

# Initial Environmental Examination

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April 2015

PRC: Le Gaga Holdings Limited Greenhouse  
Agricultural Development Project-Dayang Production  
Base

## **CURRENCY EQUIVALENTS**

(As of 10 March 2015)

Currency Unit – Yuan (CNY)

CNY 1.00 = \$ 0.1597

\$ 1.00 = CNY 6. 2633

## **ABBREVIATIONS**

ADB	–	Asian Development Bank
AP	–	Affected person
API	–	Air Pollution Index
BOD	–	Biochemical Oxygen Demand
CNY	–	Chinese Yuan
COD	–	Chemical Oxygen Demand
DEIA	–	Domestic Environmental Impact Assessment
EIA	–	Environmental impact assessment
EMP	–	Environmental management plan
EPB	–	Environment Protection Bureau
MoA	–	Ministry of Agriculture
MSDS	–	Material Safety Data Sheet
IEE	–	Initial Environmental Examination
GRM	–	Grievance Redress Mechanism
O&M	–	Operation and maintenance
PPE	–	Personnel Protective Equipments
PRC	–	People's Republic of China
SPS	–	Safeguard Policy Statement
SS	–	Suspended Solids
TEIA	–	Tabular Environment Impact Assessment
TN	–	Total Nitrogen
TP	–	Total Phosphate

## WEIGHTS AND MEASURES

kg	–	kilogram
km	–	kilometer
m <sup>2</sup>	–	square meter
m <sup>3</sup>	–	cubic meter
mg/l	–	Milligrams per liter
Mg/m <sup>3</sup>	–	Milligrams per cubic meter
mu	–	Chinese land measuring unit (1 hectare = 15 mu)
ha	–	hectare (10,000 m <sup>2</sup> )
t	–	ton (1,000 kg)

## NOTES

In the report, “\$” refers to US dollars.

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## **I. EXECUTIVE SUMMARY**

### **A. Background**

1. This project's Initial Environmental Examination (project IEE) report was prepared for the proposed Dayang Production Base Project (the project) of Le Gaga Holdings Limited (Hereafter Le Gaga) in Fujian Province, People's Republic of China (PRC). The IEE was prepared in accordance with the requirements of Asian Development Bank's (ADB) Safeguard Policy Statement (SPS,2009) on the basis of the domestic environmental impact assessment (EIA) report prepared by Nanjing Kehong Environmental Technology Limited Company in 2014 and . The domestic Tabular EIA report was reviewed and approved by Environmental Protection Bureau (EPB) of Hanjiang District, Putian Municipality of Fujian Province ([2014] No. 0438) on 22<sup>nd</sup> December 2014.

### **B. Project Description**

2. Le Gaga is planning to invest 100 million CNY to build 1000 mu agricultural production base in Hanjiang District, Putian Municipality, Fujian Province of PRC, with an annual output of 10,000 tons pollution-free vegetables. The project will rent 1000 mu farmland to construct six (6) irrigation districts, one office building, warehouse (651 m<sup>2</sup>), dormitories (266 m<sup>2</sup>), a fertilizer dozing room (760 m<sup>2</sup>) six (6) pump stations, and three (3) water storage ponds. A total of 21,756 m ditches and 8,546 m tractor road will also be build. It is planned that part of the base will be put into operation in September 2015 and the whole base will be put into operation in August 2016.

### **C. Project Rationale and Benefits**

The project is expected to reduce a farm's water consumption through the use of drip water irrigation. According to Fujian Water Consumption Norm (DB 35/T722-2007), 70 to 80% of the annual water consumption of a typical agricultural irrigation system (270 m<sup>3</sup>/mu) can be reduced. The drip water irrigation average consumption ranges from 189 to 216 m<sup>3</sup>/mu. In addition, the integrated drip irrigation system will supply water and fertilizers based on the demands of plants. The nutrient efficiency will be improved. The major product, tomato will be grown in culture bags so that the nutrient inflation into soil and groundwater will be greatly reduced. Therefore, the project will reduce non-point pollution from agricultural through adoption of such advanced horticulture practices compared with traditional extensive planting methods. In addition, the integrated drip irrigation system will supply water and fertilizers based on the demands of plants. The nutrient efficiency will be improved. The major product, such as tomato will be grown in culture bags so that the nutrient inflation into soil and groundwater will be greatly reduced. Therefore, the project will reduce non-point pollution from agricultural through adoption of such advanced horticulture practices compared with traditional extensive planting methods.

### **D. Anticipated Environmental Impacts and Environmental Management Plan**

The construction of the project will include minor field levelling. It is scheduled to be constructed within six months period. Workers will be hired locally which will not require construction camp to be set up. Major environmental issues during construction include earthwork, noise pollution, air pollution, surface water pollution and construction waste management. Overall, construction-related impacts are localized, short term, and can be effectively mitigated through the application of good

construction and housekeeping practices and implementation of construction phase community and occupational health and safety plans.

3. The potential impacts during operation of the project facilities include improper operation of wastewater treatment facilities, solid waste disposal, especially pesticide and fertilizer bags and containers, storage of pesticide, noise from pump operation, occupational health and safety related to application of pesticide. Appropriate mitigation measures and monitoring programs have been developed to address these issues. Project impacts, mitigation measures and impact monitoring are described in an environmental management plan (EMP).

### **E. Information Disclosure, Consultation and Participation**

4. Public consultation for this project was conducted in accordance with the PRC Guideline. Two rounds of information disclosure were conducted by Hanjiang District EBP on its website on 3<sup>rd</sup> December 2014 and 23<sup>rd</sup> December 2014 respectively. No concerns or objections were received during the disclosure. An environmental public consultation workshop was also organized by Le Gaga on 13<sup>th</sup> February 2015 supported by external environmental and social consultants. Five (5) potential affected villager representatives, who are all supportive of the project, attended the workshop.

5. This project IEE will be also disclosed on ADB's website.

### **F. Grievance Redress Mechanism**

6. Le Gaga will establish a grievance redress mechanism (GRM) on site for handling environmental and social complaints, including complaint recording, consultation, issue investigation, mitigation action, follow-up, general timeframe for resolution and delegation of responsibilities. The GRM will address any possible concerns and dissatisfaction of affected groups regarding the social and environmental impact of its subprojects, and seek a proper solution. It should be able to promptly respond to the affected groups, be transparent and free of gender discrimination, and adapt to the cultural traditions of the affected groups and communities. Moreover, it should enable different affected groups to express their opinions, with no fear of reprisal. The E&S General Manager will be responsible for (i) resolving appeals, complaints, and disputes concerning the environmental and social impacts of subprojects which have not been resolved by the plant managers at the subproject level, and (ii) for coordinating, guiding and supervising the subproject companies in handling appeals, complaints, and disputes.

7. The project company will inform the local community and the affected people of the grievance and appeal procedure through public information meetings, the resettlement information brochure and other media, so that they can fully understand their rights for grievance and appeal.

### **G. Environment Management Plan**

8. An EMP has been prepared for the project. It is an essential document to ensure the implementation of mitigation measures. The EMP defines appropriate mitigation measures for the anticipated environmental impacts, and defines the institutional responsibilities and mechanisms to monitor and ensure the compliance

with PRC's environmental laws, standards and regulations, and ADB's Safeguard Policy Statement (SPS 2009).

9. EMP supervision and monitoring results will be used to evaluate (i) the extent and severity of actual environmental impacts against the predicted impacts, (ii) the performance of the environmental protection measures or compliance with related rules and regulations, (iii) trends of impacts, and (iv) overall effectiveness of the mitigation measures.

#### **H. Conclusion**

10. The project IEE concludes that as long as the environmental mitigation and management measures defined in the EMP are properly implemented, all adverse environmental impacts associated with the project will be prevented, eliminated, or minimized to an acceptable level. The project is feasible from an environment safeguards point of view.



## II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK AND STANDARDS

### A. Policy, Legislative Framework for environment impact assessment in PRC

11. The EIA management procedure has been established in the PRC since early 1990s. The domestic environment impact assessment (DEIA) upon which this project IEE is based has been prepared under the provisions of the PRC's EIA law of 2003 and the PRC Management Guideline on EIA categories of Construction Project (2008). The interim Guideline on Public Participation in EIA (2006) has also been a significant development that provides for opportunities to involve the public in the EIA process. This was further strengthened by the Requirements on Preparation of Environmental Impact Report Summary (2012[51], MEP), which requires that the summary of the DEIA reports should be disclosed on local EPB websites. The primary national laws and regulations that governed the EIA studies of the proposed project are provided in Table II-1 and Table II-2 respectively.

**Table II-1: Applicable Environmental Laws**

No.	Title of the Law	Year Issued
1	Environmental Protection Law	2014 revised
2	Environmental Impact Assessment Law	2003
3	Water Law	2002
4	Water Pollution Prevention and Control Law	2008
5	Air Pollution Prevention and Control Law	2000
6	Noise Pollution Control Law	1996
7	Forestry Law	1998
8	Wild Fauna Protection Law	2004
9	Solid Waste Pollution Prevention and Control Law	2013
10	Water and Soil Conservation Law	1991
11	Cleaner Production Promotion Law	2002
12	Urban and Rural Planning Law	2008
13	Land administration Law	2004
14	Circular Economy Promotion Law	2009

**Table II-2: National and Local Administrative Regulations**

No.	Regulation	Year Issued
1	Regulation on EIA of Plans and Programs	2009
2	Regulation on Environmental Protection Management for Construction Project	1998
3	Regulation on Protection of Wild Flora	1997
4	Requirements for the EIA Summary of Construction Project	2010
	Regulation on Cultural Heritage Protection	2003
5	Regulation on Classification of Construction Project Environmental Protection Management (MEP)	2009
6	National Biodiversity Strategy and Action Plan (2011-2030)	2010
7	Requirement for Social Risk Assessment of Large Investment Projects	2012
8	The National Biodiversity Strategy and Action Plan (2011-2030)	2010
9	National Regulation for Public Disclosure of EIAs (NDRC)	2012
10	Environmental Protection Supervision Rules for Construction Projects	1998

12. The implementation of environmental laws and regulations is supported by a series of associated management and technical guidelines (Table II-3)

**Table II-3: Applicable Environmental Guidelines**

No.	Guideline	Year/Code
1	Guideline on Jurisdictional Division of Review and Approval of EIAs for Construction Projects	2009
2	Guideline on EIA Categories of Construction Projects	2008
3	Interim Guideline on Public Consultation for EIA	2006
4	Technical Guideline on EIA: Outline	HJ2.1-2011
5	Technical Guideline on EIA Regarding Surface Water	HJ/T 2.3-1993
6	Technical Guideline on EIA Regarding Atmospheric Environment	HJ 2.2-2008
7	Technical Guideline on EIA Regarding Acoustic Environment	HJ 2.4-2009
8	Technical Guideline on EIA Regarding Ecological Impact	HJ 19-2011
9	Technical Specification on Water and Soil Conservation Plan	GB50433-2008
10	Technical Guideline on Environmental Risk Assessment for Construction Project	HJ/T 169-2004
11	Industrial Restructuring Directory	Revised in 2013

13. The environmental quality standard system that supports and evaluates the implementation of the environmental protection laws and regulations in the PRC is classified into two categories by function (i.e., pollutant emission/discharge standards and ambient environmental standards). The relevant main standards applicable to the project are shown in Table II-4.

**Table II-4: Applicable Environmental Standards**

No.	Standards	Code
1	Surface Water Quality Standard	GB 3838-2002
2	Ambient Air Quality Standards	GB 3095-2012
3	Urban Ambient Acoustic Quality Standard	GB 3096-2008
4	Integrated Emission Standard of Air Pollutants	GB 16297-1996
5	Integrated Wastewater Discharge Standard	GB 8978-1996
6	Ground Water Quality Standard	GB/T 14848-93
7	Emission Standard of Environment Noise for Boundary of Site	GB 12523-2011
8	Noise Limit of Industrial Enterprises	GB 12348-2008
9	Standard for Pollution Control on the Storage and Disposal Site for General Industrial Solid Wastes	GB 18597-2001
10	Emission Standards for Odor Pollutants	GB 18599-2001

## **B. Applicable ADB and PRC Policies and Assessment Categories**

14. ADB's Safeguard Policy Statement (SPS 2009) provides the basis for this Project IEE. All projects funded by ADB must comply with the SPS. The purpose of the SPS is to establish an environmental review process to ensure that projects undertaken as part of programs funded under ADB loans are environmentally sound, are designed to operate in line with applicable regulatory requirements, and are not likely to cause significant environment, health, or safety hazards.

15. The project is classified as Category B by ADB, requiring an initial environmental examination (IEE). Domestically, the project is classified as Category B in accordance with the Guideline on EIA Classification for Construction Projects issued by the PRC's Ministry of Environmental Protection (MEP) in 2008, requiring a tabular environment impact report (TEIA). The TEIA report of the proposed project was prepared by Nanjing Kehong Environmental Technology Limited Company in 2014 and reviewed and approved by Hanjiang District EPB on 22<sup>nd</sup> December 2014.

### C. Evaluation Standards for the Project

16. **Air Quality Standard.** The PRC ranks air quality into three classes according to “Ambient Air Quality Standard” (GB 3095-1996, amendment in 2000), with Class I as the “best” air quality and Class III the “worst” air quality. According to the Air and Water Quality Function Zonal of Putian Municipality, the project area is categorized as Class II, defined as “moderate to good” air quality. The specific standard values (for Class II) are listed in Table 0-5.

**Table II-5: Ambient Air Quality Standard (Unit: mg/m<sup>3</sup>)**

Parameter	TSP	PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>2</sub>
24-hour Average	0.30	0.15	0.15	0.08
1-hour Average	-	-	0.50	0.12

Source: Ambient Air Quality Standard (GB 3095-1996)

17. **Surface water Quality Standard.** For water quality assessment, the determining standard will be Surface Water Quality Standard (GB3838-2002). It subdivides the water quality into five categories for different environmental functions. Category I is the suitable for head waters and National Nature Reserves. Category II is suitable for drinking water sources in Class I protection areas, habitats for rare aquatic organisms, breeding grounds for fish and crustaceans, and feeding grounds for fish fries. Category III is suitable for drinking water sources in Class II protection areas, wintering grounds for fish and crustaceans, migration routes, water bodies for aquaculture and capture fishery, and swimming activities. Category IV is suitable for general industrial use and non-contact recreational activities. Category V is suitable for agricultural and scenic water uses.

18. The catchment in the project area is classified as Category III as approved by the Dongzhang Water Source Protection Zone of Fuqing City issued by Fujian Provincial Government in 2014,. The key parameters for Category III standard is set out in Table II-6.

**Table II-6: Surface Water Quality Standard for Category III (Unit: mg/L, pH is dimensionless)**

Parameter	pH	DO	COD <sub>Cr</sub>	BOD <sub>5</sub>	NH <sub>3</sub> -N
Category III Standard	6-9	≥5	≤20	≤4	≤1.0

Source: Surface Water Quality Standard (GB3838-2002)

19. **Noise.** Noise level in project area shall comply with the Category I Acoustic Ambient Quality Standard (GB3096-2008) (Table II-7).

**Table II-7: Acoustics Ambient Quality Standard (Sound level: dB (A))**

Function Zone	Category	Standard Maximum Level	
		Day (06:00-22:00)	Night (22:00-06:00 of following day)
Class I	I	55	45

### D. Discharge Standards of the Project

20. **Air Pollutant Emissions.** Fugitive emission of particulate matter (such as dust from construction sites) is regulated under PRC’s Air Pollutant Integrated

Emission Standard (GB 16297-1996), which sets 120 mg/m<sup>3</sup> as the maximum allowable emission concentration and ≤ 1.0 mg/m<sup>3</sup> as the concentration limit at the boundary of construction sites, with no specification on the particular matter's particle diameter.

21. The Emission Standard of Cooking Fume (GB18483-2001) has specified the minimum removal rate of cooking fume. The treatment device is classified into three levels, based on the size and power of ovens. The project will have one small oven with capacity of 25kW during operation. The maximum emission concentration and minimum removal rate of cooking fume treatment device are shown in Table II-8. The minimum removal rate shall reach 60% at least.

**Table II-8: Maximum emission concentration and minimum removal rate of cooking fume treatment device**

Scale	Small	Medium	Large
Number of ovens	1-3	3-6	≥6
Power of oven (10 <sup>8</sup> J/h)	1.67-5.00	5.00-10	≥10
Maximum allowable emission concentration (mg/m <sup>3</sup> )	2.0		
Minimum removal rate of cooking fume treatment device (%)	60	75	85

**Water Pollutant Emissions.** Discharge of wastewater from construction sites is regulated under PRC's Integrated Wastewater Discharge Standard (GB 8978-1996). Class I standards apply to discharges into Category III water bodies under GB 3838-2002. Class II standards apply to discharges into Categories IV and V water bodies. Class III standards apply to discharges into municipal sewers going to municipal WWTPs with secondary treatment. The catchment area is classified as Category III therefore requirements of Class I are applicable.

**Table II-9: Water Pollutant Discharge Limit in Construction Stage (Unit: mg/L)**

Parameter	Class I	Class II	Class III
	(for discharging into Category III water body)	(for discharging into Categories IV and V water body)	( for discharging into municipal sewer)
pH	6 ~ 9	6 ~ 9	6 ~ 9
SS mg/L	70	150	400
BOD <sub>5</sub> mg/L	20	30	300
COD mg/L	100	150	500
TPH mg/L	5	10	20
Volatile phenol mg/L	0.5	0.5	2.0
NH <sub>3</sub> -N mg/L	15	25	---
PO <sub>4</sub> <sup>2-</sup> (as P) mg/L	0.5	1.0	---
LAS (= anionic surfactant) mg/L	5.0	10	20

Source: Wastewater Discharge Standard (GB 8978-1996)

22. The municipal wastewater during operation stage will be directed by the sewers i to the underground integrated treatment system. The treated effluent will be reused for agricultural irrigation if it satisfies the Water Quality Standard for Agricultural Irrigation (GB 5048-2005).

**Table II-10: Water Quality Standard for Agricultural Irrigation**

<b>Parameter</b>	<b>Unit</b>	<b>Dry land</b>
pH	--	5.5-8.5
COD	mg/L	200
BOD <sub>5</sub>	mg/L	100
SS	mg/L	100
Chloride	mg/L	350

23. **Noise.** Construction noise will be assessed against the Emission Standards of Ambient Noise at Boundary of Site (GB 12523-2011) and Class I of Emission Standard for Industrial Enterprises Noise at Boundary (GB 12348-2008) during operation.

**Table II-11: Construction Site Noise Limits (Unit: Leq [dB(A)])**

<b>Period</b>	<b>Noise Limit</b>	
	<b>Day</b>	<b>Night</b>
Construction	70	55
Operation	55	45

### III. DESCRIPTION OF THE PROJECT

24. Le Gaga is planning to invest 100 million CNY to build 1000 mu agricultural production base in Hanjiang District, Putian Municipality, Fujian Province of PRC (see Fig III-1), with an annual output of 10,000 tons pollution-free vegetables, including 7,000 tons of solanaceous vegetables (sweet pepper, hot pepper, tomato and eggplant) and 3,000 tons of other vegetables (such as cucumber, corn and leave vegetables). The proposed project will need to rent 1000 mu farmland to construct six (6) irrigation districts, one office building, warehouse (651 m<sup>2</sup>) for temporary storage, dormitories (266 m<sup>2</sup>) for resident workers, a fertilizer dozing room (760 m<sup>2</sup>) and six (6) pump stations, three (3) water storage ponds. All pumps will be installed indoor. The detailed construction works are listed in Table III-1. The harvested vegetables will be delivered to clients within one day to keep them fresh. Total of 21,756 m ditches and 8,546 m tractor road will also be build. Part of the base is planned to put into operation in September 2015, and the whole base will be operated in August 2016. The peak construction will last for 6 months. The layout of the production base is illustrated in Fig. III-2.

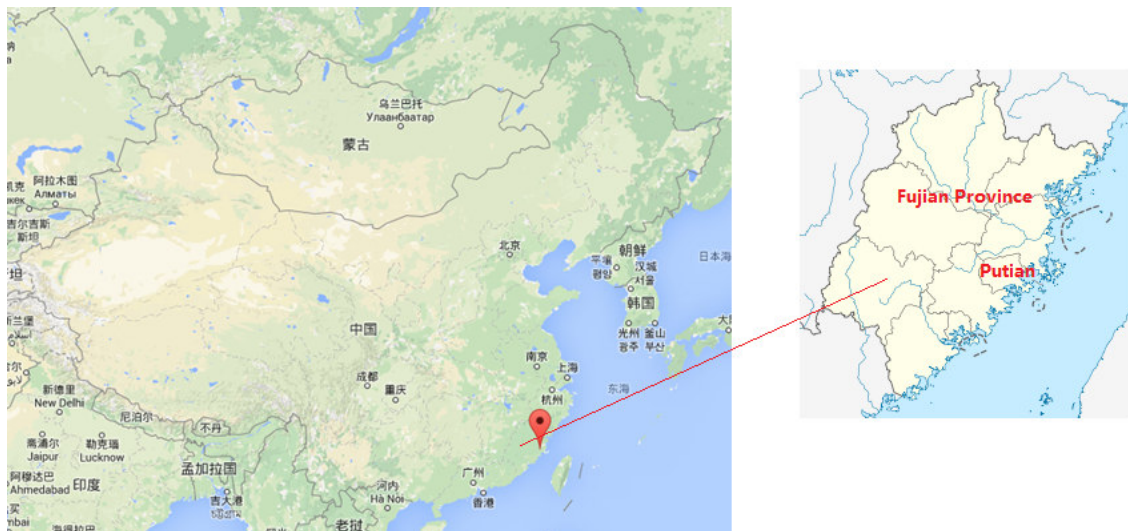
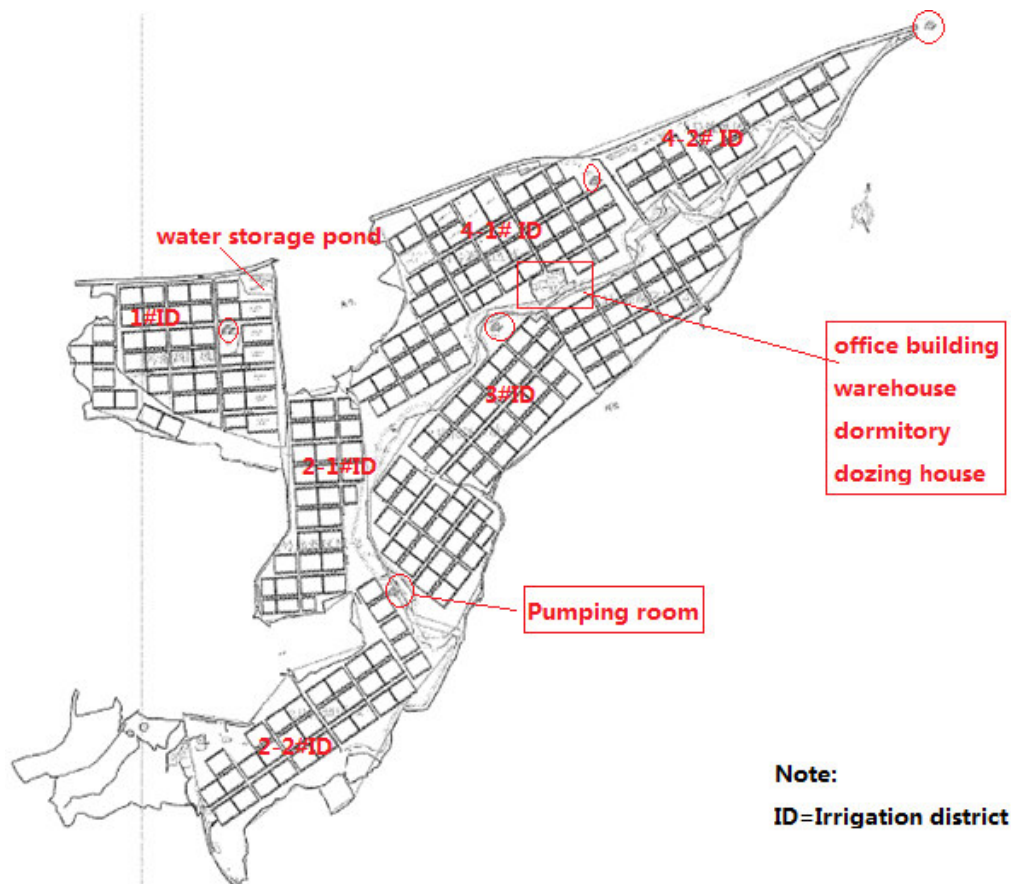


Figure III-1: Location of proposed Dayang production base

Table III-1: Proposed works of Dayang Production BaseName	Major works
Irrigation districts	The project area is divided into six (6) irrigation districts, including greenhouse ad soilless cultivation facilities
Office building	Located at 4# irrigation district; floor area:350m <sup>2</sup>
Dormitory	Located at 4# irrigation district; floor area 266m <sup>2</sup>
Dozing house	Located at 4# irrigation district; floor area: 760m <sup>2</sup> to adding fertilizer to irrigation water
Pumping room and storage tanks	Six (6) pumping house and three (3) water storage tanks.
Warehouse	Located at 4# irrigation district; floor area : 651m <sup>2</sup>
Tractor roads	Total length: 8564m



**Figure III-2: Layout of proposed Dayang production base**

25. **Water Supply.** The domestic water demand will be satisfied by the local municipal water supply system. Irrigation water will be abstracted from Yaoshan stream nearby. Referring to the Fujian Provincial Industry Water Consumption Quota (DB35/T772-2013), the annual irrigation water consumption is estimated at 740 t/d based on the water quota of 270 m<sup>3</sup>/mu per year. However, the water quota defined in the DB35/T772-2013 is based on the assumption of open field cultivation and ground surface irrigation. The actual water consumption will be significantly less than the 270 m<sup>3</sup>/mu per year considering the adoption of greenhouse and advanced drip irrigation.

26. The integrated drip irrigation system will supply water and fertilizers based on the demands of plants. A stock solution consisting of a single fertilizer, or several compatible fertilizers, dissolved in water will be supplied to the vegetables by in-line drip irrigation to ensure precise delivery of water and fertilizer to crop. Electronic conductivity (EC) and pH are monitored on line to control the concentration of nutrients. The major product, tomato will be grown in culture bags.

27. **Wastewater Treatment Facilities.** An integrated wastewater treatment facilities using cyclic activated sludge system (CASS) will be installed to treat municipal sewage and wastewater from canteen. Wastewater from canteen will be pretreated by oil trap.

28. **Materials.** The raw material usage is estimated by Le Gaga based on previous experiences in similar locations (see Table III-2).

**Table III-2: Estimated material usage per year**

<b>Raw materials</b>	<b>Usage</b>
Coconut husk	320,000
Seeds	30 kg
Fertilizer	300,000 kg
Plastic film	120,000 kg
Low toxicity biological pesticides (Toosedarin and matrine)	2,000 kg



## IV. DESCRIPTION OF THE ENVIRONMENT

### A. General

29. This section describes the environmental, (biological and physical), cultural and socioeconomic baseline conditions in the Study Area. This describes (i) the environmental setting where the project will be implemented, and (ii) the environmental conditions which will be influenced (either negatively or positively) by the project. Both of these roles are encompassed by the concept of the “baseline” environment. The baseline includes information on all receptors and resources that were identified during the scoping stage of the Impact Assessment process as having the potential to be affected by the Project

### B. Physical Setting

30. **Location.** The project is located in Dayang Country, Hanjiang District (see Fig III-1). Dayang Country is located 48 km north of Hanjiang District. Hanjiang District is in district of Putian, Fujian province, People's Republic of China. Hanjiang is in the north of the estuary of Mulan Stream, and in the west of the Xinghua Bay. It has National Road 324, Fuzhou-Xiamen Highway, Xingyou Highway, Fuzhou-Xiamen Railway, and Xiangpu Railway in its region. The Hanjiang railway station is located in Jiangkou town. The project area lies within 25°23' to 25° 27'N latitudes and 119° 04' to 119°10'E longitudes. It is located in the middle of the southeast coast, east to Taiwan Strait, and south to "triangle of the gold austral Fujian".

31. **Topography.** The proposed site is in relatively flat terrain. The regional tectonic setting is stable and there is no active fault zone in the near area.

32. **Climate.** Hanjiang has a monsoonal subtropical marine climate, characterized by long, cool and humid summers and short, mild and dry winters. The average annual temperature is 20.2°C, with an annual sunlight of 1943 hours and annual precipitation of 1289 mm. The average wind speed is 1.9 m/s with prevailing wind direction of north.

33. **Hydrogeology.** The proposed project will abstract water from Yaoshan stream. Yaoshan stream is regulated by Xuanzhongling Reservoir with a capacity of 120,000 m<sup>3</sup>. Xuanzhongling Reservoir was designed and built to provide adequate irrigation water for Dayang Country. The seasonal variation will not significantly impact the water availability for irrigation since the reservoir's stored water during the wet season (April to September) can be used during the dry season (November to March). The project area is located upstream of Dongzhang Reservoir, where is 21km out of the secondary water source protection zone of Dongzhang Reservoir.

### C. Ecological Resources

34. The greenhouse facilities will be built on the existing farmland. The proposed site was surrounded by hills which primary vegetation type is grassland as observed during the site visit by Le Gaga's external environmental consultant on February 2014. The predominant vegetation species includes *Digitaria sanguinalis* (L. ) Scop, *Eleusine indica* (L.) Gaertn, and *Cyperus difformis* L. The major animal in the project area is microtinae.. No rare, threatened, or endangered species under the IUCN Red List have been recorded in the project area as confirmed by domestic TEIA through field survey conducted by EIA institute during November 2014. The field survey conducted was based on the requirement of the PRC Technical Guideline for

Environmental Impact Assessment: Ecological Impact (HJ 19-2011) which identifies the project site as cultivated land and not located in environmental sensitive areas.



Figure IV-1: Current vegetation cover of proposed site

#### D. Physical Cultural Resources

35. No cultural heritage or archaeological sites are recorded within the project area. The project site is about 5 km to the of Laoyingjian Provincial Nature Reserve Area and 5.6 km to the Ruiyunshan Provincial Forest Park. Laoyingjian Provincial Nature Reserve Area and Ruiyunshan Provincial Forest Park are set to protect subtropical evergreen broad-leaved forest. The proposed project will not affect the forest resources in both areas.

#### E. Socioeconomic Conditions

36. Dayang Country covers 120 km<sup>2</sup> of 18 administrative villages, including 172, 000 mu cultivated land and 129, 000 mu hilly area. The total population of Dayang Country is 15,922.

37. The GDP of Dayang Country reached 2000 million CNY in 2011, of which 165 million CNY is from agriculture and forestry. The per capita net income in rural area is about 4,800 CNY. Agriculture in Dayang is unique and precocious. There are 2,000 mu chestnut, 25,000 mu late loquat, 3,000 mu ginkgo and ten thousands mu season vegetable in Dayang.

#### F. Environmental Quality Baseline

38. This section presents the environmental quality baseline conditions.

39. **Air Quality Baseline.** According to the Environmental Quality Bulletin of Putian City (Q4, 2014), the average Air Pollution Index (API)<sup>1</sup> of urban area in Putian was 54 that satisfied the requirement of Class II of Ambient Air Quality Standard

<sup>1</sup> The API level was based on the level of 5 atmospheric pollutants, namely sulfur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), suspended particulates (PM<sub>10</sub>), carbon monoxide (CO), and ozone (O<sub>3</sub>). 0-50=good, 51-100=moderate, 101-200=unhealthy, 201-300=very unhealthy, 301-500=hazardous, 500+=emergency.

(GB3095-1996). The project site is located in rural area of Putian. There is no significant industrial development in the project area. The air quality in the project area is assumed better than urban area of Putian and it could be concluded as “Moderate to Good” based on site field survey conducted on 14<sup>th</sup> February 2014 and air quality assessment published in the Environmental Quality Bulletin of Putian City (Q4, 2014).

40. **Surface Water Quality.** The project site is located in Longjiang river basin. Referring to the Environmental Quality Bulletin of Fuqing (2012), the water quality of Longjiang River complies with the requirements of Category III (GB 3838-2002).

41. The irrigation water will be sourced from Yaoshan Stream. Water quality of Yaoshan Stream was monitored on 16<sup>th</sup> December 2014 by Fujian Inspection and Research Institute for Product Quality. The monitoring results as given in Table IV-1 show that the level of heavy metals in the water is far below the maximum allowable concentrations defined in Standards for Irrigation Quality (GB 5084-2005).

**Table IV-1: Water source quality of Yaoshan Stream**

Tested Parameters	pH	H <sub>g</sub>	C <sub>d</sub>	A <sub>s</sub>	C <sub>u</sub>	P <sub>b</sub>	Cr <sup>6+</sup>
Test results	7	<0.0005	<0.001	0.002	<0.01	<0.001	<0.01
GB 5084-2005	5.5-8.5	≤0.001	≤0.01	≤0.05	≤1	≤0.2	≤0.1

42. **Noise.** Noise monitoring was conducted in the project site boundary on 28<sup>th</sup> October, 2014. Fair-weather condition was observed during the monitoring period, with recorded wind speed less than 5m/s. This is the favorable meteorological condition for noise monitoring as there are minimal interferences influencing the noise levels. Total of four (4) monitoring points were set up at the north, east, south and west boundaries of the project area. The monitoring results are shown in Table IV-2.

**Table IV-2: Noise baseline monitoring results**

Monitoring Location	1#	2#	3#	4#	Noise Standards (GB 12523-2011)
Daytime	54.1	53.2	55.7	55.4	55
Nighttime	45.3	44.6	46.1	44.9	45

43. The monitoring results indicated that the baseline noise levels meet the Class II of Acoustic Quality Standard (GB 3096-2008).

## **V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES**

### **A. Project Rationale and Benefits**

44. The project is expected to reduce a farm's water consumption through the use of drip water irrigation. The adoption of greenhouse and advanced drip irrigation technology will save 70-80% of the water demand from the traditional irrigation system, according to Fujian Water Consumption Norm (DB 35/T722-2007). The annual water consumption is expected to be reduced from 270 m<sup>3</sup>/mu to 189-216 m<sup>3</sup>/mu. In addition, the integrated drip irrigation system will supply water and fertilizers based on the demands of plants. The nutrient efficiency will be improved. The major product, tomato will be grown in culture bags so that the nutrient infiltration into soil and groundwater will be greatly reduced. Therefore, the project will reduce non-point pollution from agricultural through adoption of such advanced horticulture practices compared with traditional extensive planting methods.

### **B. Screening and Scoping of Potential Impacts**

45. **Environmental Impacts Related to the Project.** The potential impacts (positive and negative) and risks were screened during the EIA study process in order to (i) identify the relative significance of potential impacts from the activities of the proposed infrastructure; (ii) establish the scope of the assessment which assists in focusing on major, critical, and specific impacts; and (iii) enable flexibility in regard to consideration of new issues, such as those reflecting the requirements of both the PRC's environmental laws, regulations and standards, and ADB's Safeguard Policy Statement (2009).

46. The anticipated impacts caused by the proposed Dayang production base during construction phase include: noise, air pollution (mainly fugitive dust); wastewater discharge, soil erosion; solid waste disposal; and occupational and community health and safety. The potential impacts during operation phase include noise from pumps, waste plastic films and pesticides containers and occupational and community health and safety.

47. The potential environmental sensitive receivers were identified through site survey as presented in Fig. V-1, including residents in Longbianwei Village, Yaoshan Village, Xihu Village and downtown of Dayang Country.

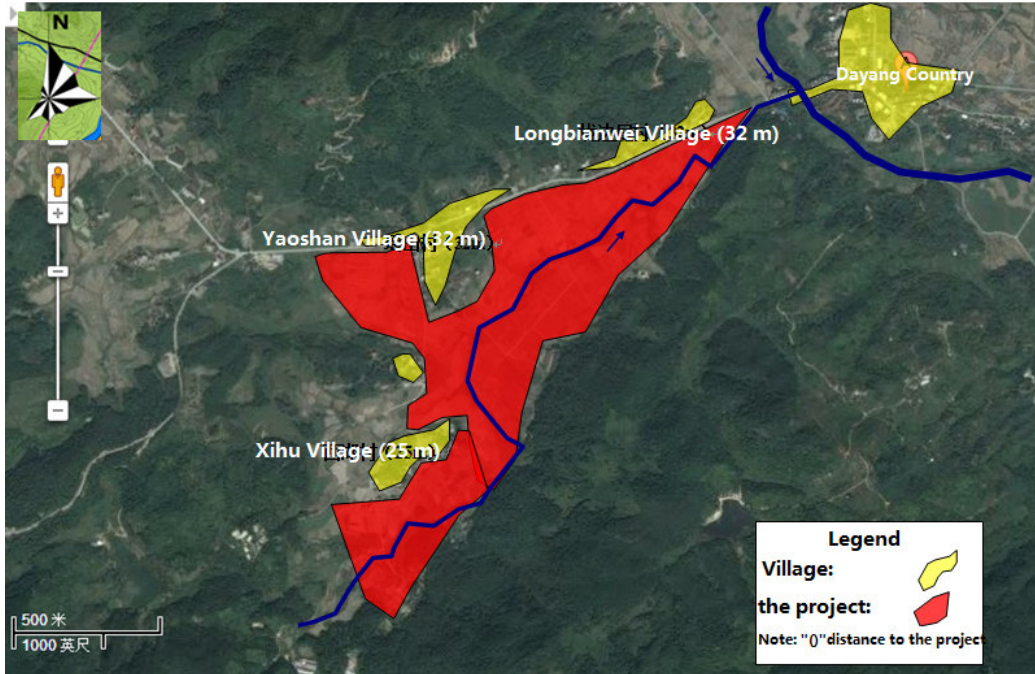


Figure V-1: Distribution of sensitive receivers

C. The following sections describe the anticipated environmental impacts of the project during the Construction and operational phases. Environmental Impacts and Mitigation Measures during Construction

1) Noise

48. The construction will be mostly done by manual labor during daytime. Heavy machinery, such as concrete mixer, excavator, bulldozer and pile hammer will not be used during construction. The construction machinery involves forklift truck and transportation trucks. The following predictive model is used to forecast the noise level in line with Technical Guideline on EIA Regarding Acoustic Environment (HJ2.4-2009).

$$L_i - L_0 = 20 \lg \left( \frac{R_i}{R_0} \right)$$

Where:  $L_i$  and  $L_0$  are equipment noise level at  $R_i$  and  $R_0$  respectively, dB (A);

49. The predicted noise level with different distances is presented in Table V-1.

Table V-1: Construction equipment noise impact distance

Distance (m)	5	10	20	30	40	50	60	70	80	100
Noise (dB)	85	78.98	72.96	69.44	66.94	65.00	63.42	62.08	60.92	58.98

50. The results show that the impact distance is 30 m away from the source without consideration of any mitigating measures. These impacts meet the PRC standard of Emission Standards of Ambient Noise at Boundary of Site (GB 12523-2011). The nearest residences are 25 m away from the boundary site and approximately 150 m away from the noise source. The following mitigation measures will be implemented to meet the PRC construction site noise limits and to protect sensitive receptors:

- Reduce noise level of the equipment: Low noise equipment shall be chosen as practical as possible; locations shall be fixed for earth excavation equipment and transportation machinery; noise shall be reduced by exhaust pipe and muffler and insulating the vibration part of the engine; idle equipment shall be closed immediately; speed of transportation vehicles shall be reduced and honking noise shall be reduced while entering the site.
- Reduce man-made noise: education awareness shall be provided for construction workers for civilized construction, construction materials shall be transported by crane or manually, throwing down from vehicles is not allowed, loud noise should be avoided when piling up steel materials.
- Reduce impact of vehicle transportation noise: avoid transportation at night as practical as possible, reduce speed for large transportation as possible, especially when entering into environmental sensitive area, honking shall be reduced or completely avoided.

## 2) Air

51. Anticipated source of air pollution from construction activities is dust from ditch digging, tractor road rolling and greenhouse construction. The existing farmland has been already graded thus, large scale land leveling and excavation are not expected in the project site. The domestic TEIA estimated the maximum impact distance to be 100 m downwind of the project site based on an average wind speed of 1.9 m/s. And prevailing wind direction is north. The nearest receptors are from Xihu Village 25 m away from site boundary at downwind direction. of the following mitigation measures are defined to reduce air pollutant emissions.

- Disclose the contacts (including site engineer, Le Gaga project company ESMS manager, telephone number etc.) and dust control measures at the entrance of the site;
- Cover the construction materials during temporary stacking and transport to avoid spillage and dust;
- earthwork, demolition and other construction activities will be reduced during strong windy days;
- Arrange vehicle cleaning facilities with provision of supporting drainage and mud sedimentation facilities;
- No mud and construction waste on the site access road and within 100m of the entrance;
- Arrange one spray trunk and spray water on construction site and roads once per day during peak construction to reduce dust from earthwork excavation, transport, loading and unloading and stacking; spraying may more frequent if the construction site is within 100 m upwind from the village.
- Maintain vehicles and construction machineries to a high standard to ensure efficient running and fuel-burning and compliance with the PRC emission standards for vehicles and machineries (GB17691-2005 and GB11340-2005).

## 3) Water

52. The construction process will be simple and last for short time. The workers will be hired locally. It will be not necessary to set up construction camp. Mobile toilet will be provided on site. The wastewater will be collected by local farmers as fertilizer.

53. The soil excavated will be stacked far from the ditch to avoid flushing into the water body.

#### 4) Solid Waste

54. **Construction solid waste.** The construction solid waste includes debris, sand, stones, broken brick, wood waste, scrap metal, scrap steel and other debris will be transported to the appointed landfill site if not be reused. The excavated earth of ditches is estimated at 4,351 m<sup>3</sup> and will be all reused for the tractor road.

#### 5) Impacts on Biological Resources

55. As established during environmental baseline assessment, the project site is in the existing cultivated land which cannot sustain high biodiversity due to long term human disturbance activities.

#### 6) Physical Cultural Resources

56. Contractor must comply with PRC's Cultural Relics Protection Law and Cultural Relics Protection Law Implementation Regulations if such relics are discovered, stop work immediately and notify the relevant authorities, adopt protection measures and notify the Security Bureau to protect the site.

### D. Environmental Impacts and Mitigation Measures during Operations

#### 1) Water

57. The domestic TEIA estimated an amount of 1810.4 t /a municipal wastewater will be generated during operation, including 29.2 t/a from canteen and 1781.2 t/a from dormitories and office building. Wastewater from canteen will be pretreated by oil separation tank to remove oil. All domestic wastewater will be discharged into an on-site underground integrated wastewater treatment facility using cyclic activated sludge system. The defined influent quality is shown in Table V-2. The effluent is designed to satisfy the Standards of Irrigation Water (GB 5084-2005) after treatment by the integrated wastewater treatment system and can be reused for traditional agricultural irrigation.

**Table V-2: Municipal wastewater estimates during operation**

Parameters	COD	BOD <sub>5</sub>	SS	NH <sub>3</sub> -N	Oil
Concentration (mg/L)	400	200	220	35	40
Amount (t/a)	0.72	0.36	0.4	0.06	0.07
Designed effluent concentration /mg·L <sup>-1</sup>	100	20	70	15	10
Amount /t·a <sup>-1</sup>	0.18	0.04	0.13	0.02	0.02
Reduction /t·a <sup>-1</sup>	0.54	0.32	0.27	0.04	0.05
GB 5084-2005	200	100	100	/	/

58. A stock solution consisting of a single fertilizer, or several compatible fertilizers, dissolved in water is supplied to the vegetables by in-line drip irrigation to ensure precise delivery of water and fertilizer to crop. Electronic conductivity (EC) and pH are monitored on line to control the concentration of nutrients.

59. Low toxic bio-pesticides, such as Toosedarin and Matrine will be used, which are highly efficient . The pesticides are also applied through drip irrigation. Therefore, fertilizers and pesticides carried by surface runoff and infiltration are limited.

Any pesticide leakage will pollute water and soil. The management of pesticide warehouse shall strictly follow Le Gaga’s Environmental and Social Management System (ESMS). This includes internal pesticide application and storage manual, which is applicable for all production bases of Le Gaga. The pesticide manual covers the associated risks of the pesticide, transportation and storage procedures, labeling procedure, and proper usage of handling of pesticides.

**2) Solid Waste**

60. On average, the production base will hire 200 workers, including 5 resident workers. It is estimated that 36.68 t municipal solid waste will be generated annually, base on the assumption that each resident worker could produce 1 kg/d solid waste and each non-resident work could produce 0.5 kg/d solid waste. The municipal solid waste will be transported to a collection point at Yaoshan Village by Le Gaga and collected by local sanitation agency regularly to Hanjiang Landfill center.

61. The rotten leaves will be collected for composting.

62. About 3 t/a waste packaging materials, mainly scrap tape and plastic bags will be disposed by the project. The unrecyclable waste packaging materials will be handled by the local sanitation agency.

63. It is estimated that the proposed production base will consume 2,000 kg pesticides and 300,000 kg pesticides, which will generate about 1.5 t/a of waste bags and containers. The pesticide and fertilizer suppliers will retrieve the waste bags and containers. This will be included in the procurement agreement between Le Gaga and suppliers.

**3) Noise**

64. Noise during operation of the production base is mainly from various pumps. The noise generated will be from the following equipment listed in Table V-3. Each irrigation district is served by one pump system so that there will be 6 sets of pumps in total. The pumps will only operated during daytime. The noise from six pumps during operation will be 86.6 dB.

**Table V-3: Noise strength of the mechanical equipment used in proposed production base**

No.	Source	Set	Strength (dB(A))
1	Centrifugal pump	6	83
2	Inverter control cabinet (25 KW)	6	75
3	Small inverter control cabinet (5 KW)	6	75
4	Self-priming pump	6	83

65. All pumps will be installed indoor. Generally, the pump room can reduce 10 dB. The cumulative noise level of six pumps is 86.6 dB. Table V-4 presents the predicted noise levels at different distances. The predicted noise level at the nearest sensitive receptors (Xihu Village, 25 m north of the project site) is 48.6 dB. This is



compliant to the Class I of Noise Standards at the Boundary of Industries and Enterprises (GB 12348-2008) which is 55dBA during daytime. In addition, all pumps will only be operated during daytime. The impacts on dormitory are limited.

**Table V-4: Noise level at different distance**

Source	Strength (dB)	Noise at different distance (dB)							
		5	10	15	20	25	30	40	50
Pumps	86.6	62.6	56.6	53.1	50.6	48.6	47.1	44.6	42.6

#### 4) Air Quality

66. The possible source of air emission during the operations of the project is from the cooking fumes from canteen. The oven will be operated about 4 hours per day. Fume purification device with removal rate above 60% will be installed and operated.

#### 5) Occupational Health and Safety

The occupational exposures to pesticides may be through dermal exposure, and inhalation from spraying operations. The production base will use biological pesticides, such as Toosendainin and Matrine which are extracted from plants, with low toxicity to human. Toosendainin and Matrine are promoted by Ministry of Agriculture (MoA) for pollution-free agricultural products (MoA, No. 194) and are not listed in the WHO Acute Hazard list. Both of them are organic botanical insecticides with the following compositions:

- (1) Toosedarin: 0.6% toosedarin, (CAS:58812-37-6) (emulsion)
- (2) Matrine: 0.3% martrine (CAS:519-02-8), (aqua)

67. Pesticides application will only be conducted by specialized team. In addition, the following measures will be taken:

- Provide safety instructions in each workshop regarding the storage, transport, handling of pesticides;
- Provide material safety data sheet (MSDS) onsite and provide training to the workers on how to use them;
- Provide the necessary personal protective equipment (PPEs) for pesticide application, equipment cleaning, or spill cleanups ;
- Ensure that employees are adequately trained;
- Provide guidelines to limit the exposure time of employees who apply, mix or handle pesticides;
- Assure that employees receive required medical surveillance;
- Distribute the internal agribusiness manual covering proper fertilizer use and pesticide management to all relevant workers.

## **VI. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION**

### **A. Legislative Framework for Public Consultation and Information Disclosure**

68. Relevant provisions in the Environmental Protection Law of PRC and the Regulations on the Administration of Construction Project Environmental Protection (Order of the State Council, No. 253) require that domestic environmental impact assessments shall solicit the opinions of units concerned and inhabitants of a proposed project construction site. The PRC National Development and Reform Commission (NDRC) issued a requirement for “Social Risk Assessment of Large Investment Projects”.

69. In August 2012, which emphasizes the importance of public consultation in an effective manner, and requires that the results of public consultation are clearly summarized in the domestic safeguards reports, including the dates of consultations, number of stakeholders, who the stakeholders are, and the comments received.

70. ADB’s Safeguard Policy Statement (2009) also has detailed and strict requirements on meaningful participation, consultation and information disclosure. The consultation process for this project therefore followed both the PRC requirements and the ADB requirements.

71. In line with ADB’s SPS and Public Communications Policy, Le Gaga commits that its subproject companies will make relevant information (whether positive or negative) about social and environmental safeguard issues available in a timely manner, in an accessible place, and in a form and language(s) understandable to affected people and to other stakeholders, including the general public and civil society organizations, so they can provide meaningful inputs into project design and implementation.

### **B. Information Disclosure and Public Consultation to Date**

72. The information of the proposed Dayang Production Base was disclosed on the website of Hanjiang District EPB on 3<sup>rd</sup> December 2014, including the full report of the draft DEIA, contact details of Le Gaga and the EIA institute to solicit public comments on the preliminary findings of the EIA (<http://www.pthjhbj.gov.cn/bmdt/gggs/hpspgggs/20141203/642900001.shtml>)(see Fig. VII-1).

73. During information disclosure on Hanjiang District EPB, Le Gaga and Hanjiang District EPB did not receive any written or oral feedbacks or objections from public.

74. Hanjiang District EPB undertook a second round disclosure on approval of the project during 23<sup>rd</sup> to 31<sup>st</sup> December 2014 (<http://www.pthjhbj.gov.cn/bmdt/gggs/hpspgggs/20141222/199600001.shtml>). The information disclosed includes project information, requirements on mitigation measures, and contacts of Hanjiang District EPB (see Fig. VII-2).



Figure VI-1: First Round of Information disclosure by Hanjiang District EPB



Figure VI-2: Second Round of Information disclosure by Hanjiang District EPB

### C. Public Consultation

75. A small scale environmental public consultation workshop was organized by Le Gaga on 13<sup>th</sup> February 2015 supported by external environmental and social consultants. Five (5) potential affected villager representatives were consulted during the workshop. All attendees were supportive to the project.



**Figure VI-3: Public consultation on environmental and social aspects for the proposed production base**

#### **D. Future Information Disclosure and Public Consultation Program**

76. Information disclosure and public consultation relating to environment safeguard will continue throughout the project implementation. The project's environmental information will be disclosed by the local EPB and ADB as follows:

- The project IEE will be disclosed on the project website at [www.adb.org](http://www.adb.org);
- All annual environmental and social performance monitoring reports of Le Gaga will be available at [www.adb.org](http://www.adb.org);
- Environmental completion acceptance inspection result will be disclosed on the website of Hanjiang District EPB at <http://www.pthjhbj.gov.cn/>.

## **VII. GRIEVANCE REDRESS MECHANISM**

77. Le Gaga, together with the subproject company, will establish a grievance redress mechanism (GRM) on site for handling environmental and social complaints, including complaint recording, consultation, issue investigation, mitigation action, follow-up, general timeframe for resolution and delegation of responsibilities. The GRM will address any possible concerns and dissatisfaction of affected groups (e.g. communities, workers) regarding the social and environmental impact of its subprojects, and seek a proper solution within a specified time frame. It should be able to promptly respond to the affected groups, be transparent and free of gender discrimination, and adapt to the cultural traditions of the affected groups and communities. Moreover, it should enable different affected groups to express their opinions, with no fear of reprisal. The E&S General Manager will be responsible for (i) resolving appeals, complaints, and disputes concerning the environmental and social impacts of subprojects which have not been resolved by the plant managers at the subproject level, and (ii) for coordinating, guiding and supervising the subproject companies in handling appeals, complaints, and disputes.

78. Each subproject company will inform the local community and the affected people of the grievance and appeal procedure through public information meetings, and other media, so that they can fully understand their rights for grievance and appeal.

79. The project company will inform the local community and the affected people of the grievance and appeal procedure through public information meetings, the resettlement information brochure and other media, so that they can fully understand their rights for grievance and appeal. All complaints submitted and actions implemented will be properly documented and be included in the grievance register.

## **VIII. ENVIRONMENTAL MANAGEMENT PLAN**

80. The EMP defines appropriate mitigation measures for the anticipated environmental impacts, and defines the institutional responsibilities and mechanisms to monitor and ensure the compliance with PRC's environmental laws, standards and regulations, and ADB's Safeguard Policy Statement (SPS 2009).

81. EMP supervision and monitoring results will be used to evaluate (i) the extent and severity of actual environmental impacts against the predicted impacts, (ii) the performance of the environmental protection measures or compliance with related rules and regulations, (iii) trends of impacts, and (iv) overall effectiveness of the mitigation measures.

### **A. Organizations and Their Responsibilities for EMP Implementation**

82. The E&S General Manager reports to Le Gaga's senior management. E&S General Manager has oversight for environmental and social issues, ensures that resources are made available for environmental and social management, and should sign and submit the annual environmental and social performance report to ADB. S/he should ensure that ADB is notified if and when there is material environmental or social safeguards non-compliance. S/he should ensure that ADB is notified if and when the responsible staff has been changed or replaced with new staff.

83. At the corporate office, an E&S officer will assist the E&S General Manager in effective safeguards planning and implementation. During subprojects preparation and implementation period, the safeguards team at the corporate office will be responsible for the environment and social issues, and will prepare IEE and Social Compliance Audit Report, supervise the effective implementation of the EMP; coordinate periodic environmental and social impact monitoring according to the approved monitoring plan; coordinate the project level GRM; prepare annual environment progress reports and submit them to ADB; conduct public consultation and inspect implementation of mitigation measures. Implement the ESMS system at both the holding company and Project Company levels.

84. An E&S manager of Project Company is appointed to implement the environment and social safeguards at Project Company and prepare and submit the annual environment and social impact monitoring report to the E&S General Manager.

85. Construction contractors engaged by the Project Company will be responsible for implementing the mitigation measures during construction under supervision of the Project Company and Corporate office. In their bids, contractors will be required to respond to the environmental management requirements defined in the EMP. After project completion, environmental management responsibilities will be handed over to the Project Company.

### **B. Summary of Potential Impacts and Mitigation Measures**

86. Table VIII-1 summarizes the potential impacts and environment safeguard issues of the production base during pre-construction, construction and operation as identified by the environmental impact assessments and set out in this IEE, as well as corresponding mitigation measures designated to minimize those impacts and address these issues.

**Table VIII-1: Potential Impacts and Mitigation Measures during Design, Construction, and Operation Phases of the Project**

Item	Impact Factor	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Implementing Agency	Supervising Agency
<b>Design Phase</b>					
<b>Design of production base</b>	<b>Noise</b>	Noise from production base	<ul style="list-style-type: none"> <li>Technical design of the production base must be able to contain the operational noises from pumps.</li> </ul>	Designer	LE GAGA, Project Company
<b>Construction phase</b>					
	<b>Impact on water quality</b>	Wastewater production	<ul style="list-style-type: none"> <li>Mobile toilet will be provided on site.</li> <li>The earth excavated will be stacked far away from the ditch to avoid flushing into the water body.</li> </ul>	Contractor	LE GAGA, Project Company, local EPB
	<b>Impact on air quality</b>	dust	<ul style="list-style-type: none"> <li>Disclose the contacts (including site engineer, Le Gaga project company ESMS manager, telephone number etc.) and dust control measures at the entrance of the site;</li> <li>Cover the construction materials during temporary stacking and transport to avoid spillage and dust;</li> <li>No earthwork, demolition and other construction activities during strong windy days;</li> <li>Arrange vehicle cleaning facilities with provision of supporting drainage and mud sedimentation facilities;</li> <li>No mud and construction waste on the site access road and within 100m of the entrance;</li> <li>Arrange one spray trunk and spray water on construction site and roads once per day during peak construction to reduce dust from earthwork excavation, transport, loading and unloading and stacking; spraying will be frequent when the construction activities are within 100 m upwind from the village.</li> <li>Maintain vehicles and construction machineries to a high standard to ensure efficient running and fuel-burning and compliance with the PRC emission standards for vehicles and machineries (GB17691-2005 and GB11340-2005).</li> </ul>	Contractor	LE GAGA, Project Company, local EPB
	<b>Impact on acoustic environment</b>	Increase of noise level	<ul style="list-style-type: none"> <li>Reduce noise level of the equipment: Low noise equipment shall be chosen as practical as possible; locations shall be fixed for earth excavation equipment and transportation machinery; noise shall be reduced by exhaust pipe and muffler and insulating the vibration part of the engine; idle equipment shall be closed immediately; speed of transportation vehicles shall be reduced and honing noise shall be reduced while</li> </ul>	Contractor	LE GAGA, Project Company, local EPB

Item	Impact Factor	Potential Impacts and Issues	Mitigation Measures and/or Safeguards	Implementing Agency	Supervising Agency
			<ul style="list-style-type: none"> <li>entering the site.</li> <li>Reduce man-made noise: education shall be provided for construction workers for civilized construction, construction materials shall be transported by crane or manually, throwing down from vehicles is not allowed, loud noise should be avoided when piling up steel materials.</li> <li>Reduce impact of vehicle transportation noise: avoid transportation at night as practical as possible, reduce speed for large transportation as possible, especially when entering into environmental sensitive area, honking shall be reduced or completely avoided.</li> </ul>		
	<b>Solid waste</b>	Municipal solid waste from workers camps, construction solid waste	<ul style="list-style-type: none"> <li>The construction solid waste will be transported to landfill if cannot be reused. The transport vehicles need to follow a specified route and time and should be covered by tarp to prevent spill.</li> <li>The contractor needs to provide appropriate number of garbage bins at suitable location. The municipal solid waste will be delivered to landfill site by the sanitation agency regularly.</li> </ul>	Contractor	LE GAGA, Project Company, local EPB
<b>Impact on socio-economic resources</b>	<b>Physical cultural resources</b>	Damage to unearthed cultural relics	<ul style="list-style-type: none"> <li>Contractor must comply with PRC's Cultural Relics Protection Law and Cultural Relics Protection Law Implementation Regulations if such relics are discovered, stop work immediately and notify the relevant authorities, adopt protection measures and notify the Security Bureau to protect the site.</li> </ul>	Contractor	LE GAGA, Project Company, local Cultural Relics Bureau
<b>Operation phase</b>					
<b>Impact on physical resources</b>	<b>Impact on water quality</b>	Failure to operate the wastewater treatment facility	<ul style="list-style-type: none"> <li>Install oil trap and integrated wastewater treatment facility;</li> <li>Ensure proper O&amp;M systems are in place and equipment in good working order and also ensure backup power system available;</li> <li>Provide operational training to the operator</li> <li>The management of pesticide warehouse shall strictly follow Le Gaga's internal pesticide application and storage manual which applicable for all production bases of Le Gaga.</li> </ul>	Operator	LE GAGA, Project Company, local EPB
		Pesticide leakage			
	<b>Impact on air quality</b>	Failure to operate the fume purification device	<ul style="list-style-type: none"> <li>Maintain the fume purification device in good working order and ensure removal rate no less than 60%.</li> </ul>	Operator	LE GAGA, Project Company, local EPB
	<b>Impact on</b>	Equipment noise	<ul style="list-style-type: none"> <li>Maintain all pumps in good working order.</li> </ul>	Operator	LE GAGA, Project



<b>Item</b>	<b>Impact Factor</b>	<b>Potential Impacts and Issues</b>	<b>Mitigation Measures and/or Safeguards</b>	<b>Implementing Agency</b>	<b>Supervising Agency</b>
	<b>noise</b>				Company, local EPB
	<b>Solid waste</b>	Improper solid waste disposal	<ul style="list-style-type: none"> <li>• The municipal solid wastes should be collected and transported by sanitation department timely.</li> <li>• Rotten leaves will be used for composting</li> <li>• The waste container and bags of pesticide and fertilizer will be retrieved by suppliers</li> </ul>	Operator	LE GAGA, Project Company, local EPB
<b>Occupational and community health and safety</b>			<ul style="list-style-type: none"> <li>• Post safety instructions in each workshop regarding the storage, transport, handling of pesticides;</li> <li>• Provide MSDS onsite and provide training to the workers on how to use them;</li> <li>• Provide the necessary PPEs for pesticide application, equipment cleaning, or spill cleanups ;</li> <li>• Ensure that employees are adequately trained;</li> <li>• Provide guidelines to limit the exposure time of employees who apply, mix or handle pesticides;</li> <li>• Assure that employees receive required medical surveillance;</li> <li>• Distribute the internal agribusiness manual covering proper fertilizer use and pesticide management to all relevant workers.</li> </ul>	Operator	LE GAGA, Project Company, local health and safety authority

EPB=environmental protection bureau;

87. Those that are temporary measures particularly during the construction stage, such as dust suppression, use of quiet / low noise powered mechanical equipment will need to be included in the tender documents, otherwise they are not budgeted by the contractor and they won't be done.

88. Those that will permanently become part of the infrastructure such as noise reduction materials for production base will need to be included in the design, otherwise they won't be built. Environmental investments are listed in Table VIII-2. The environmental investment is 690,000 CNY, accounting for 0.69% of the total investment.

**Table VIII-2: Environmental Investment for the production base**

Aspects	Facility	Cost Estimate (Unit: 10,000 CNY)
Air	Cooking fume treatment	1
Water	Integrated wastewater treatment facility+oil separation tank	20
Noise	Noise insulation and absorption facilities	40
Solid waste	Collection and storage	8
Total		69

### C. Environmental Inspection, Monitoring and Reporting

89. Table VIII-3 shows the environmental monitoring program specifically designed for this project, defining the requirements on the scope, location, parameter, duration and frequency of monitoring during operational stages.

90. During construction and operation, the E&S manager of the Project Company will undertake daily inspection on the implementation of environmental mitigation measures.

91. Monitoring will also be periodically conducted by the local environmental authorities in the framework of their legal mandate to check compliance with applicable environmental regulations. They will be responsible for undertaking regular and random environmental monitoring and inspection activities before, during, and after construction as well as in the event of emergencies.

**Table VIII-3: Environment Monitoring Plan**

Type	Monitoring Location	Monitoring Items	Monitoring Frequency
<b>During Construction</b>			
Air	at the construction boundary that on downwind direction	TSP	Once during construction peak
Noise	Boundaries of construction sites	Equivalent continuous A sound level	2 ( 1 in daytime, 1 in night time) samples at each boundary; once per month during construction period
Soil erosion	Construction	Check the implementation of soil	Quarterly during construction

	site	erosion protection measures defined in Table VIII -1.	
<b>During Operation</b>			
Air	Canteen cooking fume	Cooking Fume	Annually
Noise	1m outside of production base	Equivalent continuous A sound level	2 ( 1 in daytime, 1 in night time) samples at each boundary quarterly
Wastewater	Outlet of the integrated wastewater treatment system	COD <sub>cr</sub> , BOD <sub>5</sub> , SS, NH <sub>3</sub> -N, oil	Annually

92. Environmental acceptance monitoring and reporting. Within three months after construction completion, or no later than 1 year with permission of the local EPB, environmental acceptance monitoring and audit report of completion of project shall be: (i) prepared by a licensed environmental monitoring institute in accordance with the PRC Regulation on Project Completion Environmental Audit (MEP, 2001), and (ii) reviewed for approval of the official commence of individual component operation by environmental authorities. The environmental acceptance reports will indicate the timing, extent, effectiveness of completed mitigation and of maintenance, and the needs for additional mitigation measures and monitoring during operations.

**Table VIII-4: Proposed Project "Three-Simultaneity" Environmental Protection Inspection Checklist**

Type	Treatment	Requirements
Wastewater	i) Municipal wastewater is treated by integrated wastewater treatment system. The effluent is reused for agriculture irrigation;	Effluent shall comply with Irrigation Water Quality Standards (GB 5084-2005)
	ii) Install oil separation tank for the canteen wastewater;	
	iii) Strictly control use of pesticides. High toxic pesticides are banned.	
Air	i) Install cooking fume purification facility	Comply with Cooking Fume Emission Standard (GB 18483-2001): The removal rate shall be 60% at least; Maximum allowable emission: 2.0 mg/m <sup>3</sup>
Noise	i) Use of low noise equipment and various noise reduction practices;	Noise at boundary shall comply with Emission Standard of Environment Noise for Boundary of Construction Site (GB12348-2008) Class I standard.
	ii) Maintain the pumps in good condition;	
	iii) No operation during nighttime;	
Solid Waste	Waste collection classification, collection and transportation by local sanitation agency	Removal rate shall be 100%
	The pesticide and fertilizer suppliers will retrieve the waste bags and containers	

93. **EMP compliance reporting.** Le Gaga will report to ADB the environmental and social compliance of the project through annual environmental and social performance report, including the implementation of EMP.

## IX. CONCLUSION

94. During the preparation of domestic EIA and project IEE, potential environmental impacts were carefully assessed and addressed. The domestic EIA was prepared by Nanjing Kehong Environmental Technology Limited Company in 2014 and reviewed and approved by Hanjiang District EPB on 22<sup>nd</sup> December 2014.

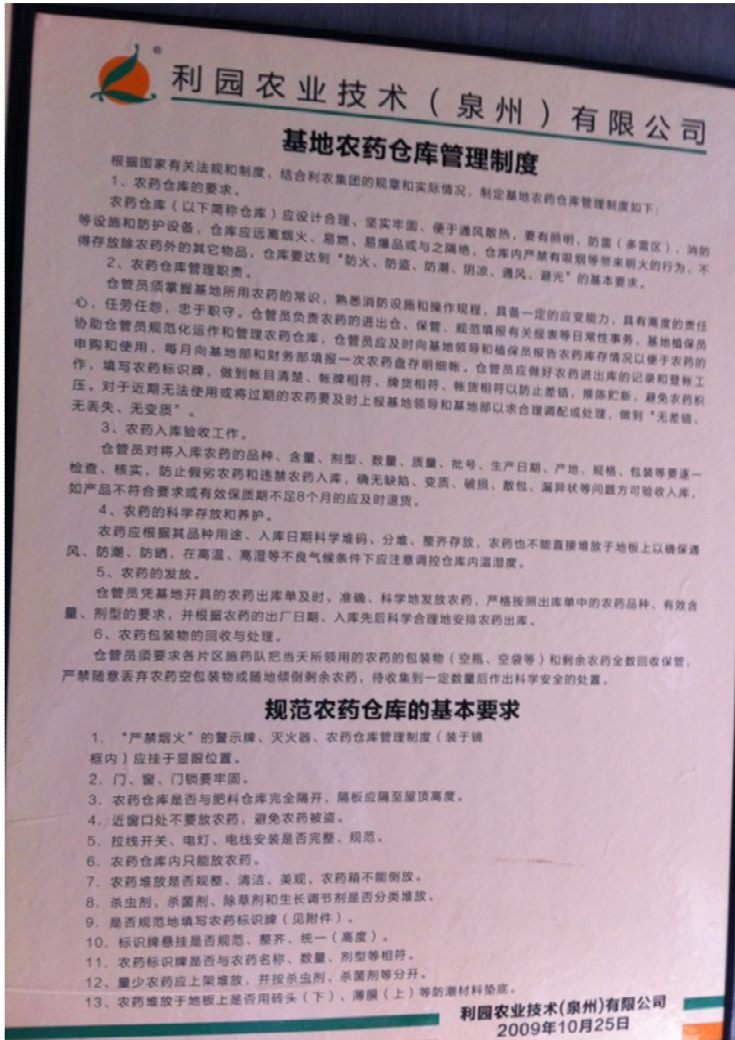
95. Major safeguards issues during construction include significant earthwork and soil erosion, noise pollution, air pollution, surface water pollution, inadequate construction waste management, and occupational and community health and safety. Overall, construction-related impacts are localized, short term, and can be effectively mitigated through the application of good construction and housekeeping practices and implementation of construction phase community and occupational health and safety plans. Appropriate mitigation measures and monitoring programs have been developed to address these issues.

96. The main potential adverse impacts during operation of the project facilities include improper operation of wastewater treatment facilities, solid waste disposal, especially pesticide and fertilizer bags and containers, storage of pesticide, noise from pump operation, occupational health and safety related to application of pesticide.

97. Mitigation measures and a monitoring program are defined for all identified impacts, and are included in the EMP of the project IEE. The EMP sets out the procedures and plans to carry out mitigation measures and monitoring during sequential stages of the project including design, construction and operation. For each impact, appropriate mitigation measures are described. Monitoring and supervision will be undertaken to ensure that environmental impacts will be minimized to acceptable levels.

98. The project IEE concludes that as long as the environmental mitigation and management measures defined in the EMP are properly implemented, all adverse environmental impacts associated with the project will be prevented, eliminated, or minimized to an acceptable level. The project is feasible from an environment safeguards point of view.

# Attachment 1: Le Gaga Internal Pesticide Management Procedures and Requirements





## Attachment 2: Minutes of Environmental and Social Public Consultation

<b>Project Title</b>	Le Gaga Holdings Limited Greenhouse Agricultural Development Project-Dayang Production Base
<b>Subject</b>	Environmental and social impact public consultation
<b>Data of workshop</b>	13 <sup>th</sup> February 2015
<b>Location</b>	Training Center of Dayang Country, Putian, PRC
<b>Attendees</b>	<p>Chenhang-Le Gaga ESMS manager  Yan Shengren- ESMS manager of Le Gaga (Putian) Branch  Chen Sheng-Manager of Dayang Production Base</p> <p>Villagers of Dayang country:  -Deng Yuanlong  -Liu Wenge  -Gongchengru  -Tang Guofei  -Wu Qizai</p> <p>Zhou Jian-external ESMS consultant</p>
<b>Main content</b>	<ol style="list-style-type: none"> <li>1. Le Gaga briefly introduced the proposed project to the villagers;</li> <li>2. Consultant introduced the anticipated potential environmental and social impacts of the proposed project;</li> <li>3. Consultant explained Le Gaga's GRM to the villagers;</li> </ol> <p>The villagers expressed welcome to Le Gaga to invest in Dayang as the project will bring additional income for the villagers and promote local economic development without sacrifice of environmental benefits. All villagers consulted were supportive to the project.</p>