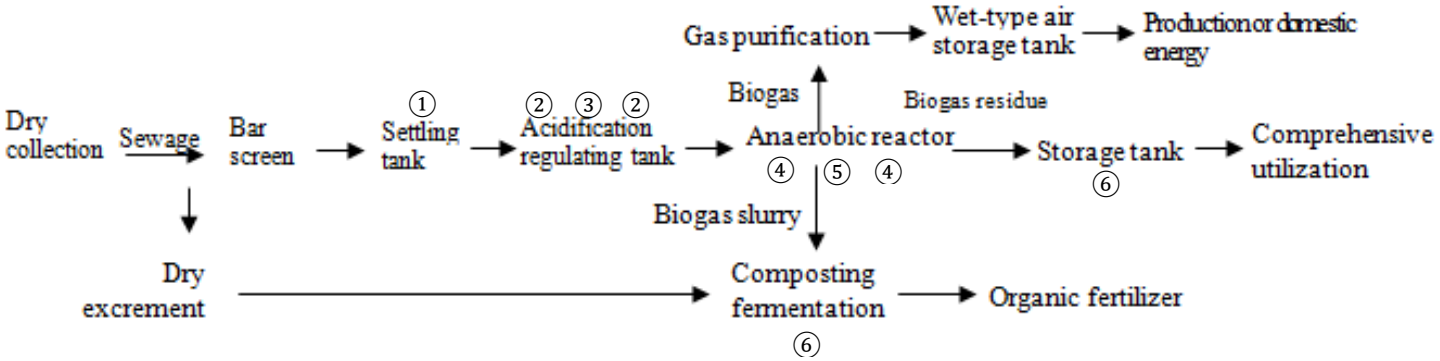


Figure 7-2 Monitoring point distribution diagram for ecological energy mode

Form 7-3 Monitoring plan for the acceptance of new "high-bed fermentation" farms

No.	Monitoring item	Monitoring point	Monitoring (observing) index	Monitoring frequency	Cost (yuan)	Enforcement body	Responsible Organization	Supervisory organization
1	Compost detection	Composting area	Ascaris suum eggs, fecal coliforms, flies	1	1000	Municipal environmental monitoring station	Owner	Environment protection agency of city and county level
Total sum of 2 frams (yuan)					2×1000yuan/each =2000			

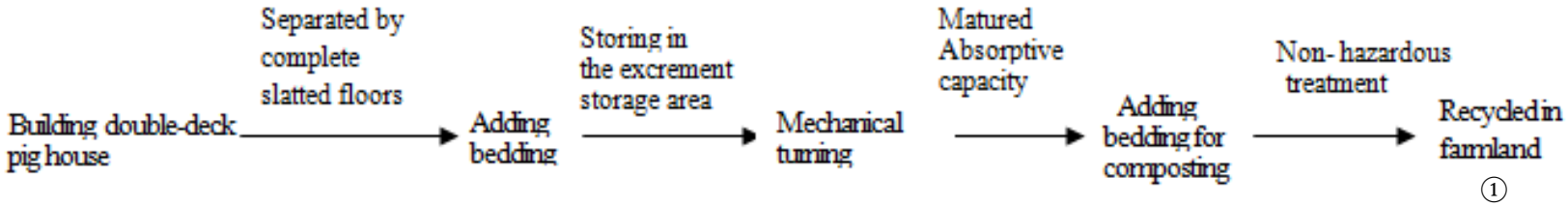


Figure 7-3 Monitoring point distribution diagram for new "high-bed fermentation" farms

7.2 Monitoring plan for environmentally friendly farming

Since the environmentally friendly farming subproject contains less construction works and most of activities are completed in the remote farmlands, orchards and vegetable gardens, virtually free of any environmental sensitive sites nearby and little environmental impact from a small amount of activity, no specific environmental monitoring plan in the construction period of environmentally friendly farming industry has been formulated while virtually meeting the environmental quality standards. The environmental monitoring plan described below is mainly for its operation life cycle.

7.2.1 Distribution of monitoring points

Distribution principle: in order to reflect in maximum degree both the self-purification of pollutants in the general trunk and the quality variance of water coming in and from irrigation ditch, the monitoring points should be distributed subject to the principle of maximization of absolute distance between the water outlet and inlet.

a) For some general individual farmers, there farmlands are small, provided with simple canal system layout, only an water inlet and outlet, as shown in Figure 7-4 (b), where the monitoring points may be selected at the inlet and outlet.

b) For some medium and large irrigated areas lack of planning and construction, generally the network canal system, as shown in Figure 7-4 (a), is formed. According to the distribution principle, the monitoring points should be selected respectively at the inlet and outlet with the farthest absolute distance.

c) For some medium and large irrigated areas with complete planning and construction, generally the tree canal system, as shown in Figure 7-4 (c), is formed. The monitoring points should be selected according to the distribution principle of maximization of absolute distance between the water outlet and inlet.

Since the environmentally friendly farming subproject covers individual farmers, cooperatives, vegetable gardens and farms in other forms, widely scattered and quite large in number, random sampling is confirmed as the major sampling method: 5 project demonstration areas will be annually selected from each demonstration town among 30 in Jiangmen and Huizhou City, 2 monitoring points per area will be confirmed, that is, 300 monitoring points will be selected annually.

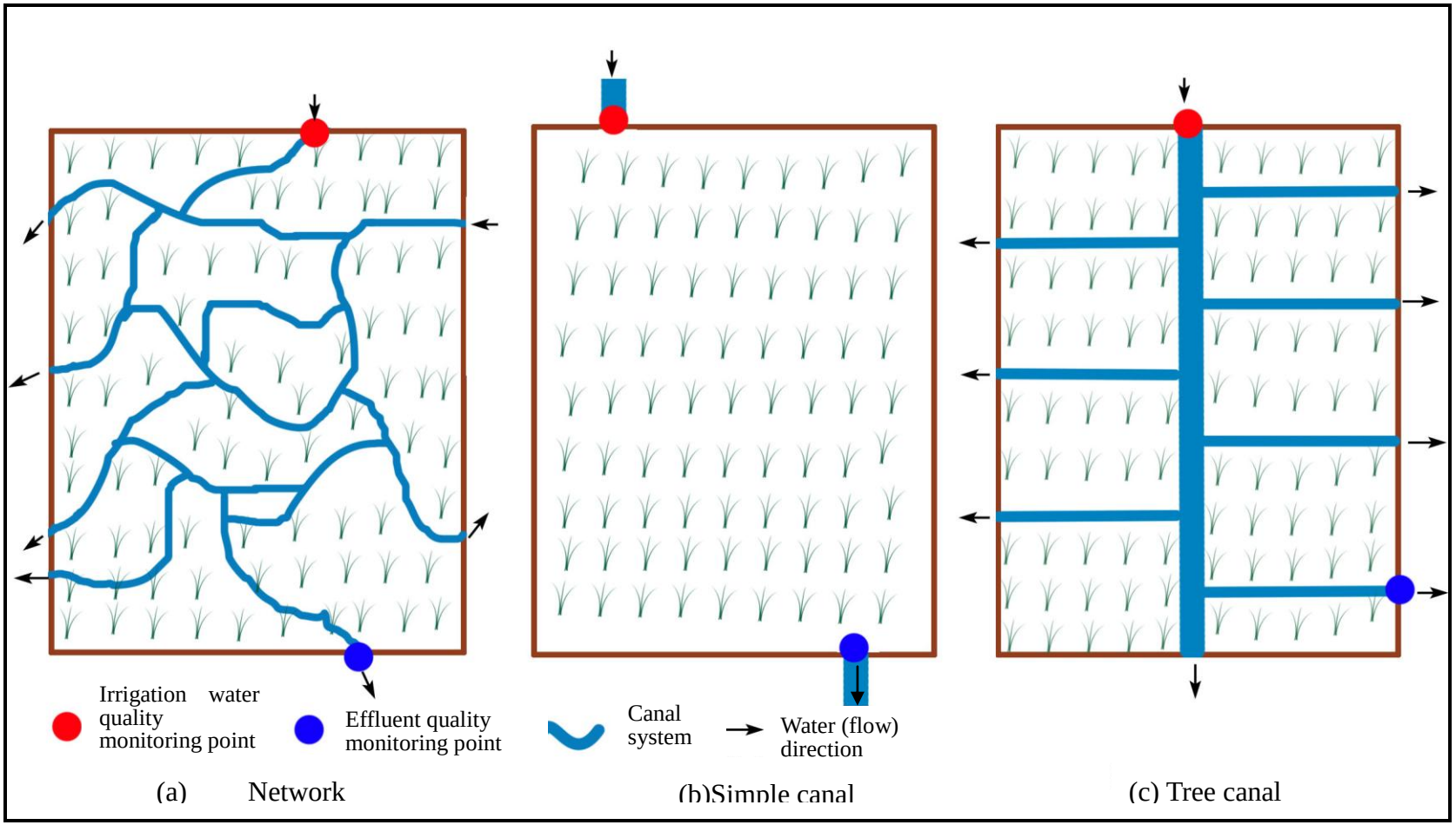


Figure 7-4 Distribution diagram of monitoring points in the typical canal layout

7.2.2 Monitoring frequency

Sampling frequency should be subject to the watering period of local major irrigated crops, generally at least once every irrigation period. Sampling frequency at each stage of growth and development phase for rice and maize, the major food crops in Guangdong province shall be as follows:

1. Single cropping rice: take samples in the soaking, tillering, jointing and grain filling stage, particularly the tillering and jointing stage;
2. Double cropping rice: take samples in middle May, late June, early August and late September;
3. Maize: take samples in the earlier sowing stage, seedling stage, jointing stage, induction period and grain filling stage, particularly the jointing and booting stage.
4. 3-5 samples should be taken every time for water quality monitoring.

7.2.3 Impact of irrigation and drainage mode on monitoring plan

Most of farmlands in Jiangmen City are provided with pumping station for drainage or water diversion irrigation. The period of irrigation by electric pumping is consistent with that of crop irrigation, while the period of drainage by pumping is irregular, for instance, the pumping station may continue working even in case of rainstorms. In Huizhou City, free drainage and irrigation is adopted for irrigation water. There may be no water draining when taking monitoring samples, especially at the water outlet.

In such case, it is necessary to take into account such factors and take samples according to the weather condition, and meanwhile, after confirming the monitoring project area, it is required to strengthen communication with owners in the monitoring period to ensure the successful sampling.

Form 7-4 Environmental monitoring plan for the operation life cycle of environmentally friendly farming

Monitoring item	Distribution of monitoring points (QTY)	Monitoring parameters	Monitoring frequency	Unit price (yuan /period)	Annual cost (yuan /year)	Total cost (yuan)	Enforcement body	Responsible Organization	Supervisory organization	Executive standard and code
Irrigation water quality	The head of canal, pump station and water gate in the project area, 1 point for each project area	Water temperature, pH, BOD5, CODcr, total suspended solids, total salt, chloride, sulfide, total mercury, cadmium, total arsenic, chromium, lead, fecal coliform bacteria number, number of Ascaris suum eggs	1. Vegetables and fruit trees: sampling once in the irrigation period; 2. Single cropping rice: sampling once in the tillering and jointing stage; 3. Double cropping rice: sampling once in middle May, late June, early August and late September 4. Rice: sampling once in jointing or booting stage.	5650	5650	28250	Entrusted qualified institute	Owner	Environment protection agency of city and county level	Farmland irrigation water quality (GB5084-2005) Procedural Regulations Regarding the Environment Quality Monitoring of Water for Agricultural Use (NY/T396-2000)
Farmland drainage quality	Surface drainage outlet, irrigation backwater, self-draining and electric draining outlet in the project area, 1 point for each project area			5650	5650	28250				
Total						8.475 millino yuan				

Note: The unit price refers to the monitoring cost of one monitoring point in one period for the monitoring item. Annual costs= Unit price×Monitoring frequency; Total costs= Annual costs×Construction period (5 years); Total= Number of monitoring items×Total costs of each monitoring item

7.3 Monitoring plan for the operation life cycle of livestock and poultry waste management project

No specific environmental monitoring plan has been formulated and the environmental monitoring plan described below is mainly for the operation life cycle of livestock and poultry waste management project since no environmental sensitive areas, such as the drinking water conservation district, scenic spot, natural protection zone, urban and town residential zone, are located nearby the selected project site, and the focus of livestock and poultry waste management project is concentrated on the starting crude pretreatment system, anaerobic digestion system, raw material pretreatment facility and the biogas and biogas manure utilization facility, which is characterized by weak construction strength and short construction time, in such case, as long as the environmental management plan for the operation life cycle of livestock and poultry waste management project is strictly implemented, the filling of construction site inspection list and form is well completed prior to construction by the engineering construction supervisor and project management unit as well as administrative competent departments at different levels responsible for EP exercise supervision and control over the construction process, there will be little environmental impact during the construction period.

7.3.1 Distribution of monitoring points

Water consumption may be monitored by the flowmeter. For the air monitoring, one monitoring point at the upwind and downwind of farm is selected in accordance with the Integrated Emission Standard of Air Pollutants (GB 16297－1996). As to the air monitoring for boiler, the monitoring point should be confirmed in accordance with Measurement Method of Smoke and Dust Emission from Boilers (GB5468-91) and Determination of Particulates and Sampling Methods of Gaseous Pollutants Emitted from Exhaust Gas of Stationary Source (GB/T16157-1996): vertical pipe sections are

preferred for selection of sampling positions. The bends of flue ducts and those parts with sharp variation of cross sections shall be avoided. Sampling positions shall be located no less than 6 times the diameters downstream of the bends, valves and reducers and no less than 3 times the diameters upstream of the said parts. As the gaseous pollutant is generally uniformly mixed in the sampling sections, it is recommended to select the point next to the center of flue as the sampling point.

For the water quality and solid waste monitoring, the distribution of water quality and solid waste monitoring points under each mode will vary due to the variance in technical process and pollution discharge method of three breeding modes:

- Environmentally friendly energy mode: under the mode, as the standard discharge is required, the quality of effluent from the final end outlet after post-treatment is necessary to meet the requirement specified in Discharge Standard of Pollutants for Livestock and Poultry Breeding (DB44/613-2009), one monitoring point should be selected at the location, and in practice, it is generally located at the outlet of the last stabilization pond, while if there are multiple stabilization ponds for discharging, monitoring points should be selected at all outlets. To achieve better reflection of the pollution reduction of aerobic system and stabilization pond, one monitoring point is also selected at the outlet of anaerobic reactor.
- Ecological energy mode: livestock and poultry waste water will, after anaerobic digestion, discharge to farmland, fish pond or aquatic plant pond instead of directly to the environment. Under the mode, the composted pig manure and biogas residue is effectively recycled in the farmland. In accordance with the hygienic requirement specified in the Technical Requirement for Non-Hazardous Treatment of Animal Manure (NY/T1168-2006), samples should be taken from the biogas slurry storage pool and the compost fermentation area.
- "High-bed fermentation" mode: No rinsing is required in the breeding process; after regular heap turning of excrement and urine and bedding, the organic fertilizer will be produced without any efflux of waste water. The bedding for organic fertilizer should meet the hygienic requirement specified in the Technical

Requirement for Non-Hazardous Treatment of Animal Manure (NY/T1168-2006), and samples should be taken from the compost fermentation area.

7.3.2 Monitoring frequency

According to the requirement specified in the Technical Specification for Operation Maintenance and Safety of Biogas Plant in Scale Livestock and Poultry Farms (NY/T 1221-2006), once monitoring of pH (pH test strip) and discharge capacity (sewage flowmeter or measuring pool) a month, once air monitoring a year as well as once a quarter monitoring of other indexes such as CODCr, BOD5, total phosphorus, ammonia nitrogen, total suspended solids, Ascaris eggs and fecal coliform is required, while due to its extensive reach and the limited project fund, water quality and organic fertilizer monitoring frequency is adjusted as twice a year, supervised by the administrative competent departments responsible for EP above the county level.

The environmental monitoring plan for the operation life cycle under each breeding mode are as shown in Form 7-5 to 7-7, with corresponding monitoring point location diagram shown in Figure 7-5 to 7-7, and the numbers labeled in the figure are corresponding to the sequence number of monitoring item. The air monitoring refers in particular to the monitoring of pollutants from boiler. Air monitoring will be performed on site; and for the water quality monitoring, 3-5 samples will be taken every time; stratified samples will be taken from the upper, middle and lower layer for the composting and the further detection will be made when an average sample made with a mix of them weighing about 500g is completed.

Form 7-5 Monitoring plan for the operation life cycle of environmentally friendly energy breeding mode

No.	Monitoring item	Distribution of monitoring points (QTY)	Monitoring parameters	Monitoring frequency	Unit price (yuan /period)	Annual cost (yuan /year)	Total cost (yuan)	Enforcement body	Responsible Organization	Supervisory organization	Executive standard and code
1	Air	①Take one sample point at the downwind and upwind of farms as per the standard ②Take one sample point at the boiler chimney pipeline	①Odor concentration, ammonia and hydrogen sulfide ②Smoke, SO2 and NOx	Once a year	2000	2000	10000	Qualified institute	Owner	Environment protection agency of city and county level	①The secondary standard specified in the Discharge Standard of Pollutants for Livestock and Poultry Breeding (DB44/613-2009), Integrated Emission Standard of Air Pollutants (GB 16297－1996) ②Emission Standard for Air Pollutants from Boilers (GB13271-2001), Measurement Method of Smoke and Dust Emission from Boilers (GB5468-91) and Determination of Particulates and Sampling Methods of Gaseous Pollutants Emitted from Exhaust Gas of Stationary Source (GB/T16157-1996),

2	Water quality	Take one sample point at the outlet of anaerobic reactor and that at the final end	pH, fecal coliform, CODCr, BOD5, total phosphorus, ammonia nitrogen, total suspended solids	Twice a year	1800	3600	18000				Discharge Standard of Pollutants for Livestock and Poultry Breeding (DB44/613-2009) and Technical Specifications Requirements for Monitoring of Surface Water and Waste Water (HJ/T91-2002).
3	Solid waste	Take one sample point at the compost fermentation area	Ascaris suum eggs, fecal coliforms, flies	Twice a year	1000	2000	10000				Technical Requirement for Non-Hazardous Treatment of Animal Manure (NY/T1168-2006)
Total sum of 100 farms (yuan)							3.80 million				

Note: The unit price refers to the monitoring cost of one farm in one period for the monitoring item. Annual costs= Unit price×Monitoring frequency; Total costs= Annual costs×Construction period (5 years); Total= Number of farms of the mode×Total costs of each monitoring item

Form 7-6 Monitoring plan for the operation life cycle of ecological energy breeding mode

No.	Monitoring item	Distribution of monitoring points (QTY)	Monitoring parameters	Monitoring frequency	Unit price (yuan /period)	Annual cost (yuan /year)	Total cost (yuan)	Enforcement body	Responsible Organization	Supervisory organization	Executive standard and code
1	Air	① Take one sample point at the downwind and upwind of farms as per the standard ② Take one sample point at the boiler chimney pipeline	① Odor concentration, ammonia and nitrogen sulfide ② Smoke, SO2 and NOx	Once a year	2000	2000	10000	Qualified institution	Owner	Environment protection agency of city and county level	①The secondary standard specified in the Discharge Standard of Pollutants for Livestock and Poultry Breeding (DB44/613-2009), Emission standard for odor pollutants (GB14554－93) and the Integrated Emission Standard of Air Pollutants (GB 16297－1996) ②Emission Standard for Air Pollutants from Boilers (GB13271-2001), Measurement Method of Smoke and Dust Emission from Boilers, (GB5468-91)Determination of Particulates and Sampling Methods of Gaseous Pollutants Emitted from Exhaust Gas of

											Stationary Source (GB/T16157-1996)
2	Liquid organic fertilizer	Take one sample point at the outlet of biogas slurry storage tank	Parasitic ovum, schistosoma egg, fecal coliform and mosquitoes and flies	Twice a year	1500	3000	15000				Technical Requirement for Non-Hazardous Treatment of Animal Manure (NY/T1168-2006)
3	Solid organic fertilizer	Take one sample point at the compost fermentation area	Ascaris suum eggs, fecal coliforms, flies	Twice a year	1000	2000	10000				Technical Requirement for Non-Hazardous Treatment of Animal Manure (NY/T1168-2006)
Total sum of 200 farms (yuan)							7.00 million				

Note: The unit price refers to the monitoring cost of one farm in one period for the monitoring item. Annual costs= Unit price×Monitoring frequency; Total costs= Annual costs×Construction period (5 years); Total= Number of farms of the mode×Total costs of each monitoring item

Form 7-7 Monitoring plan for the operation life cycle of new "high-bed fermentation" breeding mode

No.	Monitoring item	Distribution of monitoring points (QTY)	Monitoring parameters	Monitoring frequency	Unit price (yuan /period)	Annual cost (yuan /year)	Total cost (yuan)	Enforcement body	Responsible Organization	Supervisory organization	Executive standard and code
1	Air	Take one monitoring point at the upwind and downwind of farm	concentration, ammonia and nitrogen sulfide	Once a year	980	980	4900	Qualified institution	Owner	Environment protection agency of city and county level	The secondary standard specified in the Discharge Standard of Pollutants for Livestock and Poultry Breeding (DB44/613-2009), Emission standard for odor pollutants (GB14554－93) and Integrated Emission Standard of Air Pollutants (GB 16297－1996)》（GB16297-1996）
2	Solid waste	Take one sample point at the composting bedding after non-hazardous treatment	Ascaris suum eggs, fecal coliforms, flies	Once a quarter	1000	4000	20000				Technical Requirement for Non-Hazardous Treatment of Animal Manure (NY/T1168-2006)
	Total sum of 2 farms (yuan)						49,800 yuan				

Note: The unit price refers to the monitoring cost of one farm in one period for the monitoring item. Annual costs= Unit price×Monitoring frequency; Total costs= Annual costs×Construction period (5 years); Total= Number of farms of the mode×Total costs of each monitoring item.

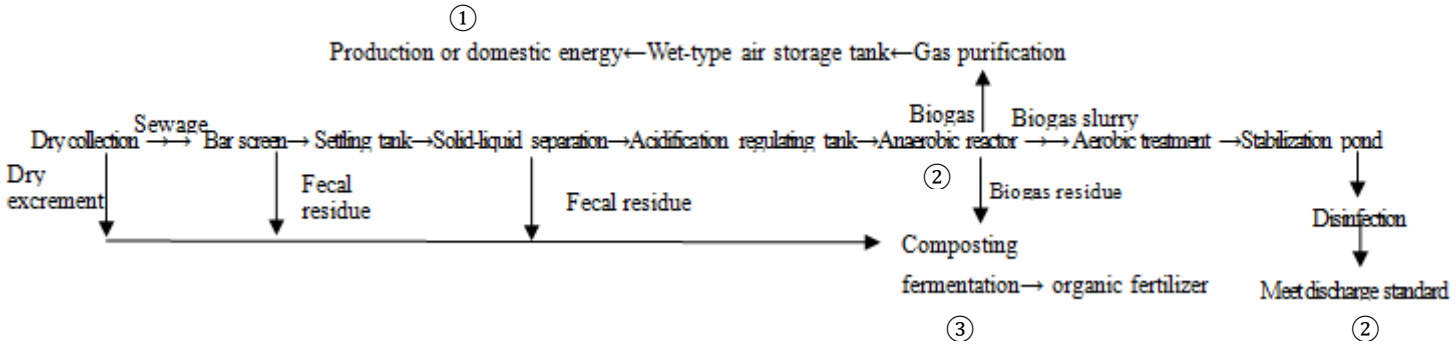


Figure 7-5 Monitoring point distribution diagram for environmentally friendly energy farms in the operation life cycle

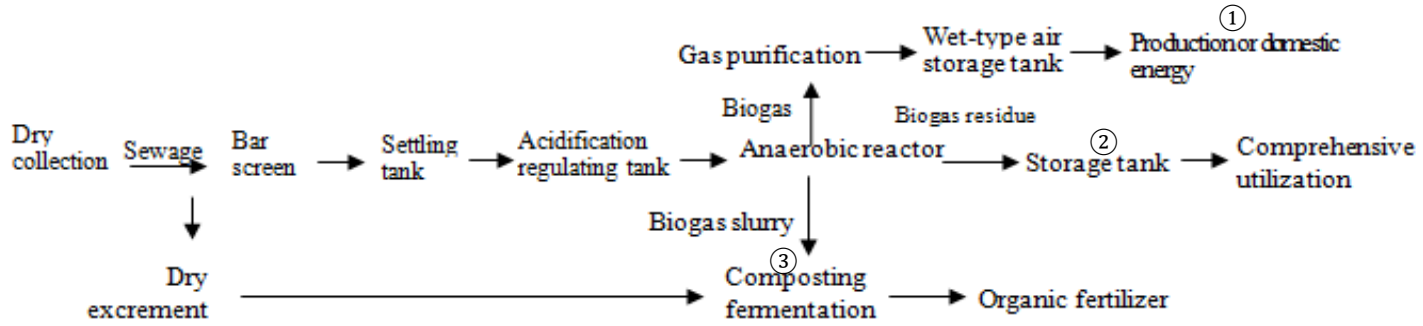


Figure 7-6 Monitoring point distribution diagram for ecological energy farms in operation life cycle

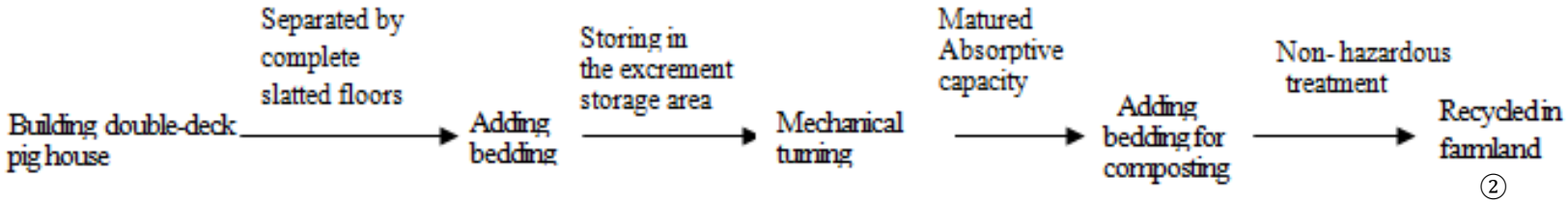


Figure 7-7 Monitoring point distribution diagram for new "high-bed fermentation" farms in operation life cycle

7.4 Monitoring plan for environmental benefit from project implementation

7.4.1 Forecast for emission reductions by livestock waste management

In order to forecast environment benefit obtained by this project and put forward stage plan for this project, we predict yearly pollution reduction by livestock waste management within 5-year construction. Take the 18 livestock farms included into this project for example, its calculation is as follows:

7.4.1.1 Breeding number

Table 7-8 Breeding quantity computation

	Environmental friendly type			Ecological type		
Breeding scale	Breeding stock	Breeding farm quantity	Subtotal	Breeding stock	Breeding farm quantity	Subtotal
	3000-5000	2	8000	3000-5000	6	24000
	5000-10000	2	15000	5000-10000	4	30000
	10000-15000	2	25000	10000-15000	2	25000
Total			48000			79000
Number of breeding farms included into the project	18					

Breeding quantity of different levels listed in the table takes the average value, while number of breeding farms at different levels is distributed by proportion designed by this project (Table 3.3).

7.4.1.2 Reduction effect

Table 7-9 Change of concentration of each monitoring index before and after project implementation

Monitoring index	Before project implementation		After project implementation	
	Environmental friendly type	Ecological type	Environmental friendly type	Ecological type
COD	6800	6800	279.94	1036.8
NH3-N	1275	1275	67.33	897.75
BOD	2380	2380	140	610
TP	85	85	7	80

Reduction effect data of each index under different breeding mode is from previous GEF project monitoring result. Remission concentration of COD and NH3-N is 8000mg/L and 1500mg/L respectively. According to baseline survey, most livestock farms have consumption spaces such as pool, therefore, remission concentration of two indexes is 85% before project implementation, that is, remission concentration of COD and NH3-N before project implementation is 6800mg/L and 1275mg/L respectively.

7.4.1.3 Water consumption

Table 7-10 Water consumption changes of 18 livestock farms in the first year before and after project implementation

Water consumption	Before project implementation		After project implementation	
	Environmental friendly type	Ecological type	Environmental friendly type	Ecological type
Water consumption per day (Ton)	480	790	460.8	758.4
Water consumption per year (Ton)	175200	288350	168192	276816
Remarks	Water consumption by water rinsing is 100 ton per day per 10,000 pigs. Water consumption by dry collection is 80 ton per day per			

	10,000 pigs. Before project implementation, it is 100% water rinsing. After project implementation, it is 80% water rinsing and 20% dry collection.

Take environmental friendly type for example, breeding quantity is 48000, before project implementation, it is 100% water rinsing technology. If 100 ton per day per 10,000pigs, Water consumption per day =breeding quantity 48000/10000*100(ton/ten thousand) =480ton.

7.4.1.4 Reduction statistics in the first year

Table 7-11 Water consumption changes of 18 livestock farms in the first year before and after project implementation

	Before project implementation		After project implementation	
	Environmental friendly type	Ecological type	Environmental friendly type	Ecological type
COD emission concentration (mg/L)	6800	6800	279.94	1036.8
COD discharge amount （mg）	1.19136E+12	1.96078E+12	47083668480	2.87003E+11
COD reduction amount (ten thousand amount)	0.28180535			
NH3-N emission concentration (mg/L)	1275	1275	67.33	897.75
NH3-N discharge amount （mg）	2.2338E+11	3.67646E+11	11324367360	2.48512E+11
NH3-N reduction amount (ten thousand amount)	0.033119032			
BOD emission	2380	2380	140	610

concentration(mg/L)				
BOD discharge amount（mg）	4.16976E+11	6.86273E+11	23546880000	1.68858E+11
BOD reduction amount (ten thousand amount)	0.091084436			
TP emission concentration (mg/L)	85	85	7	80
TP discharge amount（mg）	14892000000	24509750000	1177344000	22145280000
TP reduction amount (ten thousand amount)	0.001607913			

Calculation principle listed in the above table is as below: total reduction amount =discharge amount before project implementation -discharge amount after project implementation

Discharge amount=water consumption*remission concentration

7.4.1.5 Reduction statistics year by year

Other index reduction in the rest project implementation year can be determined by the first year reduction amount, statistics results are shown in Table 7-12.

Table 7-12 Reduction statistics in five-year construction period

Year	Quantity of livestock farm	Reduction amount (ten thousand amount)			
		COD	NH3-N	BOD	TP
Year 1	18	0.28	0.03	0.09	0.002
Year 2	68	1.02	0.11	0.33	0.005
Year 3	148	2.25	0.26	0.73	0.012
Year 4	248	3.46	0.37	1.11	0.016
Year 5	300	4.55	0.52	1.47	0.024

7.4.2 Emission reduction of environmental-friendly planting

For environmental friendly planting, due to lack of monitoring data and recognized

calculation method at present, reduction calculation can only be taken from the perspective of planned reduction, therefore, the selected 6 towns for first implementation has the following year by year reduction target:

Table 7-13 Schedule for environmental friendly planting reduction (6 towns for the first batch)

Index			Cumulative target value				
	Measurement unit	Baseline	Year 1 —3.0%	Year 2 —2.5%	Year 3 —2.0%	Year 4 —1.5%	Final target —1.0%
Total Nitrogen （TN）	Kg	70600	68482	66717	65305	64246	63540
Total phosphorus （TP）	Kg	41323	40083	39050	38224	37604	37191
Nitrate Nitrogen （NO3--N）	Kg	50850	49324	48053	47036	46273	45765
Ammonium nitrogen （NH4+-N）	Kg	18692	18131	17664	17290	17010	16823
Total dissolved phosphate （DTP）	Kg	13679	13269	12927	12653	12448	12311

7.4.3 Monitoring plan for environmental benefit from project implementation

To evaluate the environmental benefit from project implementation, monitoring points, 3-5 sampling points every time, are selected at the control section of lower reach within the sphere of project influence for monitoring indexes such as CODcr, BOD, total phosphorus, ammonia nitrogen and total suspended solids in the rich, average and dry period every year. The monitoring plan for environmental benefit from project implementation, as shown in Figure 7-8, is formulated on the basis of index data change before and after project implementation and the monitoring measurement of section of

water system, river, lake and reservoir so as to evaluate the environmental benefit from the project implementation.

When the farms are positioned, it may cause great non-point source pollution, therefore, it is necessary to have the farm connected to the urban drainage map. Allowing for the scale and degree of centralization of farms in the small watershed as well as the location of environmentally friendly farming subproject, 5 sections are selected from 3 project demonstration cities as the monitoring points for environmental benefit, as shown in Figure 7-8 to 7-10. Since the current farm is only planned to be included in the project, its location confirmation may have possible error, the selected section in the figure is for reference only. Before starting practical monitoring, it is required to select monitoring point according to actual condition, confirm the rationality of section on the basis of water system and the source of pollution in the river basin, and another site should be selected after field survey if it fails to meet the requirement for the section for environmental benefit.

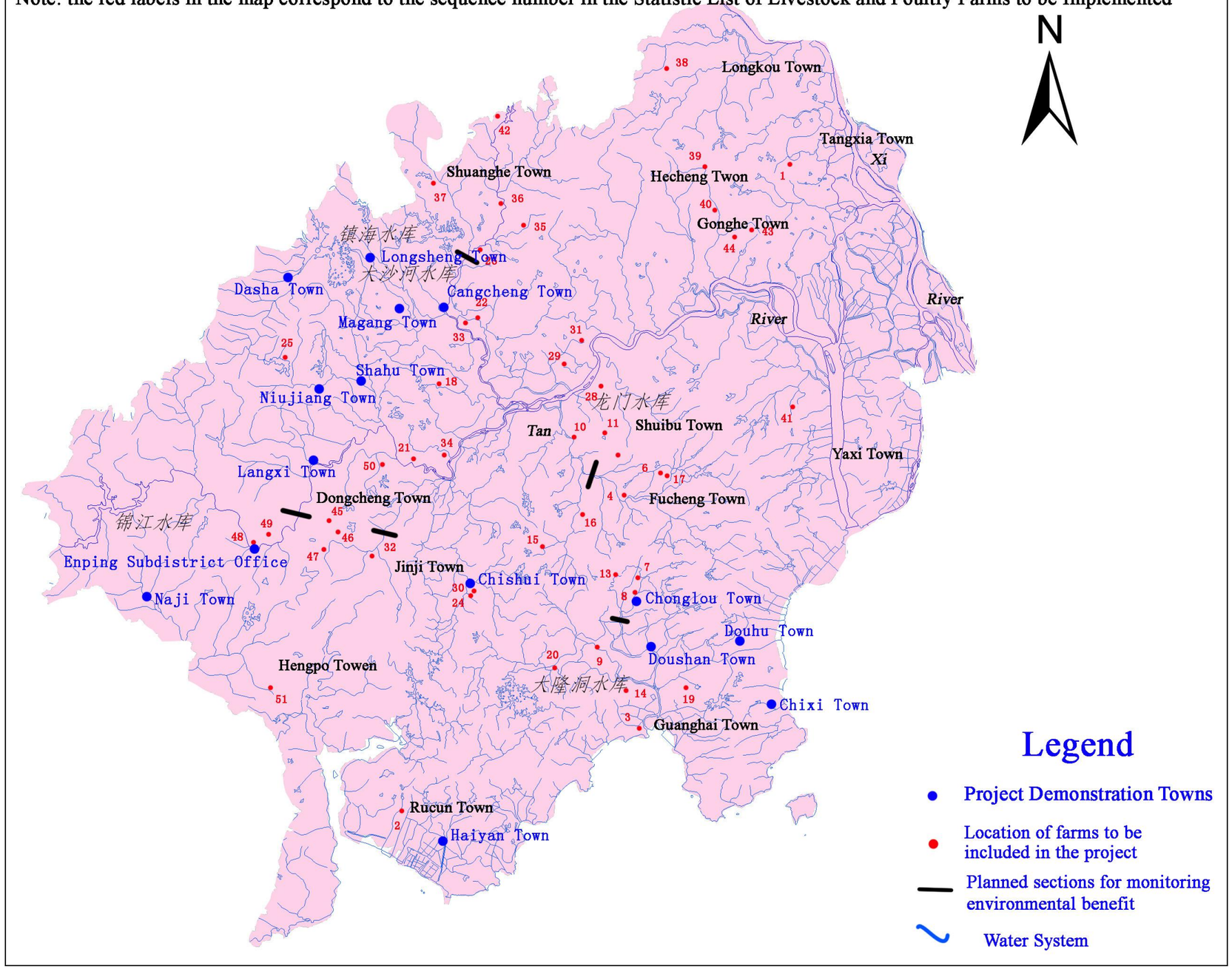
By comparing the monitoring performed on the control section of downstream of small watershed with the monitoring results of section on the state-controlled water system, river, lake and reservoir, it is able to confirm the degree of contribution of agricultural non-point source pollution to the total pollution in the river basin, providing decision basis for source control and scientific pollution control.

Form 7-8 Monitoring plan for environmental benefit from project implementation

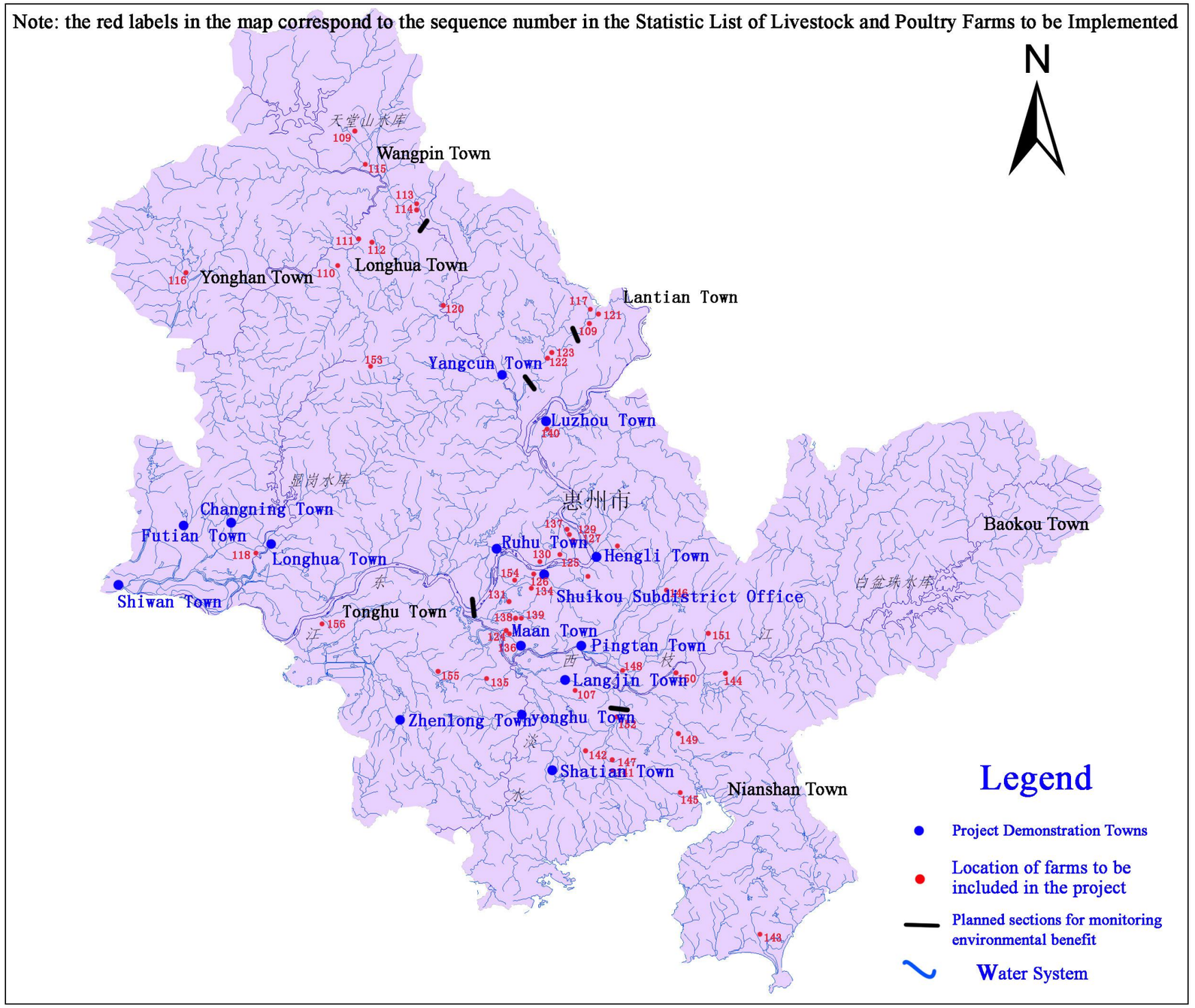
Monitoring item	Distribution of monitoring points (QTY)	Monitoring parameters	Monitoring frequency	Unit price (yuan /period)	Annual cost (yuan /year)	Total cost (yuan)	Enforcement body	Responsible Organization	Supervisory organization	Executive standard and code
Water quality	5 control sections in each project demonstration city, totaling 15 monitoring points, should be selected at the downstream of small watershed	pH, fecal coliform, CODCr, BOD5, total phosphorus, ammonia nitrogen, total suspended solids	Complete once monitoring in in the rich, average and dry period every year	1800	5400	27000	Qualified institution	Owner	Environment protection agency of city and county level	Environmental quality standards for surface water (GB3838-2002), Technical Specifications Requirements for Monitoring of Surface Water and Waste Water (HJ/T91-2002)
Total (yuan)						405,000 yuan				

Note: The unit price refers to the monitoring cost of one monitoring section in one period for the monitoring item. Annual costs= Unit price× Monitoring frequency; Total costs= Annual costs× Construction period (5 years); Total= Number of monitoring sections× Total costs of each monitoring item.

Note: the red labels in the map correspond to the sequence number in the Statistic List of Livestock and Poultry Farms to be Implemented

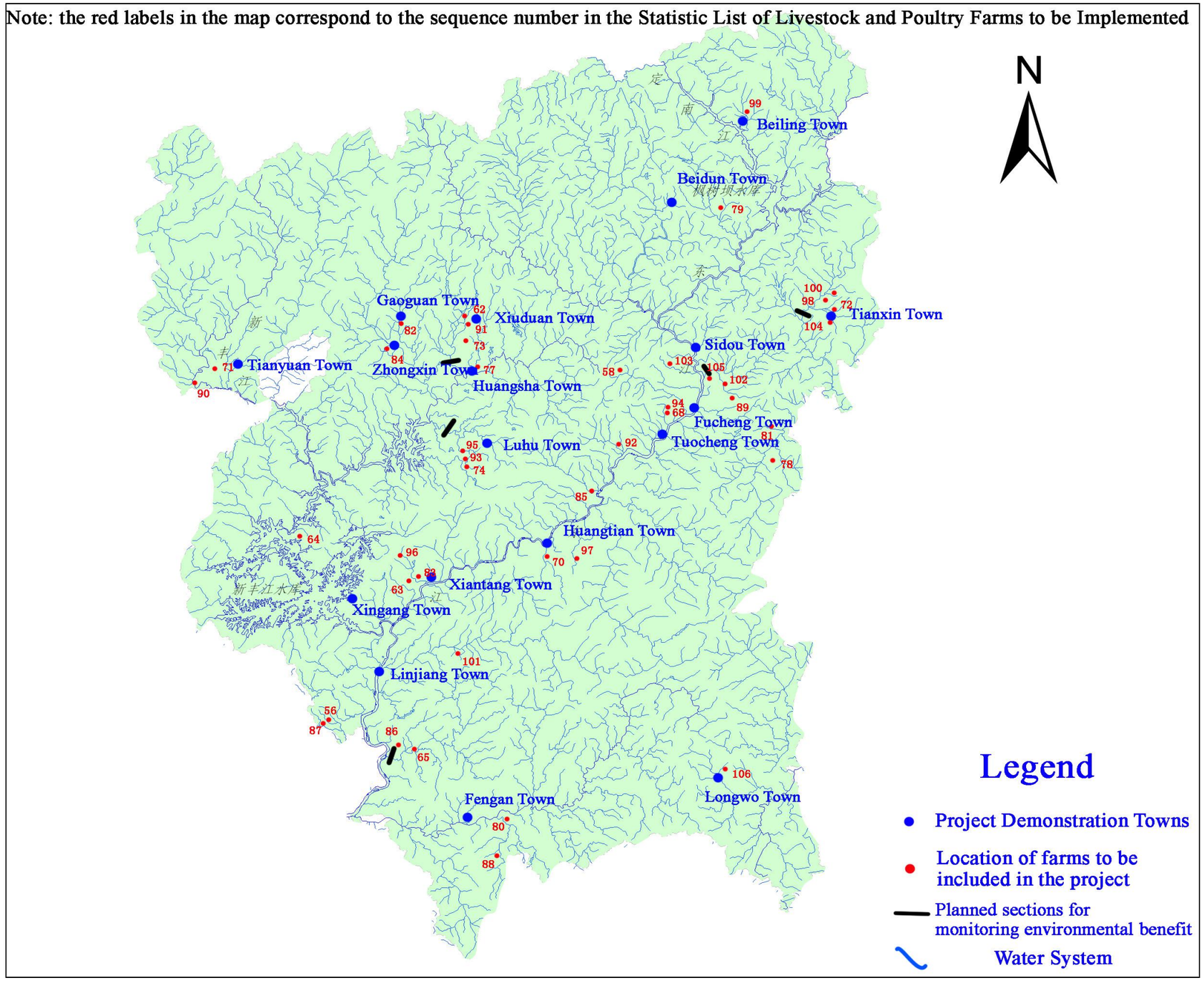


Form 7-8 Section layout diagram for monitoring environmental benefit in Jiangmen City



Form 7-9 Section layout diagram for monitoring environmental benefit in Huizhou City

Note: the red labels in the map correspond to the sequence number in the Statistic List of Livestock and Poultry Farms to be Implemented



Form 7-10 Section layout diagram for monitoring environmental benefit in Heyuan City

Chapter 8 Information management for environmental management plan

8.1 Exchange of information

Environmental management requires necessary exchange of information among different departments and posts in the project department, the owners, contractors and operators, and also the report relevant information to the outsider (relevant party and social public). Internal exchange of information may be achieved in many ways like the meeting and internal brief report, while once formal meeting a month is necessary to keep all exchanged information in record and archives. External exchange of information should be conducted once every six months or a year, the exchange of information with cooperative units should be kept in records.

8.2 Recording mechanism

To ensure the effective operation of environmental management system, it is required to establish a complete recording system and maintain records in following aspects:

(1) Law and regulation requirements;

(2) Permit;

(3) Environmental factor and related environmental impact;

(4) Training;

(5) Check, verification and maintenance activity;

(6) Monitoring data;

(7) Effectiveness of orrective and preventive measures;

(8) Information of interested party;

(9) Examination and verification;

(10) Review.

In addition, it is required to conduct necessary control for above records, including the identification, collection, catalog, archiving, save, management, maintenance, inquiry,

storage period and disposal of records.

8.3 Reporting mechanism

During construction, the contractor, operator, monitoring unit, environmental supervising engineer and project department should keep record of the project progress, EMP implementation and environmental monitoring result and timely report to the related department. It mainly consists of following six parts:

(1) Environmental supervising engineer will keep detailed monthly record of the implementation of EMP and timely submit the weekly and monthly report to the PO and the project department of each city; the weekly and monthly report should cover the implementation of EP measures, the progress of environmental monitoring and monitoring data.

(2) The contractor and operator will keep detailed quarterly record of the implementation of EMP and timely submit the quarterly report to each project department as well as report to the municipal environment protection agency.

(3) The monitoring unit will, after completion of the entrusted monitoring task, timely submit monitoring report to the contractor (operator) and environmental supervising engineer.

(4) The project department of each city level will timely submit the project progress report to the project department of provincial level and to the EP agency as well. The project progress report (suchas monthly, quarterly and annual report) should be cover the progress of EMP, like the implementation effectiveness and working progress of EMP, particularly the environmental monitoring result.

(5) In case of any severe violation in the aspect of EP, the environmental supervising engineer and project department should report the local administrative department in charge of EP, and if necessary, report the case level by level.

(6) The annual EMP implementation report of project shall be completed and submitted to the WB prior to March 31 of the coming year. EMP implementation report should cover following contents:

a. Implementation of training plan;

b. Project progress;

c. The implementation of EP measures, environmental monitoring and major monitoring results;

d. If there is any public complaint, if any, record its details, solution and public satisfaction;

e. EMP implementation plan of the next year.

8.4 Document management

During the implementation of Environmental Management Plan, the corresponding documents shall be subject to the management by the WB, Project Leader Group and the PMO at provincial and town level as well as EIA unit, engineering PS and the unit in charge of construction.

Form 8-1 Document management requirement for organizations

Name of organization	Document management
① The unit in charge of construction.	1. Keep weekly record of project implementation and keep them on file, report to the engineering PS; 2. Together with the engineering PS, complete the construction site inspection form prior to construction, keep them on file and report the project office at county (district) level; 3. In case of emergency and accident, record the detailed implementation of works, keep them on file and report to the engineering PS; 4. Complete rectification within 3 working days upon receipt of rectification notice (10 working days when the coordination from management organization is necessary), and keep them on file.
② Engineering PS	1. Keep weekly record of the reports from construction unit, keep them on file and report to the project office at county (district) level; 2. Together with the construction unit, complete the construction site inspection form prior to construction, keep them on file and report to the project office at county (district) level; 3. In case of emergency and accident, record the detailed implementation measures taken by the construction unit, keep them on file and report to the project office at county (district) level;; 4. Put forward rectification program and

Name of organization	Document management
	solution in response to the environmental problems construction unit face in the construction, and follow up the implementation, including the issuance of the rectification notice and rectification check sheet and archiving of examination documents.
③ The unit with Class A Qualification Certificate and qualified to assess environmental impact of construction project and	1. Compile the Environmental Management Plan, keep the first draft, the draft for review and the approved version on file.
④ Project offices at country (district) level	1. Organize study or relevant research, manage and keep on file the working documents regarding the seminar and research; 2. Complete the recording, management and archiving of complaints in the engineering construction and operation; 3. Keep quarterly record of the reports from engineering PS, keep them on file and report to the project office at provincial level; 4. Sign for the construction site inspection form submitted by the construction unit and engineering PS, confirm the environmental sensitive issues and keep them on file; 5. Keep record of the rectification notices and keep them on file.
⑤ Project Leader Group and PMO at	1. Compile and supervise the implementation of Environmental Management Plan, keep

Name of organization	Document management
provincial level	them on file; 2. Keep record of reports from project leader group and PMOs at town level once half a year, report to the WB and keep them on file; 3. Along with other related departments, provide solutions to the major environmental problems, keep record of the detailed measures and keep them on file;
⑥ WB	1. Keep record of reports from project leader group and PMOs at provincial level once half a year, and keep them on file;

Chapter 9 Public Participation

9.1 Purpose of public participation

Public participation and information disclosure represents the two-way communication between the project proponent and the public by EA, also plays an important role in the EIA for construction project, significantly crucial for making decision for improvement. It aims to make project-related information public to the project area and the public concerning the engineering construction, allow them aware of major engineering-related information, construction and operation feature and the engineering-related environmental problems of great significance; help assessment professional find problems, confirm that the environmental problems of great significance arising from the engineering have been analyzed and assessed through the environmental management plan; and confirm the feasibility of EP measures and the implementation and enforcement of optimization measures. Public consultation lays stress on the contact and communication between project parties and the public, since it can directly reflect the public opinion, help decision making department with timely discovery of potential problems, timely revision and improvement of design plan so as to provide practical solution to the problems of public concern, achieve more perfect and rational project planning, design and environmental monitoring and management, as well as realize the optimal environmental, social and economic benefit.

9.2 Consultation method and content

In accordance with the PRC Environmental Impact Assessment Law, and the Temporary Methods of Public Consultation for EIA issued by the Ministry of Environmental Protection as well as the Operational Policy (OP4.01) of the WB, we have completed two rounds of public consultation and information disclosure during assessment. The first was carried out after the screening of environmental problems, prior to the final confirmation of working outline for EA, and the second was carried

out in the completion stage of initial drafting of environmental assessment report.

9.2.1 Consultation methods

The major ways of public participation in consultation include:

(1) Convene forums in the project areas;

(2) Pay a visit to the public in the project areas;

(3) General survey of public opinion is made by questionnaires.

(4) Non-government organization: forums or telephone interviews.

9.2.2 Consultation contents

(1) Forum and visit

By convening forums, we aim to brief participants on the project construction and detailed information regarding EP, listen to their thoughts and suggestions on the project and EP.

(2) Major contents of questionnaire survey (See Appendix 9 and 10)

9.3 Public opinion and suggestion

9.3.1 Summary of public inquiry

Form 9-1 Summary of public inquiry in Huizhou

Time	Form	Place	Object and number	Contents
Sept. 20, 2012	Forum	Municipal Agriculture Bureau	10 from municipal competent departments in charge of agriculture	Know existing non-point source pollution of local agriculture, consult local project progress and listen to the suggestions of competent departments in charge of agriculture on the project.
Sept. 20, 2012	Post announcements	Boluo County Government	/	Post the project announcements on the bulletin board
Sept. 20, 2012	On-site visit	Rice field, Changning Town, Boluo	About 10 local residents	By investigating local rice cultivation, local residents welcome the beneficial project and expect it to proceed shortly.
Sept. 20, 2012	On-site visit	Yifeng Farm, Longhua Town, Boluo	Farm owner and staff, totaling 15	Know the existing farming condition and the EP facility; the farmer is positive toward the project, and the treatment facility in the pig farm has now relatively improved.
Oct. 12,	Forum	Municipal	50 from the municipal	Municipal leaders report the preliminary works of

Time	Form	Place	Object and number	Contents
2012		Agriculture Bureau	project office, agricultural bureau and responsible departments in project areas	agricultural nonpoint source pollution project under WB loan, particularly of the baseline, institutional framework and publicity.
Oct. 12, 2012	On-site visit	High-yield grain production point, Guanghui Village, Pingtan Town, Huiyang District	50 members, including the town-level competent department in charge of agriculture, technicians and growers from the demonstration point.	Know the implementations regarding the soil testing, straw application and real-time monitoring of pests and diseases; the on-site investigation reveals that there are many farmland wastes, and the knapsack sprayer have been still popular among some peasants.
Oct. 12, 2012	On-site visit	Project point in Aiguang Village, Liangjin Town, Huiyang District	50 members, including the member from the town-level competent department in charge of agriculture and the growers from the	Irrigation facility is quite complete; vegetable farms are designed with sprinkling irrigation, and know the information regarding irrigation process and organic compost.

Time	Form	Place	Object and number	Contents
			demonstration point.	
Oct. 13, 2012	Forum	Huiyang Government	35 members, including the leaders of Huiyang District Government in charge of agriculture, the project leader and representatives of planting and breeding households.	Know the project progress in Huiyang District, especially the baseline investigation, and the next focus is to implement the project at the grassroots, even to every household.
Oct. 13, 2012	On-site visit	Zhuangshi Pig Farm, Rengbei Village, Ruhu Town, Huicheng	15 members, including the members from Huicheng District Animal Husbandry Bureau, the farmers and staff	Farms have invested 3 million in the construction of EP facility, complete in the existing facility, while there is still much room for waste water treatment to be improved.
Oct. 14,	On-site visit	Formula fertilizer	30 members, including	Know the actual operation of soil testing, the sales of

Time	Form	Place	Object and number	Contents
2012		distribution sales outlets of Yangcun Town, Boluo County	the sales staff from sales outlets, technicians and local peasants.	fertilizer, pesticides and seeds. It was found that the sales outlets are of great importance to local peasants in the aspect of pesticides and seeds.
Oct. 14, 2012	Forum	Huizhou Guangboda Professional Cultivation Cooperative	20 members, including the director and staff	Know the organization and operation mode of cooperative. It is found that the cooperative uniformly take prevention measures, purchase seeds and sell goods, and lay stress on the technical training for peasants.
Nov. 7, 2012	Forum	Boluo Changning Town Government	7 members, local farming households	Know existing non-point source pollution of local agriculture, consult local project progress and listen to the suggestions of competent departments in charge of agriculture on the project.
Nov. 7, 2012	On-site visit	Tianhe Agricultural Materials Company,	2 members, one responsible person of the corporation and one staff	Know the sales of fertilizer and pesticides as well as the promotion of testing soil for formulated fertilization.

Time	Form	Place	Object and number	Contents
		Changning Town, Boluo County		
Nov. 7, 2012	On-site visit	Fengyuan Cooperative, Changning Town, Boluo County	4 responsible persons of the cooperative	Know local fruit plantation, and it is found that local water pollution is considerably severe.
Nov. 7, 2012	On-site visit	Niannianfeng Farm, Shuikou Sub-district Office, Huicheng District	5 members, including the farmer and its staff	Know the existing condition of farm and the construction of EP, it is found that the farm is quite positive toward the project and the treatment facility in the farm has now been under construction.
Nov. 7, 2012	Forum	Xiayuan Village Committee, Shuikou Sub-district Office, Huicheng District	6 local cultivation households	Know existing non-point source pollution of local agriculture, consult local project progress and listen to the suggestions of competent departments in charge of agriculture on the project.

Time	Form	Place	Object and number	Contents
Nov. 7, 2012	On-site visit	Xingguang Vegetable Company, Shuikou Sub-district Office, Huicheng District	One responsible person of the company and one staff	Know the cultivation and detection of vegetables.
Dec. 10, 2012	Forum	Hengli Town Government, Huizhou City	35 members, including the representatives of the Agricultural Bureau and the Finance Bureau of Huizhou and local peasants.	Discussions were made in the meeting, covering the cultivation mode, subsidy standard, the effectiveness of formulated fertilizer and the equipment storage during project implementation.
Dec. 10, 2012	On-site visit	High-yield grain farmland in Hengxing Village	40 members, including the representatives of the Agricultural Bureau and the Finance Bureau of Huizhou and local	After on-the-scene observation of rice fields, know the operation mode of cooperative, hiring number , and employment cost

Time	Form	Place	Object and number	Contents
			peasants.	
Dec. 11, 2012	Forum	Huiyang Agricultural Technical Service Center	50 members, including the representatives of the Agricultural Bureau and the Finance Bureau of Jiangmen City and local vegetable farmers.	The project leader of Huiyang District reported the project's work plan, and held a meeting covering the equal selection of project participants, company and households, the variance in subsidy standard and the treatment of pesticide and fertilizer package.
Dec. 11, 2012	On-site visit	Zhouji Papaya Cooperative, Pingtan Village, Pingtan Town, Huiyang District	55 members, including the representatives of the Agricultural Bureau and the Finance Bureau of Jiangmen City	Observe the cultivation and growth condition of papaya, know the green and efficient cultivation techniques, like the application effect of the integration of formulated fertilizer and water-fertilizer.

Form 9-2 Summary of public inquiry in Jiangmen City

Time	Form	Place	Object and number	Contents
Sep. 21, 2012	Forum	Municipal Agriculture Bureau	13 from municipal competent departments in charge of agriculture	The competent department described the non-point source pollution in Jiangmen, confirmed the severity of agricultural non-point source pollution and discussed the difficulty and critical factor of project implementation.
Sep. 21, 2012	On-site visit	Rice Demonstration Area, Huangbulang Pumping Station, Chonglou Town, Taishan	20 members, including members from the competent department	It is found by on-the-site investigation that, may farmlands in Jiangmen are equipped with pumping stations for drainage, complete irrigation facility and rice fields suitable for mechanical operation.
Sep. 21, 2012	On-site visit	Qishan Pig Farm, Chonglou Town, Taishan City	8 members, including the farmer and staff	The farm has passed the EA. We have got better understanding of the pollution discharge condition and pollutant treatment process in the farm.

Time	Form	Place	Object and number	Contents
Oct. 15, 2012	Forum	Municipal Agriculture Bureau	45 members from Agricultural Bureau, Environmental Protection Agency of Jiangmen City	Know the preliminary works, particularly the works of baseline, institutional framework and publicity.
Oct. 15, 2012	On-site visit	Farmland, vegetable and rice cooperative, Niujiang Town, Enping City	30 members, including the staff and local peasants.	Crop rotation: rice- rice – potato, know the detailed implementation of unified prevention and governance and the irrigation condition.
Oct. 15, 2012	Forum	Enping Municipal People's Government	20 members, including the project leader of Enping City and representatives of local farmers.	Key focus is laid on the production and tillage method, production and organization mode, sales mode, typical cropping system and the participant of final project.
Oct. 15, 2012	On-site visit	Zhuluo Village, Chonglou Town,	20 local peasant households	Cropping pattern is most the crop rotation, no practical unified prevention and governance. Irrigation facility is quite

Time	Form	Place	Object and number	Contents
		Taishan City		complete.
Oct. 15, 2012	Forum	Taishan Municipal People's Government	25 members, including the members from agricultural competent department in Taishan and representatives of local peasants.	Know the project progress, confirm the baseline investigation of project points, and take more efforts in publicity.
Oct. 16, 2012	On-site visit	Ten Thousand High-yield Grain Demonstration Zone, Cangcheng Town, Kaiping City	30 cultivation households in the demonstration zone and local residents	The area is equipped with favorable agricultural basis for soil testing and fertilizer recommendation, straw mulching. It achieves high efficiency in the unified prevention and governance of pest and disease, applicable for the promotion of mechanical operation.
Oct. 16, 2012	Forum	Kaiping Municipal People's	20 members, including the members from agricultural	Know the existing agricultural non-point source pollution and focal point of project; it is necessary to lay stress on the

Time	Form	Place	Object and number	Contents
		Government	competent department and representatives of local peasants.	baseline investigation, take more efforts in the publicity and communication.
Nov. 8, 2012	Forum	Niujiang Town Government, Enping City	8 members, including the staff of Niujiang Farmland, Vegetable and Rice Cooperative and local peasants	Crop rotation: rice- rice – potato, know the detailed implementation of unified prevention and governance and the irrigation condition.
Nov. 8, 2012	On-site visit	Field of Rice Demonstration Zone, Niujiang Town, Enping City	4 local peasants	The area is equipped with favorable agricultural basis with efficient controlled release fertilizer. Soil testing and fertilizer recommendation has not yet applied in large scale; It achieves high efficiency in both straw mulching and unified prevention and governance of pest and disease, applicable for the promotion of mechanical operation.
Nov. 8,	Forum	Encheng	20 members, including the	Key focus is laid on the production and tillage method,

Time	Form	Place	Object and number	Contents
2012		Agricultural Bureau, Enping City	project leader in Enping City, local cultivation households.	production and organization mode, sales mode, typical cropping system and the participant of final project.
Nov. 8, 2012	On-site visit	Cultivation households around Encheng Sub-district Office	2 local peasants	It was found that land rent here is quite high, the planting and cultivation areas are dispersed.
Nov. 8, 2012	Forum	Douhu Town Government, Taishan City	40 members, including the assessment and investigation team, group leader in Taishan, representatives of Jiangmen Agricultural Bureau and the Bureau of Finance	The project leader in Taishan briefed the initial scheme; the experts from the WB put forward questions and provided suggestions for the improvement of scheme.

Time	Form	Place	Object and number	Contents
Nov. 8, 2012	On-site visit	Demonstration Zone of Unified Prevention and Governance of Crop Diseases and Pest designated by Ministry of Agriculture	50 members, including the assessment and investigation team, group leader in Taishan, representatives of Jiangmen Agricultural Bureau and the Bureau of Finance	Make observation of rice on site, know the change in cost, rice output after the unified prevention and governance as well as the public opinion.
Nov. 9, 2012	On-site visit	Standardization demonstration plot of Enping Shengrentang Yijie Vegetables	30 members, including the representatives of Jiangmen Agricultural Bureau and the Bureau of Finance and local vegetable farmers.	Investigate the degree of vegetable production mechanization; know the change in vegetable output and income after the mechanization.

Time	Form	Place	Object and number	Contents
Nov. 9, 2012	Forum	Niujiang Finance Office, Enping City	45 members, including the group leader in Taishan, representatives of Jiangmen Agricultural Bureau and the Bureau of Finance and representatives of local cultivation and planting hoseholds.	The project leader in Enping City reported the project scheme and experts discussed the key points and difficulties found during the project implementation.

a. Forum held in Huiyang Bureau of agriculture

b. Newly-built biogas tank of Yifeng Farm, Longhua Town, Boluo County

c. The farmer in the project area is filling the public participation investigation form

d. Solid wastes at the high-yield grain demonstration plot of Guanghui Village, Pingtan Town

e. Backpack sprayer at the high-yield grain demonstration plot of Guanghui Village, Pingtan Town

f. Straw burning at the high-yield grain demonstration plot of Guanghui Village, Pingtan Town

g. Organic fertilizer composting area at Aiguang Village, Liangjin Town

h. Sprinkling irrigation at project site in Aiguang Village, Liangjin Town

i. Solid-liquid separator in Zhuangshi Pig Farm, Huicheng District

j. Aerobic treatment pool in Zhuangshi Pig Farm, Huicheng District

k. Sewage discharge permission of Zhuangshi Pig Farm, Huicheng District

l. Forum held in in Zhuangshi Pig Farm, Huicheng District

m. Automatic fertilizer preparation machine in the formulated fertilizer sales outlet, Yangcun Town, Boluo County

n. Guangboda Professional Cultivation Cooperative

o. Forum held in Jiangmen Bureau of Agriculture

p. Rice Demonstration Area, Huangbulang Pumping Station, Chonglou Town, Taishan

q. Feed mixing tank of Qishan Pig Farm, Chonglou Town, Taishan City

r. Biogas digester of Qishan Pig Farm, Chonglou Town, Taishan City

s. Irrigation ditch of Enping Farmland, Vegetable and Rice Cooperative

t. Paddy field of Zhuluo Village, Chonglou Town, Taishan City

u. Boluo Changning Tianhe Agricultural Materials Company

v. Boluo Changning Fengyuan Cooperative

w. Water-fertilizer mixing tank of Niujiang Vegetable and Rice Cooperative

x. Rice Demonstration Plot in Niujiang Town, Enping City

Figure 9-1 Public inquiry scene

9.2.2 Statistics and analysis of public participation and result

Separate questionnaires (See Appendix 9 and 10) were respectively designed in response to the environmentally friendly planting industry and the livestock and poultry waste management for the purpose of listening to the thoughts and suggestions from project-affected masses on the project construction and EP, and then such questionnaires were issued to the related personnel in the project area, including the farmer, planting household, village cadre, peasant and staff.

9.2.2.1 Analysis of questionnaire result concerning the environmentally friendly planting industry

For the environmentally friendly planting industry, 180 questionnaires were issued, 171 recycled, recovery rate was 95%, 160 of which are valid. Basic information of interviewees is listed in Form 9-3, the questionnaire result shown in Form 9-4. The statistical form of basic information of interviewees relating to questionnaire of the environmentally friendly planting industry shows that, 14% interviewees are female, about 74% aged 41 to 60, 73% with senior and junior high school education, which represent for basic features of the group affected by the environmentally friendly planting industry. In addition, the questionnaire forms completed by interviewees virtually reflect their practical situation and thoughts. Statistics and analysis has also been made for the problems reflected in the questionnaire, detailed in Form 9-4.

Form 9-3 Statistical form of basic information of interviewees relating to questionnaire of the environmentally friendly planting industry

	Gender		Age			Degree of education			
	Male	Female	18~40	41~60	60 and above	College degree or above	Senior high school	Junior high school	Primary school
Number	137	23	26	119	15	9	36	82	33
Percentage (%)	86	14	16	74	9	6	23	50	21

Form 9-4 Statistics and analysis of questionnaire result concerning the environmentally friendly planting industry

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
1	Are you familiar with the project?	Familiar	80	50	More efforts should be taken in the publicity since 11% of interviewees have not yet familiar with project.
		Heard about	63	39	
		Unfamiliar	17	11	
2	Where did you get the project information?	Bulletin board	55	34	The publication of project information has shown effect since 34% of interviewees got the project information from bulletin board.
		TV/Newspaper /Network	36	23	
		Local residents	53	33	
		others	16	10	
3	What do think of the project?	Agree	152	95	Most of interviewees agree with the project, and about 95% of them welcome the construction of project.
		Disagree	0	0	
		I don’t know	8	5	
4	What do think of the project site selection?	Rational	133	83	No one considers the project site is irrational, and 83% of interviewees deem it rational.
		Irrational	0	0	
		I don’t know	27	17	

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
5	What impact do you think will the project construction have on the local economic development?	Promote economic development	132	83	No one think the project construction will hinder the development of local economy, and most of interviewees consider it a propellant.
		Hinder economic development	0	0	
		No impact	7	4	
		I don't know	21	13	
6	In which aspect do you think will the project construction have the biggest impact?	Water environment	66	41	Nearly half of interviewees think that the project may have the biggest impact on the water environment.
		Air environment	22	14	
		Ecological environment	61	38	
		others	9	6	
7	What major environmental benefits do you think will the project bring about?	Pollution abatement	115	72	72% of interviewees think the major environmental benefit from the project is the pollution abatement.
		Reduce energy consumption	16	10	
		Improve product quality	29	18	
8	In which aspect have you and local residents been significantly	Income increase	53	33	Only 33% of interviewees think the implementation of project will
		Environmental improvement	84	53	

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
	affected after the project construction?	Food security	23	14	increase income of local residents.
9	Are you satisfied with existing local environmental quality?	Satisfied	67	42	38% of interviewees are dissatisfied with existing local environmental quality, demonstrating that the project area is confronted with severe environmental problems.
		Dissatisfied	61	38	
		I don’t know	32	20	
10	What is the major existing environmental problem do you think in the area?	Water pollution	69	43	43% of interviewees consider the local water pollution as the focus, and the environmentally friendly planting industry will significantly improve local water environment.
		Air pollution	23	14	
		Noise	14	9	
		Ecological damage	54	34	
11	What is major environmental problem do you think that the	Pesticide pollution	109	68	80% of interviewees consider the pesticide pollution and overfertilization
		Overfertilization	19	12	

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
	farmland/vegetable farm is currently confronted?	Salinization of soil	13	8	as the biggest existing environmental problems to the land, demonstrating that the the construction contents of the environmentally friendly planting industry is targeted and suitable.
		Others	19	12	
12	What is the existing problem of your most concern?	Source of find breed	30	19	37% of interviewees consider it necessary to reduce production cost; the reduced application of pesticides and fertilizers in the project will effectively meet the goal.
		Production cost	59	37	
		Production technology	57	36	
		Product sales	14	9	
13	What impact on the grain output do you think will have after	Increase	126	79	79% of interviewees think the implementation of
		Decrease	7	4	
		Unchanged	5	3	

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
	the implementation of project?	I don’t know	22	14	project will promote the grain yield and the grain yield will play an important role in guaranteeing the smooth implementation of project.
14	What do you think of existing agricultural and water irrigation facility?	Complete	48	30	Only 30% of interviewees consider the existing agricultural and water irrigation facility complete and improved, demonstrating that the construction of local irrigation facility is considerably weak.
		Simple and crude	110	69	
		No irrigation facility	2	1	
15	Have you grasped techniques	Proficient	16	10	Most of interviewees think that they have
		General grasp	125	78	

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
	regarding the construction and maintenance of field irrigation system?	Have not yet grasp	19	12	basically grasped techniques regarding the construction and maintenance of field irrigation system, only few consider they have not yet.
16	Are you willing to participate in the engineering design, construction and implementation of local farmland irrigation system, if any?	Willing	103	64	64% of interviewees are willing to participate in the engineering design, construction and implementation of local farmland irrigation system, considerably high degree of public participation.
		Unwilling	6	4	
		I don't know	51	32	
17	Have you ever participated in any agricultural training?	No	37	23	23% of interviewees have not yet received any agricultural training; relevant training is required during the construction of project.
		1-2 time (s)	76	48	
		3-5 times	40	25	
		More than 5 times	7	4	

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
18	What is your crop growing mode>	Completely manual work	19	12	74% of interviewees take the “manual work + a small proportion of mechanical operation, 12% completely adopts manual work, demonstrating that the existing agricultural mechanization is quite weak.
		Manual work +a small proportion mechanical operation	119	74	
		Agricultural machinery +a small portion manual work	21	13	
		Completely with agricultural machinery	1	1	
19	What is the type of fertilizer you applied?	Farmyard manure	21	13	Compound and microelement fertilizer accounts for 39%, testing soil for formulated fertilization 16%, demonstrating that the basis of testing
		Compound and microelement fertilizer	62	39	
		Testing soil for formulated fertilization	16	10	

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
		Mixed fertilizer	61	38	soil for formulated fertilization will facilitate the smooth implementation of project.
20	How do you select fertilizers and pesticides?	Recommended by agricultural technicians	46	29	44% of interviewees select fertilizer and pesticide merely by experience (or recommended by neighborhood).
		Recommended by distributor	37	23	
		By experience (or recommended by neighborhood)	70	44	
		Label (advertising)	7	4	
21	How do get the fertilizer and pesticide?	Pesticide stores	137	86	86% of interviewees purchase fertilizer and pesticide from the stores.
		From the manufacturer	18	11	
		From street peddler	5	3	
22	How do you define the application amount of chemical fertilizer?	Ask someone with experience	28	18	\Most of interviewees define the application amount of chemical
		By experience	66	41	

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
		According to label instruction	22	14	fertilizer by learning from others or own experience, less than 28% under the guidance of agricultural technician.
		Under the guidance of agricultural technician	44	28	
23	How do you confirm the application frequency for fertilizer and pesticide?	By experience	43	27	39% of interviewees confirm the application frequency for fertilizer and pesticide under the guidance of agricultural technician.
		According to label instruction	49	31	
		Under the guidance of agricultural technician	63	39	
		Recommended by distributor	5	3	
24	What is the pesticide application	1-2	33	21	21% of interviewees have the pesticide application
		3-4	86	54	
		5-6	33	21	

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
	frequency for each rotation of crop?	More than 6	8	5	frequency of 5-6, demonstrating that the pesticide application amount in project area is quite high and the area suffers severe plant diseases and pest.
25	How do you complete crop-spraying?	Shaking style sprayer	42	26	87% of interviewees have still used the shaking style sprayer and backpack sprayer which has quite low efficiency. The introduction of new type sprayer in the project will be an ideal solution.
		Backpack sprayer	97	61	
		Power sprayer	21	13	
		The company responsible for unified prevention and governance	0	0	
26	How do you disposal of pesticide bottle and plastic film mulching?	Discarded in the farmland	38	24	It is necessary to achieve non-hazardous treatment of pesticide package since improper
		Discarded in the dustbin	70	44	
		Burning/landfill	38	24	

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
		others	14	9	discarding of wastes such as the pesticide bottle and plastic film mulching is quite prevalent.
27	To ensure the successful implementation of project, in which aspect do you think should more effort to be taken to?	Publicity and education	46	29	73% of interviewees consider the publicity, education and training as the focus of preliminary works.
		Training	71	44	
		Organization and implementation of monitoring and assessment	18	11	
		Others	25	16	
28	Do you have any comment and suggest on the construction of project and EP?	Major comments and suggestions include: project should be implemented as soon as possible while ensuring quality and EP. It is required not to affect the normal life of masses during the construction period.			
29	What is the difficulty in the project implementation and construction and what is your hope for the project?	Major difficulty and hope: the project with continuity should be provided with increased economic subsidy; take more efforts in publicity, allow more masses to participate in the project, play an exemplary role for local agricultural development with ideal implementation effect.			

9.2.2.2 Analysis of questionnaire result concerning the livestock and poultry farm waste management

For the livestock and poultry farm waste management, 80 questionnaires were issued, 74 recycled, recovery rate was 93%, 73 of which are valid. Basic information of interviewees is listed in Form 9-5, the questionnaire result shown in Form 9-6. The statistical form of basic information of interviewees, most of them are the farmers and staff relating to the livestock and poultry farm waste management shows that, 4% interviewees are female, about 62% aged 41 to 60, 70% with senior and junior high school education, which represent for basic features of farmers and staff. In addition, the questionnaire forms completed by interviewees virtually reflect their practical situation and thoughts. Statistics and analysis has also been made for the problems reflected in the questionnaire, detailed in Form 9-6.

Form 9-5 Statistical form of basic information of interviewees relating to livestock and poultry farm waste management

	Gender		Age			Degree of education			
	Male	Female	18~40	41~60	60 and above	College degree or above	Senior high school	Junior high school	Primary school
Number	70	3	25	45	3	29	22	20	2
Percentage (%)	96	4	34	62	4	40	30	27	3

Form 9-6 Statistics and analysis of questionnaire result concerning the livestock and poultry farm waste management

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
1	Are you familiar with the project?	Familiar	59	80	More efforts should be taken in the publicity since 10% of the interviewees have not yet familiar with project.
		Heard about	7	10	
		Unfamiliar	7	10	
2	Where did you get the project information?	Bulletin board	18	25	The publication of project information has shown effect since 34% of interviewees got the project information from bulletin board. The major source among others is the announcement of agricultural
		TV/Newspaper/Network	9	12	
		Local residents	5	7	
		others	41	56	

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
					department, accounting for 56%.
3	What do think of the project?	Agree	73	100	All interviewees are in favor of the project construction.
		Disagree	0	0	
		I don’t know	0	0	
4	What do think of the project site selection?	Rational	70	96	No one considers the project site is irrational, and 96% of interviewees deem it rational.
		Irrational	0	0	
		I don’t know	3	4	
5	What impact do you think will the project construction have on the local economic development?	Promote economic development	66	90	No one think the project construction will hinder the development of local economy, and most of interviewees consider it a propellant.
		Hinder economic development	0	0	
		No impact	6	8	
		I don’t know	1	1	
6	In which aspect do you think will the project construction have the biggest impact?	Water environment	56	77	77% of interviewees think that the project may have the biggest impact on the water environment.
		Air environment	1	1	
		Ecological environment	14	19	
		others	2	3	
7	What major environmental	Pollution abatement	63	86	86% of interviewees think the major

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
	benefits do you think will the project bring about?	Reduce energy consumption	4	5	environmental benefit from the project is the pollution abatement.
		Improve product quality	6	8	
8	In which aspect have you and local residents been significantly affected after the project construction?	Income increase	27	37	Only 37% of interviewees think the implementation of project will increase income of local residents, demonstrating that the public is not optimistic about the economic return of project.
		Environmental improvement	43	59	
		Personal safety	3	4	
9	Are you satisfied with existing local environmental quality?	Satisfied	52	71	25% of interviewees are dissatisfied with existing local environmental quality, demonstrating that the project area is confronted with severe environmental problems.
		Dissatisfied	18	25	
		I don’t know	3	4	
10	What is the major	Water	55	75	75% of interviewees

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
	existing environmental problem do you think in the area?	pollution			consider the local water pollution as the focus, and the livestock and poultry waste management project will significantly improve local water environment.
		Air pollution	9	12	
		Noise	0	0	
		Ecological damage	9	12	
11	What is the major environmental problem do you think that the livestock and poultry farm is currently confronted?	Mosquitoes and flies	8	11	Half of interviewees consider the water pollution as the biggest existing environmental problem arising from livestock and poultry farms.
		Fecal pollution	17	23	
		Water pollution	39	53	
		Air pollution	9	12	
12	What is your current cultivation scale (breeding stock)?	3,000-5,000	43	59	Most of them are of medium and small size, only 11% have the breeding stock exceeding 15,000.
		5,000-10,000	13	18	
		10,000-15,000	9	12	
		More than 15,000	8	11	
13	What is your future plan within the coming 5 years?	Stay the same	29	40	More than half of farmers have the expansion plan within the project
		Expansion	39	53	
		Demolition	1	1	
		No plan	4	5	

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
					construction period.
14	Have you got Guangdong Pollutant Discharge Permit?	Yes	29	40	Only 40% of farms have got Guangdong Pollutant Discharge Permit.
		No	40	55	
		Never heard of	4	5	
15	Are you currently adopting ecological breeding mode such as biogas digester and solid-liquid separation machine?	Yes, a complete set of equipments	20	27	Only 27% of farms are equipped with complete EP facility, while 16% even have no any related facility, it is necessary to carry out the project.
		Yes, some equipments have been equipped	41	56	
		No	12	16	
16	Do you think the existing EP facility is complete and improved?	Quite complete	27	37	More than half of interviewees consider it necessary to further improve existing EP facility.
		Quite simple and obsolete	39	53	
		No EP facility	7	10	
17	Have you grasped EP techniques relating to breeding?	Fully grasped	27	37	63% of interviewees have no idea of or do not know specific EP techniques relating to breeding.
		General ideal	44	60	
		Not yet	2	3	
18	How did you learn the breeding techniques?	Self-study	29	40	Most of farmers learnt the breeding techniques by
		Training	40	55	
		From other	4	5	

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
		farmers			themselves and from the training class.
19	How do you get the feeds?	Self-made	40	55	Half of farms get feeds by self-preparation, only 18% from stores.
		From manufacturers	27	37	
		Feed stores	6	8	
20	How do you dispose of the dumped feeds and packaging materials?	Burning/landfill	11	15	79% of interviewees transport the dumped feeds and packing materials away after collection, only 5% select to directly abandon them.
		Transported after collection	58	79	
		Directly abandoned	4	5	
21	How do you dispose of carcass?	Burning by biogas	14	19	No one directly abandon the carcass, more than half of interviewees bury carcass in the pits.
		Directly abandoned	0	0	
		Buried in pits	49	67	
		others	10	14	
22	How do you deal with livestock and poultry excrement and sewage?	Piled up and discharge at will	2	3	More than half of interviewees utilize the livestock and poultry excrement and sewage as organic fertilizer, while there is still arbitrary pilling up and discharge.
		Discharge into the biogas tank	34	47	
		Utilized as organic	27	37	

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
		fertilizer			
		Others	10	14	
23	Is diversion devices like the ditch equipped around farms to guide the clean runoff?	No	14	19	Only 63% of farms are equipped with diversion devices, which may be a potential hazard to the surface water environment.
		Yes, but no continuous ditches.	13	18	
		Yes	46	63	
24	Is there any kind of environment available for consumption and absorption of pollutants?	Economic forest	24	33	Most of farms are surrounded by economic forests, only 5% of farms have no environment for absorption and digestion of pollutants, which may play a decisive role in selecting the breeding mode.
		Farm land	23	32	
		Economic forest + Farm land	22	30	
		No	4	5	
25	What is the area of waste absorption and digestion area?	No	12	16	Most of farms have no sufficient lands to absorb and consume the wastes. It may be difficult to define their absorption and digestion area.
		Less than 500 mu	40	55	
		500~1000 mu	2	3	
		More than 1000 mu	19	26	

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
26	Should incoming vehicles entering farms be disinfected?	Necessary	60	82	There is risk with livestock and poultry epidemic prevention since 11% of farms have not yet equipped with disinfecting tank.
		Unnecessary	5	7	
		No disinfecting tank	8	11	
27	To ensure the successful implementation of project, in which aspect do you think should more effort to be taken to?	Publicity and education	19	26	68% of interviewees consider the publicity, education and training as the focus of preliminary works.
		Training	31	42	
		Organization and implementation of monitoring and assessment	15	21	
		others	8	11	
28	Do you have any comment and suggest on the construction of project and EP?	Major comments and suggestions include: project should be implemented as soon as possible while ensuring quality and EP. It is required not to affect the normal operation of farms during the construction period.			
29	What is the difficulty in the project implementation	Major difficulty and hope: high breeding cost and a high proportion of funds are borne by individual farmers; government should take more efforts in providing support; it is hoped the fund from the WB as well as the breeding and EP technology training will come as soon			

No.	Content of investigation	Options	Number of interviewee	Percentage %	Analysis and conclusion
	and construction and what is your hope for the project?	as possible			

9.4 Information disclosure and feedback

9.4.1 On-site announcement

On-site announcement was completed after the initial public participation, mainly by posting paper announcements in the bulletin boards of town government and village committee as well as other densely populated area, as shown below:

a. Publicity in Aibei Village Committee, Hengli Town

b. Publicity in Longhua Neighborhood Village Committee, Hengli Town

Figure 9-2 Photo of on-site announcement

9.4.2 On-line announcement

The initial on-line announcement was mainly made on the website of Department of Agriculture of Guangdong Province and Hydrology Bureau of Pearl River Water Resources Commission:

http://www.gd.agri.gov.cn/rdzt/myzl2012/myzhyw/

http://www.zwsw.gov.cn/ggtz/23076.shtml

Announcement contents include:

① General information of project construction;

② Working procedure and major contents of assessment;

③ Scope and major items for seeking public opinion;

④ Detailed contents for seeking public opinion;

⑤ The way and term for access to abridged edition of environmental impact report;

⑥ The commencement date and deadline of seeking public opinion;

⑦ Contact information: including the mailing address, postal code, telephone number, fax number, E-mail address and contact person of the construction unit and the EIA agency.

a. On-line announcement on the website of the Department of Agriculture of Guangdong Province

b. On-line announcement on the website of Hydrology Bureau of Pearl River Water Resources Commission

Figure 9-3 Screenshot of on-line announcement (initial)

The second public announcement was made on the website Guangdong Provincial Department of Agriculture after revision based on the comments from the WB and when the first draft of project is subject to the approval of safety guarantee team from the WB, with major contents as shown below:

① Abridged edition of environmental impact report (in Chinese Version);

② The commencement date and deadline of seeking public opinion;

③ Contact information: including the mailing address, postal code, telephone number, fax number, E-mail address and contact person of the construction unit and the EIA agency.

Website for information disclosure:

http://www.gd.agri.gov.cn/rdzt/myzl2012/myzhyw/201301/t20130115_204006.htm

Attached with screenshot.

Figure 9-3 Screenshot of on-line announcement (second)

9.4.3 Summary of comments and feedback from public participation

Form 9-7 Summary sheet of comments and feedback from public participation

Type	Public opinion	Feedback corresponding to environmental management plan
Common comments for the construction period	1. Control construction dust	① Make necessary ground hardening and watering for dust suppression ② The granular materials with fine particle should be kept tightly, ③ The remaining dusty materials after removal of composting should be timely cleaned. ④ Vehicles should slow down when entering the construction site.
	2. Control construction noise	① Shock absorption foundation should be prepared for mechanical equipments with big noise; ② it is necessary to select the low-noise equipment and control the construction time ③ The equipment with operation noise should be placed indoor ④ Make regularly maintenance of construction equipment ⑤ 5 Construction and transportation vehicles are required to slow down and forbidden to toot near the construction site.
	3. Control construction wastewater	① It is necessary to construct sedimentation pool for precipitating the industrial wastewater; the wastewater after sedimentation may be used for dust suppression ② Pipeline sealing should be guaranteed when laying drip irrigation pipe network.

Type	Public opinion	Feedback corresponding to environmental management plan
		③ Vehicles should be maintained in the professional maintenance point ④ Mechanical equipment before using should be inspected for oil or water leakage.
	4. Control construction garbage	① Wastes should be sorted for further treatment ② Recyclable or renewable materials should be sorted for recycling. ③ Unrecyclable wastes should be timely cleaned by the entrusted garbage collection unit; ④ All solid wastes produced during construction shall be completely removed upon the completion of engineering project.
	5. Construction safety control	① ①Publicity about the engineering construction information should be posted at the site and surrounding areas. ② ②The constructors working in the dusty site should wear respirator. ③ ③Personnel engaged in drilling or electric welding shall be equipped with earplug and arc protection goggles. ④ ④ For painting and chemical solvent, it is necessary to select the eco-friendly and non-toxic materials.
Specific suggestions on environmentally friendly planting	1. Straw burning leads to air pollution to local environment.	① Smashed straws are recycled in farmland by burying straws in the land at the time of soil preparation, which may significantly improve soil organic matter.
	2. Project	① Make long sequence monitoring of inflow and

Type	Public opinion	Feedback corresponding to environmental management plan
industry	implementation effect	effluent in the irrigated area of the project area and perform accurate quantitative analysis of the environmental benefit from the project.
	3. Need more opportunities to participate in agricultural technology training	① The project experts have been specifically assigned in the corresponding project area to provide agricultural technology training regarding pesticide and fertilizer for local peasants.
Specific suggestions on livestock and poultry waste management	1. Site selection	① Strictly comply with the site selection principle relating to the farms and livestock and poultry waste management engineering specified in the environmental management plan, away from the densely populated area and other sensitive areas.
	2. Water pollution	① Be sure the design volume of water collection pools meet the related requirements ② Rainwater and sewage should be separately treated. ③ The bar screen should be equipped and used before waste water entering the collection tank. ④ High-pressure and low-flow nozzle is recommended. ⑤ Waste water from livestock and poultry farm should be disinfected before discharging or recycling. ⑥ Composting should be completed in a place with cover or ceiling
	3. Air pollution	① Before entering boiler room or generator set, biogas shall be subject to desulfurization.

Type	Public opinion	Feedback corresponding to environmental management plan
		② Biogas from anaerobic treatment, which should be completely utilized, is not allowed to directly release into the environment. ③ It is necessary to plant high and ever-green arbors as well as build green belt separation to absorb odor and clean the air. ④ Each of excretion treatment unit should be designed as the closed type ⑤ It is required to drop or sprinkle chemical deodorants to prevent the occurrence of odor
	4. Solid waste pollution	① Keep feeding system under sound working condition ② Transport container for livestock and poultry wastes should be reliably sealed ③ Livestock and poultry died of disease shall be timely disposed of and not allowed to be casually discarded, sold or reused as feed. ④ Livestock and poultry excrement may not be used for farmland until subject to non-hazardous treatment.
	5. Noise pollution	① Generator and pump station shall be operated in a closed room
	6. Safety management and personal health	① Meet requirements relating to animal epidemic prevention ② The personnel engaged in special type of works should get the related professional certificate. ③ Regularly check and replace protection facility and

Type	Public opinion	Feedback corresponding to environmental management plan
		equipment relating to safety and fire fighting. ④ Preparations relating to the gas leakage, fire and negative pressure shall be completed. ⑤ A safety fire-protection distance should be kept for air storage tanks
	7. Safety utilization of biogas	① Specific biogas operation safety and emergency plan training should be provided in the environmental management training.

9.5 Public participation and summary

To listen to the public opinion and suggestion, we have successively held forums, paid visits, issued questionnaires and made on-site and on-line public announcements. According to the information collected by different ways, it has been found that, the public in the project area have got the general understanding of project and expressed general support for the project as well; they believe that the project construction will both boost local economic development and improve environmental quality; they hope the project will be commenced and implemented as soon as possible while ensuring quality and EP so as to bring in the social, environmental and economic efficiency.

Appendix I

Guangdong Agricultural Non-point Source Pollution Control Project Loaned by World Bank

Public Supportive Engineering Environmental Codes of Practice

Department of Agriculture of Guangdong Province

Institute Of Pearl River Water Resources Protection

October of 2012

Environmental Codes of Practice for Public Supportive Engineering

To maintain the smooth implementation of project and guarantee the normal operation of scientific research performed by provincial-level soil and fertilizer testing center laboratory, renovation and reconstruction has been made for the laboratory, including the structure, roofing, outdoor and indoor decoration, doors and windows, water supply and sewage drainage, heating, ventilation and fume hood, air conditioner, electric equipment, telephone, network, monitoring, alarm and gas line.

Environmental codes of practice for public supportive engineering include: ① Engineering design EP measures; ② EP measures during construction period; ③ EP measures during the operation life cycle.

I. Engineering design EP measure

1. Contractors are required to establish the supervising and liability system for the implementation of EP measures in the construction period, responsible for the implementation so as to ensure construction activities compliant with requirements of EP and all necessary measures have been taken during construction.

2. The construction unit and PS shall, prior to construction, receive training relating to EP and environmental management. The project office at provincial level is required to entrust outside experts providing training for contractors and PS so as to allow them confirm project-related EP requirements.

3. The contractor shall, based on the annual budget, reserve deposits for the completion of environmental management accounting approximately for 3% of budget in the project contract fund. When the construction unit fails to take effective EP measures, the administrator in charge of EP shall put forward rectification opinions, in case EP measures are still not effectively implemented after rectification, the project office at provincial level will, in accordance with the contract, impose fines on the construction unit, detain the project payment as the fines for failure in EP and entrust others to take related measures.

II. EP measures during construction period

(I) Dust pollution control

Primary source of construction dust: dust from driving vehicles on roads on construction site, from piled building decoration materials and earthworks, from earthwork, muck and construction garbage in transit and from mortar mixing.

For above sources of dust pollution, following dust pollution control measures are provided by the code:

1. Road hardening has been completed on the construction site, while the dusty road section should be regularly watered for dust suppression.

2. The material storage area, machining area and large template storage place in the construction site should be flat and solid. Materials should be piled up in compactness to reduce land occupation.

3. The granular materials with fine particle should be kept tightly, and shelters should be equipped during loading and transporting. The remaining dusty materials after removal of composting should be timely cleaned.

4. The exposed area in the construction site should be properly watered for dust suppression.

5. Strengthen the management of transport vehicle. Vehicles entering the construction site should slow down to reduce dust. In addition, the loading space for the vehicles transporting earthworks, mucks and construction wastes should be properly sealed.

(II) Water pollution control

Waste water from public supportive engineering construction mainly include the waste water from construction, mainly including the waste water from mortar mixing and washing water, and production and the domestic sewage. Following discharge control measures are provided by the code for above waste water:

1. After sedimentation, the waste water from mortar mixing should be utilized for dust suppression.

2. It is required to regularly dredge the drainage channel.

3. Domestic sewage and equipment washing water should be discharged in the municipal pipe network.

(III) Noise pollution control

Noise pollution during the construction period mainly comes from the construction machinery and transport vehicles. Based on the features of noise pollution of public supportive engineering, following control measures are provided by the code:

1. Related noise regulation shall be complied with during construction period.

2. Construction time should be strictly kept within 8: 00～20: 00, during lunch break (12:00～14:00) among which, construction shall be ceased. The access time for construction vehicles shall be compliant with requirements of local government.

3. Residents leaving nearby should be informed of continuous construction at night. In addition, it is necessary to complete relevant formalities and take measures to mitigate the impact on surrounding residents. Within the noise limit period, construction unit shall receive the effective CNP.

4. Night construction, if necessary, should be performed within the specified period after getting approval from the competent department. No unauthorized operation of noisy mechanical equipment is allowed.

5. The equipment with noise shall be operated in a closed room.

6. To reduce impact on surrounding environment during construction, tt is required to use low-noise equipment and close windows and doors as much as possible

7. By performing regular maintenance, the contractor is required to keep the construction equipment under the optimum working condition and lowest level of noise as much as possible.

8. Facilities left used have to be shut down or controlled under energy-saving and vibration reduction state.

9. Construction and transportation vehicles are required to slow down and forbidden to toot near the construction site.

(IV) Waste control

Solid wastes produced during construction period mainly include the construction garbage, dumped oil, chemical solvents and household garbage, among which, the construction garbage is the major solid wastes, mainly containing soil, muck, scattering mortar and concrete, masonry and broken concrete, and the wastes from decoration, sorts of packing materials and other wastes. For those solid wastes from project construction, following waste control measures are provided by the code:

1. Construction and domestic wastes should be separately collected, stored and timely removed as per regulations.

2. Construction wastes should be cleaned daily and forbidden to throw from high.

3. Wastes from construction, demolition and site cleaning should be sorted for further treatment, among which, recyclable or renewable materials should be sorted for recycling, with remaining wastes timely cleaned by the entrusted garbage collection unit. Garbage collection unit shall hold the environmental service certificate issued by relevant department.

4. The dumped oil and chemical solvent should be stored in centralization, treated by the qualified entrusted unit and may not be poured out at will.

5. Construction equipment should be maintained to prevent oil spillage.

6. All solid wastes produced during construction shall be completely removed upon the completion of engineering project.

(V) Construction safety and others

1. Prior to construction, construction unit should handle the temporary access card, and the constructors should access with the card.

2. During engineering construction period, the publicity about engineering construction information should be posted at the construction site and surrounding areas so as to inform the public of specific construction activity and time, contact and contact phone number of construction unit as well as get to know the public complaint and suggestion on the construction activity.

3. The constructors working in the dusty site should wear respirator. Personnel engaged in drilling or electric welding shall be equipped with earplug and arc protection goggles. 4. For painting and chemical solvent, it is necessary to select the eco-friendly and non-toxic materials.
III EP measures to be taken during operation life cycle It is required, during operation life cycle, to focus more on the storage of experimental chemicals and reagents and the operation management of ventilation facilities, further improve the rules and regulations relating to lab safety management; in addition, the lab management personnel should have stronger environmental awareness, receive safety education, strictly comply with lab-related disciplines and regulations so as to prevent the leakage of poisonous gases and fire disasters.

Appendix II

THE WORLD BANK
Working for a World Free of Poverty

Guangdong Agricultural Non-point Source Pollution Control Project Loaned by World Bank

Water-fertilizer Integration Demonstration Base Engineering Environmental Codes of Practice

Department of Agriculture of Guangdong Province

Institute Of Pearl River Water Resources Protection

October of 2012

Environmental Codes of Practice for Water-fertilizer Integration Demonstration Base Engineering

For the water-fertilizer integration demonstration base engineering, the vegetables and fruit trees in Huizhou city was selected as the water-fertilizer integration base for technology demonstration, covering about 38,2000 mu, mainly including the construction of drip irrigation system and storage pool of organic fertilizer.

Environmental codes of practice for water-fertilizer integration demonstration base engineering include: ① Engineering design EP measures; ② EP measures during construction period; ③ EP measures during the operation life cycle.

I. Engineering design EP measures

Site selection for pumping station should be the focus during engineering design period. Its major principles include:

1. Pumping station should be constructed on the natural foundation with solid ground and excellent permeability, shall not be located on the large and movable fault tectonic zone and other unfavorable geological sections.

2. Site should be near the source of water, allowing water conveyance system located at an ideal place.

3. Pumping station should be kept away from noise sensitive areas like the residential area as much as possible.

II. EP measures during construction period

(I) Water pollution control

Water pollution during the construction period of water-fertilizer integration demonstration base engineering mainly includes the water from pit excavation and the mechanical oil-polluted wastewater. Major mitigation measures are as follows:

1. It is necessary to construct sedimentation pool for precipitating the industrial wastewater; the wastewater after sedimentation may be used for construction site or dust suppression.

2. It is not recommended to set up machinery and vehicle maintenance point or cleaning

point on the construction site. To prevent oily sewage on the site, maintenance shall be performed in the professional maintenance point.

3. Mechanical equipment before using should be inspected for oil or water leakage.

(I) Dust pollution control

Primary source of dust: dust from driving vehicles on roads on construction site, from piled building decoration materials and earthworks, from earthwork, muck and construction garbage in transit and from mortar mixing

For above sources of dust pollution, following dust pollution control measures are provided by the code:

1. Regular watering for dust suppression is necessary for the dusty area.

2. The material storage area, machining area and large template storage place in the construction site should be flat and solid. Materials should be piled up in compactness to reduce land occupation.

3. The granular materials with fine particle should be kept tightly, and shelters should be equipped during loading and transporting. The remaining dusty materials after removal of composting should be timely cleaned.

4. Strengthen the management of transport vehicle. Vehicles entering the construction site should slow down to reduce dust. In addition, the loading space for the vehicles transporting earthworks, mucks and construction wastes should be properly sealed.

(III) Noise pollution control

Noise pollution during construction period mainly comes from the construction machinery and transport vehicles. Based on the features of noise pollution of water-fertilizer integration demonstration base engineering, following control measures are provided by the code:

1. Legislations for noise shall be complied with within the construction period.

2. Construction time should be strictly kept within 8: 00～20: 00, during lunch break (12:00～14:00) among which, construction shall be ceased.

3. Shock absorption foundation or support as well as damping materials should be prepared for mechanical equipments with big noise;

4. The construction period should be properly arranged to avoid simultaneous operation of multiple large-size machines with strong noise on the same site.

5. By performing regular maintenance, the contractor is required to keep the construction equipment under the optimum working condition and lowest level of noise as much as possible.

6. Facilities left used have to be shut down or controlled under energy-saving and vibration reduction state.

7. Construction and transportation vehicles are required to slow down and forbidden to toot near the construction site.

(IV) Waste control

Major wastes from the water-fertilizer integration demonstration base engineering include the construction wastes, abandoned pipes, construction parts, hoardings, packing materials and domestic wastes. Following major measures are to be taken during the construction period:

1. Wastes from construction, demolition and site cleaning should be sorted for further treatment, among which, recyclable or renewable materials should be sorted for recycling, with remaining wastes timely cleaned by the entrusted garbage collection unit. Garbage collection unit shall hold the environmental service certificate issued by relevant department.

2. The soil contaminated by the oil spillage during construction should be cleared in a timely manner.

3. The obstruction in the drainage ditch should be regularly cleared.

4. All solid wastes produced during construction shall be completely removed upon the completion of engineering project.

(V) Eco-environmental protection

Major ecological impacts during the construction period of water-fertilizer integration demonstration base engineering include the vegetation deterioration caused by earth excavation and the farmland occupation due to bedding accumulation. Major following mitigation measures are to be taken:

1. It is required to construct strictly compliance with project design so as to minimize vegetation deterioration and protect surrounding surface vegetation. After completion of construction, ecological restoration, land reclamation and vegetation replanting is required for the temporary site.

2. Construction unit shall minimize the period of temporary land occupancy, control the construction time of earthwork and stabilize the cut-and –fill side slope while ensuring construction quality.

3. The temporarily occupied land should, after the completion of construction, restored for farming.

(VI) Construction safety and others

1. Personnel engaged in drilling or electric welding shall be equipped with earplug and arc protection goggles.

2. For painting and chemical solvent, it is necessary to select the eco-friendly and non-toxic materials.

3. Safety fence should be provided around the organic fertilizer storage pool to keep away the people and animal.

III EP measures to be taken during the operation life cycle

1. Drip irrigation equipment should be regularly inspected to ensure the movable ground hose and drip irrigation pipe network in good condition.

2. Pumping station should be designed in compliant with the ventilation, heating and lighting requirement, damp-proof, fireproof and noise-exclusion.

3. Organic fertilizer storage pool should be regularly discharged and cleaned to ensure storage capacity.

4. It is required to properly arrange the operation time of drip irrigation system

according to crop demand so as to prevent surface runoff contamination due to excess of irrigation water.

Appendix Ⅲ

Guangdong Agricultural Non-point Source Pollution Control Project Loaned by World Bank

Conservation Tillage Environmental Codes of Practice

Department of Agriculture of Guangdong Province

Institute Of Pearl River Water Resources Protection

October 2012

Environmental Code of Practice for Conservation Tillage

Implementation of conservation tillage in Guangdong Province will generate the following benefits: 1. Return straw to the field to increase soil organic matter, improve filed fertility and decrease fertilizer so as to lead straw burning with effective technology; 2. Minimum or no tillage combines with straw mulch to reduce surface runoff and the water pollution induced by chemical fertilizers and pesticides taken by the runoff; 3. Application of machinery helps to increase the utilization efficiency of fertilizers and pesticides, minimize the use of fertilizers and pesticides and thus to reduce the pollution resulted by their runoff; 4. It has effects of decreasing frequency of operation, shortening operating time, cutting production costs and boosting crop yields. In this project, the subproject of conservation tillage is an advanced agricultural technology to sow by no or minimum tillage when the surface is covered by crop straws or stubbles. The most important activity of this project is to purchase advanced farm machineries and promote agricultural skills, which have significant environment protective measures, including the leading technology of straw smashing and returning despite having no specific construction content.

In China's rice production area, the planting patterns include fertilizer-rice, fertilizer-rice-rice, rapeseed-rice, rapeseed-rice-rice, wheat-rice etc. Before seeding rice, the residual straws (stubbles) after the harvest of previous crops get higher and higher to the average height of 30－50cm, and some are even wholly left in the field and greatly hindered the seeding of the next crops. In order to seed at the best time, in many places, farmers choose to dispose them by burning, which caused the increase of emissions of carbon dioxide and some other greenhouse gases as well as the severe pollution to atmosphere and environment.

The technology of straw smashing and returning uses the specialized boat-rotary tillage and stubble-mulch machine to bury the straws into the field at time of soil preparation. This method can not only clear the residual straws but also improve the soil organic

matter by burying straws into the field.

Picture 1 Boat-rotary tillage and stubble-mulch machine

Appendix Ⅳ

THE WORLD BANK
Working for a World Free of Poverty

Guangdong Agricultural Non-point Source Pollution Control Project Loaned by World Bank

Livestock Waste Management Environment Management Framework

Department of Agriculture of Guangdong Province

Institute of Pearl River Water Resources Protection

October 2012

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Chapter 1 Project Introduction and Objective

1.1 Project Introduction

This environment management framework includes only the livestock waste management contents in Guangdong Agricultural Non-point Pollution Control Project loaned by WB, whose construction investment totals RMB 1,441,405,500 (Loan of USD 100,000,000 applied from WB (RMB 630,000,000), donation of USD5, 100,000 (RMB 32,130,000) applied from GEF, financial support of RMB 638,215,500 given by Guangdong Provincial Government and self-raised funds of RMB141, 060,000), RMB 806,063,800 of which is invested in livestock waste management.

Waste treatment for livestock and poultry makes focus on Huizhou, Jiangmen and Heyuan and gives attention to some other places with the aim of involving 300 livestock farms (about 100 farms in the first phase) in the treatment plan. The construction contents of livestock waste management include starting crude preparation equipments, anaerobic digestion system and raw material preparation equipments, biogas and digested fertilizer utilization equipments; The starting crude preparation equipments include grating, solid-liquid separation device, aggregate tank, adjusting tank, grit chamber etc. Anaerobic digestion system consists of anaerobic digestion device, warming equipment, dewatering equipment, desulfurization equipment, gasometer, detection instruments and equipments etc; biogas utilization equipments include transmission and distribution network, flowmeter, cooking utensils, heating equipments, generator set, waste heat utilization equipments etc. Digested fertilizer utilization equipments include liquid storage tank, processing equipments and conveying equipments for digested fertilizer; In addition, there are a lot of supporting facilities, such as fire fighting in the area, lighting, water supply and drainage, identification etc. Since the environment and natural conditions of plant and aquaculture industries around the livestock farms may vary from different regions, we have proposed three construction modes for livestock waste management: energy

environmental protection mode, ecological energy mode and the new type high-bed fermentation mode.

1.2 Objective

We plan to determine 100 livestock farms before WB carries out the assessment, and then determine the rest 200 during the implementation process. Objective of the environmental management framework is to screen and manage the new-added livestock farms according to the site requirements and relevant regulations, ensuring to avoid or minimize the environmental impact by all means when lending from WB; and for the inescapable impacts, we will work out and implement some necessary alleviating measures after confirming according to related policies of WB and Chinese laws. The environment management framework composed of the text, an Attached List (Attached List8) and map (Figure1) has established a system use to select and management the new-added livestock farms and another one to solve the possible public complaints by public participation and includes some specialized screening tools recommended to use in all subprojects. In the workbook, some technical guides and specifications relating to the environment management framework will be supplemented to provide guidelines for EIA as well as a set of screening tools for environmental experts involved in this project, including experts working for project implementation organizations and WB. These guidelines cover some critical materials needed by project capacity building, which will accept further modification and update in the implementation process of project so as to incorporate the newly acquired experience.

1.3 Selection of Subprojects

Waste treatment for livestock and poultry makes focus on Huizhou, Jiangmen and Heyuan and gives attention to some other places with the aim of involving 300 livestock farms (about 100 farms in the first phase) in the plan. Subproject is defined as one activity of the general project, or a group of similar activities of some major industry (infrastructure) located in some single county. Each subproject is subject to

legal requirements on the project, including financial and safety control requirements. All the subprojects (pig farm) are required to meet the following requirements:

1. The current livestock farm is a completed project;
2. The livestock farm is not built in prohibited area, which includes drinking water source protection area, scenic spot, core and buffer area of natural reserve; residential area in city and town-cultural education and scientific research district, medical treatment district, commercial district, industrial park, scenic spot and other densely inhabited areas; prohibited area defined by local people's governments at the county level according to law; other districts under special protection according to state or local laws and regulations.
3. Livestock farms near the prohibited-construction areas should be located in the downwind or crosswind areas of the prevailing wind direction of the prohibited-construction areas.
4. A minimum distance greater than 500m should be kept between boundaries of livestock farm and prohibited-construction area; The livestock farm shall keep more than 2,000m from the environmentally disastrous area, animal epidemics-prone area or market and trading market; over 1,000m from the major transpiration roads and railways; over 2,000m from residential districts and other livestock farms; over 500m from sewage outlet in residential area; and over 1,000 m from the drinking water source.
5. The livestock farm shall have good engineering geological conditions;
6. The waste water of livestock farm shall be prevented from going into sensitive water areas and water areas with special functions;
7. The land of livestock and poultry farm conforms to the overall plan for land utilization of the town and goes through land contract (sub-contract) and relevant formalities;
8. The livestock farm is required to obtain EIA documentation formulated by qualified EIA organizations and approval of competent department of EP administration with approval right before construction;

9. Livestock farm is required to obtain a Permit for the Production and Business Operation of Breeding Livestock and Poultry which is approved and issued by administrative department for animal husbandry and veterinary under people's government above county level;
10. Livestock farm is required to be filed by administrative department for animal husbandry and veterinary under people's government at county level and obtain livestock and poultry identification and *Certificate of Animal Epidemic Prevention Conditions*;
11. Livestock farm is required to possess *Pollutant Discharge Permit of Guangdong Province* issued by the local environmental authority;
12. The livestock farm should have 3,000 pigs on hand throughout the year;
13. The livestock farm should have convenient transportation, water and power supply condition;
14. The livestock farm should keep room for expansion in case of construction of pollution treatment projects of livestock and poultry farm.
15. The livestock farm should be able and promise to make available the self-raised funds (taking 35% of the total investment of project).

The project team of WB will preliminary screen and confirm the qualification of projects newly added by project office. After all subprojects are prepared, project team of WB will conduct pre-audit and assessment to subprojects considered complicated. As for the rest subprojects, project team of WB will conduct post audit by sampling at the time of visiting the inspection team of simple subprojects.

1.4 Policy Framework for Environmental Problems

Environment management framework is formulated in accordance with the following relevant state laws and regulations and safety control policies of WB.

1.4.1Administrative Regulations of the State

Since 1980s, China has implemented EIA according to the requirements of

Environmental Protection Law and relevant laws and regulations, as a documented procedure applicable to all investments in China. The laws and regulations on EP, water pollution control and preventing pollution for livestock and poultry breeding are closely related to this project.

1. *Environmental Protection Law of the People's Republic of China* (December 26, 1989);
2. *PRC Environmental Impact Assessment Law*(September 1, 2003);
3. *Water Law of the People's Republic of China* (October 1, 2002);
4. *Water Pollution Prevention and Control* Law *of the People's Republic of China* (June 1, 2008)*;*
5. *Detailed Rules for the Implementation of the Water Pollution Prevention and Control Law of the People's Republic of China* (March 20, 2000);
6. *Law of the People's Republic of China on the Prevention and Control of Atmospheric* Pollution (September 1, 2000);
7. *Law of PRC on the Prevention and Control of Environmental Pollution by Solid Wastes* (April 1, 2005);
8. *Law of the People's Republic of China on the* Prevention *and Control of Environmental Noise Pollution* (March 1, 1997)*;*
9. *Law of The People's Republic of China on the Prevention and Treatment of Infectious Diseases* (December 1, 2004);
10. Water and Soil *Conservation Law of the People's Republic of China* (March 1, 2011);
11. Land *Administration Law of PRC* (August 28, 2004);
12. *Cleaner Production Promotion* Law *of the People's Republic of China* (Revised on February 29, 2012);
13. *Law of the People's Republic of China on the* Protection *of Wildlife* (March 1998);
14. *Law of PRC on Protection of Cultural Relics* (October 2002);
15. *Regulations of The* People's *Republic of China on Wild Plants Protection* (January 1997);

16. *Regulations on the Administration of Construction Project* Environmental *Protection of PRC* (November 1998);
17. *Implementation Regulations for PRC Law of* Land *Administration* (August 28, 2004);
18. *Decision of the State Council on Several Issues Concerning Environmental Protection* (GF[96] No.31, August 3, 1986);
19. *Notice of the State Council on Issuing National Eco-environmental Construction Planning* (2012);
20. *Notice of the State Council on issuing "the 12th Five-year" Energy Saving and Emission Reduction Comprehensive Work Program* (GF[2011] No.26);
21. *Regulations on the Administration of Construction Project Environmental* Protection (No.253 Decree of the State Council, November 29, 1998).

1.4.2 Department Rules

1. *Stipulations for Environment Protection Design of Construction Project* (GHZ (1987) No.002);
2. *Policy of Prevention and Control Technology of Hazardous Waste Pollution* (State Environmental Protection Administration, HF [2011] No.199).

1.4.3 Normative Documents

1. *The National Programme for Ecological Environment Protection* (November 28, 2005);
2. *Noise L*imits *for Construction Site* (GB12523-90);
3. *Integrated Wastewater Discharge S*tandard (GB8978-1996);
4. *Regulation on Administration of Breeding Livestock and Poultry* (July 1994);
5. *Regulation on Handling Major Animal Epidemic Emergencies* (November 2005);
6. *Regulations on* Administration *of Feeds and Feed Additives* (December 2001);
7. *Technical Specifications for Pollution Treatment Projects of Livestock and Poultry Farms* (HJ497-2009);
8. *Criteria for Designing of Biogas Plant in Scale Livestock and Poultry*

Breeding Farms (NY/T 1222-2006);

9. *Farmland Environmental Quality Evaluation Standards for* Livestock *and Poultry Production* (HJ 568-2010);
10. Technical *Standard of Preventing Pollution for Livestock and Poultry Breeding* (HJ/T81-2001);
11. *Code for the Bio-safety Disposal of Carcasses and By*-products *from Diseased Livestock and Poultry* (GB16548);
12. *Technical Requirement for Non-hazardous Treatment of Animal Manure* (NY/T 1168-2006);
13. *Technical Policy of Preventing Pollution for Livestock and Poultry Breeding Industry* (HF[2010] No.151).

1.4.4 Safety Control Policies of World Bank

Safety control policy of WB is made to ensure that due consideration is given to the environmental impact brought by the projects funded by WB, including analysis on the possible impact and measures to reduce the adverse impact. It is able to avoid damage to environment or affected populations other than completing project design, improving implementation efficiency and protecting reputation of WB and lending country. These potential subprojects will/may trigger the following policies of WB:

1. OP/BP 4.01 EA: This policy will be adopted on account of the nature of the project. It will filter the individual subprojects by OP 4.01 and divide into appropriate environment type. The technical guideline on "formation and implementation of EIA and environment management plan/cutting measures, including standards and code of environmental behavior adopted by contractor" will be incorporated into the workbook.
2. OP/BP 4.11 material cultural resource: All sub-items of this project are completed livestock farms. In case that extension of some subprojects are found to contain reconstruction or protection of historical or archeological sites, such subprojects need to be provided with material culture resource management plan as an internal part or an independent report. It will review

the environment assessment/environment management plans of all subprojects to determine its potential influence on the material culture resources and incorporate these procedures into all standard bidding documents so as to handle with the opportunity discovery problems that occur during the construction process. A technical guideline concerning "formation and implementation of material culture management plan" will be integrated into the workbook.

3. *Environment, Health and Safety Guidelines for Mammalian Livestock Feeding Field* (briefly EHS Guidelines for Mammalian Livestock Feeding Field): Information involved in EHS Guidelines for Mammalian Livestock Feeding Field such as waste management, waste water, atmospheric emission, hazardous material management, ecological impact, animal disease and occupational health and safety is applicable to this project and will be taken into the workbook.

1.5 Solutions to Environment Safety Control Problems

The environment management framework will used to direct the formation and standard-reaching of environment management plan in implementation of subprojects. Since such subprojects will be confirmed and get loan in succession during project's implementation, the measures for screening, cutting and management of potential environmental impact will be made according to the agreed screening and assessment framework for environment safety control.

Steps

Formation and implementation of subproject selection, environmental impact alleviating and management measures will be conducted by the following steps, as detailed in flow chart in Figure 1:

Step 1: Recognize subprojects according to selection standard and principles;

Step 2: The technical expert group of provincial PMO reviews and filters the list

(Attached list 8) to determine subprojects;

Steps: The technical expert group of subproject selects some mode and offers proposals based on the farm site, scale and current conditions of the subproject;

Step 4: Place corresponding environmental requirements on three modes;

Step 5: Place management requirements on three modes;

Step 6: Report to the provincial PMO and file documents;

Step7: Go through internal review and approval by WB;

Step8: Put the agreed action, supervision, monitor and assessment into practice.

Step 1 Identify subprojects according to selection standard and principles

Firstly identify the newly added subprojects according to the requirements in Attached List 1 Subprojects Screening and Check List. The standards have been expounded in the section on selection of subprojects. According to such standards, the subprojects should (1) meet the first requirement about site selection in Attached List 1. Failure to do so will result in disqualification of subproject of WB; (2) possess corresponding certificates and qualifications; (3) all meet requirements on livestock farm; (4) have relevant process with public participation. In step 1, the identification and selection of subprojects should be involved by environmental experts/consultant experts of provincial PMO. They will make assessment on the subprojects and throw into work to optimize concept of subproject and reduce the environmental impact. Attached List 1 has given guidelines on preliminary screening to determine the above-mentioned issues.

Step 2: The technical expert group of provincial project management office reviews and filters the list to determine subprojects;

Technical experts will filter each subproject to determine the applicable laws and regulations of the state and WB. Once identified and confirmed, the subprojects will be reported to provincial PMO, with the relevant documents being filed.

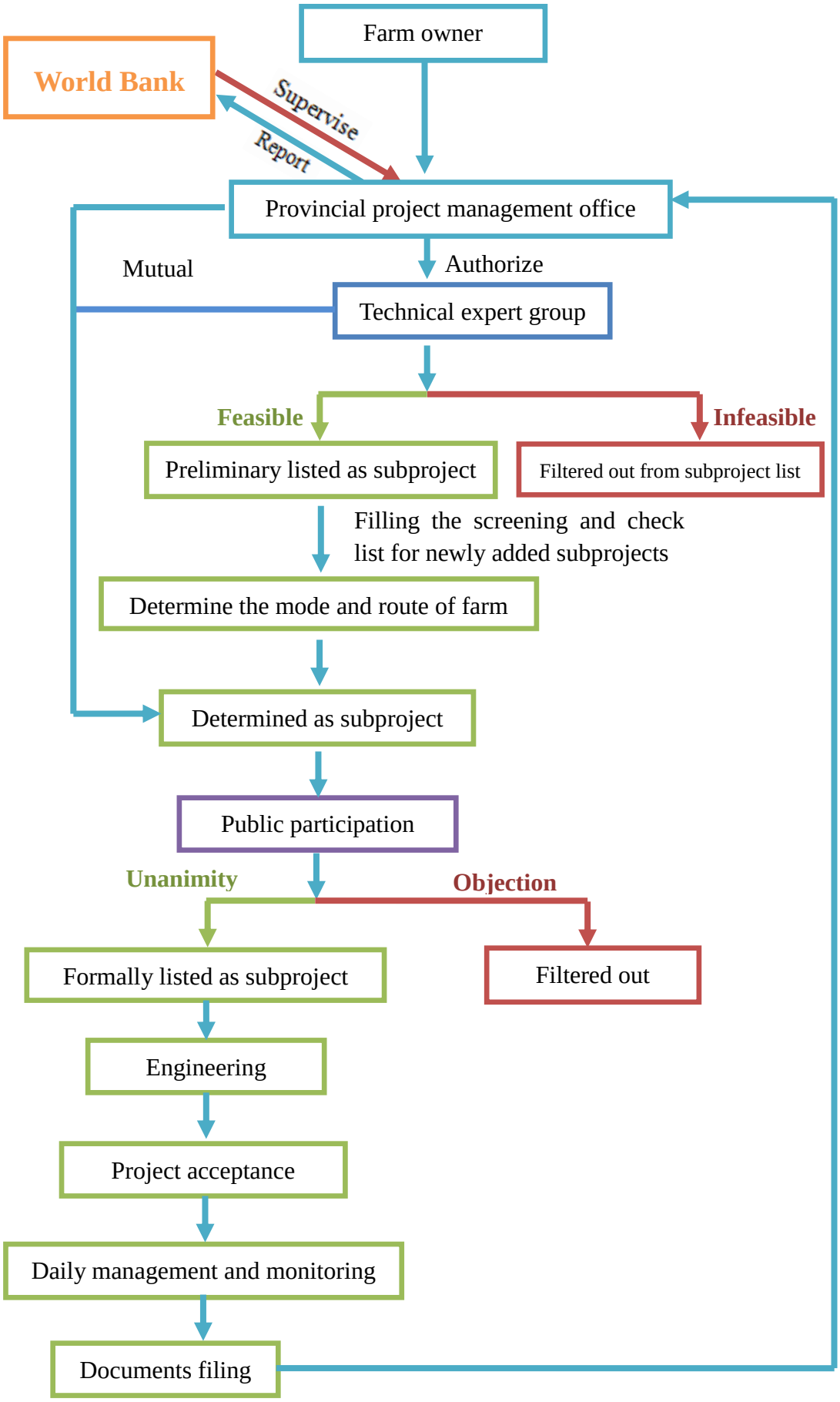


Figure 1 Flow chart for adding livestock farms in project

Step 3: The technical expert group of subproject selects some mode and offers proposals based on the farm site, scale and current conditions of the subproject;

Once the subproject is determined, the technical experts will select one mode from energy environmental protection mode, ecological energy mode and the new type high-bed fermentation mode according to the farm site, scale and current conditions of the subproject. Since the three modes have different requests for farm site, processing technology and wastewater discharge standard, the result of site survey and current condition of the livestock farm (for example: Is there farmland, mountain forest, fruit forest, fishpond, aquatic plant pond and other facilities to digest pollutants surrounding it) will be considered to determine the appropriate mode for subproject. After the route is drafted preliminary, the proposal will be submitted to provincial PMO to determine the final breeding mode.

An information publication, negotiation and complaint handling process should be added to the above.

Information publication and negotiation

Information disclosure and public negotiation is significant and essential for preparation and implementation of subproject. Such process enable the affected populations and other interest parties to participate in planning and implementation of the subproject and make certain contribution, thus to minimize its adverse influence and achieve maximum benefit. Level of public negotiation and coverage of information publication should correspond to the environment type and seriousness of the social impact.

Information to be disclosed should comprises the following at least： Design and influence of subprojects and proposed alleviating measures. In the phase of project design and implementation, the above information should be timely updated and continually reported to interested parties. And the information can be disclosed in several ways such as poster, handbook, newspaper, internet and community meeting. All of the safety control documents should be disclosed at a public place easily

approached by affected populations and other interested parties before the negotiation begins in order to lay a foundation for it. The mechanism related to such disclosure and negotiation should be planned and specified in relevant safety control documents.

Complaint handling

If the affected individuals and organizes think that they are not treated properly in this project, it is necessary to establish a complaint handling mechanism to achieve a reasonable concern. Such mechanism should include: (1) Record and report system, including written and oral complaint; (2) being in charge of personnel designate by all levels of governments; (3) time limit for handling complaint. Besides, the mechanism will be specified in the safety control documents of the subproject. During implementation of the project, the PMO will carry out regular monitoring and assessment on execution of the complaint handling mechanism.

Step 4: Place corresponding environmental requirements on three modes;

Different environmental alleviating measures may be required for three modes owing to their difference in processing technology. The details of their corresponding environmental codes of practice have been given in Appendix 4. Such environmental alleviating measures are made with the purpose of slowing environmental impact made by the project in construction and operation period.

Step 5: Place management requirements on three modes;

Place the respective management requirements on different modes of disposing farm wastes.

Step 6: Report to the provincial project management office and file documents;

File the related information of the confirmed subprojects, including approval of EIA, relevant qualification and screening and check list for subprojects.

Step 7: Go through internal review and approval by World Bank;

The provincial PMO should be responsible for reviewing in accordance with national

regulations and approving the environment files.

WB has expresses the following requirements on review and approval of the environment files:

Category project: the simplified EIA of category B project (or report on EIA) and the environment management plan do not need to go through the review and approval procedure of WB before the subproject is approved.

Step 8: Put the agreed action, supervision, monitor and appraisal into practice.

Implementation

The developer of subproject should be responsible for executing the safety control measures in implementation period.

Supervision and inspection

The provincial PMO should be responsible for supervising the implementation of environment management plan and the social security related actions approved by governments and WB. The project group of WB will visit the project areas regularly in implementation period of the project, with the aim to:

1、Direct and assist to prepare safety control tools;

2、Review the screening results, examination report and safety control documents;

3、Supervise execution of safety control tools to determine whether it is conforming to the policies of WB.

Monitoring and appraisal

The provincial PMO will call in qualified and experiences consultant experts to monitor the plan, thus to get some critical information on the environment and effectiveness the alleviating measures. This is meaningful for the government and WB to make appraisal on the performance of environmental plan and take corrective actions when necessary. For the subprojects that need to prepare relocation action plan, the provincial PMO will employ acceptable third-party independent consultant experts

from WB to conduct external monitoring on implementation of the plan. The report of external monitor will be submitted to WB and provincial PMO. The details of monitoring and appraisal are provided in the monitoring plan.

Chapter 2 Organizational Arrangement

When making the above mentioned environmental and social alleviating plan, organizations should take roles and responsibilities as below:

Environmental impact screening:

With the assistant of professionals and/or qualified consultant experts, the provincial PMO will conduct environmental screening to each planned subproject and WB will review the screening result based on the nature of subproject, impact type and scale.

Supervision and inspection: the provincial PMO will be responsible for providing directions on planning and implementation of safety control measures. The provincial and municipal technical departments will provide technical guidance, supervision and technical ability support to their counterpart department at county level.

General responsibility: the provincial PMO will be responsible for compiling and implementing the environment management plan for the project while WB will provide support by regular inspection and training.

Supervision, monitoring and appraisal: Guangdong Provincial Government will be wholly responsible for supervision, monitoring and appraisal on implementation of safety control documents. And the provincial PMO will plan, organize and direct the supervision, including appointing external environmental and social monitoring team.

Chapter 3 Capacity Building

Building local capacity is very critical to implementation of the above safety control activities. As for the local organizational arrangement, the local governments, especially county-level government should give effective support to the local capacity building to make their due responsibility fulfilled.

Capacity building concerning environment involves three aspects:
Firstly, the provincial PMO will determine the personnel demands at all levels and put forward suggestions on additional personnel;

Secondly, with support of WB, the provincial government will establish a series of planning, implementation tools and guidelines by modifying and updating the technical guidelines formulated in the environment management framework during the period of project appraisal. And such materials will be used for training in implementation period and reference of technician;

Thirdly, set out and implement training projects for environmental staff within scope of the project. And this task should be prioritized.

Attached List 1 Check List for Public Supporting Project Construction

No. Contract No. and name:

Project name: Copy:

Current construction stage: Reviewed by: Date:

Check item	Implemented or not			Remarks/recommended actions
	Yes	No	N/A	
1. Check before commencement				
1.1 Have you employed construction team?				
1.2 Has construction site been arranged and whether the construction mechanism is in normal condition?				
1.3 Do the constructors have Temporary Pass and wear them when going in and out?				
1.4 Is there project publicity tables posted at and surrounding the construction site?				
1.5 Have the construction protective equipments been prepared such as respirator, earplug, arcing protection glasses?				
1.6 Are the materials being used environment-friendly and nontoxic?				
1.7 Others (please specify)				
2. Air pollution control				
2.1 Is the construction site watered to reduce dust in dry condition?				
2.2 Have the vehicles transporting powder materials been covered and cleared before				

Check item	Implemented or not			Remarks/recommended actions
	Yes	No	N/A	
leaving the construction site?				
2.3 Have the dusty roads been water to reduce dust?				
2.4 Has it confirmed that the water used to reduce dust will not affect surface flow or the local community?				
2.5 Are the yards stacking powder materials being covered or watered to reduce dust; and are if the bags of cements are unpacked in a sheltered area?				
2.6 Have the transported goods are covered properly and lashed securely during transportation?				
2.7 Has the effect wind direction been considered when selecting places to pile materials?				
2.8 Is there any anti-wind and dust-controlling measures taken when piling the construction materials?				
2.9 If the construction vehicles runs within speed limits?				
2.10 Are the residual powder materials cleared from the road when the piled materials are removed?				
2.11 Others (please specify)				

Check item	Implemented or not			Remarks/recommended actions
	Yes	No	N/A	
3. Water pollution control				
3.1 Is the drain tank being cleared regularly?				
3.2 Is the domestic wastewater and equipment cleaning waste water being discharged into municipal pipe?				
3.3 Is the waste water treatment system (such as sedimentation tank) at construction site working and maintained normally?				
3.4 Do the constructors clean equipments before constructors leaving the construction site?				
3.5 Others (please specify)				
4. Noise pollution control				
4.1 Do the constructors comply with the laws and regulations relating to noise during construction?				
4.2 Is there a valid CNP provided during noise prohibited or limited period?				
4.3 Are the noise-making equipments placed in a closed room in running time?				
4.4 Are there low-noise equipments to be applied in construction period?				
4.5 Is the construction conducted in specified working hours so as to reduce noise				

Check item	Implemented or not			Remarks/recommended actions
	Yes	No	N/A	
pollution?				
4.6 Does the contractor maintain the construction equipments and try their best to keep it at best working condition and lowest noise level?				
4.7 Are the unused facilities at the construction site in off or energy-saving and vibration-controlling state?				
4.8 Have you got approval of relevant departments and conducted construction in specified period when in need of night construction?				
4.9 Others (please specify)				
5. Solid waste management				
5.1 Has a unit possessing environmental service qualification certificate been selected for solid waste treatment?				
5.2 Is the construction site in clean and tidy condition?				
5.3 Do you clear and classify the construction waste, reclaimable waste, general trash etc at the stacking yard periodically?				
5.4 Is there any greasy dirt spilling out during construction and if the polluted soil is				

Check item	Implemented or not			Remarks/recommended actions
	Yes	No	N/A	
cleaned timely?				
5.5 Are the residual wastes at the construction site removed timely and disposed properly after completion of the project?				
5.6 Is the domestic garbage transported by covered containers or tracks to designated garbage disposal places?				
5.7 Is there adequate area at the construction site for temporary storage of solid wastes?				
5.8 Others (please specify)				
6. Staff health and safety management				
6.1 Are there fire equipment equipped at camp, on-site facility and construction area?				
6.2 Are the machine operators and vehicle managers provided with operation certificate?				
6.3 Is the construction camp equipped with sufficient fire fighting equipments, fire hoses and hydrants for fire protection purpose?				
6.4 Do the constructors wear respirator, earplug, arcing protection glasses when necessary?				
6.5 Others (please specify)				

Attached List 2 Check List for Project Construction for Demonstration Base of Water and Fertilizer Integration

No. Contract No. and name:

Project name: Copy:

Current construction stage: Checked by: Date:

Check item	Implemented or not			Remarks/recommended action
	Yes	No	N/A	
1. Check before commencement				
1.1 Have you employed construction team?				
1.2 Is the construction site located at or near water source conservation area or other sensitive area?				
1.3 Has construction site been arranged and is the construction mechanism in normal condition?				
1.4 Is there project publicity tables posted at and surrounding the construction site?				
1.5 Have the construction protective equipments been prepared such as respirator, earplug, arcing protection glasses?				
1.6 Are the materials being used environment-friendly and nontoxic?				
1.7 Others (please specify)				
2. Air pollution control				
2.1 Is the construction site watered to reduce dust in dry condition?				
2.2 Have the vehicles transporting powder				

Check item	Implemented or not			Remarks/recommended action
	Yes	No	N/A	
materials been covered and cleared before leaving the construction site?				
2.3 Have the dusty roads been water to reduce dust?				
2.4 Has it confirmed that the water used to reduce dust will not affect surface flow or the local community?				
2.5 Are the yards stacking powder materials being covered or watered to reduce dust; and are if the bags of cements are unpacked in a sheltered area?				
2.6 Have the transported goods are covered properly and lashed securely during transportation?				
2.7 Has the effect wind direction been considered when selecting places to pile materials?				
2.8 Is there any anti-wind and dust-controlling measures taken when piling the construction materials?				
2.9 Are the residual powder materials cleared from the road when the piled materials are removed?				
2.10 Others (please specify)				
3. Others (please specify)				

Check item	Implemented or not			Remarks/recommended action
	Yes	No	N/A	
3.1 Are the mechanical equipments checked and overhauled for oil and water leakage before use?				
3.2 Is the waste water treatment system (such as sedimentation tank) at construction site working and maintained normally?				
3.3 Do the constructors clean equipments before constructors leaving the construction site?				
3.4 Is the water from foundation pit excavation drained to the drainage channels?				
3.5 Others (please specify)				
4. Noise pollution control				
4.1 Do the constructors comply with the laws and regulations relating to noise during construction?				
4.2 Are there low-noise equipments to be applied in construction period?				
4.3 Does the mechanical equipment that makes lots of noise have base damping, shock mount and damping materials?				
4.4 Is the construction period arranged reasonably to avoid several large noisy machines working at the same time at a construction site?				
4.5 Is the construction conducted in specified				

Check item	Implemented or not			Remarks/recommended action
	Yes	No	N/A	
working hours so as to reduce noise pollution?				
4.6 Does the contractor maintain the construction equipments and try their best to keep it at best working condition and lowest noise level?				
4.7 Are the unused facilities at the construction site in off or energy-saving and vibration-controlling state?				
4.8 Others (please specify)				
5. Solid waste management				
5.1 Is the construction site in clean and tidy condition?				
5.2 Do you clear and classify the construction waste, reclaimable waste, general trash etc at the stacking yard periodically?				
5.3 Is there any greasy dirt spilling out during construction and if the polluted soil is cleaned timely?				
5.4 Are the residual wastes at the construction site removed timely and disposed properly after completion of the project?				
5.5 Is the domestic garbage transported by covered containers or tracks to designated garbage disposal places?				

Check item	Implemented or not			Remarks/recommended action
	Yes	No	N/A	
5.6 Is there adequate area at the construction site for temporary storage of solid wastes?				
5.7 Others (please specify)				
6. Ecological environment management				
6.1 Is there any measures taken to recover the destroyed ecological plan species?				
6.2 Are exposed side slope and soils recovered and revegetated in time and are the finished areas fully-recovered to achieve stability of side slope as well as completeness of soils?				
6.3 Are the areas temporarily occupied by construction recovered and farmed after completion of construction?				
6.4 Others (please specify)				
7. Staff health and safety management				
7.1 Are there fire equipment equipped at camp, on-site facility and construction area?				
7.2 Are the machine operators and vehicle managers provided with operation certificate?				
7.3 Do the constructors wear respirator,				

Check item		Implemented or not			Remarks/recommended action
		Yes	No	N/A	
	earplug, arcing protection glasses when necessary?				
7.4	Are there safety fences and safety warning marks prepared around the storage pool of organic fertilizers to prevent people and animals falling into it?				
7.5	Others (please specify)				

Attached List 3 Notice on Environmental Rectification

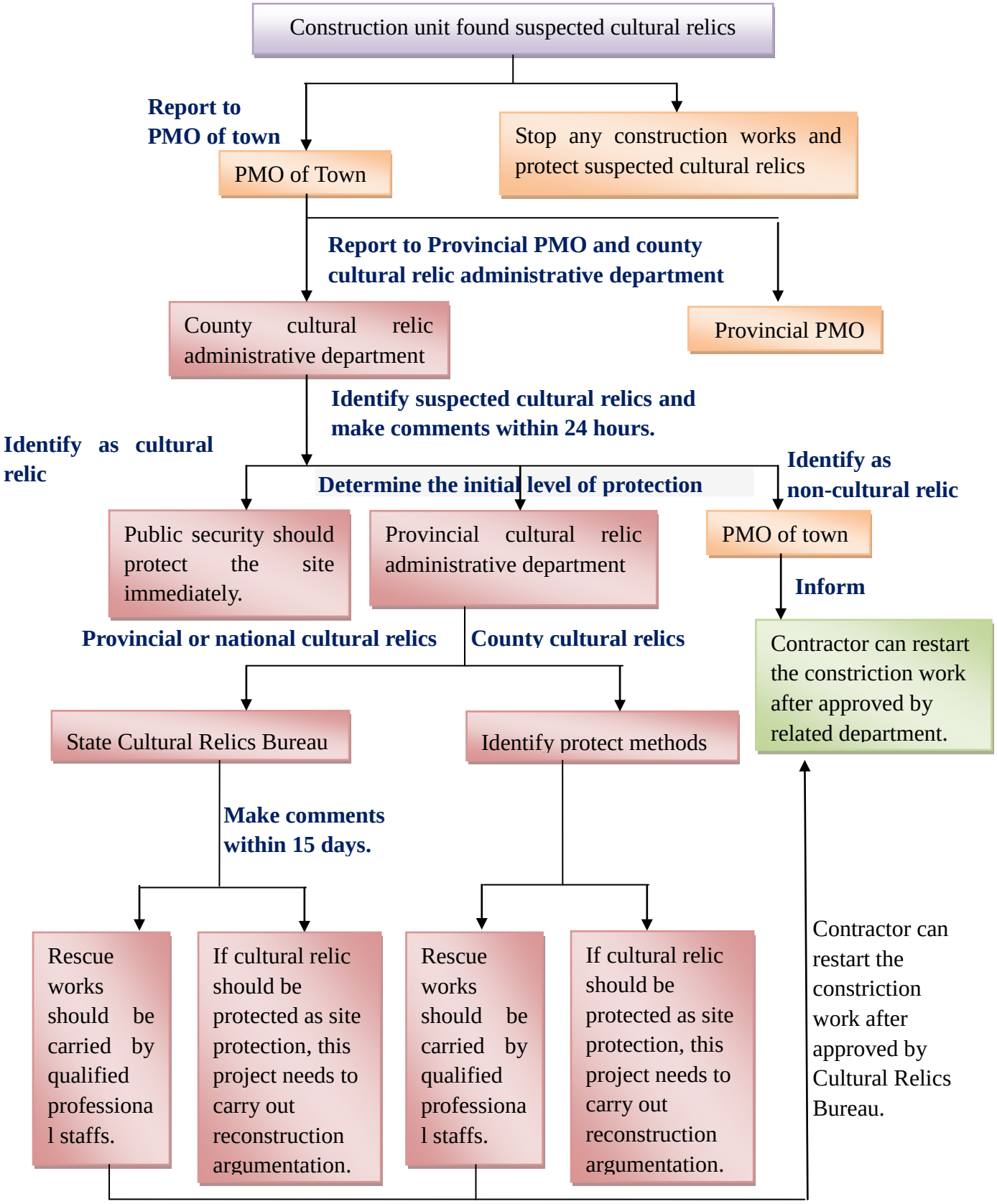
No.: Contract No. and name:

Project name: Copy:

Current construction stage: Date:

Problems discovered in on-site inspection:
Analyzed cause and improvement measure:
Rectification comments proposed by environmental authorities (when necessary):
Environment checker: Date: Time limit for rectification: complete within days Accepter: Date:
Conclusion of recheck: Rechecked by: Date:

Attached List 4 Cultural relic emergency preplan flow chart



Attached List 5 Minimum Parameters List for All Stages of "Ecological Energy Type" Waste Treatment for Large-Scale Pig Breeding Farms

Type of pig farm	Scale (pig)	Manure cleaning technology	Effective volum	Volume of sewage sump		Matched farm land (mu)						
					Single-cropping rice	Vegetable	Sugarcane	Shatian Pomelo	Banana	Clover	Tobacco	Eucalyptus, green belt
Poker farm (Annual output)	100	Dry	10	44	25	8	8	5	18	18	15	30
		Water rinsing		84								
		Water		22								
	500	Dry	50	216	125	40	40	25	90	90	75	150
		Water rinsing		420								
		Water		110								
	1000	Dry collection	100	432	250	80	80	50	180	180	150	300
		Water rinsing		840								
		Water		220								
	3000	Dry	300	1296	750	240	240	150	540	540	450	900

Type of pig farm	Scale (pig)	Manure cleaning technology	Effective volum	Volume of sewage sump		Matched farm land (mu)						
					Single-cropping rice	Vegetable	Sugarcane	Shatian Pomelo	Banana	Clover	Tobacco	Eucalyptus, green belt
		Water rinsing		2520								
		Water		660								
	5000	Dry	500	2160	1250	400	400	250	900	900	750	1500
		Water rinsing		4200								
		Water		1100								
Piglet farm (Number of sow)	100	Dry	30	480	125	40	40	25	90	90	75	150
		Water		240								
	300	Dry	90	1440	375	120	120	75	270	270	225	450
		Water		720								
	500	Dry	150	2400	625	200	200	125	450	450	375	750
		Water		1200								
	1000	Dry	300	4800	1250	400	400	250	900	900	750	1500

Type of pig farm	Scale (pig)	Manure cleaning technology	Effective volum	Volume of sewage sump		Matched farm land (mu)						
					Single-cropping rice	Vegetable	Sugarcane	Shatian Pomelo	Banana	Clover	Tobacco	Eucalyptus, green belt
		Water		2400								
Homebred pig farm (annual output)	1000	Dry	115	672	315	100	100	65	225	225	190	380
		Water rinsing		1080								
		Water		340								
	3000	Dry	345	2016	945	300	300	195	675	675	570	1140
		Water rinsing		3240								
		Water		1020								
	5000	Dry	575	3360	1575	500	500	325	1125	1125	950	1900
		Water rinsing		5400								
		Water		1700								
	10000	Dry collection	1150	6720	3150	1000	1000	650	2250	2250	1900	3800

Type of pig farm	Scale (pig)	Manure cleaning technology	Effective volum	Volume of sewage sump		Matched farm land (mu)						
					Single-cropping rice	Vegetable	Sugarcane	Shatian Pomelo	Banana	Clover	Tobacco	Eucalyptus, green belt
		Water rinsing		10800								
		Water		3400								

Attached List 6 Reference Values for Daily Outputs of Pig Feces

Sort	Manure kg/（pig·d）	Urine kg/（pig·d）	Raising cycle （d）
Pig	2.0	3.3	199

Attached List 7 Mass Concentration of Pollutants in Pig Farm Waste Water

mg/L（not include pH value）

Manure cleaning method	CODcr	NH_3-N	TN	TP	pH value
Water rinsing	1.56×10^4~4.68×10^4 Average 21600	1.27×10^2~1.78×10^3 Average 590	1.41×10^2~1.97×10^3 Average 805	3.21×10~2.93×10^2 Average 127	6.3~7.5
Dry collection	2.51×10^3~2.77×10^3 Average 2640	2.34×10^2~2.88×10^3 Average 261	3.17×10^2~4.23×10^2 Average 370	3.47×10~5.24×10 Average 43.5	

Attached List 8 Screening and Check List for New-added Livestock Waste Management Project

Date: No.:

Farm owner: Contact information:

Farm name: Farm address:

Questions	Answer		Verification
	Yes	No	
I. Site selection requirements			
1. Is the livestock farm a completed project?			□
2. Does the farm satisfy the requirements of not building within prohibited areas? (prohibited areas include: drinking water source protection area, scenic spot, core and buffer area of natural reserve; residential area in city and town-cultural education and scientific research district, medical treatment district, commercial district, industrial park, scenic spot and other densely inhabited areas; prohibited area defined by local people's governments at the county level according to law; other districts under special protection according to state or local laws and regulations.			□
3. When near the prohibited area, is it located in the downwind or crosswind areas of the prevailing wind direction of the prohibited-construction areas?			□
4. Is the minimum distance between borders of farm and prohibited area greater than 500m?			□
5. Is it satisfies that the there should no livestock farm built near environmentally disastrous area, animal epidemics-prone area or market and trading market (within 2000 meters)?			□
6. Is the livestock farm distanced more than 1000m from major transportation roads and railways?			□
7. Is the livestock farm distanced more than 2000m from residential			□

areas and other farms?			
8. Is the livestock farm distanced more than 500m from the sewage outlet in residential area?			□
9. Is the livestock farm distanced more than 1000 m from the drinking water source?			□
10. Is the livestock farm located in good engineering geological conditions?			□
11. Does the livestock farm waste water satisfy the requirements of not draining into sensitive water areas and water areas with special functions?			□
II. Certificate and qualification			
1. Does the land of livestock and poultry farm conform to the overall plan for land utilization of the town and goes through land contract (sub-contract) and relevant formalities?			□
2. Does the livestock farm obtain EIA documentation formulated by qualified EIA organizations and approval of competent department of EP administration with approval right before construction?			□
3. Does the livestock farm obtain a Permit for the Production and Business Operation of Breeding Livestock and Poultry which is approved and issued by administrative department for animal husbandry and veterinary under people's government above county level?			□
4. Is the livestock farm filed by administrative department for animal husbandry and veterinary under people's government at county level and does it obtain livestock and poultry identification and *Certificate of Animal Epidemic Prevention Conditions*?			□
III. Farm conditions			
1. Does the annual average pig number of livestock farm reach 3000?			□
2. Does the livestock farm have convenient transportation, water and			□

power supply conditions?			
3. Does the livestock farm keep room for extension used for construction of pollution treatment projects of livestock and poultry farm?			□
4. Does the livestock farm have ability and promise to make available the self-raised funds (taking 35% of the total investment of project)?			□
IV. Public participation			
1. Has the provincial PMO invited environmental experts to inspect the farm site and make full understanding on its current situation (including the pollution control facilities and digestion area?			□
2. Has the provincial project management office carried out public participation work, such as publicity, visiting and issuing public participation survey?			□
3. Does the surrounding public support building farm?			□
V. Related parameter of modes			
1. Current scale (pig number) is	Pig		□
2. The total area of pollutant-digestive farmland surrounding the farm is	m^2		□
3. The total area of pollutant-digestive forest surrounding the farm is	m^2		□
4. The total area of pollutant-digestive fishpond surrounding the farm is	m^2		□
5. The total area of pollutant-digestive aquatic plant pond surrounding the farm is	m^2		□
6. Is it guaranteed that the right to use farmland, forest, fruit forest, fishpond and aquatic plant pond surrounding the farm belongs to the farm before 2020?	Yea	No	□
VI. Mode confirmation			
Expert group suggests that the farm is suitable to adopt: □Not incorporated into the project □Energy environmental mode			

□Ecological energy mode □New type “High-bed fermentation” raising mode Other comments of expert group:
Signature of head of expert group:_____ Date: _____ Signature of principal of provincial PMO_____ Date: _____

Note: The “answer” section should be filled by the farm owner; once “No” is filled in this section, the livestock farm will lose its qualification to WB project. “Verification” section will be checked by the project management office after on-the-spot verification completed.

Attached List 9 Public Opinion Polls (1) on Environmental Impact Assessment for Guangdong Agricultural Non-point Source Pollution Control Project Loaned by World Bank

Name	Sex	Age	Nationality	Education degree
Address	Post	Occupation	Name of specialized cooperative/farm	

This project has three construction focuses: pesticide and chemical fertilizer pollution and farm waste pollution. The demonstration sites for pesticide and chemical fertilizer pollution control are concentrated in Huizhou and Jiangmen City, involving 30 towns and 500,000 mu farmland, and there chemical pollution control demonstration project and pesticide reduction project are mostly conducted. As for the demonstration sites for livestock and poultry waste control, they are focused in Huizhou, Jiangmen and Heyuan, with some other districts involved. It plans to manage 300 large-scale farms and will project is expected to be completed within 5 years (2014-2018)

1. Do you know anything about this project?	Yes	Ever heard of it	No	
2. How do you get information on this project?	Bulletin board	Television/newspaper/internet	local residents	Other
3. What's your attitude to this project?	Agree	Disagree	Not sure	
4. How do you think about location of the project?	Reasonable	Unreasonable	Not sure	
5. What impact do you think will the project construction have on the local economic development?	Boosting	Hindering	No impact	Not sure
6. Which aspect do you think will be affected mostly by the project construction?	Water environment	Atmospheric environment	Ecological environment	Other
7. Which aspect do you think the major	Reducing pollution	Reducing energy consumptio	Improving product quality	

environmental benefits of the project are seen in?		n		
8. What is the biggest benefit to you and the locals after project construction starts?	Income rising	Environment improvement	Food security	
9. Are you satisfied at the local environment quality?	Yes	No	Not sure	
10. What do you think is the most dominating environmental problem in local place?	Water pollution	Atmospheric pollution	Noise	Ecological damage
11. What do you think is the most dominating environmental problem of present farmland/vegetable farm?	Pesticide pollution	Over fertilization	Land Salinization	Other
12. What problem do you want most to solve in current agriculture production?	Fine breed source	Production cost	Production technology	Product sales
13. What do you think will happen to the output of food crops after implementation of the project?	Increase	Cutting	Stay the same	Not sure
14. How do you think about the local agricultural and water conservation irrigation facilities?	Very complete	Inadequate	There is no EP facility	
15. Have you mastered the related skills on construction and maintenance of farm irrigation	Skillful	Have basic skills	Have no skill	

system?				
16. Do you want to participate in whole process of engineering design, construction and implementation if the farm irrigation system is designed locally?	Yes	No	Not sure	
17. Have you ever attended in training on agricultural knowledge?	Never	1~2 Times	3~5times	Above 5 times
18. What pattern do you use to grow plants?	Totally artificially planting	Artificial planting+ a little agricultural machinery	Agricultural machinery + a little artificial planting	Totally agricultural machinery
19. What kind of chemical fertilizer do you use?	Farmyard manure	Complex trace elements fertilizer	Soil testing and formulated fertilization.	Mixed fertilization
20. How do you select chemical fertilizer and pesticide?	By recommendation of agricultural technician	By recommendation of dealer	By experience (or neighbor's recommendation)	Referring to labels (advertisements)
21. How do you acquire chemical fertilizer and pesticide?	Pesticide store	Manufacturer selling	Street vendor	
22. How do you determine the dosage of chemical fertilizer and pesticide?	Seeking advice from someone have used	By experience	Referring to label	By guidance of agricultural technician
23. How do you determine the use frequency of chemical fertilizer and pesticide?	By experience	Referring to label	By guidance of agricultural technician	By recommendation of dealer
24. How many times do you use pesticide for each phase of crop?	1~2times	3~4times	5~6 times	Above 6times
25. What kind of	Hand-powere	Knapsack	Electric	Unified

crop-spraying method do you use?	d sprayer	sprayer	sprayer	prevention and control company
26. How do you dispose pesticide bottle and mulch after use?	Throw by fields	Throw in garbage can	Burning/landfilling	Other
27. What do you think we need to mainly strengthen by next step to ensure successful implementation of the project?	Publicity and education	Training	Organization and implementation of monitoring and appraisal	Other
28. Do you have any advice and suggestion on the project construction and EP?				
29. Is there any difficulty and expectation in projection implementation and construction?	Discuss from aspects of EP facilities, training guidance, funding etc.			

Note: This table is applicable to pesticide and chemical fertilizer pollution control project

Attached List 10 Public Opinion Polls (2) on Environmental Impact Assessment for Guangdong Agricultural Non-point Source Pollution Control Project Loaned by World Bank

Name	Sex	Age	Nationality	Education degree
Address	Post	Occupation	Name of specialized cooperative/farm	

This project has three construction focuses: pesticide and chemical fertilizer pollution and farm waste pollution. The demonstration sites for pesticide and chemical fertilizer pollution control are concentrated in Huizhou and Jiangmen City, involving 30 towns and 500,000 mu farmland, and there chemical pollution control demonstration project and pesticide reduction project are mostly conducted. As for the demonstration sites for livestock and poultry waste control, they are focused in Huizhou, Jiangmen and Heyuan, with some other districts involved. It plans to manage 300 large-scale farms and will project is expected to be completed within 5 years (2014-2018)

1. Do you know anything about this project?	Yes	Have heard of it	No	
2. How do you get information on this project?	Bulletin board	Television/newspaper/internet	local residents	Other
3. What's your attitude to this project?	Agree	Disagree	Not sure	
4. How do you think about location of the project?	Reasonable	Unreasonable	Not sure	
5. What impact do you think will the project construction have on the local economic development?	Boosting	Hindering	No impact	Not sure
6. Which aspect do you think will be affected mostly by the project construction?	Water environment	Atmospheric environment	Ecological environment	Other
7. Which aspect do you think the	Reducing pollution	Reducing energy	Improving product	

major environmental benefits of the project are seen in?		consumption	quality	
8. What is the biggest benefit to you and the locals after project construction starts?	Income rising	Environment improvement	Food security	
9. Are you satisfied at the local environment quality?	Yes	No	Not sure	
10. What do you think is the most dominating environmental problem in local place?	Water pollution	Atmospheric pollution	Noise	Ecological damage
11. What do you think is the most dominating environmental problem in the livestock farm currently?	Mosquitoes band flies	Fecal pollution	Water pollution	Air pollution
12. What is your present raising scale (pig number)?	3000-5000	5000-10000	10000-15000	Above 15000
13. Do you have any plan for the farm within the next 5 years?	Remain the same	Extension	Dismantling	No plan
14. Do you have Guangdong Pollutant Discharge Permit?	Yes	No	Never heard of that	
15. Do you adopt any ecological breeding mode currently, such as building biogas digester and solid-liquid separator?	Yes, I have a set of equipments	Yes, I have some equipments	没 No	
16. Do you think the	Very	Inadequate	There is no EP	

	current EP facilities of the livestock farm are complete?	complete		facility	
17.	Have you mastered all EP skills in livestock raising process?	Skillful	Having basic skill	Have no skills	
18.	How do you get your breeding skills?	Learn by myself	Learn from training course	Learn from other farmers	
19.	How do you get feeds?	Self-made	Manufacturer selling	Feed store	
20.	How do you dispose the dumped feeds and packaging materials?	Burning/land filling	Transported after collection	Discard directly	
21.	How do you dispose the livestock carcass?	Biogas incineration	Discard directly	Buried in deep pit	Other
22.	How do you dispose the animal dung and sewage in the farm?	Dump and discharge at will	Recycle in biogas digester	Make it of organic fertilizer	Other
23.	Are there ditch and other guiding devices surrounding the farm to guide clean runoff?	No	Yes, but not consecutive	Yes	
24.	Are there conditions to digest pollutants surrounding the farm?	There is economic forest	There is farmland	Economic forest + farmland	No
25.	What is the current area for farm waste digestion?	0	Less than 500mu	500~1000mu	More than 1000 mu
26.	Is it necessary to disinfect cars entering in the livestock farms?	Absolutely necessary	Not necessary	There is no disinfecting tank	
27.	What work do you think we need to mainly strengthen by next step to ensure successful implementation of	Publicity and education	Training	Organization and implementation of monitoring and appraisal	Other

the project?				
28. Do you have any advice and suggestion on the project construction and EP?				
29. Is there any difficulty and expectation in projection implementation and construction?	Discuss from aspects of EP facilities, training guidance, funding etc.			

Note: This table is applicable to livestock waste management project.

Attached List 11 Statistics of Respondents to Public Opinion Questionnaire (1)

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation/post
1	Li Nenghuo	Male	49	Senior high school	Heng'an Village Committee	Director
2	Liang Quanyou	Male	59	Senior high school	Heng'an Village Committee	Clerical assistant
3	Zhou Rujiao	Female	54	Senior high school	Dachang Village Committee	Clerical assistant
4	Zhou Renhao	Male	51	Senior high school	Dachang Village Committee	Director
5	Yan Shaoting	Male	50	Junior high school	Songbai Village, Longsheng Town	
6	Zhang Haihua	Male	38	Senior high school	Wucun Village, Longsheng Town	
7	Liang Jinghui	Male	38	Senior high school	Guandu Village, Longsheng Town	
8	Zhao Chengye	Male	45	Junior high school	Guandu Village, Longsheng Town	
9	Liang Genchang	Male	45	Junior high school	Panlong, Longsheng Town	
10	Tan Zhuoyun	Male	63	Junior high school	Qinghu Village, Chongkou	Farmer

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation/post
11	Zhu Weitang	Male	54	Senior high school	Yanggemier Village	Farmer
12	Liang Yongxin	Male	43	Senior high school	Longgang Village, Wapiankeng	Farmer
13	Chen Jian	Male	48	Junior high school	Xinlou Village, Shazhou	Farmer
14	Guan Haixin	Male	57	Senior high school	Laoya Village, Shazhou, Chishui Town, Kaibu	Farmer
15	He Wei	Male	59	Junior high school	Zecun Village, Lianhe, Cangcheng	Farmer
16	He Shunjing	Male	58	Junior high school	Shengshui Village, Lianhe, Cangcheng	Farmer
17	Su Xuejing	Male	54	Senior high school	Daluo Village, Cangcheng	Farmer
18	Zhu Xiawen	Male	50	Senior high school	Daluo Village, Cangcheng	Farmer
19	Liu Ronghui	Male	36	Junior high school	Liucun Village, Longhua Village	Farmer
20	Chen Huanqiu	Male	39	Junior high school	Huatang Village, Longhua Town	Farmer
21	Yang	Male	38	Junior high	Ninghe Village,	Farmer

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation/post
	Guisheng			school	Longhua Town	
22	Guan Jiakun	Male	40	Junior high school	Xuexi Village, Longhua Town	Farmer
23	Li Jiahe	Male	39	Junior high school	Longhua Town	Farmer
24	Li Runtian	Male	42	Junior high school	Liangqiao Village, Longhua Town	Farmer
25	Chen Peicong	Male	38	Senior high school	Xuri Village, Longhua Town	Farmer
26	Guan Jihui	Male	45	Senior high school	Xuexi Village, Longhua Town	Farmer
27	Gao Canjun	Male	35	Senior high school	Xincun Village, Changning Town	Company management
28	Xie Zhong	Male	52	Junior high school	Yangcun Town	
29	Zhu Yanwei	Male	47	Primary school	Yangcun Town	
30	Liao Qiaoxin	Male	42	Junior high school	Shuibian Village, Changning Town	Farmer
31	Zeng Youqiang	Male	41	Senior high school	Shixiatun, Daning, Boluo	
32	Yang Guigu	Male	34	Junior high school	Ninghe Village, Longhua Town	

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation/post
33	Hu Xinyuan	Male	49	Senior high school	Lugang, Shuikou	Farmer
34	Chen Zhixin	Male	48	Junior high school	Shangcun Village, Shuikou	Farmer
35	Hu Yongqiang	Male	30	Senior high school	Lugang, Shuikou	Farmer
36	Chen Guodai	Male	59	Primary school	Shangcun Village, Shuikou	Farmer
37	Hu Shiquan	Male	51	Junior high school	Lugang, Shuikou	Farmer
38	Hu Shunqiang	Male	40	Junior high school	Lugang, Shuikou	Farmer
39	Hu Tansheng	Male	56	Junior high school	Lugang, Shuikou	Farmer
40	Chen Zhenhua	Female	48	Junior high school	Shangcun Village, Shuikou	Farmer
41	Zhu Wenjie	Male	47	Senior high school	Hengli	
42	Luo Xiaohong	Female	45	Senior high school	Sengdong, Hengli	Clerical assistant
43	Luo Wanhua	Male	49	Senior high school	Maquan, Hengli	Clerical assistant
44	Qiu Ziqiang	Male	43	Senior high school	Keshu, Hengli	Clerical assistant
45	Zhang Guiliang	Male	51	Junior high school	Zhepu, Hengli	
46	Zhu Xianlan	Female	55	Junior high	Heiyuan, Hengli	

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation/post
				school		
47	Xu Congming	Male	54	Junior high school	Fuyuan, Hengli	
48	Chen Fuju	Male	53	Junior high school	Hengli	
49	Zhang Ruiping	Male	54	Junior high school	Shazhouwei, Ruhu Town	Farmer
50	Zheng Youliang	Male	59	Junior high school	Shazhouwei, Ruhu Town	Farmer
51	Li Zhixiong	Male	62	Primary school	Shazhouwei, Ruhu Town	Farmer
52	Chen Jiaquan	Male	57	Junior high school	Shazhouwei, Ruhu Town	Farmer
53	Lin Decai	Male	54	Junior high school	Nanhua, Ruhu Town	Farmer
54	Huang Jinlang	Male	58	Junior high school	Nanhua, Ruhu Town	Farmer
55	Huang Qiyou	Male	56	Junior high school	Nanhua, Ruhu Town	Farmer
56	Lin Rigang	Male	51	Junior high school	Nanhua, Ruhu Town	Farmer
57	Tao Enqi	Male	55	Senior high school	Pingtan Demonstration Farm	
58	Chen Qianchun	Female	43	Junior college education	Yangguang, Pingtan Town	

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation/post
59	Chen Huaqiang	Male	47	Junior college education	Hongguang, Pingtan Town	
60	Zhang Yupei	Male	52	Junior high school	Zhangxin, Pingtan Town	Village secretary
61	Yuan Wenou	Male	32	Junior college education	Xingang Village, Pingtan Town	Country doctor
62	Huang Naifa	Male	46	Junior high school	Xingang Village, Pingtan Town	Farmer
63	Zhong Jinwu	Male	43	Junior high school	Xingang Village, Pingtan Town	Farmer
64	Huang Lianguo	Male	48	Junior high school	Xingang Village, Pingtan Town	Farmer
65	Huang Guoxin	Male	53	Primary school	Xingang Village, Pingtan Town	Farmer
66	Zeng Yuzhu	Male	40	Junior college education	Fangkeng Village, Pingtan Town	Principal
67	Ruan Gao	Male	48	Senior high school	Yaocengdun, Guanghui	Village director
68	Lin Shiming	Male	54	Junior high school	Hongtang, Yonghu	

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation/post
69	Zhao Yong	Male	45	Senior high school	Xiner, Yonghu	
70	Zeng Qingliang	Male	51	Junior high school	Diaoli, Yonghu	
71	Xu Zhongtai	Male	43	Junior high school	Matou, Yonghu	
72	Ye Weiguang	Male	42	Junior high school	Matou, Yonghu	
73	Huang Yongping	Male	48	Junior high school	Yonghu	
74	Chen Gucun	Male	46	Junior college education	Shatian, Huiyang	Director
75	Lai Zhongsheng	Male	46	Junior high school	Xingrong Fruit and Vegetable Professional Cooperative	Cooperative manager
76	Lai Bolian	Male	49	Middle school	Shatian, Huiyang	Village head
77	Huang Yunlai	Male	40	Junior high school	Qianfeng, Liangjin Town	
78	Yang Weixiong	Male	45	Secondary vocational school education	Qianfeng, Liangjin Town	
79	Zeng Huayou	Male	49	Junior high school	Songzhi Village, Liangjin Town,	

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation/post
					Huiyang District	
80	Zhang Hui	Male	43	Senior high school	Liangjin Town, Huiyang District	Head of enterprise
81	Luo Shunlai	Male	52	Junior high school	Songzhi Village, Liangjin Town, Huiyang District	
82	Li Dongsheng	Male	35	Junior high school	Xingguang Village, Liangguang Town	
83	Tang Yuanliang	Male	49	Senior high school	Xinchun Group, Gaotian Village, Zhenlong Town	Farmer
84	Liu Yuehua	Female	55	Junior high school	Xintian Group, Gaotian Village, Zhenlong Town	Farmer
85	Ye Jincai	Male	56	Primary school	Zhenlong Town, Huiyang District	Farmer
86	Li Jiexia	Male	63	Primary school	Huangjiao Village, Naji Town	Farmer
87	Zhang Suhua	Female	41	Junior high school	Tanjiao Village, Naji Town	Farmer
88	Chen Guanhua	Female	72	Junior high school	Quantang	
89	Wu Minghui	Male	41	Junior high school	Zhelang Village, Tanglao Town	

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation/post
90	Feng Shudong	Male	67	Junior high school	Shanrengen Village	
91	Zhang Yaoquan	Male	52	Primary school	Micang	
92	Zhang Fengxian	Female	46	Junior high school	Langxin Village, Encheng Town	
93	Liang Huixian	Female	59	Junior high school	Lianzhuang, Dingchong	
94	Lan Peisheng	Male	55	Primary school	Micang, Encheng	
95	Xue Guosheng	Male	43	Senior high school	Jianfeng, Nanlian	
96	Feng Boquan	Male	45	Junior college education	Liyuan, Niujiang	Self-employed businessman
97	Lu Dongye	Female	44	Primary school	Jiucun Village, Liangxi Town	Farmer
98	Feng Lvchang	Male	55	Primary school	Yane Village, Liangxi Town	
99	Liang Guisen	Male	51	Primary school	Longshan Village, Liangxi Town	Farmer
100	Li Lihua	Female	56	Primary school	Gaobei, Liangdong Village	Farmer
101	Xu Keping	Male	54	Primary	Fuping, Liangxi	Farmer

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation/post
				school	Town	
102	Wu Xiaomei	Female	47	Primary school	Nawan Village, Liangxi Town	Farmer
103	Wu Chunfeng	Female	62	Junior high school	Wushi Village, Shahu Town	
104	Cen Huanqiang	Male	56	Primary school	Qixingtang, Naji	Farmer
105	Feng Guohui	Male	61	Senior high school	Huangnitan Village, Niujiang	Self-employed business man
106	Wu Jinshi	Male	55	Primary school	Wubian, Shahu Town	Farmer
107	Zhu Lvchang	Male	44	Primary school	Longshan Village, Liangxi Town	Farmer
108	Yu Lirong	Male	43	Junior high school	Hongshi Village, Liangxi Town	Grower
109	Huang Qijin	Male	43	Junior high school	Shahe Village, Naji Town	Farmer
110	Rong Jianwen	Male	39	Junior high school	Dalian Village, Naji Town	Farmer
111	Wu Shuqiang	Male	56	Junior high school	Gaoyuan	
112	Liang Yifan	Male	70	Junior high school	Tanjiao Village, Naji	Farmer

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation/post
113	Cen Jinyuan	Male	56	Primary school	Naxi, Naji	Farmer
114	Liu Hailiang	Male	41	Junior high school	Juhou Village, Shahu Town	Farmer
115	Yu Yingchao	Male	68	Junior high school	Nanping	
116	Wu Fahu	Male	65	Junior high school	Guancun Village, Shahu Town	Farmer
117	Li Weisen	Male	51	Primary school	Bianchong Village, Shahu Town	Farmer
118	Wu Guihuan	Male	54	Junior high school	Niujiang	Farmer
119	Zhan Huanrong	Male	55	Junior high school	Henglonggang, Shilian	
120	Wu Guangliang	Male	41	Senior high school	Chaoyang, Encheng	
121	Feng Qinrui	Male	55	Junior high school	Niujiang	Farmer
122	Feng Yinping	Female	53	Junior high school	Niujiang	Self-employed businessman
123	Feng Songxing	Male	57	Junior high school	Malongtang, Niujiang	Farmer
124	Wu Guokai	Male	47	Senior high	Pengchang,	Farmer

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation/post
				school	Niujiang	
125	Guo Ming	Male	70	Junior high school	Nabei, Naji	Farmer
126	Cen Huanling	Male	60	Primary school	Nabei, Naji	Farmer
127	Feng Boqiang	Male	48	Primary school	Liyuan, Niujiang	Farmer
128	Wu Huimei	Female	43	Primary school	Changmei, Niujiang	Farmer
129	Liang Jingmei	Female	42	Primary school	Dalian, Naji	Farmer
130	Yuan Wenfang	Female	52	Primary school	Huangjiao, Naji	Farmer
131	Wu Guoqing	Male	48	Junior high school	Niujiang	Farmer
132	Wu Lifang	Female	48	Junior high school	Xiyi, Shangkai	
133	Liang Zhaojie	Male	39	Junior high school	Qixingtang, Naji	Farmer
134	Li Jinming	Male	45	Junior high school	Long’antang, Liangxi	Farmer
135	Wang Jinlan	Female	36	Junior college education	Nawan, Liangxi	Grower
136	Cen Shunhai	Male	48	Primary school	Naxi, Naji	Farmer
137	Li Ruibin	Male	66	Primary	Huangjiao, Naji	Farmer

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation/post
				school		
138	Liang Ruihua	Male	40	Senior high school	Nankeng, Shahu	Farmer
139	Liang Junnong	Male	56	Primary school	Baosheng, Yushui	Farmer
140	Liang Ruzan	Male	42	Junior high school	Shengyuan, Shahu	
141	Feng Weijia	Male	60	Senior high school	Lianhua, Niujiang	Self-employed business man
142	Zhen Chiyong	Male	39	Junior high school	Pingjiang 1st Team	
143	Zhen Shuwen	Male	65	Junior high school	Jingang Team, Encheng	
144	Liang Yongzhao	Male	39	Senior high school	Tanjiao, Naji	Farmer
145	He Jize	Male	65	Junior high school	Chengping, Shahu	Farmer
146	He Shangrong	Male	46	Junior high school	Dong’an, Shahu	Farmer
147	He Yunjuan	Female	56	Junior high school	Nali, Shahu	
148	Cen Guangzai	Male	57	Primary school	Shalian, Encheng	
149	Liang Yinfang	Female	35	Senior high school	Hejing 4th Village, Shalian	

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation/post
150	Wu Rongqiang	Male	57	Senior high school	Niujiang	Farmer
151	Feng Yongcong	Male	40	Junior high school	Liangxi	Grower
152	Qiu Guoyou	Male	52	Primary school	Xinlian, Heping	Farmer
153	Wu Tiannong	Male	56	Junior high school	Hengpo, Shahu	
154	Chen Huanping	Male	37	Junior high school	Sha'an, Encheng	
155	Luo Xianghua	Female	46	Primary school	Xincun Village, Liangxi	Farmer
156	Feng Wolin	Male	72	Junior high school	Liantang, Niujiang	Village head
157	Cen Linfu	Male	45	Primary school	Nawan	Grower
158	Xu Bingquan	Male	39	Senior high school	Liangxi Town	Grower
159	Feng Mingchu	Male	60	Junior high school	Changmei Village, Niujiang Town	Self-employed businessman
160	Feng Ruhuan	Male	45	Primary school	Liantang Village, Niujiang Town	Farmer

Attached List 12 Statistics of Respondents to Public Opinion Questionnaire (2)

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation /post
1	Ye Fayi	Male	49	Junior college education	Chang'an Street, Yuancheng District, Heyuan City	Manager of administrative business department
2	Zhu Desong	Male	39	Junior high school	Pengjiang District, Jiangmen City	Farmer
3	Lai Zhijian	Male	50	Junior high school	Bishan Village, Pingshan, Huidong County	Manager
4	Chen Yanhui	Male	57	Junior high school	Huqiu Village, Baihua Town, Huidong County	Business owner
5	Tan Songjuan	Male	40	Junior college education	Chengxi Village, Daling Town, Huidong County	
6	Fu Wenke	Male	35	Senior high school	Mingjiao Forest Farm, Rentuo, Daling Town, Huidong County	Business owner
7	Li Sheng	Male		Bachelor degree	Futian Village, Baihua Town, Huidong County	Business owner
8	Li Zhen	Male	42	Secondary vocational school	Yumin Village, Lianghua Town, Huidong County	General manager

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation /post
				education		
9	Huang Wengao	Male	42	Bachelor degree	Shidong Branch of Shenzhen Agriculture & Animal Husbandry Co., Ltd.	Manager
10	Chen Nanshen g	Male		Bachelor degree	Huidong Shengyuan Agriculture & Animal Husbandry Co., Ltd.	
11	Zhou Ganxion g	Male	46	Primary school	Pengbai Village, Daling Town, Huidong County	
12	Mei Lianghon g	Male	36	Junior college education	Longhua Town, Longmen County	
13	Yuan Zhenbiao	Male	51	Senior high school	Dapu, Yonghan Town, Longmen	
14	Huang Mozhao	Male	52	Junior high school	Shilian Village, Shibai Towm, Boluo	President
15	Mo Jianjun	Male	50	Senior high school	Qianfeng Village, Liangjin Town, Huiyang District	
16	Liu Haijun	Male	40	Senior high school	Hengshe Village, Daya Bay West	Manager

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation /post
					District	
17	Zhong Langbo	Male	53	Junior college education	Luodong Village, Shibai Town, Boluo	Business owner
18	Zhang Yuanying	Male	36	Bachelor degree	Huizhou City Anima Yuan Yin Technology Co., Ltd.	Deputy general manager
19	Zhuang Zhuqing	Male	63	Bachelor degree	Zhuangmin Agriculture & Animal Husbandry Co., Ltd.	President
20	Yi Liang	Male	30	Bachelor degree	Hunan New Wellful Co., Ltd.	Deputy general manager
21	Zhang Zhiqiang	Male	55	Junior high school	Huizhou Xingqu Sightseeing Co., Ltd.	Business owner
22	Huang Fenghui	Male	35	Senior high school	Huizhou Zhangsenglin Agricultural Co., Ltd.	
23	Chen Jianwei	Male	45	Bachelor degree	Huizhou Sangzihu Livestock Fine Breed Co., Ltd.	
24	Liang Daoguan	Male	39	Senior high school	Shuanghe Town, Heshan City	

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation /post
	g					
25	Liang Jianrong	Male	52	Senior high school	Yuetang Village Committee	Clerical assistant
26	Liang Xiongfei	Male	30	Secondary vocational school education	Zhaiwu, Heshan	
27	Zhang Yuan	Male	63	Bachelor degree	Longmen Huitai Animal Husbandry Co., Ltd.	Principal
28	Chen Yaopeng	Male	27	Bachelor degree	Zixu Livestock Farm	Business owner
29	Wang Guangqiang	Male	44	Secondary vocational school education	Shunfa Pig Farm in Hehu, Yonghan Town, Longmen County	
30	Zhang Weiquan	Male	49	Junior high school	Longmen Yuans Pig Farm	
31	Liu Weiguang	Male	60	Secondary vocational school education	Qifu Livestock Farm	Factory director
32	Tan Gangwei	Female	48	Senior high school	Tai’an Livestock Farm in Huicheng District	
33	Yan Zhiying	Male	50	Senior high school	Junmao Agriculture & Animal	

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation /post
					Husbandry Industrial Co., Ltd.	
34	Li Jianzhou	Male	44	Junior college education	Ronghua Livestock Farm	Farmer manager
35	Li Zhaorong	Male	50	Senior high school	Dabu Village, Magang	Farmer
36	Zhao Xinqiao	Male	65	Senior high school	Tianping, Niushan	Clerical assistant
37	Huang Huayao	Male	53	Junior high school	Chegang Village, Huangwu	Farmer
38	Xu Huanrong	Male	49	Junior high school	Lianhe Village Committee	Clerical assistant
39	Liang Zhongwen	Male	59	Senior high school	Baicun Village, Longsheng Town	Worker
40	Wu Xiaoming	Male	50	Bachelor degree	Panlong Livestock Farm	Farmer manager
41	Long Shugen	Male	57	Senior high school	Rong’an, Longsheng Town	
42	Chen Guoning	Male	35	Junior college education	Huangcun Village, Longsheng Town	
43	Xie Yifeng	Male	37	Senior high school	Shengqiao, Longsheng Town	Worker

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation /post
44	Liang Zhiqiang	Male	42	Junior college education	Qidong, Longsheng Town	
45	Fang Zhanrong	Male	44	Senior high school	Wapiankeng Village	Farmer
46	He Meijiao	Female	32	Junior high school	Zecun Village, Lianhe, Cangcheng	Farmer
47	Chen Xiaoping	Male	46	Senior high school	Near Cangsheng Street	Farmer
48	He Jianrong	Male	46	Junior high school	Zecun Village, Lianhe, Cangcheng	Farmer
49	Xu Xianjun	Male	50	Junior high school	Zecun Village, Lianhe, Cangcheng	Farmer
50	Li Jinhong	Male	29	Bachelor degree	Kaiping	Manager
51	Liang Zhenhua	Male	32	Bachelor degree	Xinxing County, Yunfu City	Manager
52	Sun Fangkun	Male	47	Bachelor degree	Zhaizigang, Cangcheng, Kaiping City	General manager
53	Yang Rongxiang	Male	47	Junior high school	Dachongying, Shatang Town, Kaiping City	Manager
54	Liang	Male	43	Junior high	12th team, Lianhe,	Farmer

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation /post
	Shuangman			school	Cangcheng	
55	Deng Fuji	Male	48	Bachelor degree	Tonghu Troop, Zhongkai District	
56	Peng Jinsheng	Male	49	Bachelor degree	Bishan Village, Pingshan, Huidong	
57	Lin Yinghao	Male	42	Senior high school	Room 102, Unit 3, No.1 Building, Xiuhehua town, Pingtan	Livestock farmer
58	Zhang Zuxun	Male	30	Junior college education	Yueming Village, Miaobian Village Committee, Duanfen Town	Livestock farmer
59	Tan Guobing	Male	48	Senior high school	Foshan	Livestock farmer
60	Li Qiming	Male	45	Junior college education	Sanhewei, Sanhe Town, Taishan City	Manager
61	Li Xing	Male	34	Secondary vocational school education	Shaqi, Wencun Village, Taishan City	Farmer manager
62	Peng Jundong	Male	32	Secondary vocational school education	Yonghe, Haiyan, Taishan City	Farmer manager

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation /post
63	Guan Songbao	Male	38	Secondary vocational school education	Fenghuojiao, Guanghai, Taishan City	Farmer manager
64	Jin Zhonglin	Male	28	Junior college education	Hongling, Chongwei, Taishan Cit	Farmer manager
65	Chen Changsh eng	Male	56	Senior high school	Chashan, Libian, Taishan City	Farmer manager
66	Tan Shuqiang	Male	58	Senior high school	Qingxi Village, Chishui, Kaiping	Business owner
67	Liu Guoli	Male	45	Senior high school	Tianshipo, Shuibu Town, Taishan City	Breeding industry
68	Zheng Xiangfen g	Male	31	Junior college education	Taichung Town, Taishan City	Technician
69	Li Weiguan g	Male	28	Senior high school	Cuntou Village, Hengli Town, Dongguan	Manager
70	Wei Fenying	Femal e	34	Bachelor degree	Qihuali, Jiangmen City	Director
71	Jiang Jianchan g	Male	53	Junior college education	Lian’an, Sanhe, Taishan City	Manager
72	Yang YijuN	Male	46	Secondary vocational	Qishan, Chongwei, Taishan City	Farmer manager

Serial number	Name	Sex	Age	Education degree	Working unit /address	Occupation /post
				school education		
73	Cui Lihua	Male	26	Bachelor degree	Laisu Management Area, Gonghe Town, Heshan, Jiangmen City	Deputy manager of sales department

Attached List 13 The scanned documents of public participation questionnaire

附表 1　世界银行贷款广东农业面源污染治理项目环评公众意见调查表（1）

姓名	性别	年龄	民族	文化程度
陈健	男	48	汉	初中.
住址	职务	职业	合作社/农场名称	
汤泗新塘村	农民	农		

本项目建设重点是农药、化肥污染和养殖废弃污染三大内容。农药、化肥污染治理示范区集中在惠州、江门两市，共涉及 30 个乡镇，农田 50 万亩，主要为化肥污染治理示范工程和农药减量控制工程。畜禽废弃物治理示范区以惠州、江门、河源为重点，兼顾其他地区，计划治理规模养殖场 300 个。项目建设年限为 5 年（2014-2018 年）。

1. 您是否了解本项目？	了解	听到过 ✓	不了解	
2. 您是通过什么途径了解本项目信息的？	公告栏	电视/报纸/网络	✓ 当地居民	其它
3. 您对该项目持何种态度？	赞同 ✓	不赞同	不知道	
4. 您如何看待项目的选址问题？	合理 ✓	不合理	不知道	
5. 您认为项目建设对当地经济发展带来什么影响？	促进作用	阻碍作用	没有影响	✓ 不知道
6. 您认为项目建设对当地环境哪个方面产生影响最大？	水环境	大气环境	生态环境	✓ 其它
7. 您认为本项目的主要环境效益表现为那些方面？	减少污染 ✓	降低能耗	提高产品质量	
8. 本项目建设以后，您和当地居民的利益受到最大影响是？	收入提升	环境改善	✓ 粮食安全	
9. 您对当地环境质量现状是否满意？	满意	不满意	✓ 不知道	
10. 您认为当地最主要环境问题是？	水污染 ✓	大气污染	噪音	生态破坏

11. 您认为当前耕地/菜场的最主要环境问题是?	农药污染	施肥过多	土地盐碱化	其他
12. 当前农业生产中您最想解决的问题是什么?	良种来源	生产成本	生产技术	产品销售
13. 您认为项目实施后粮食作物产量会有什么变化	提高	削减	不变	不知道
14. 您认为当地农业及水利灌溉设施如何?	较完善	较简陋	没有灌溉设施	
15. 您是否已掌握田间灌溉系统建设和维护的各种相关技能?	完全掌握	大概知道	没有掌握	
16. 如本地设计田间灌溉系统建设,您是否想参加工程设计、建设和实施全过程?	愿意	不愿意	不知道	
17. 您是否参加过农业知识方面的培训?	没有	1~2 次	3~5 次	5 次以上
18. 您种植作物的方式是	全人工种植	人工种植+少量农业机械	农业机械+少量人工种植	全农业机械
19. 您施用的化肥种类为	农家肥	复合及微量元素肥料	测土配方施肥	混合施肥
20. 您是怎么选择化肥农药的?	农技人员推荐	经销商推荐	凭经验(或邻居推荐)	看标签(广告)
21. 您是如何获取化肥农药的?	农药店	厂家直销	流动摊贩	
22. 您当前化肥农药用量的根据是?	问用过的人	凭经验	标签说明	农技人员指导
23. 您怎样确定化肥农药的使用次数?	凭经验	按标签说明	农技人员指导	经销商推荐
24. 您每造作物的使用农药次数为?	1~2 次	3~4 次	5~6 次	6 次以上

25. 您喷洒农药的方式是	手摇式喷雾器	背负式喷雾器	电动喷雾器	统防统治公司
26. 您是如何处置使用完的农药瓶及地膜的?	丢在田边	丢在垃圾箱	烧毁/填埋	其它
27. 为确保项目的成功实施,您认为下一步应该主要加强哪方面的工作?	宣传教育	培训	监测评价的组织实施	其它
28. 您对项目的建设及环境保护工作方面有何意见和建议?				
29. 项目实施和建设过程中有什么困难和希望?	可从环保设施、培训指导、资金补贴等方面提出。			

注:此表适用农药化肥污染治理工程

附表 1　世界银行贷款广东农业面源污染治理项目环评公众意见调查表（1）

姓名	性别	年龄	民族	文化程度
张辉	男	43	汉	高中
住址	职务	职业	合作社/农场名称	
惠阳区良井镇	企业负责人		绿安菜场	

本项目建设重点是农药、化肥污染和养殖废弃污染二大内容。农药、化肥污染治理示范区集中在惠州、江门两市，共涉及 30 个乡镇，农田 50 万亩，主要为化肥污染治理示范工程和农药减量控制工程。畜禽废弃物治理示范区以惠州、江门、河源为重点，兼顾其他地区，计划治理规模养殖场 300 个。项目建设年限为 5 年（2014-2018 年）。

1. 您是否了解本项目？	了解	听到过 ✓	不了解	
2. 您是通过什么途径了解本项目信息的？	公告栏	电视/报纸/网络 ✓	当地居民	其它
3. 您对该项目持何种态度？	赞同 ✓	不赞同	不知道	
4. 您如何看待项目的选址问题？	合理 ✓	不合理	不知道	
5. 您认为项目建设对当地经济发展带来什么影响？	促进作用 ✓	阻碍作用	没有影响	不知道
6. 您认为项目建设对当地环境哪个方面产生影响最大？	水环境	大气环境	生态环境 ✓	其它
7. 您认为本项目的主要环境效益表现为那些方面？	减少污染	降低能耗	提高产品质量 ✓	
8. 本项目建设以后，您和当地居民的利益受到最大影响是？	收入提升	环境改善 ✓	粮食安全	
9. 您对当地环境质量现状是否满意？	满意 ✓	不满意	不知道	
10. 您认为当地最主要环境问题是？	水污染 ✓	大气污染	噪音	生态破坏
11. 您认为当前耕地/菜场的最主要环境问题是？	农药污染	施肥过多	土地盐碱化	其他 ✓
12. 当前农业生产中您最想解决的问题是什么？	良种来源	生产成本 ✓	生产技术	产品销售
13. 您认为项目实施后粮食作物产量会有什么变化	提高 ✓	削减	不变	不知道
14. 您认为当地农业及水利灌溉设施如何？	较完善 ✓	较简陋	没有灌溉设施	

15. 您是否已掌握田间灌溉系统建设和维护的各种相关技能？	完全掌握	大概知道 ✓	没有掌握	
16. 如本地设计田间灌溉系统建设，您是否想参加工程设计、建设和实施全过程？	愿意 ✓	不愿意	不知道	
17. 您是否参加过农业知识方面的培训？	没有	1~2 次	3~5 次 ✓	5 次以上
18. 您种植作物的方式是	全人工种植	人工种植+少量农业机械 ✓	农业机械+少量人工种植	全农业机械
19. 您施用的化肥种类为	农家肥	复合及微量元素肥料	测土配方施肥 ✓	混合施肥
20. 您是怎么选择化肥农药的？	农技人员推荐 ✓	经销商推荐	凭经验（或邻居推荐）	看标签（广告）
21. 您是如何获取化肥农药的？	农药店	厂家直销 ✓	流动摊贩	
22. 您施用化肥农药用量的根据是？	施用过的人	凭经验 ✓	标签说明	农技人员指导
23. 您怎样确定化肥农药的使用次数？	凭经验	按标签说明	农技人员指导 ✓	经销商推荐
24. 您每造作物的使用农药次数为？	1~2 次	3~4 次	5~6 次 ✓	6 次以上
25. 您喷洒农药的方式是	手摇式喷雾器	背负式喷雾器 ✓	电动喷雾器	统防统治公司
26. 您是如何处置使用完的农药瓶及地膜的？	丢在田边	丢在垃圾箱 ✓	烧毁/填埋	其它
27. 为确保项目的成功实施，您认为下一步应该主要加强哪方面的工作？	宣传教育	培训 ✓	监测评价的组织实施	其它
28. 您对项目的建设及环境保护工作方面有何意见和建议？	提高宣传			
29. 项目实施和建设过程中有什么困难和希望？	可从环保设施、培训指导、资金补贴等方面提出 ✓			

注：此表适用农药化肥污染治理工程

附表 2　世界银行贷款广东农业面源污染治理项目环评公众意见调查表（2）

姓名	性别	年龄	民族	文化程度
张云庆	男	36	汉	本科
住址	职务	职业	养殖场名称	
	副总		源茵畜牧科技有限公司	

本项目建设重点是农药、化肥污染和养殖废弃污染三大内容。农药、化肥污染治理示范区集中在惠州、江门两市，共涉及 30 个乡镇，农田 50 万亩，主要为化肥污染治理示范工程和农药减量控制工程。畜禽废弃物治理示范区以惠州、江门、河源为重点，兼顾其他地区，计划治理规模养殖场 300 个。项目建设年限为 5 年（2014-2018 年）。

1. 您是否了解本项目？	了解	听到过	不了解	
2. 您是通过什么途径了解本项目信息的？	公告栏	电视/报纸/网络	当地居民	其它
3. 您对该项目持何种态度？	赞同	不赞同	不知道	
4. 您如何看待项目的选址问题？	合理	不合理	不知道	
5. 您认为项目建设对当地经济发展带来什么影响？	促进作用	阻碍作用	没有影响	不知道
6. 您认为项目建设对当地环境哪个方面产生影响最大？	水环境	大气环境	生态环境	其它
7. 您认为本项目的主要环境效益表现为那些方面？	减少污染	降低能耗	提高产品质量	
8. 本项目建设以后，您和当地居民的利益受到最大影响是？	收入提升	环境改善	人身安全	
9. 您对当地环境质量现状是否满意？	满意	不满意	不知道	
10. 您认为当地最主要环境问题是？	水污染	大气污染	噪音	生态破坏
11. 您认为当前养殖场的最主要环境问题是？	蚊蝇滋生	粪便污染	水污染	空气污染
12. 你当前的养殖规模（存栏量）为？	3000-5000 头	5000-10000 头	10000-15000 头	15000 头以上
13. 你对养殖场 5 年内有什么规划吗？	保持原样	扩建	拆除	没有计划
14. 您是否有《广东省排放污染物许可证》	有	没有	没听说过	

附表 2　世界银行贷款广东农业面源污染治理项目环评公众意见调查表（2）

姓名	性别	年龄	民族	文化程度
李声	男		汉	大学
住址	职务	职业	养殖场名称	
惠东白花镇[illegible]	老板		[illegible]有限公司	

本项目建设重点是农药、化肥污染和养殖废弃污染三大内容。农药、化肥污染治理示范区集中在惠州、江门两市，共涉及 30 个乡镇，农田 50 万亩，主要为化肥污染治理示范工程和农药减量控制工程。畜禽废弃物治理示范区以惠州、江门、河源为重点，兼顾其他地区，计划治理规模养殖场 300 个。项目建设年限为 5 年（2014-2018 年）。

1. 您是否了解本项目？	了解✓	听到过	不了解	
2. 您是通过什么途径了解本项目信息的？	公告栏	电视/报纸/网络	当地居民	其它✓
3. 您对该项目持何种态度？	赞同✓	不赞同	不知道	
4. 您如何看待项目的选址问题？	合理✓	不合理	不知道	
5. 您认为项目建设对当地经济发展带来什么影响？	促进作用	阻碍作用	没有影响✓	不知道
6. 您认为项目建设对当地环境哪个方面产生影响最大？	水环境✓	大气环境	生态环境	其它
7. 您认为本项目的主要环境效益表现为那些方面？	减少污染✓	降低能耗	提高产品质量	
8. 本项目建设以后，您和当地居民的利益受到最大影响是？	收入提升	环境改善✓	人身安全	
9. 您对当地环境质量现状是否满意？	满意✓	不满意	不知道	[illegible]
10. 您认为当地最主要环境问题是？	水污染✓	大气污染	噪音	生态破坏
11. 您认为当前养殖场的最主要环境问题是？	蚊蝇滋生✓	粪便污染	水污染	空气污染
12. 你当前的养殖规模（存栏量）为？	3000-5000 头	5000-10000 头✓	10000-15000 头	15000 头以上
13. 你对养殖场 5 年内有什么规划吗？	保持原样✓	扩建	拆除	没有计划
14. 您是否有《广东省排放污染物许可证》	有✓	没有	没听说过	

15. 您当前是否采取如建设沼气池、固液分离机等生态养殖模式？	是，有一整套设备	是，有一部分设备	没有	
16. 您认为养殖场目前的环保设施完善吗？	较完善	较简陋	没有环保设施	
17. 您是否已掌握牲畜饲养过程各种环保技能？	完全掌握	大概知道	没有掌握	
18. 您的养殖技术是怎么学习来的？	自己摸索	培训班	别的养殖户	
19. 您是如何获到饲料的？	自己调配	厂家直销	饲料商店	
20. 您是如何处理废弃的饲料和包装材料的？	焚烧/土埋	堆集后运走	直接丢弃	
21. 您是如何处理牲畜死尸的？	沼气焚烧	直接丢弃	深坑掩埋	其它
22. 您的养殖场禽畜粪便及污水如何处理？	随意堆排放	入沼气池资源化	制作有机肥	其它
23. 养殖场周围有沟渠等导流装置引导干净的径流吗？	没有	有但不连续	有	
24. 养殖场周边有消纳污染物的环境吗？	有经济林	有农田	经济林+农田	无
25. 您当前养殖场废弃物消纳面积有多大？	没有	500 亩以内	500~1000 亩	1000 亩以上
26. 外来车辆进入养殖场是否要进行消毒？	必须要	可以不用	没有消毒池	
27. 为确保项目的成功实施，您认为下一步应该主要加强哪方面的工作？	宣传教育	培训	监测评价的组织实施	其它
28. 您对项目的建设及环境保护工作方面有何意见和建议？	工程进行顺利			
29. 项目实施和建设过程中有什么困难和希望？	可从资金筹措、环保设施、培训指导等方面提出			

注：此表适用于牲畜废弃物管理工程

Attached List 14 Statistical List of Planned Livestock Farms

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
1	Zhu Desong Farm	Jingkou Village, Tangxia Town, Pengjiang District, Jiangmen City	7000	Environment-friendly
2	Wencun Pig Farm of Taishan Changjiang Food Co., Ltd.	Niuweishanbian, Shaqi Village, Wencun Town, Taishan City	54200	Ecological
3	Fenghuojiao Pig Farm of Taishan Changjiang Food Co., Ltd.	No.168, Fenghuojiao, Guanghai Town, Taishan City	28325	Ecological
4	Yukeng Farm	Likeng District, Taichung Town, Taishan City	1500	Ecological
5	Pig Breeding Farm of Taishan Changjiang Food Co., Ltd.	Moshan Farm, Lian' an, Sanhe Town, Taishan City		Ecological
6	Haiyan Pig Farm of Taishan Changjiang Food Co., Ltd.	Shizi Shanbian, No.5 Village, Yonghe Village Committee, Haiyan Town	10523	Ecological
7	Hongling Pig Farm of Taishan Changjiang Food Co., Ltd.	No.236, Near Hongling Development Zone, Chonglou Town, Taishan City	28003	Ecological
8	Qishan Pig Farm of Taishan	Near Qishan Reservoir,	11500	Ecological

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
	Changjiang Food Co., Ltd.	Xinwu Village Committee, Chonglou Town, Taishan City		
9	Duanfen Pig Farm of Taishan Changjiang Food Co., Ltd.	Shangzelongshan, Duanfen Town, Taishan City	21000	Ecological
10	Taishan Branch of Guangdong Wanhe Agriculture and Animal Husbandry Co., Ltd.	Dashanjiao, Chang'an Village, Miaobian Village Committee, Duanfen Town	1300	Environment-friendly
11	Pig Farm of Taishan Huiying Planting and Breeding Specilized Cooperative in Hefengling, Jiucun Village, Guantian	Hefengling, Jiucun Village, Guantian Village Committee, Shuibu Town, Taishan City	2700	Ecological
12	Beikeng Farm	Beikeng District, Taicheng Town, Taishan City	4500	Ecological
13	Taishan Zhiji Livestock Co., Ltd.	No.1. Shiyashan, Xikeng, Chonglou, Taishan City	3000	Ecological
14	Ronghua Ecological Pig Farm in Duanfen Town, Taishan City	Yueming Village, Miaobian Village Committee, Duanfen Town, Taishan City	4700	Ecological

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
15	Taishan Shengfeng Agricultural Co., Ltd.	Xihua Village Committee, Sanhe Town, Taishan City	8000	Ecological
16	Chaishan Farm	Libian District, Taicheng Town, Taishan City	3320	Ecological
17	Huangqikeng Pig Farm	Huangqikeng, Xihua District, Sanhe Town, Taishan City	4500	Ecological
18	Zhongguang Xinyu Farm in Sanshe, Taishan City	Sanshe Village Committee, Taicheng Town, Taishan City	3500	Ecological
19	Doushan Livestock Farm of Foshan Shunsheng Xugang Poultry and Livestock Technology Co., Ltd.	Zhoushan Village, Liufu Village Committee, Doushan Town, Taishan City, Jiangmen	1450	Environment-friendly
20	Tangmei Pig Farm of Kaiping Wens Animal Husbandry Co., Ltd.	Tangmei Village Committee, Chishui Town, Kaiping City	7200	Environment-friendly
21	Yuzhou Livestock Farm	Maoxi Village Committee, Baihe Town	3200	Ecological
22	Fine Breed Farm in Shatang Town	Tanglang Village Committee, Shatang Town	7000	Ecological

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
23	Lianxing Livestock Farm	Lianqing Village Committee, Jinji Town	5600	Ecological
24	Kaiping Yongxiang Breeding Co., Ltd.	Jiaoqishan, Xiali Village, Dajin Village Committee, Chishui Town, Kaiping City	3500	Ecological
25	Yueshun Dairy Farm in Magang Town, Kaiping City	Houses and Mountains of Chentian New Village, Huangwu Village Committee, Magang Town, Kaiping City	800	Environment-friendly
26	Guangdong Kaiping Guang Sand Pou Animal Husbandry Co., Ltd.	Shezigang Village, Lianxing, Cangcheng Town, Kaiping City, Guangdong Province	24000	Environment-friendly
27	Huangjiazhuang Pig Farm in Yueshan Town, Kaiping City	Huangjiazhuang, Shuier Village, Yueshan Town, Kaiping City, Guangdong Province	3000	Environment-friendly
28	Cangcheng Pig Farm of Heshan Branch of Guangdong Huanong Wens Animal Husbandry Co., Ltd.	North Village, Lianxing Village Committee, Cangcheng Town, Kaiping City, Guangdong Province	6710	Environment-friendly

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
29	Longweigang Livestock Farm in Kaiping City	Longweichang, Shanggang, Shuikou Town, Kaiping City	10000	Environment-friendly
30	Fengrun Pig Farm in Chishui Town, Kaiping City	Bamboo Farm, Dongshan District, Chishui Town, Kaiping City	10000	Environment-friendly
31	Dongrun Swine Breeding Farm in Chishui Town, Kaiping City	Yuantangshan, Nantangmei District, Chishui Town, Kaiping City	3000	Ecological
32	Pig Farm of Kaiping Hemin Breeding Development Co., Ltd.	Lianqing Village, Jinji Town, Kaiping City	6000	Ecological
33	Rongquan Livestock Farm	Rongshukeng, Dongfang Village Committee, Shatang Town, Kaiping City	5000	Ecological
34	Baihe Dekang Livestock Farm (Preparation)	Luozhichang, Baihe Town	7000	Ecological
35	Heshan Green Lake Farm Co., Ltd.	Yingding, Zhaitong Town, Heshan City	28000	Ecological
36	Zhaiwu Pig Farm of Heshan Branch of Guangdong Huanong Wens Animal Husbandry Co., Ltd.	Niuguding, Tangma Village Committee, Zhaitong Town, Heshan City	8556	Ecological
37	Shuangh Pig Farm of Heshan	Near Matou Reservoir,	3280	Ecological

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
	Branch of Guangdong Huanong Wens Animal Husbandry Co., Ltd.	Shuanghe Town, Heshan City		
38	Guangdong Yishiyuan Farm Co., Ltd.	Banliao Village, Longkou Town, Heshan City	10000	Ecological
39	Liye Farm in Hecheng Town, Heshan City	Nanxing Village Committee, Hecheng Town, Heshan City	8000	Ecological
40	Hexing Agriculture and Livestcok Breeding Farm in Gonghe Town, Heshan City	He'an Village, Laisu Village Committee, Gonghe Town, Heshan City	4563	Ecological
41	Heshan Zhongs Hualiang Ecological Agriculture Co., Ltd.	Huanghoukeng, Xinpochang, Zhishan Town, Heshan City	7000	Environment-friendly
42	Shunfeng Pig Farm in Longkou Town, Heshan City	Leigongkeng, Tiantang Village, Banliao District, Longkou Town, Heshan City	6000	Ecological
43	Heshan Branch of Guangdong Wanhe Agriculture and Animal Husbandry Co., Ltd.	Pinghan Village, Gonghe Town, Heshan City	3500	Environment-friendly
44	Jiduo Pig Farm in Gonghe Town, Heshan City	Bangtang Village, Pinghan, Gonghe Town, Heshan City	3500	Ecological
45	Shigang Pig Breeding Farm of	Shigang Pig Farm,	7875	Environm

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
	Enping Branch of Kaiyang Wens	Shigang Village Committee, Dongcheng Town, Enping City		ent-friendly
46	Shiqiaotou Pig Farm of Enping Wens	Shiqiaotou Pig Farm, Shiqiaotou Village Committee, Dongcheng Town, Enping City	10095	Environment-friendly
47	Dongxin Pig Farm of Enping Branch of Kaiaping Wens Livestock Co., Ltd,	Dongxin Pig Farm, Southeast, Caotang Village, Dongxin District, Dongcheng Town, Enping City	8588	Ecological
48	Enping Pingshi Pig Breeding Farm of Taishan Changjiang Food Co., Ltd.	Dagangshan,	22105	Ecological
49	Jian'an Livestock Farm in Enping City	Jiangnan Langjiao Village, Encheng Subdistrict Office, Enping City	5330	Ecological
50	Livestock Farm of Enping Xianghong Agriculture and Animal Husbandry Co., Ltd.	Near Enshui Reservoir, Xintang Village Committee, Juntang Town, Enping City	22000	Ecological
51	Agricultural Base of Enping Aomeiduo Feed Co., Ltd.	Mahan Chicken Farm, Houbeishan, Nan'an Village, Nanhua	2500	Ecological

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
		Village Committee, Hengpo Town, Enping City		
52	Lingxi Pig Breeding Farm in Heping County	Lingxi Village, Pengzhai Town	3200	
53	Qingquan Livestock Farm in Linzhai Town, Heping County	Hekeng, Zhongdong Village, Linzhai Town	3150	
54	Lvsheng Livestock Farm in Lianping County	Hengshui Village, Neiwan Town, Lianping County	3000	
55	Dongyuan Shunxin Breeding Specilized Cooperative	Niutan Forest Farm, Shuntian Town, Dongyuan County	3000	
56	Fumin Breeding Specilized Cooperative in Shangcun Village, Puqian Town, Yuancheng District, Heyuan City	Shangcun Village, Puqian Town, Yuancheng District	15000	
57	Zhenchang Pig Farm in Yangming Town, Heping County	Meipu Village, Yangming Town	3200	
58	Longchuan Xinle Breeding Farmer’s Specilized Cooperative	Mati’ao, Oujiang Village, Huangbu Town	7668	
59	Guangdong Jinshun Agriculture and Animal Husbandry Development Co., Ltd.	Xingxing Village, Yangming Town	3300	
60	Jinguoyuan Pig Breeding Base in	Shengping Village,	3500	

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
	Zijin County	Zicheng Town		
61	Zhifu Pig Breeding Farm of Guangdong Ruichang Foodstuffs Import and Export Co., Ltd.	Zhifuling Pesture, Luohu Town, Dongyuan County	14000	
62	Lianqing Hengde Planting Specilized Cooperative	Panshi Village, Dahu Town, Lianping County	3400	
63	Dongyuan Yuanxing Agriculture and Animal Husbandry Development Co., Ltd.	Xudong Village, Xiantang Town, Dongyuan County	3300	
64	Fengshou Green Farm Co., Ltd. in Heping County	Chaotian Village, Daba Town	3400	
65	Zijin Longtouma Breeding Farmer’s Specilized Cooperartive	Pingdu Village, Guzhu Town	6000	
66	National Pig Breeding Farm of Guangdong Ruichang Foodstuffs Import and Export Co., Ltd.	Zhifu Village, Luohu Town, Dongyuan County	43000	
67	Pig Farm in Pengzhen Village, Pengzhai Town, Heping County	Pengzhen Village, Pengzhai Town	3050	
68	Longchuan Wangxing Pig Breeding Farm	Fengshen Village, Tuocheng Town, Longchuan County	10000	
69	Shilong Breeding Specilized Cooperative in Lianping County	Shilong Village, Yuanshan Town, Lianping County	3100	
70	Dongyuan Maofeng Ecological Agriculture Development Co., Ltd.	Liangcun Village, Huangtian Town,	10300	

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
		Dongyuan County		
71	Lianping Branch of Shenzhen Wufengtai Agricultural Investment Co., Ltd.	Hejiangping, Tianyuan Town	12000	
72	Ruichang Longyuan Pig Farm	Tianxin Village, Tianxin Town, Longchuan County	58000	
73	Heyuan Lihu Pig Farm of Guangdong Lizhi Agriculture Co., Ltd.	Ma'antang, Dahu Town	22500	
74	Pig Breeding Farm of Dongyuan Dongxing Agricultural Development Co., Ltd.	Huangpudi Village, Lighthouse Town, Dongyuan County	7000	
75	Heping Xingsheng Livestock Farm	Shanqian Village, Linzhai Town	3250	
76	Ningjiashan Pig Farm in Pengzhai, Heping County	Wuxing Village, Pengzhai Town	3100	
77	Dongyuan Luqiao Agricultural Technology Development Co., Ltd.	Xiaoshui Village, Chuantang Town, Dongyuan County	3200	
78	Longchuan Pig Breeding Farm	Shekang Village, Heshi Town	10628	
79	Shang'ao Pig Farm in Pengzhai Town, Heping County	Dayetang Village, Pengzhai Town	3080	
80	Heyuan Ruichang Lantan Pig Development Co., Ltd.	Shibei Village, Lantang Town, Zijin County	42000	

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
81	Yiping Animal Husbandry and Acquaculture Field in Dengyun Town	Zhangtang Village, Dengyun Town	8700	
82	Lianping Shenlian Ecological Agriculture and Animal Husbandry Development Co., Ltd.	Xucun District, Gaowan Town, Lianping County	7000	
83	Kanghui Breeding Co., Ltd.	Daoji Village, Xiantang Town, Dongyuan County	6000	
84	Dadonghua Livestock Farm in Dadong Village, Youxi Town, Lianping County	Dadong Village, Youxi Town, Lianping County	3200	
85	Dongyuan Jinming Agricultual Technology Co., Ltd.	Peiqun Village, Lankou Town, Dongyuan County	4000	
86	Zijin County Hongrun Breeding Farmer’s Specilized Cooperative	Xinwei Village, Guzhu Town	3000	
87	Huangdongbai Livestock Farm of Heyuan Sanyou Group Co., Ltd.	Shangcun, Puqian Town, Heyuan City	4000	
88	Zijin County Yiwei Breeding Farmer’s Specilized Cooperative	Nanshan Village, Lantang Town	3000	
89	Longchuan Mingzun Local Pig Breeding and Conservation Co., Ltd.	Mianbei’ao, Fengren Village, Fengren Town	7015	
90	Baisou Fine Breeding Farm	Baisou Village, Longjie Town	4500	

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
91	Heyi Pig Farm	Hudong Village, Dahu Town	3100	
92	Heyuan Dafeng Animal Husbandry Co., Ltd.	Liucheng Village, Liucheng Town, Dongyuan County	13000	
93	Dongyuan Yuanfen Ecological Planting and Breeding Center	Huangpudi Village, Lighthouse Town, Dongyuan County	4300	
94	Longchuan Qinglong Agricultural and Animal Husbandry Development Co., Ltd.	Fengshen Village, Tuocheng Town	4090	
95	Xinyi Pig Farm in Lighthouse Town, Dongyuan County	Huangpudi Village, Lighthouse, Dongyuan County	3600	
96	Huayuan Planting and Breeding Farm in Litian, Dongyuan County	Litian Village, Xingang, Dongyuan County	3000	
97	Dongyuan Xinfu Specialized Cooperative	Lidong Village, Huangtian Town, Dongyuan County	3000	
98	Yuandong Livestock Farm in Tianxin Town, Longchuan County	Da'ao Village, Tafeng Village, Tianxin Town	6615	
99	Longchuan Shengda Pig Farm	Beiling Town	3100	
100	Tianxin Wanjia Farm	Pojiao Village, Tianxin Town	3400	
101	Lanye Agricultural Development	Fanghu Village, Baipu	3000	

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
	Co., Ltd. in Zijin County	Town		
102	Fengren Fudakang Pig Farm	Wuguantang, Fengren Village, Fengren Town	3700	
103	Hongfa Livestock Farm in Yidu Town, Longchuan County	Dawokeng, Hongxing Village, Yidu Town	3824	
104	Heyuan Minghuang Eco-technology Co., Ltd.	Songlin Village, Tianxin Town, Longchuan County	3050	
105	Daiwang Agricultural Development Co., Ltd.	Wushiba Village, Fengren Town	3380	
106	Huamu Planting and Breeding Farm in Longwo Town, Zijin County	Shangkeng Village, Longwo Town	3000	
107	Suitun Pig Breeding Farm in Liangjin Town, Huiyang District, Huizhou City	Qianfeng Village, Liangjin Town, Huiyang District	10000	
108	Hongchang Breeding Industrial Co., Ltd.	Zhangxin Village, Pingtan Town, Huiyang District	3000	
109	Longmen Qifu Livestock Farm	Wucun Village, Longtian Town, Longmen County	3000	
110	Longhua Branch of Longmen Royal Agricultural Development Co., Ltd.	Langbei Village, Longhua Town, Longmen County	13000	
111	Yingfeng Pig Farm in Huazhu,	Huazhu Village,	5000	

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
	Longhua Town, Longmen County	Longhua Town, Longmen County		
112	Longmen Shunxing Agriculture and Animal Husbandry Co., Ltd.	Lingju Village, Longjiang Town, Longmen County	4500	
113	Pingling No.1 Pig Farm of Boluo Wens Animal Husbandry Development Co., Ltd.	Lingbei Village, Pingling Town, Longmen County	9300	
114	Pingling No.2 Pig Farm of Boluo Wens Animal Husbandry Development Co., Ltd.	Lingbei Village, Pingling Town, Longmen County	8700	
115	Longcheng Pig Farm of Boluo Wens Animal Husbandry Development Co., Ltd.	Luchi Village, Longcheng Subdistrict Office, Longmen County	9700	
116	Dongying Planting and Breeding Farm in Yonghan Town, Longmen County	Dachangwei, Dapu, Yonghan Village, Longmen County	3500	
117	Boluo Baoyuanfeng Agriculture and Animal Husbandry Co., Ltd.	Renmianshi Mountain, Shilian Village, Shibai Town, Boluo County	4000	
118	Yifeng Pig Farm in Longhua Town, Boluo County	Beidi Village, Longhua Town, Boluo County	3500	
119	Huizhou Huixingyuan Agricultural Development Co., Ltd.	Liudong Qingtang, Luodong Village, Shibai Town, Boluo	3000	

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
		County, Huizhou City		
120	Gongzhuang Wens Pig Farm	Nanxi Village, Gongzhuang Town, Boluo County	6005	
121	Shibai Wens Pig Farm	Shibai Office, Yangqiao Town, Boluo County	13300	
122	Yangcun Wens Pig Farm	Fifth Team, Taxia Sub-field, Yangqiao Town, Boluo County	6405	
123	Yangqiao Wens Pig Farm	Fourth Team, Taxia Sub-field, Yangqiao Town, Boluo County	8165	
124	Huizhou Xingmu Animal Husbandry Development Co., Ltd.	Ma'anwei, Huizhou City	8000	
125	Ruhu Farm of Huizhou City Anima Yuan Yin Technology Co., Ltd.	Huangpu Village, Ruhu Town, Huizhou City	6850	
126	Huizhou Niannianfeng Agriculture and Animal Husbandry Co., Ltd.	Daguling, Guxian Village, Ruhu Town, Huicheng District	7000	
127	Zhuang's Agriculture and Animal Husbandry (Huizhou) Co., Ltd.	Rengbei Village, Ruhu Village, Huicheng District	11000	
128	Huizhou Jiaxing Livestock Co., Ltd.	Macha Village, Hengli Town, Huicheng District, Huizhou City	5000	

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
129	Huizhou Branch of Hunan New Wellful Co., Ltd.	Rengbei Village, Ruhu Village, Huicheng District	22000	
130	Huizhou Xingqu Sightseeing Co., Ltd.	Guxian Village, Ruhu Town, Huizhou City	5100	
131	Huizhou Lizhicheng Livestock Co., Ltd.	Lizhicheng, Shuikou Sub-district Office, Huizhou City	5000	
132	Huizhou Hongsenglin Agricultural Development Co., Ltd.	Xiaolan Village, Hengli Town, Huizhou City	4000	
133	Tai'an Livestock Farm in Huicheng District, Huizhou City	Tai'an District, Aipo, Hengli Town, Huicheng District, Huizhou City	3000	
134	Huizhou Ronghua Livestock Farm	Zhangxia Village Committee, Shuikou Sub-district Office, Huicheng District	3400	
135	Huizhou Sangzihu Livestock Fine Breed Co., Ltd.	Sandong Town, Huizhou City	4300	
136	Huizhou Huinuan Animal Husbandry Development Co., Ltd.	Ma'an Town, Huicheng District, Huizhou City	3500	
137	Huizhou Xing'anda Agricultural Development Co., Ltd.	Jinbaodao, Zhongtu Farm, Rengbei Village, Ruhu Town, Huizhou City	3500	

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
138	Chengxu Livestock Farm	Botian Village, Ma'an Town, Huicheng District, Huizhou City	3500	
139	Huizhou Junmao Agriculture & Animal Husbandry Industrial Co., Ltd.	Lishanbei, Botian Village, Ma'an Town, Huicheng District	3100	
140	Dingsheng Breeding Co., Ltd.	Qikeng Farm, Qingtang Village, Luzhou Town, Huicheng District, Huizhou City	5600	
141	Dongjian Agro-Pastoral (Huidong) Co., Ltd.	Bailing Group, Putian Village, Baihua Town	68000	
142	Huidong Branch of Shenzhen Agriculture & Animal Husbandry Industrial Co., Ltd.	Moling Village, Baihua Town	70000	
143	Huidong Shengyuan Agro-Pastoral Co., Ltd.	Pinghai Town	3000	
144	Huizhou Huasheng Agro-Pastoral Co., Ltd.	Dabu Village, Pingshan Town	4800	
145	Huidong Yuxing Industrial Co., Ltd.	Niugudun Village, Renshan Town, Huidong County, Huizhou City	5500	
146	Houde Pig Farm in Lianghua Town, Huidong County	Yuming Village, Lianghua Town	6150	
147	Huidong Yanshenhomg Husbandry	Futian Village, Baihua	6000	

Serial number	Name of pig farm	Detailed address	Number of pigs on hand	Construction mode
	Co., Ltd.	Town		
148	Pig breeding farm of Guangdong Huidong Foodstuffs Import and Export Co., Ltd.	Mingjiao Forest Farm, Daling Town	5320	
149	Yongxing Pig Farm in Bishan, Huidong County	Bishan Village, Pingshan Town, Huidong County	5000	
150	Gaotan Livestock Farm of Huidong Jiahe Husbandry Co., Ltd.	Sanlian Crossing, Huancheng North Road, Pingshan Town	13000	
151	Hexing Husbandry Livestock Farm in Huidong County	Sanhe Team, Chengxi Village, Daling Town, Huidong	2500	
152	Huqiu Village Committee, Baihua Town, Huidong District	Hepai Village, Huqiu District, Baihua Town	10000	
153	Daya Bay Livestock Farm of Guangxi Jianbang Agricultural Co., Ltd.	Nanshan, Hengshe Village, Daya Bay West, Huizhou City	8000	
154	Huizhou Daya Bay Jiayu Agro-Pastoral Development Co., Ltd.	Yanlinggang Village, Daya Bay Town, Huizhou City	4800	
155	Huamei (Huizhou) Animal Husbandry Technology Co., Ltd.	Xikang Village, Huihuan Office	2700	
156	Tonghu Pig Breeding Farm of Shenzhen Agri-Pastoral Enterprises Co., Ltd.	2nd Field, Tonghu Troop	22300	