Executive Summary

This case study examines the implementation of the World Bank Eco-Farming Project in Hunan, China. The project addressed the development challenge of unsustainable farming practices and environmental degradation. It introduced biogas technology into rural households often reliant on farming for their income, which delivered economic and environmental benefits by making farming practices more efficient and reducing pollution. During implementation, the Hunan Eco-Farming Project dealt with delivery challenges, including a lack of local government buy-in and capacity, low levels of participation by rural households, and poor maintenance of biogas systems after project completion. These challenges were overcome by: establishing a management system based on existing administrative structures to enhance representation and capacity at central, provincial, and local government levels; placing an emphasis on information-sharing and the needs of farmers to increase local participation; and securing a post-project maintenance system to improve sustainability.
Introduction

Xiaojiao Village in Longhui County was typical of many rural communities in China, with outdated farming practices limiting agricultural output and farmers’ incomes. The indiscriminate disposal of agricultural and household waste resulted in dirty and unhealthy living environments. Furthermore, many farmers were overworked—women in particular, in addition to tending crops, spent a great deal of time gathering firewood, starting cooking fires, and raising children. Supported by the World Bank, through the Eco-Farming Project, local governments in four provinces and one municipality helped many rural households to build biogas1 digesters. The biogas digesters replaced traditional fuel sources like coal and firewood, and reduced reliance on chemical fertilizers. This not only lowered the cost of fuel, benefitting households economically, but also improved farmers’ working conditions and helped to protect the environment. One of the earliest project beneficiaries, Guifeng Chen, recalled how before the project, “there was garbage everywhere. Ponds were filled with dirty, smelly water, and mosquitos were rampant. In some places trees started to die, their leaves eaten by insects. More and more fertilizer was being used in fields, which contaminated the local water sources and killed off fish and shrimp. People also started to get ill.” Now, he says, the situation is better. “It’s cleaner, indoors and out. There are fewer insects and life is more comfortable. We’re also making more money.”

This case study explores the implementation of the Eco-Farming Project in Hunan Province, and details how it secured the support, uptake, and continued use of biogas technology among local officials and a diverse rural population.

Development Challenges: Unsustainable Farming Practices and Environmental Degradation

Unsustainable farming practices emerged as a serious concern in Hunan Province, one of China’s largest agricultural producers, for several key reasons:

• Improper disposal of agricultural waste2. Rearing livestock is a central pillar of Hunan’s rural economy. On average, farmers in Hunan raise three pigs and, with the addition of cows, sheep, and fowl including chickens and ducks, households produce around 5,000 kg of human and animal waste every year (Foreign Economic Cooperation Center of Ministry of Agriculture 2008). Before the project began, less than five percent of this waste was used to produce biogas.

• Increased burning of crop stalks. In 2004, Hunan produced just over 3,372 tons of crop stalks, 43 percent of which were used as fuel for cooking fires, 19 percent for feed, 17 percent for fertilizer, and just over six percent as an industrial raw material. Nearly 15 percent of the stalks went unused (Foreign Economic Cooperation Center of Ministry of Agriculture 2008). In recent years, an increase in agricultural production, combined with a greater reliance on coal and liquefied gas, has created an enormous growth in the number of unused crop stalks. Subsequently, the burning of crop stalks in fields has become commonplace, resulting in significant levels of pollution.

• Environmental degradation. Unsustainable farming practices in rural areas have resulted in degradation of the ecological environment. The prolonged overuse of logging and chemical fertilizers has resulted in widespread land erosion and serious damage to vegetation. In 2002, erosion affected over four million ha of land in Hunan, resulting in soil degradation and increasingly severe floods and droughts. Furthermore, the use of organic fertilizers fell while chemical fertilizers increased, resulting in soil crusting and decreased fertility. In 2004, the use of 87,000 tons of pesticide, 686 tons of chemical fertilizer, and 47,600 tons of agricultural film degraded soil and water quality (Foreign Economic Cooperation Center of Ministry of Agriculture 2008). Worsening environmental conditions have also affected the quality of Hunan’s agricultural products and the sustainability of the province’s agricultural sector.

The Central Government and Hunan Provincial Government placed a high priority on addressing unsustainable farming practices and environmental degradation, which resulted in the design and implementation of the Eco-Farming

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1 Biogas is convenient, clean gaseous fuel that is produced at heat under certain anaerobic conditions from the fermentation of organic compounds including human and animal waste, waste water, and plant stalks and leaves containing a certain amount of water. It can be used for cooking, heating and drying, or as a light source, and saves energy and helps to protect the environment. Leftover bio-sludge and bio-slurry can be used as bio-fertilizers that reduce reliance on chemical fertilizers and pesticides, improving the quality and volume of crops produced.

2 Agricultural waste here refers to human and animal waste, waste water, and crop stalks.
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The Hunan Eco-Farming Project had as its goal protection of the environment in rural areas through changing traditional farming techniques and patterns of energy use and encouraging the consumption of biogas. Project implementation was impeded by three main challenges:

- **A lack of government buy-in and capacity.** At the local level in China, public works rely heavily on the strength, resources, and support of ‘blocks,’ political coalitions that span a range of local agencies and services led by the party official in that area. Without the support of these blocks, central directives such as the Eco-Farming Project would not receive local governmental support. In addition, the project needed to take into account the interests of different groups throughout central, provincial, and local governments to achieve the objective of environmental protection.

Prior to the project’s implementation, the success metrics for economic development tended to focus on urban strategies. Therefore, local officials and administrators placed greater emphasis on attracting investment into urban projects, rather than rural ones. Additionally, some local officials perceived rural projects as complex and difficult to implement, resulting in limited human investment in rural projects. As a result of this perspective, engagement with farmers and villagers, whom the project would impact most, was not as robust as it could have been, further impeding the dissemination of project information.

- **Low levels of participation by rural residents.** The second major challenge that the project faced was a lack of awareness about, and participation in, such projects among rural households. Previously, the local governance structure did not encourage sufficient community engagement; there was a limited level of trust between villagers and their local government officials. In addition, villagers did not have enough confidence in the biogas technology. Consequently, many villagers were disinterested in the project and unwilling to change their lifestyles, farming techniques, and traditional modes of fuel consumption. This made it difficult to mobilize information and gain the support of local residents.

- **Insufficient maintenance of biogas systems after project completion.** Finally, after its completion, it became apparent that the project would only achieve sustainable results if systems were put in place to support the maintenance of the new technology. Even where farmers and residents bought in to the project and its benefits, many biogas systems fell into disrepair because locals lacked access to the resources needed to maintain them.

**Tracing the Implementation Process**

The World Bank Eco-Farming Project was coordinated by the Chinese Ministry of Agriculture (MOA), and was implemented in four provinces—Hunan, Anhui, Guangxi, and Hubei—and in the Chongqing municipality. This case study specifically focuses on the implementation of the project in Hunan Province. The design of the Eco-Farming Project began in 2004; it was then implemented in 18 counties in Hunan between 2009 and 2014. The project contained three components: Integrated Eco-Farming Systems, Local Technical Extension and Biogas Service Systems, and Project Management, Monitoring, and Evaluation.

The Chinese Government’s strong commitment to promoting biogas utilization was seen as a means of improving the lives of rural households and addressing environmental degradation, and was crucial for the success of the project. A large National Rural Biogas Program (NRBP) was launched in 2001, and by the time of project preparation of more than US$440 million had been invested (World Bank 2014). Both the World Bank and the NRBP financed the project.

This case study traces how the implementation process met and overcame the delivery challenges outlined above.
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GLOBAL DELIVERY INITIATIVE

Because local governmental institutional structures and conventions might inhibit the project’s implementation, the Ministry of Finance (MOF) and MOA established a multi-level project management system that dovetailed onto existing provincial and county political and administrative organizational structures.

At the central, provincial, and county levels the structure introduced Project Leading Groups (PLG), consortia of high-ranking government officials who oversaw the project in their jurisdiction, and Project Management Offices (PMO), which carried out project activities. This new system adopted the following organizational structure:

This organizational structure brought personnel from different agencies together, ensuring a range of views and interests were represented. For example, the Central PLG and PMO were established under the MOA, and were staffed by personnel from the National Development and Reform Commission (NDRC), MOF, Ministry of Environmental Protection (formerly the State Environmental Protection Administration), and various bureaus under the MOA.

Local authorities in Hunan established a Provincial PLG in 2009. Key figures within the County Party Committees were appointed to lead the group, and its other members included officials from the People’s Congress, the local Committee of People’s Political Consultative Conference, the Energy and Auditing Offices, the local All-China Women’s Federation, and the Bureaus of Agriculture, Finance, Environmental Protection, and Livestock, Herding and Fisheries. Officials from the Bureaus of Agriculture, Energy, and Finance led and staffed the County PLG. Township and Village Working Groups were also established to represent and coordinate with the residents affected by the project.

The new organizational structure enabled different groups to communicate their perspectives on the project. For example, the Linli County PMO held biannual coordination meetings, and then reported any unresolved issues that arose to the County PLG. The PLG then coordinated responses to these challenges, which ensured that the project could progress through a consultative process.

Distribution of Responsibilities and Incentives to Increase Capacity

Allocating Clear Responsibilities to Individuals

Several areas’ counties allocated specific responsibilities to individual people, to ensure that all aspects of the project would be implemented while simultaneously avoiding the duplication of efforts. Linli County PMO, for instance, established a Working Plan that gave individuals responsibility for different project elements, such as training farmers, procurement, and the drafting of construction guidelines and inspection procedures. This system also ensured that there was an official point of contact for each aspect of the project’s implementation. The head of another county’s PMO recalled:

“All tasks and indicators were linked to an individual, which allowed us to follow-up with that person if a task was not completed. Each person at each level knew what he or she was responsible for. This helped things run smoothly.”

Granting Greater Financial Control to County PMOs

The distribution of power to access and allocate funding was equally important as the distribution of responsibilities.
Historically, central or provincial finance departments have retained this power, meaning that funds were not always clearly earmarked for local projects and could be easily diverted elsewhere. The Eco-Farming Project, however, established relatively independent channels of fund management by granting financial controls to PMOs at all levels. This helped to ensure that dedicated funding could only be used for its intended project and not other local activities. One County PMO official said:

“The most difficult part of our job was that department heads wanted to take project money and use it for other projects. They didn’t get any, though, because of our strict policy that funding would only be used for its designated purpose, meaning people could only access funds for the activities for which they had responsibility.”

Getting the Right Incentives in Place

It was also important to get the right incentives in place, to encourage proactive and productive engagement by project staff during implementation. Some incentives were financial; Longhui County PMO, for instance, allocated a portion of its funding to reward townships that completed project stages on or ahead of time.

Incentives were also used to align local government officials’ performance objectives with key project outcomes. At the start of the year, County PMOs would write “Statements on Targeted Project Objectives,” establishing local officials’ responsibilities for various aspects of the project’s implementation at township and village levels. At the end of the year, the County PMO would then evaluate the work that had taken place, and local officials who had met these objectives would be eligible for promotions and bonuses.

Adapting Strategies to Increase Farmers’ Participation

In the initial stages of the program the uptake of, and engagement with, biogas technology by farmers was not as high as had been anticipated. Local agencies adopted three approaches to overcome this challenge. The first was ensuring that local leaders led by example, the second was securing more effective information sharing across agencies, and the third was ensuring that the training offered met farmers’ needs.

Leading by Example

Many of the farmers involved in the project were hesitant to engage with biogas technology, and implementing agencies knew that a “top-down” approach could generate further resistance or alienate the local population. For this reason, they adopted a model whereby village leaders installed their own biogas digesters, before inviting their peers in other villages to witness for themselves the technology and its benefits. Farmers and other villagers then began to recognize the advantages of the biogas digesters. Villagers’ confidence in this new technology increased as they saw the ways in which it was relevant to them, rather than simply feeling it had been imposed upon them.

Information Sharing

Despite receiving either full or nearly full payback for their biogas systems, many farmers remained unwilling to install them. Alongside a lack of confidence in the technology itself, there was only a limited level of trust between the villagers and their local government officials. To navigate this challenge, the officials developed new channels of communication to actively reach out to the villagers within their jurisdictions.

The first way in which township PMOs achieved this was to hold meetings with a cross-section of village representatives, taking into account economic status, gender, and those with and without biogas systems already installed. These forums provided opportunities to gather opinions and discuss key concerns or challenges. Secondly, township PMOs conducted on-site surveys and interviewed villagers to gather opinions and address concerns about the new technology. Thirdly, the PMOs set up eco-farming information boards in the project villages. These outlined the anticipated social and environmental benefits of the technology, and gave project investment plans and timelines. Finally, villagers received bespoke advice from officials to help them reach a constructive solution, taking into account factors such as land ownership, financial standing, and their willingness to engage in the program.

These strategies improved the openness and transparency of local government, and thereby increased the villagers’ faith in their local officials. In addition to heightening villagers’ uptake of and engagement with the biogas technology, this consultative approach provided

3 Interview with author, November 20, 2015.
officials with a far better understanding of the needs of local households in their jurisdictions.

**Ensuring Training Met Farmers’ Needs**

Farmers had a range of concerns regarding training. Some were anxious that the training would interrupt their existing routines. Others felt the training would lack relevance, or be difficult to understand. Some were concerned that the training sessions were poorly organized, too long, or too far away. To overcome these concerns, many areas adopted tailored training models to meet the needs of local farmers.

An initial set of survey results revealed three things farmers wanted from training: how to use the biogas systems; practical techniques for land cultivation and animal husbandry; and skills relevant to cottage industry crafts and processing.

Counties began making adjustments to the contents of the training, so that it related more to issues directly relevant to the farmers. This included the construction, safe use, and maintenance of biogas systems; the efficient use of bio-sludge and bio-slurry; and fruit and vegetable cultivation techniques. Counties delivered lecture-style training sessions alongside practical, on-site demonstrations, ensuring that the content was both accessible and practical. Some sessions were scheduled in the winter and spring, when there was less work to be done in the fields. The sessions that focused on crop cultivation, though, took place during the spring and summer, so that farmers could immediately put the training into practice. For example, sessions on grooming fruit trees coincided with pruning, and training on bio-fertilizers corresponded with fertilizing fields.

Some counties opted for more flexible training formats, integrating scheduled training sessions alongside smaller household sessions that took place “in-situ.” Biogas technicians held scheduled lecture-style training sessions at locations such as village committee offices two or three times a year. These sessions were convenient for the farmers, and provided an efficient means by which to convey information about the technology. Counties also increased the number of in-situ training sessions taking place at the farmers’ houses. During the initial phase of the project in Linli County, for example, representatives from the County PMO and biogas technicians arrived at 6:00 A.M., allowing them to conduct training before the farmers began their working day. While this approach only permitted one or two households at a time to participate in the training, it was responsive to the farmers’ routines, and dramatically increased engagement with the project among rural farming communities.

**Establishing a System to Support Ongoing Post-Project Maintenance Services**

Difficulties arose in providing sufficient technical services shortly after the project implementation began in 2010 and 2011. Biogas systems were prone to breakdown, and many technicians were required to carry out maintenance. Local government and project offices, however, were focused on building the systems, and did not have enough time or technicians to carry out repairs. As a result, many households were often forced to stop using their biogas systems.

Counties sought to address this challenge by establishing a series of socially coordinated maintenance services and aligning technicians’ incentives with farmers’ needs.

**Socially Coordinated Maintenance Services**

A number of counties experimented with a model through which social organizations and local government combined to take responsibility for providing sustainable biogas maintenance services.

Firstly, the County PLG and Energy offices established biogas associations and cooperatives, which were run by villagers. Every household involved in the project joined one of these organizations, and could voluntarily pay a management fee (in Linli County, costing RMB 50 per year). This fee contributed to the costs of technicians making home visits, the maintenance costs of farmers’ biogas systems, and the running costs of new biogas service stations.

In accordance with guidelines written by the County PLG, cities and counties provided financial subsidies to build service stations, which over time established an extensive service network. In 2012 for example, Linli County allocated RMB 300,000 for 20 service stations that contained bio-sludge tanks, filling and emptying equipment, spare parts, and tools. The associations and cooperatives helped to manage the service stations by communicating through their directors—local leaders involved with the project—with other levels of government about ongoing service needs. The service stations lowered the overall operation costs associated
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with maintaining villagers’ biogas systems, and the role of social cooperatives and associations in managing the stations ensured that local maintenance needs could be acknowledged and met.

**Incentivizing Technicians**

Another critical factor for securing consistent quality technical services was providing adequate payment and incentives to technicians. The distinct outcomes experienced in Linli County as opposed to Dongkou County and Longhui County, where different payment systems were used, proved this point.

In Linli County, it became increasingly difficult for farmers to arrange for technicians to visit them, largely because the technicians were not being adequately compensated. Technicians’ compensation in Linli County consisted of two parts: (i) a fixed salary from the government, totaling approximately RMB 20,000 a year; and (ii) a service-based income of approximately RMB 10 to RMB 20 per household visit, paid by the farmers. Many technicians moved within the local labor market to become construction workers, where they could earn higher wages of around RMB 200 a day. As a result, between 2009 and 2015, the number of active biogas technicians in Linli County declined from 109 to 65. Many biogas systems fell into a state of disrepair; according to locals, over half of all biogas systems in some villages were left unused.

The counties of Dongkou and Longhui enjoyed greater success, however, by implementing payment systems that better incentivized technicians. In these counties, technicians again received two forms of compensation. The first was for installing new biogas systems, for which technicians were paid RMB 750 in 2010, a figure that rose to RMB 1,580 by 2015. They were also paid a service fee for household maintenance visits, at a rate of RMB 80 for a half-day and RMB 160 for a full day. While this rate was still lower than the average for the local labor market, the work was easier, and technicians were able to manage their own time while generating a steady income.

The majority of the Eco-Farming Project was completed between 2009 and 2014, and produced actual reduction ranging between 19 and 73 percent against the baseline of 500-1500 kg per household per year (World Bank 2014). Farmers learned how to raise livestock to feed their biogas systems and, in turn, make fertilizer. This sustainable system reduced spending on pesticides and chemical fertilizers, and bolstered the quality of produce.

The project also helped to reduce the consumption of firewood and the emissions of greenhouse gases, thereby lowering the indiscriminant disposal of wastewater, garbage, and human and animal waste, while also securing improvements in residents’ quality of life. Kitchen smoke from cooking with solid fuel was greatly reduced as a result of the decreased use of firewood and coal as fuel. Also, the time spent on cooking was reduced on average by 16 days per household per year (World Bank 2014).

Environmental conditions in all participating households significantly improved while homes and neighborhoods became markedly cleaner.

**Lessons from the Case Study**

**Management Systems Based on Existing Administrative Structures**

**Enhanced Representation and Capacity at All Levels**

Securing adequate levels of buy-in and capacity from governmental agencies was a key delivery challenge for the project, particularly at the local level. Prior to implementation, the project team conducted research focused on how to effectively mobilize local government, farmers, and social organizations across systematic and cultural parameters. This allowed them to study the effectiveness of multi-stakeholder collaboration throughout. Subsequently, the MOA introduced a system that dovetailed neatly into the existing administrative structures in place, while also encouraging increased representation and capacity at the central, provincial, and local levels.

This system resulted in two key outcomes:

- The representation of different interests and across different levels enabled enhanced coordination.

Establishing PLGs and PMOs at central, provincial, and county levels, and encouraging the townships and villages involved in the project to establish their own working groups, ensured that their different interests
and needs were represented throughout the project management system. Potential tensions and challenges could be discussed, and solutions could be proposed and coordinated.

- **Clear allocation of responsibilities supported accountability.** Counties clearly demarcated the individuals responsible for each specific aspect of the project’s implementation. In conjunction with these individuals taking on responsibility for particular elements of the project, the County PMOs also obtained greater control over funding allocations, which were traditionally the purview of central and provincial offices. As a result, project funding was directed towards designated functions, avoiding the potential for it to be funneled into alternative and unrelated projects. Finally, by aligning the performance objectives of project staff with key project outcomes, the county PMOs incentivized staff to work together; staff that met their targets became eligible for promotions and bonuses.

**Emphasis on Information Sharing and the Needs of Farmers Increased Participation**

The project faced another key delivery challenge in securing the trust and engagement of local residents and farmers with new biogas technology. Three approaches were deployed to help overcome this challenge:

- **‘Leading by example’ encouraged uptake.** One approach was to encourage village officials to ‘lead by example’ by installing biogas systems themselves and demonstrating the benefits to other villagers. This helped to ensure that villagers saw firsthand how the technology was relevant to their needs by learning from their peers.

- **Information sharing increased trust.** The project introduced local forums, comprised of villagers across economic status and gender, and those with and without biogas systems already installed. This allowed them to discuss their various needs and concerns. Local forums helped to foster trust in the government and what it was seeking to achieve. They also provided valuable information channels for officials, who were able to gain a much better understanding of residents’ concerns about the project.

- **Relevant and accessible training supported engagement by farmers.** Finally, farmers received training in a variety of formats, teaching them how to use the biogas systems effectively to enhance their farming practices. While initially the training did not address farmers’ needs and schedules, a combination of ‘lecture-style’ sessions and sessions held at farmers’ homes helped to secure high levels of engagement with the new technology. The culmination of these approaches ensured that farmers knew how best to harness the technology for their own needs.

**Securing a Post-Project Maintenance System Improved Sustainability**

The final challenge was ensuring the technology would remain usable after the biogas systems had been installed. Project organizers soon found that many households lacked the capacity to maintain their systems, and that a high number of systems fell into disrepair. Two approaches helped overcome this challenge:

- **Socially coordinated services provided sustainable maintenance.** County PLGs established social cooperatives and associations led by villagers with input and support from local officials; every household involved in the project participated in these cooperatives. These organizations helped raise and coordinate support for maintenance services and also helped to manage new biogas service stations. These service stations were subsidized by county and city administrations, which reduced the operating costs associated with maintenance.

- **Finding appropriate incentives improved technician retention.** Sustainable maintenance was also achieved through finding the right incentives to reward the biogas technicians. Where this occurred successfully, technicians were paid both to install the systems and to repair them in villagers’ homes. While the pay remained below the rates offered in comparable jobs, technicians were able to have more flexibility to manage their time, making the work more attractive.
## Annex 1: Project Timeline

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Reason for Inclusion/Relevance</th>
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<tbody>
<tr>
<td>2003–2004</td>
<td>Conceptualization of Eco-Farming Project</td>
<td>Development of a concept, consensus and collaboration before project implementation.</td>
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<tr>
<td>2004–2006</td>
<td>Design of Project Content</td>
<td>Selection of development goals and technical model for the project.</td>
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<tr>
<td>2004–2006</td>
<td>Selection of Tracing Tools</td>
<td>Confirmation of 3 key outcome indicators and 20 intermediate outcome indicators.</td>
</tr>
<tr>
<td>2004–2006</td>
<td>Safety Assurance Review</td>
<td>Design of a comprehensive system for monitoring and evaluation of environmental, social, and economic impacts, as well as a complete implementation plan.</td>
</tr>
<tr>
<td>2006</td>
<td>Institutional Risk due to Systematic Nature, Complexity and Difficulty of the Project</td>
<td>Research focused on how to effectively mobilize local government, farmers, and social organizations under systematic and cultural restrictions to ensure effective maintenance and operation of biogas systems.</td>
</tr>
<tr>
<td>2006–2008</td>
<td>Creation of a Multi-layer Management and Mobilization System</td>
<td>Project leading groups and management offices were established at the central, provincial, municipal and county levels; implementation offices were also established at the township level along with village implementation teams.</td>
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<tr>
<td>2008</td>
<td>Project Construction Delay</td>
<td>Extended project preparation time resulted in a one-year delay from the original 2008 construction start date.</td>
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<tr>
<td>2009</td>
<td>Project Implementation Begins</td>
<td>Key turning point – program implemented in 65 counties in 5 provinces nationwide; 18 of these counties are in Hunan.</td>
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<tr>
<td>2009–2014</td>
<td>Project Management, Monitoring and Evaluation</td>
<td>The project Management Information System (MIS) was created and put into operation, collecting project planning and progress data, and conducting three rounds of impact monitoring data collection and environmental monitoring.</td>
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<tr>
<td>2010</td>
<td>Difficulties in Repair/ Maintenance of Biogas Systems Forcing Some Farmers to Abandon Biogas</td>
<td>Key turning point – research content focused on how to create a sustainable technical service system that could resolve repair and maintenance difficulties with limited governmental resources.</td>
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<tr>
<td>2010–present</td>
<td>Creation and Improvement of Technical Service System</td>
<td>Biogas associations and cooperatives hired technicians to provide repair and maintenance services, providing detailed schemes in terms of policy, organizations, and the supply of raw materials to ensure the long-term sustainability of the project.</td>
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Annex 2: Key Stakeholders

Note:
—— Single solid lines indicate close sharing of information, shared interests, good cooperation and mutual trust.
- - - Dashed lines indicate weak or unofficial relationships; dashed lines with a question mark indicate unclear relationships.
——— Double solid lines indicate a contractual or institutional cooperation or alliance.
References


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Ministry of Finance People’s Republic of China

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