



Baseline Study on Biogas Plant Performance in China

中国沼气工程运行评估基线调查

Short Description of the Project

项目简介

The German Technical Cooperation (GTZ) is implementing the 'SINO-GERMAN Project for Optimization of Biomass Utilization', together with the Foreign Economic Cooperation Center (FECC) of the China Ministry of Agriculture (MOA).

德国技术合作公司（GTZ）正在于农业部（MOA）外经中心（FECC）开展一项中德生物质能优化利用项目。

The aim is to provide Technical Assistance (TA) and to support the set up of about 110 middle and large scale biogas plants (MLBGPs) financed with a sector loan provided by Asian Development Bank (ADB), mainly at large scale animal husbandries and agro-industries in 4 selected provinces. Further, the project aims to support some selected projects as "best practice" demonstration projects under the aspect of renewable energy utilization, greenhouse gas mitigation and other environmental and socio-economic benefits. The support is extended to other potential biogas project developers in 'non-ADB provinces' with the intention to cooperate in terms of technology transfer and PPP in the field of advanced large scale biogas technology.

项目目标是为亚行行业贷款项目下的 110 座大中型沼气工厂的建立提供技术援助（TA）与支持，主要针对四个省份的大规模畜牧养殖场和农业行业。进而，在可再生能源利用，温室气体减排，以及其他有利于环境和社会经济的方面，本项目也会对特定的省份提供最佳实践的示范工程。该项目还将对其他非亚行项目省份的沼气项目开发商提供支持，目的是开展技术转移合作，并在先进的大中型沼气技术方面建立公私合作。

Baseline Study

基线调查

A **Baseline Study** on biogas plant performance in China is carried out as integral part of the 'SINO-GERMAN Biomass Utilization Project' of GTZ and FECC/MOA. The purpose is to **analyze the performance of up to 12 large scale biogas plants in China.**

此项针对中国沼气工程运行状况的**基线调查**作为德国技术合作公司（GTZ）和农业部对外经济合作中心（FECC/MOA）的“中德生物质能优化利用项目”的一部分，其目的是对中国的 12 座大规模沼气厂的运行状况进行分析。

Investigations of this type and scope have not been made in China before and cannot be provided by the regular laboratory services (even in Europe this kind of analysis is rather new) and experts involved in recently conducted, similar research in Germany will provide first hand information and interpretation.

在中国，此类调查以前从未开展过，常规实验室也无法进行此项分析（甚至在欧洲此类分析也是相当新的），目前在德国指导此项研究的专家将提供第一手的信息与说明。

In particular, plants differing in feedstock, technology and region will be analyzed and the results compared with recent findings from (mainly) German plants. The study will mainly focus on the biochemical and microbiological fermenter conditions (about 20 parameters) and plant operation characteristics.

特别是，我们将对使用不同原料，应用不同技术，处于不同地区的沼气厂进行分析，并将结果与德国（主要）沼气厂的最新研究结果进行比较。该分析将主要集中在发酵的生物化学和微生物学条件上（大约 20 项参数）以及工厂运行特点方面。

The results will be used to: 该分析结果将被用于

(i) Advise the analyzed plants (plant operators) how to better run their own digesters or which parameters might be critical to achieve better performance in future operation (for example accumulation of toxic substances, under- or over loading);

(i) 为参与分析的沼气厂提供建议，如何更好的运行其发酵罐，哪些尚未被注意的参数将对未来的运行产生重要影响（比如有毒物质的积累，低负荷或超负荷）。

(ii) Compile the field data and all data provided by the involved provinces and projects to issue an **anonymized final Baseline Study Report**. The report shall provide a thorough analysis of the state of biogas plant operation in China and a comparison to ‘international best practice’.

(ii) 将会整理实地调查数据，撰写基线调查最终报告，其中沼气厂名字会被隐去，该报告将会对中国的沼气工厂的运行情况提供详细分析，并与“国际最佳实践”标准进行对比。

Lessons learned and conclusion drawn will be considered in the future plants design and in developing the training curricula for plant operators and plant designers in future trainings of the project. They shall further be reflected in standards and guidelines for large scale biogas plants, e.g. in the **China Biogas Handbook**, which is to be developed within the project.

获得的经验以及得到的结论将被考虑应用于未来沼气厂的设计，以及针对工厂操作人员和沼气设计人员提供的课程培训，并将其作为大型沼气工厂的运行标准与设计指南，例如：纳入项目组将会撰写的《中国沼气手册》。

Baseline Study Training Measure / 基线调查培训

A training measure for the analyzing laboratories will be held before the on-site measurements are carried out. The title of the training will be

在开展实地调查之前，将提供实验室测定结果分析培训。培训命名为

‘Training for on-site measurements for performance evaluation of middle and large scale biogas plants in China’

中国大中型沼气工程运行评估实地测定培训

The training will be held on **18th and 19th of Mai in Beijing** for app. 6 teams, each app. 2 people at Chinese Agricultural University. The number of teams depends on the number of projects analyzed, but it is also seen under the training aspect - therefore the project wants to involve as many key laboratories as considered relevant. The estimated 14-18 participants will be instructed how to analyze the parameters relevant to evaluate the performance of a biogas plant. The study teams will further be advised in which format the field and laboratory analysis data has to be delivered for further processing and compilation.

该培训将于 5 月 18 日-19 日在北京中国农业大学举行，面向大约 6 个工作组，每个组两人。工作组的数目取决于需要调查分析的实地项目数量，但同时也兼顾培训目的，因此该项目希望主要相关实验室参与其中。大约 14-18 名参与者将会在如何分析相关参数，评估沼气工厂运行方面，得到培训指导，并在实地调查和实验室分析数据方面进一步得到指导，以便日后数据传送，加工和整理。

Plant Evaluation 工厂评估

The following information/parameter will be assessed / analyzed at each site during two 11-days sessions, one in warm (May/June) and one in cold season (November/December).

在每个现场，将会评估/分析如下信息/参数，此类工作将会在两个季节开展，温暖季节（五月/六月），寒冷季节（十一月/十二月），每次 11 天，共开展两次调查。

On-site assessment of project design and operation mode / 项目设计与运行模式现场评估:

(In cooperation with the project owner, the project designer, the domestic consultants and the local rural energy office)/（通过与项目业主，项目设计单位，国内顾问和当地农村能源办开展合作）

- Design, capacity and actual steps of processing and specification of main equipment
工艺设计，日产能力和实际步骤，主要设备说明
- Set and current process features such as throughput capacity, hydraulic retention time (HRT), specific organic loading rate, fermenter productivity
拟定和现有工艺参数如，日产能力，水力停留时间、有机负荷、产气率，
- Current process monitoring
现有工艺流程监控
- Use of biogas and digester effluent
沼气，沼液和沼渣利用
- Energy consumption
能量消耗
- Emissions (gaseous, liquid, solid, noise)
排放（气体，液体，固体，噪音）

On-site process related measurements (the bold parameters will be measured by the German experts) /现场工艺相关测定（黑体部分参数将由德国专家测定）:

(In cooperation and as advised by the German experts)/（与德国专家开展合作，并按照他们的建议执行）

- **Input / output (feedstock/digester effluent): quantity (t/d) and dry matter (105°C) for a simple mass balance**

- 进出料（发酵原料/沼液沼渣）：量（吨/天），干物质含量（105 °C）
- Fermenter conditions: timelines of fermenter temperature, pH and NH₃, random monitoring of buffer capacity, salinity, volatile fatty acids (VFA titration)
发酵罐内条件：发酵温度时间，pH，NH₃，缓冲容量，盐度，挥发性脂肪酸（滴定法）
 - Biogas: timeline of quantity generated (m³), random monitoring of CH₄ content and H₂S concentrations before and after desulphurization (if applicable), indicative investigations of biogas leakages
沼气：产气量（m³），脱硫前后甲烷含量和硫化氢浓度随机监控（如果适用），沼气泄露调查

Lab measurements / 实验室测定

- Input / output (feedstock/digester effluent): organic dry matter (ODM, 550°C ignition loss), biogas generation potential (50 days standard incubation test)
进出料（发酵原料/沼液沼渣）：有机干物质（550°C 灼烧损失）潜在产气量（50 天）
- Fermenter conditions: VFA (GC or HPLC), trace elements (ICP)
发酵罐内条件：挥发性脂肪酸（气相色谱或高效液相色谱）微量元素（ICP 光谱仪）

The German experts will provide the required instructions how to collect information and how to measure the required parameters to the Chinese study teams during a two days training at CAU Beijing and during the first two days of the on-site evaluation of each project. The expert will provide guidance for the Chinese study teams how to carry out the required measurements and how to treat the samples. The experts will also perform own measurements, e.g. those necessary for quality assurance. Further, the experts will request further data necessary for the Baseline Study from the project owner and from the domestic experts to for an overall flow description of the plant and a description of technical plant layout. A Chinese biogas expert from the project team will be present for English-Chinese translation.

在中国农业大学进行的两天培训以及每个项目调查的头两天，德国专家会对国内研究团队进行关于如何收集信息、如何测定必要数据、如何开展测定以及如何处理样品等方面的指导。其也会亲自进行测定，比如必要的质量保证。此外，德国专家还会通过项目业主和国内专家收集技术流程，工厂布局等必要的的数据。来自项目团队的一名沼气专家将会从事中英翻译。

Domestic experts on national (2) and provincial (4) level will be involved. The domestic experts will work in close cooperation with the international and domestic teams and provide assistance on the detailed activities and approaches of the Baseline Study.

国家级专家（2名）和省级专家（4名）也将参与此项工作，并与国际专家和国内团队保持紧密的合作，提供详细的活动和基线调查方法学方面的援助。

Baseline Study Workshop

基线调查研讨会

As final activity of the Baseline Study, a workshop for the biogas plants and other stakeholders concerned (provincial PIUs and the design institutes) will be carried out in Beijing to present the findings and discuss the Draft Final Report. The preliminary title of the workshop held around **March 2011** is:

‘Workshop on the performance of middle and large scale biogas plants in China’

基线调查结束后，沼气厂与有关单位（省级项目执行单位和设计单位）将在北京举行专题研讨会，讨论调查结果与拟定最终报告。目前初定在 2011 年 3 月举行的研讨会名称为：

“中国大中型沼气工程运行情况研讨会”

For the workshop, the German expert Dr. Clemens will come to Beijing. He will present the results, the analysis and his conclusions. All involved stakeholders will be invited to give their advice and comments to the experts’ work and the Baseline Study in general. The project owners will be advised how to better run their own digesters or which parameters might be critical to achieve better performance in future operation (for example accumulation of toxic substances, under- or over loading). The design institutes may gain substantial understanding about how to achieve better results in plant performance. The provincial PIUs may receive important input for their work to support the projects and to design a framework suitable for the special requirements of biogas utilization.

德国专家 Clemens 博士届时将参加研讨会。他将出具调查结果，分析以及结论。所有相关单位都将被邀请参加，并对专家工作和基线调查的结果提出建议和意见。项目业主也会得到建议，关于如何在将来更好的运行自己的发酵装置，哪些参数会对运行产生重要影响（例如有毒物质的积累，低负荷或超负荷）。设计单位也可能会得到更多关于如何更好运行沼气工程的理解。省级项目执行单位也可能会得到许多支持其工作的重要的知识，并针对沼气利用的特殊要求设计框架。

The results from the workshop will be used by Dr. Clemens will be used to improve the Final Report of the Baseline Study (end of March 2011).

Clemens 博士将把来自研讨会的成果用于改进基线调查最终报告（2011 年 3 月底）。

Progress of the Baseline Study (as of May 16th, 2010)

基线调查进展情况（截至 2010 年 5 月 16 日）

The Training of the Baseline Study will be held on May 18th and 19th. Schedule, materials, facilities are prepared for the two days. 6 Chinese biogas laboratories will participate in the Baseline Study, (a list of which is shown below). Each of them will send at least two people (Lab Teams 1-6) to the Baseline Study Training. They will be advised in a two day training measure by two German experts, Dr. Clemens and Dipl.-Ing. Hafermann from Gewitra Company, who where recently involved in this kind of Study in Germany. A biogas plant in the vicinity of Beijing was confirmed to be visited for the on-site part of the training measure.

关于基线调查的培训将在 5 月 18、19 日举行。日程，材料及相关设备将在近两日内准备妥当。六个中国沼气实验室将参与到此项活动中，（见下）。每个实验室将至少提供两名实验人员。来自德国 Gewitra 公司的，在德国专门从事该项调查的专家 Clemens 博士与 Hafermann 硕士将对实验人员进行两天的培训，包括在北京附近的一座沼气厂现场培训。

The first session of the Baseline Study will begin directly after the Training on May 20th. 11 projects in 7 different provinces were confirmed as Study sites and will be visited and analyzed for 11 days each between May 20th and June 25th. 4 Provincial Experts were selected to join the Chinese Teams in the study. The schedule is finished and the trips are prepared right now. The two German experts (see above) will guide the Teams in the first session of the Baseline Study.

培训之后，基线调查将在 5 月 20 日开始。直到 6 月 25 日，研究团队将对 7 个不同省份的 11 处沼气工程进行分析。4 位省级沼气专家也将加入到该项研究中。该日程已经确定。两位德国专家（见上）将指导研究团队进行工作。

Participating Biogas Laboratories 参加的实验室包括

1. CAU (China Agriculture University) 中国农业大学, rjdong@cau.edu.cn
2. ZJU (Zhejiang University) College of Biosystems Engineering 浙江大学, mehrdad.adl@zju.edu.cn; kcsheng@zju.edu.cn
3. NCEPU (North China Electric Power University) 华北电力大学 dongcq@ncepu.edu.cn; zhengzm@ncepu.edu.cn
4. ICEEE (Institute of Clean Energy and Environmental Engineering of Shenyang, Biogas lab) 沈阳航空航天大学清洁能源与环境工程研究所, 沼气实验室, rdlee@163.com
5. BIOMA (Chengdu Biogas Institute of MOA), 农业部成都沼气研究所 brtcyanli@yahoo.com.cn
6. UST (University of Science and Technology Beijing, Dept. Environmental Engineering), 北京科技大学环境工程系 zifulee@yahoo.com.cn

Baseline Study Project Sites 项目列表

Project Name 项目名称	Operation 运行情况	Feedstock 发酵原料	t/y 吨/年	Technology 发酵工艺	Designer 设计方	Comments, Willingness 备注
Zhaozhou Zhuangda, Heilongjiang 黑龙江肇州壮 大沼气工程	Since 2007, Operation over 3 years 2007 年运 行, 超过 三年	3000 f- cattle manure collection 收集 3000 头奶牛粪	36,500	Horizontal CSPFR , 2,000 m ³ side mounted mixtures, 横向全混平 推流反应器, 2000 m ³ , 侧搅拌 HCPF	Hainan Hua Fu Environmental Engineering Co., Ltd 海南华福环境 工程有限公司	ADB province, cold climate 亚行省份, 寒 冷地区 Depends on PIU 取决于 PIU OK 同意
Jiamusi Suburb Wanbao , Heilongjiang 佳木斯市郊区 万宝养殖场大 型沼气工程	Since 2009 Operation 2009 年运 行	10,000 f- pigs manure 猪粪, 10000 头育 肥猪	40,000	1200 m³ CSTR 800-1000 m ³ biogas / day 1200 立方 CSTR 工 艺, 每天产气 800- 1000 立方	Huimin Industrial Co., Ltd. 惠民实业有限 公司	ADB province 亚行省份 OK 同意
Tieling Hongfu Liaoning 辽宁铁岭宏福 沼气工程	Operation almost 2 years. Just stop, will restart in June. 运行接近 两年, 刚 停止运 行, 六月 份将重新 运行。	dairy cattle manure 奶牛粪	7,000 (operated below capacity) 实际运行低于 设计能力	CSTR , top mounted mixer, 2000 m ³ 2000 m ³ CSTR, 顶部搅 拌。	Liaoning Beifang 辽宁北方	CSTR, operated under design capacity 操作低于设计 能力
Sanyuan Derenwu (Lvhe) Beijing 北京三元德仁 务(绿荷)沼 气工程	6 months	Dairy cattle manure 奶牛粪	10,950 t/yr TS 18% 10,950 吨/年, 干物质含量 18%	CSTR 1350 m³ biogas / d, 120 KW installed capacity, since 2009 CSTR 工艺, 1350m ³ 日沼气产量, 装机容 量 120 千瓦, 2009 年 运行	HEEE 杭能	Monitoring by Beijing Univ. of S&T. 正在由北京科 技大学监测
Beixu Henan 河南北徐沼气 工程	Since 2006, Operation over 4 years 2006 年运 行, 超过 四年	100,000 f- pigs manure 猪粪, 100,000 头 育肥猪	100,000 wastewater + manure 100000 吨粪污	1600 m³ UASB (for liquid phase) 1600 m ³ UASB (处理 液体部分) 2000 m ³ biogas / day in summer 夏季每天产气 2000 立 方	Henan Dacheng Environmental Protection Engineering Ltd 河南大成环保 工程公司	ADB province 亚行省份 OK 同意

Muyuan Henan 河南牧原股份第十分场 沼气工程	Since 2007 operation over 3 years 2007 年开始运行,超过 3 年	30,000 f-pigs manure 猪粪, 30000 头育肥猪	150,000 wastewater + manure 150000 吨粪污	7400 m³ (3300+3300+800) EGSB+IC (for liquid phase) 7400 m ³ (3300+3300+800) EGSB+IC (处理液体部分) 1500-2000 m ³ biogas / day 每天产气 1500-2000 m ³	Muyuan Infra-structure Construction Department 牧原基建工程部	ADB province 亚行省份 OK 同意
Suichuan Jiangxi 江西遂川沼 气工程		10,000 f-pigs manure 猪粪, 10000 头育肥猪	50,000 wastewater (20 kg flush water/ pig/day, 70% waste water is treated) 50000 吨废水 (每头猪每天需要冲洗水 20 公斤, 70%被处理)	300 m³ × 2 UASB (for liquid phase) Only one AD operating 300 m ³ × 2 UASB (处理液体部分) 仅一个运行中	Shenzen Long Tai Ji Env. Ltd 深圳隆泰基工程公司	ADB province 亚行省份 Depends on PIU OK – DEMO project (5) 取决于 PIU, 同意-示范项目 5
Jian Huahai Jiangxi 江西吉安华海沼气工程	Since 2008, Operation over 3 years 2008 年运行, 超过三年	3,000 f-pigs manure 猪粪, 3000 头育肥猪	15,000 t wastewater 15000 吨废水	400 m³ UASB (for liquid phase) 400 立方 UASB (处理液体部分)	Local designer	ADB province 亚行省份 operated under design capacity 操作低于设计能力 OK 同意
Yuanshan Sichuan 四川袁山沼 气工程		Rabbit manure 兔粪	2,000	Passive AD, 800 m³, 34 KW engine (passive technology), 80 m³ biogas /day in Summer, 地下厌氧罐, 600 m³, 34 千瓦发电机 (落后工艺), 夏季每天产气 80m3	Chengdu Biogas Institute 成都沼科所	Comparison with AD passive technology 对比落后工艺 OK (6) 同意 (6)
Bajie Food Ltd, Feicheng City, Shandong 山东省肥城市八戒食品有限公司沼 气工程	Since 2007, Operation over 3 years 2007 年运行, 超过 3 年	10,000 f-pigs manure 猪粪, 10000 头育肥猪	57,600 wastewater (16kg flush water/ pig/day, 100% waste water is treated) 57,600 吨废水 (每头猪每天需要冲洗水 16 公斤, 100%被处理)	1500 m³ USR (for liquid phase) 800 m³ biogas / day 1500 m ³ USR (处理液体部分) 每天产气 800 立方	济南市十方圆通水处理有限公司 Jinan Shifang Yuantong Wastewater Treatment Ltd	ADB province 亚行省份 OK 同意

Agri. Hi-tech Zone, Jinan City, Shandong 山东省农业高新技术示范园畜牧示范区沼气工程	Since 2008, Operation over 2 years 2008 年运行, 超过 2 年	600 Dairy cow, 600 头奶牛	20.7t manure and 25m ³ wastewater/day 7,500t manure + 9,000t wastewater 日清理粪污约 20.7 吨, 污水 25 立方米 年处理牛粪 7500 吨, 污水 9000 吨	600 m³ CSTR with heating system (for cow manure) 600 m ³ CSTR 有保温 (处理牛粪) 500-600 m ³ biogas / day 每天产气 500-600 立方	Qingdao Tianren Environmental Engineering Co., Ltd. 青岛天人环境工程有限公司	ADB province 亚行省份 OK 同意
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Data available 日期可行	Beilangzhong Beijing 北京北郎中沼气工程	Pig manure 猪粪	45,000	USR, HCF, 1,500 m³	Already analyzed by BMBF project 已经由“中国农业及城市有机垃圾循环利用-沼气技术部分”项目开始分析
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Baseline Study Summary Project Sites

Project Name 项目名称	Feedstock 发酵原料	t/y 吨/年	Technology 发酵工艺	Designer 设计方	Comments, Willingness 备注
1. Zhaozhou Zhuangda, Heilongjiang	f-cattle	36,500	Horizontal CSPFR, HCPF	Hainan Huafu	ADB province, PIU? OK
2. Tieling Hongfu Liaoning	Dairy cattle	7,000	CSTR	LN Beifang	OK, 2. Project possible
3. Sanyuan Derenwu Beijing	cattle	10,950	CSTR,	HEEE	Univ. of S&T. OK
4. Suichuan Jiangxi	pigs	50,000	UASB , solids separated	Shenzen Long TaiJi Env. Ltd	ADB province DEMO - OK
5. Yuanshan Sichuan	Rabbit	2,000	Passive AD,	BIOMA	owner, OK
6. Shunmu, Suining, Sichuan	Pig	14,600	CSTR,	Tianren	Rural Energy office, OK
7. Wanbao Jiamusi, Heilongjiang	f-pig	40,000	CSTR	Huimin	ADB province
8. Beixu Henan	f-pig	100,000	UASB	Dacheng	ADB province
9. Muyuan Henan	f-pig	150,000	EGSB + IC	Muyuan	ADB province
10. Bajie Shandong	f-pig	57,600	USR	Sifang Yuantong	ADB province
11. Jinan Shandong	Dairy	7,500 manure + 9,000 wastewater	CSTR	Tianren	ADB province
Beilangzhong	Pig	40,000	USR		CAU/BMBF
GERMAN BGPs	Pig, cattle, NARAWO				UNIV Bonn, DBFZ

Map of Projects Sites



Link:

<http://maps.google.com/maps/ms?ie=UTF8&hl=de&vps=1&jsv=232a&oe=UTF8&msa=0&msid=107519998133318096673.0004856b4a1936e1d40cb>

Green: All

Blue: Team Clemens

Red: Team Hafermann



Warm Season (May-June)								
Date	GTZ		CHN Team					
	Mr. Clemens	Mr. Hafermann	Team 1 UST	Team 2 BIOMA	Team 3 ZJU	Team 4 CAU	Team 5 NCEPU	Team 6 ICEEE
16-May-2010		Preparation at CAU						
17-May-2010	Preparation at CAU	Preparation at CAU		Travel to Beijing	Travel to Beijing			Travel to Beijing
18-May-2010	Laboratory and on-site Training in Beijing							
19-May-2010	Laboratory and on-site Training in Beijing							
20-May-2010	Travel to Heilongjiang 1	Travel to Henan 1	Travel to Henan 1	Travel home	Travel home			Travel to Heilongjiang 1
21-May-2010	ONSITE	ONSITE	ONSITE					ONSITE
22-May-2010	ONSITE	ONSITE	ONSITE					ONSITE
23-May-2010	Travel to Heilongjiang 2	Travel to Jiangxi 1	ONSITE	Travel to Jiangxi 1		Travel to Heilongjiang 2		ONSITE
24-May-2010	ONSITE	ONSITE	ONSITE	ONSITE		ONSITE		ONSITE
25-May-2010	ONSITE	ONSITE	ONSITE	ONSITE		ONSITE		ONSITE
26-May-2010	Travel back Beijing	Travel to Jiangxi 2	ONSITE	ONSITE	Travel to Jiangxi 2	ONSITE		ONSITE
27-May-2010		ONSITE	ONSITE	ONSITE	ONSITE	ONSITE		ONSITE
28-May-2010		ONSITE	ONSITE	ONSITE	ONSITE	ONSITE		ONSITE
29-May-2010		Travel to Shandong 1	ONSITE	ONSITE	ONSITE	ONSITE	Travel to Shandong 1	ONSITE
30-May-2010		ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE
31-May-2010		ONSITE Qian btB	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE
1-Jun-2010		Travel to Beijing	Travel to Beijing	ONSITE	ONSITE	ONSITE	ONSITE	Travel back
2-Jun-2010		ONSITE	ONSITE Beijing	ONSITE	ONSITE	ONSITE	ONSITE	
3-Jun-2010		ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	
4-Jun-2010		Travel to Liaoning	ONSITE	Travel back	ONSITE	Travel back	ONSITE	Travel to Liaoning
5-Jun-2010		ONSITE	ONSITE		ONSITE		ONSITE	ONSITE
6-Jun-2010		ONSITE	ONSITE		ONSITE		ONSITE	ONSITE
7-Jun-2010		Travel to Sichuan	ONSITE		Travel to Sichuan		ONSITE	ONSITE
8-Jun-2010		ONSITE	ONSITE		ONSITE		ONSITE	ONSITE
9-Jun-2010		ONSITE	ONSITE		ONSITE		ONSITE	ONSITE
10-Jun-2010		Travel to Shandong 2	ONSITE		ONSITE		Travel to Shandong 2	ONSITE
11-Jun-2010		ONSITE	ONSITE		ONSITE		ONSITE	ONSITE
12-Jun-2010		ONSITE	ONSITE and back		ONSITE		ONSITE	ONSITE
13-Jun-2010		Travel to Henan 2			ONSITE	Travel to Henan 2	ONSITE	ONSITE
14-Jun-2010		ONSITE			ONSITE	ONSITE	ONSITE	ONSITE
15-Jun-2010		ONSITE			ONSITE	ONSITE	ONSITE	ONSITE
16-Jun-2010		Travel back			ONSITE	ONSITE	ONSITE	Travel back
17-Jun-2010					ONSITE	ONSITE	ONSITE	
18-Jun-2010					ONSITE	ONSITE	ONSITE	
19-Jun-2010					Travel back	ONSITE	ONSITE	
20-Jun-2010						ONSITE	ONSITE	
21-Jun-2010						ONSITE	ONSITE	
22-Jun-2010						ONSITE	Travel back	
23-Jun-2010						ONSITE		
24-Jun-2010						ONSITE		
25-Jun-2010						Travel back		
26-Jun-2010								
27-Jun-2010								
28-Jun-2010								
onsite days	10	32	26	17	29	28	27	29
trips	3	10	2	4	5	4	3	5

Cold Season (November)									
Date	GTZ		CHN Team						
	Mr. Cheng	Mr. Qian	Team 1 UST	Team 2 BIOMA	Team 3 ZJU	Team 4 CAU	Team 5 NCEPU	Team 6 ICEEE	
2-Nov-2010	Travel to Heilongjiang 1	Travel to Henan 1	Travel to Henan 1	Travel to Jiangxi 1	Travel to Jiangxi 2		Travel to Shandong 1	Travel to Heilongjiang 1	
3-Nov-2010	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE		ONSITE	ONSITE	
4-Nov-2010	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE		ONSITE	ONSITE	
5-Nov-2010	Travel to Heilongjiang 2	Travel to Jiangxi 1	ONSITE	ONSITE	ONSITE	Travel to Heilongjiang 2	ONSITE	ONSITE	
6-Nov-2010	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	
7-Nov-2010	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	
8-Nov-2010	Travel back Beijing	Travel to Jiangxi 2	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	
9-Nov-2010		ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	
10-Nov-2010		ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	
11-Nov-2010		Travel to Shandong 1	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	
12-Nov-2010		ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	
13-Nov-2010		ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	ONSITE	
14-Nov-2010		Travel to Beijing	Travel to Beijing	Travel back	Travel to Sichuan	ONSITE	Travel to Shandong 2	Travel to Liaoning	
15-Nov-2010		ONSITE	ONSITE		ONSITE	ONSITE	ONSITE	ONSITE	
16-Nov-2010		ONSITE	ONSITE		ONSITE	ONSITE	ONSITE	ONSITE	
17-Nov-2010		Travel to Liaoning	ONSITE		ONSITE	Travel to Henan 2	ONSITE	ONSITE	
18-Nov-2010		ONSITE	ONSITE		ONSITE	ONSITE	ONSITE	ONSITE	
19-Nov-2010		ONSITE	ONSITE		ONSITE	ONSITE	ONSITE	ONSITE	
20-Nov-2010		Travel to Sichuan	ONSITE		ONSITE	ONSITE	ONSITE	ONSITE	
21-Nov-2010		ONSITE	ONSITE		ONSITE	ONSITE	ONSITE	ONSITE	
22-Nov-2010		ONSITE	ONSITE		ONSITE	ONSITE	ONSITE	ONSITE	
23-Nov-2010		Travel to Shandong 2	ONSITE		ONSITE	ONSITE	ONSITE	ONSITE	
24-Nov-2010		ONSITE	ONSITE		ONSITE	ONSITE	ONSITE	ONSITE	
25-Nov-2010		ONSITE	ONSITE		ONSITE	ONSITE	ONSITE	ONSITE	
26-Nov-2010		Travel to Henan 2	Travel back		Travel back	ONSITE	Travel back	Travel back	
27-Nov-2010		ONSITE				ONSITE			
28-Nov-2010		ONSITE				ONSITE			
29-Nov-2010		Travel back				Travel back			
30-Nov-2010									
onsite days	7	28	25	13	25	25	25	25	
trips	3	10	2	2	3	3	3	3	