Chapter 7 Environmental Aid for the Benefit of Poor Farmers' Livelihoods and the Environment: GERES's Assistance for Improved Cooking Stoves in Cambodia

1. Introduction

Cambodia's reconstruction and economic development has been strongly supported by the international donor community. To ensure macroeconomic stability and encourage transition to market economy, various donor countries assisted the Cambodian government to formulate socio-economic plans including the Five Year Socioeconomic Plan and the National Poverty Reduction Strategy, and a variety of economic laws and regulations. The International Monetary Fund (IMF) also published the Medium-Term Economic and Financial Policy Framework to impose a variety of financial policy reform as conditionality in providing the Enhanced Structural Adjustment Facility (Hirohata, 2004).

At the outset, the donors emphasized the need of the transition to a market economy, and required deregulation and liberalization of the market. Enactment of the Law on Investment, together with a variety of privileged measures, attracted foreign direct investment (FDI) to labor-intensive industries such as textile, which have become an engine of economic growth. Qualification of the Most Favored Nation Treatment from the United States and accession to the ASEAN attracted FDI and accelerated export-oriented industrialization. The share of manufacturing has gradually risen up to 19% of GDP in 2006 compared to only 9% in 1993 (1) (Figure 7-1). Per capita GDP has increased to US$785 in 2008, increasing threefold as compared to 1993, although Cambodia is still classified as one of the poorest and least developed countries in Asia.

A shift of the focus among donor countries directly influenced the Second Five Year Socio-economic Development Plan. The United Nations' declaration on the Millennium Development Goals (MDGs) and the 9/11 terrorism turned the its attention to poverty reduction and its linkage with environment. The Second Five Year Socio-economic Development Plan placed poverty reduction as a priority and set forth three objectives: (a) private sector led economic growth and fair distribution, (b) social and cultural development through improved access to education, health care, safe water, electricity, finance, market, information, and (c) sustainable management and proper use of natural resources and the environment.

Regarding natural resources and the environment, the government had raised concern about deforestation in its policy statements. Deforestation has risen due to overexploitation and illegal logging, agricultural expansion and subsistence activities of the poor such as firewood collection. The forest coverage was 73% in 1965 but declined to 58.6% in 1997. Due to protection efforts such

as the launch of a community forestry program, it was revived to 61% in 2002, but dropped again to 59% in 2006 (Danish Ministry of Foreign Affairs and UK Department for International Development, 2006).

To tackle the deforestation problem, the Cambodian government enacted the Forest Act and Sub-Decree on Community Forestry Management in 2002, which pushed for an increase in forest protection area. This Sub-Decree allows an allocation of forestland to community groups in renewable 15-year management periods, but aimed at protecting areas with few remaining forests and at rehabilitating degraded ones by allowing the adjacent communities only to collect non-timber forest products (NTFPs) and firewood. This caused conflicts among villagers either within a specific community village or with a neighboring village, for it generated little income while forcing farmers to walk long distances for firewood collection or to buy firewood at a higher price in the market (GERES Cambodia, 2010).

The government also set a firewood dependent target at 54% of total household energy consumption from 73% in 2008 in the National Strategic Development Plan, and mentioned the necessity of a diffusion policy of improved cooking stove (ICS) for palm sugar refinery in the Cambodian Energy Sector Strategy. Along this line, it initiated the Cambodian Firewood Saving Program (CFSP) to acknowledge the potential of ICS.

Despite the government initiative, actual implementation has been conducted by Groupe Energies Renouvelables, Environnement et Solidarités (GERES), a French-based NGO and Yayasan Diean Desa (YDD), an Indonesian-based NGO. They collaborated and concluded a memorandum of understanding (MoU) with the Ministry of Industry, Mining and Energy (MIME) to transfer their acquired knowledge through the model ICS projects for further capacity building in MIME. However, both NGOs have not gained any support from the government. They have used their own budget to initiate the diffusion of a kind of ICS – the so called “Vattanak Stove” (Figure 7-2) – to palm sugar farmers in five provinces including Kampong Chhnang, Kampong Thom, Kampong Speu, Kandal and Prey Veng (Figure 4-3). This stove can be used in the distillation process. Its advantages lie not only in reducing firewood consumption, but also in producing better quality sugar that can be sold at higher price in the market. This offers an opportunity to earn higher income for poor farmers who often engage in palm sugar production (Min Kim, 2008).

The performance of this program has been mixed so far, however. It showed rapid diffusion at the outset, but gradually faced difficulty in 2010 and eventually came to a standstill. This raises the question whether this assistance provides sufficient net gains to beneficiaries and is consistent with the local context.

This chapter first analyzes how the international donor community, i.e., both government and NGOs has committed to environmental rehabilitation. Then it takes the Vattanak stove diffusion

as a case to examine barriers that should be taken into account in providing aid for the benefit of the poor and the environment.

2. Environmental Assistance to Cambodia

2.1 Official Development Assistance from International Donor Community

The international donor community has provided US$4,785 million of Official Development Assistance (ODA) during 2000-2008 with an average amount of US$532 million per year, accounting for 8.7% of Cambodia's GDP. According to the Development Assistance committee of the Organization of Economic Co-operation and Development (OECD-DAC), the largest donor is Japan, followed by the Asian Development Bank, the United States, the International Development Association (IDA), the United Kingdom (UK), Germany and France. The foreign aid has focused on the sector of governance, health, population control and transport, while support to the environmental sector accounts only for 3% (Table 4-1). However, aid to non-environmental sectors, such as governance, education, energy and agriculture, as well as multi-sector assistance, often include environmental components or aim to generate environmental benefits at the same time. According to the Development Assistance Committee, the environmental aid is defined as ODA that has the preservation of the environment as a primary or secondary objective. During the period of 2000-2008, only 20% of ODA is accounted for environmental purpose, though its share fluctuated year by year (Figure 4-4).

One of the remarkable features of ODA to Cambodia is its extensive involvement of NGOs. This involvement dates back to its refugee support programs since the 1980s. A number of international NGOs, such as Oxfam, came in to assist refugees amid the civil war with a wide range of activities, from demining to microfinance, orphanages to agri-business, public health to snaring globe-trotting pedophiles. Since the Law on Organizations was enacted, a myriad of domestic NGOs have emerged, including such umbrella NGOs as Cooperation Committee for Cambodia, some of which worked in the fields of development, good governance and the environment. Some donor countries, such as Sweden, Germany, the United States and Belgium regard local and international NGOs as important partners and deliver part of ODA through them (Hirohata, 2004).

Guthrie (2008) indicates that 22 donors were working with over 100 NGOs to deliver US$110 million in ODA through 109 projects in the health sector in 2008 (2). NGOs have contributed an amount of US$176 million or 3.7% of total ODA during 2000-08. The contribution to the environment accounted for US$39 million equaling 4.2% of the total environmental ODA during the same period (Development Assistance Committee, 2010).

2.2 Program-based Approach in Environmental Aid

International donors have raised concerns about aid effectiveness and ownership of recipients in the 1990s (Development Assistance Committee, 1996). To enhance recipients' ownership, the UK initiated a sector-wide approach that donors and recipients collaborate to formulate mid-term development plan and a common fund approach that unifies aid disbursement of many donors to reduce transaction costs. This initiative is materialized in the *Paris Declaration on Aid Effectiveness* in 2005 that lays out a practical, action-oriented roadmap to improve the quality of aid and its impact on development.

Along this line, international donors supported the Cambodian government to integrate the five-year National Strategic Development Plan (NSDP) (2006-2010) into which the Cambodian Millennium Development Goals, development and sector policies, strategies and targets by line ministries, national budget allocation and requirement for donor assistance were integrated. On their part, Danida and DFID decided to harmonize development collaboration and established a Multi-Donor Livelihoods Facility (MDLF), to replace project-based aid to program-based ones that allowed Cambodian government to reflect priority in the national planning process. They set up the Government-Donor Coordination Committee (GDCC) to provide high-level policy dialogue and facilitate resolution.

In this context, they jointly collaborated with the Cambodian government to initiate the Natural Resource Management and Livelihoods Programme (NRMLP) in 2006, with the aim of reducing poverty and the vulnerability of poor people's livelihoods whilst improving natural resource management in rural areas. This program addressed these challenges to be consistent with MDG, to emphasize income generation of the poor, and to target the commune council level instead of NGOs. Thus it focused more on (a) secured rights, land titles and access of poor people to natural resources, land and water; (b) funds for investing natural resources management through the decentralized mechanism, and (c) greater engagement and opportunity for communities in the sustainable management, processing and marketing of natural resources (Danish Ministry of Foreign Affairs and UK Department for International Development, 2006).

Environmental aid in natural resource management has been fairly small so far (Table 4-3). Nevertheless, Denmark designed the natural resources and environment program in 1997 and implemented it in 2001 within the framework of the Environmental, Peace and Stability Facility. This program aimed to enhance sustainable management and equitable use of natural resources and protection of the environment to improve the livelihoods of poor people and support balanced socio-economic development. The "National Community Forestry Programme (NCFP)" project, a subproject of this program, aims to develop sustainable community-based forest management consisting of four components namely; (a) community forestry project activities in selected

locations, (b) training, (c) policy development based on results of participatory research, and network meetings with national level forestry staff, and (d) institutional strengthening (Danish Ministry of Foreign Affairs, 2004). However, community forestry was undermined by severe lack of financial resources, institutional and personal capacity, and heavy dependence on the support of foreign donors and transnational NGOs (Sunderlin, 2004).

2.3 Project-based Approach for Environmental Aid

GERES has provided a project-based aid to Cambodia since 1994. It has been very active in enhancing the sustainability of renewable energy services with the aim of preserving the environment and improving the living conditions of the local people. In this context, it has mainly focused on ICS for individual use for more than a decade and actually succeeded in massive diffusion of the New Lao stove for individual household use in Cambodia, leading to reduction in firewood consumption (GERES and L'AFD, 2009). In 2005, it launched a project on improving the livelihoods of small-scale palm sugar farmers. It targeted at disseminating an energy saving stove – the so-called "Vattanak Stove" – to palm sugar farmers and embarked on it from 2008. There are about twenty thousand palm sugar farmers in Cambodia, but most of them are poor, because of the infertility of the soil and harsh working conditions in palm sugar production. Harvesting and refinery of palm sugar is concentrated to densely populated areas with fragile soil. Farmers engage in paddy rice production during the rainy season, and in palm sugar production in the dry season. In order to harvest the palm juice, they have to climb up and down trees by 750 meters in total per day, and have to spend seven hours a day on the fermentation process (Min Kim, 2008). To improve conditions and make a sustainable livelihood, the GERES assisted massive diffusion of the Vattanak stove that enables farmers to refine high quality granulated sugar to earn a higher income, and moreover to reduce firewood consumption at the same time.

3. Energy Saving and Cleaner Production in Palm Sugar Processing

3.1 The Vattanak stove as an alternative

More than 60% of the world's sugar production is from sugar cane, while the remainder is derived from sugar beet (World Bank, 1999: 401). Processing and refining causes a variety of emissions as well as evaporation and crystallization consume a lot of energy.

To manage these pollutions, sugar manufacturing companies have employed end-of-pipe technology such as aerobic and anaerobic treatment at the outset, but then adopted continuous processing and scaled up to increase efficiency and reduce waste. Some companies go far to assess the whole supply chain to invest in a new drying process for pulp, and to adopt a new process that can convert waste to saleable products (Kerndrup et al, 1999).

In palm sugar production, its refining process consumes a lot of energy and discharges air pollutants. In this context the Vattanak stove can be a viable cleaner technology. The Vattanak stove is one type of ICS, employing post-combustion technology that enables users to save up to 30% of firewood use and provides them with safer working conditions by non-smoke and low ambient temperature, and even with better quality palm sugar (3). The reduction in the firewood use is also expected to lead to cost reduction in purchasing and traveling to get more firewood for the farmers, thus alleviating poverty (GERES Cambodia, 2009).

3.2 Supporting scheme for the diffusion of Vattanak stove

Figure 4-5 depicts the GERES scheme for diffusing the Vattanak stoves. According to the interview with a manager of Eco-biz, GERES sells the Vattanak stove to an individual farmer at the price of US$80 with favorable terms of payment conditions. A farmer is required to pay US$5 as a down payment in cash, and the rest by the *granulated* palm sugar produced by the Vattanak stove without setting a specific deadline. In addition, the Eco-biz, a social venture company created by GERES, offers to buy the rest of *granulated* palm sugar at a price higher than *pasted* palm sugar that is prevalent in the domestic market. Since the *granulated* sugar requires the additional work such as cracking and sieving after the process of the *pasted* sugar, it aims to establish a business model that earns a profit by selling *granulated* sugar in the foreign markets, which enables it to purchase *granulated* sugar at a higher price to compensate for such additional works. It assumes this higher price provides sufficient income for a farmer to pay back the cost of a Vattanak stove within even one season (4). Considering the average income of US$ 628-707 per season (GERES, 2010), additional income of US$ 250-280 by *granulated* sugar per season and US$33.8 per season of payback from firewood saving, GERES assumed that a farmer can afford to pay for the down payment and to recover the cost of the stove.

GERES also provided a variety of assistance to enhance the enabling conditions for diffusion. To ensure the local availability of the stoves, GERES provided training programs and even paid wages to local traditional stove crafts and farmers to master the methods to make, assemble and install the Vattanak stoves. To enhance marketing, it called for village heads and officers to select target farmers, and then made an on-site demonstration. Furthermore, it published the “Guidelines for the Vattanak Stove Dissemination” to explain the material and health benefits as well as the technological specification. Farmers who were interested in the stove could also participate in a one-week training that GERES provided. Farmers were even paid an allowance for testing the stove and could purchase it at the end if they wanted to. A year of free repair service was also guaranteed upon the purchase for further support.

GERES set a diffusion target of twenty thousand farmers in five provinces. However, it

implemented the project only in Kampong Chhnang province and has diffused to 110 farmers since 2008. Yet, 49 out of 110 farmers have stopped using this stove since 2010 (5). This suggests that farmers are not satisfied with the Vattanak stove and this dissatisfaction at the initial stage may have prevented widespread diffusion.

3.3 Strengths and weaknesses of GERES's technology dissemination

Previous surveys have pointed to several key factors that have promoted and hindered the diffusion of ICS. Following Barnes et al (1994) and Simon (2010) suggestion to divide a project into various project phases to elucidate more of those factors, we structure the project into manufacturing, sales and usage stages on the one hand, and technological design and diffusion program stages on the other hand.

At the technological design in the manufacturing stage, a demand-driven stove creation is most important (Shastri et al., 2002). Such technological designs that enhance fuel saving, durability and safety and produce less smoke are not only essential for acceptance, but also affect other parameters, cooking time being one of them. Users are likely to abandon new stoves when they find it requires longer cooking time, as seen in the case of Zimbabwe (Gill, 1987). Cultural aspects also need to be considered; the case of a failed introduction of ICS in India showed that the users cooked their local daily bread in a way that outsiders could hardly imagine (Rouse, 2002). Versatility is also important because some traditional stoves allow users to employ it as a heater or a mosquito repellent while cooking (Barnes et al, 1994). Finally, users' satisfaction is affected by what kind of benefit they can gain. In this context, the extent of higher income to compensate the risk for the shift should be considered especially when the stove is employed for the use in local processing.

On the other hand, the diffusion program such as ownership, quality control and local availability are the cornerstones again in the manufacturing stage. Ownership of crafts assures the integrity of the supply chain (Gaul, 2009). Quality control is important to convince people to buy stoves (Shastri et al, 2002). Local availability or production with the local material and locally available technology makes it easier to duplicate the same product for wider diffusion (Rouse, 2002).

Pricing in the sales stage is a major factor affecting diffusion. Gaul (2009) found that free distribution discourages people's ownership in use. However, too high a price will reduce farmers' incentive to purchase the technology. To increase their willingness to purchase while keeping their ownership in use, the price should be carefully balanced in an affordable range.

Even when the price is low enough, farmers will not purchase an ICS unless they perceive larger gains (Rouse, 2002). Such gains stem from firewood saving and better health, especially in

preventing respiratory diseases, which are not so visible at hand. In addition, they can achieve firewood saving only through proper use and maintenance (Barnes et al, 1994). Awareness raising in the sales stage and after-sales service in the usage stage are essential in this regard and should be integrated into the promotion strategy.

4 An evaluation of enabling factors on Vattanak Stove adoption

We evaluate the model case project with the above-mentioned enabling factors in both technical design and diffusion program (Table 4-2) simply by checking how many such factors are actually incorporated in this ICS project to see the effectiveness of the actual aid.

In the technological design, a Vattanak stove can enable farmers to cook something during boiling palm juice, let them enjoy a smoke-free kitchen environment as well as increased safety in use and improved end products (GERES Cambodia, 2009a). In addition, although the reduction was less than expected, it proved to save 25% firewood as compared with the traditional stove in the field test, and 89% of the customers actually perceived firewood saving, according to the GERES's satisfactory survey (GERES Cambodia, 2009b). However, a Vattanak stove only accepts small and dried firewood because of its design to enhance the burning efficiency. Though it accepts thick, small and dried material such as palm wastes as fuel, farmers too often have to chop and dry firewood while traditional stoves can cope with any kind of firewood (GERES Cambodia, 2009a). Furthermore, GERES requires farmers to produce *granulated* sugar which forces them to work another half an hour longer than the time needed for producing *pasted* sugar (GERES Cambodia, 2009a). Regarding the diffusion program, the organization failed to establish any quality assurance scheme. A Vattanak stove consists of more than 20 small parts, and GERES seems to have recognized that this structure makes it difficult to establish a quality assurance labeling scheme for the stove (GERES Cambodia, 2009a). In addition, ownership of the stove potteries and installers seems to be impaired by the system of their earnings that are paid by GERES and not directly by customers. Further, raising awareness on forest protection and respiratory disease reduction through the improved cook stove was not incorporated into the promotion program since poverty reduction became more of its focus in the course of this project, according to the interview with GERES. On the other hand, GERES made good efforts to make the Vattanak stove locally available. Therefore, all the materials and skills required to make the stoves are within local (GERES Cambodia, 2009a). GERES also provided a repayment scheme and set a sugar purchase price that were favorable to farmers, and assumed a payback period even within one season so that farmers would not perceive too high risks from the new technology (Eco-biz, 2009). In addition, one-year free repair services were offered for the users to secure the stove performance until they get used to the new method (6).

Overall, it is found that 10 out of 15 enabling factors were incorporated in this project. Despite this fact, the use of 49 out of 110 Vattanak stoves was discontinued after initial adoption. As a result, it is difficult to say how effective the aid for this project was.

5. Assessing deterrent factors toward Vattanak stove adoption: A field survey at Kampong Chhnang province

To find out both the potential for the further diffusion and the most critical factors that affect massive diffusion, we conducted interviews in 5 villages of Kampong Chhnang province where the GERES has intensively promoted this technology. We interviewed 45 out of 110 farmers that had installed Vattanak stoves. The interviewees were selected randomly from all the villages where the Vattanak stoves were installed to take the regional attributes into account. Among them, there are 32 farmers who had already stopped using Vattanak stoves and 13 farmers who continue to use them (Table 4-3).

Judging from the answers of 11 interviewees who are continuously using the stove that they wanted to keep using the stove, we cannot evaluate this project as a complete failure. In total, 61 out of 110 farmers are still using the Vattanak stove, implying that this project has potential for further diffusion.

To investigate the critical factors preventing widespread diffusion, we made interviews on the reasons to stop using the Vattanak stoves. The result shows that most farmers consider “longer cooking time” as the main deterrent factor (Table 4-4). They recognize that a Vattanak stove requires longer hours, although it was designed to be as good as the traditional one in terms of cooking time as long as a farmer produces *pasted* sugar.

As regards the regional attributes, it is mostly the farmers in Thmey village that gave up using the Vattanak stove for the reason of “longer cooking time.” In fact, Thmey village shows the highest ratio of the discontinuance among the five villages. Follow-up interviews found that most of the Vattanak stoves had the problem with regard to strength of fire at the outset in this village. It is assumed that the installers made some technical mistakes, and this failure was responsible for the longer boiling time of the palm juice.

However, the technical failure proved not to be the real factor for deterrence. Farmers in Thmey village have tried to take advantage of this technical failure to raise the price of their products. All the farmers accepted GERES’s offer of free repair service on the condition that the GERES raised the purchasing price. GERES set the purchasing price of the granulated sugar at 3,300 riel per kg, but the purchasing price of the pasted sugar reaches its peak at about 3,500 to 3,800 riel/kg in the first months of the season specifically in this village, though it gets lower to 2,000 riel/kg at the end. When looking at the higher purchasing price for their *pasted* sugar, the farmers in Thmey village

felt that the price set by GERES was not sufficient to compensate for the additional work that was required to produce *granulated* sugar from *pasted* sugar.

Secondly, as a consequence of the additional process to make *granulated* sugar, ten farmers complained that using the Vattanak stove deprived them of time for taking care of children. For the Cambodian palm sugar farmers, the men climb up the palm tree to sap the palm juice and women cook the juice. Women usually take care of continuously stirring the sugar and adding firewood to keep the fire strong, while breast-feeding their babies and looking after their kids. However, the additional work for producing *granulated* sugar by breaking and sieving the *pasted* sugar made them feel that they became too busy to take care of children at the same time. In other words, they can produce *granulated* sugar and earn higher income at the expense of childcare. Our survey unveiled that farmers who focus on childcare gave up using the Vattanak stove, while those who keep using it just leave children unattended or let their older siblings or relatives take care of them.

The third deterrent factor is the aforementioned limitation of the type of firewood in use. This discouraged farmers from using the Vattanak stove and made them resort to their traditional one. Our survey confirmed that this condition prevented farmers from continuously using Vattanak stove because of higher cost to obtain this kind of firewood. Although there were still some farmers who overcame this barrier by drying wood under the sun in their front yard from 15 days to several months, or by roasting it by residual heat after cooking palm juice, or by buying drop brunches. It means that all these activities required adjustment of the traditional practices and additional work for farmers. Farmers are often reluctant to doing so unless they perceive clear and visible benefits to compensate.

6. Discussion

Assistance to NGOs faces the same challenges as support of governmental organizations when it aims to change people's traditional practices and behaviors. Through the case study of GERES's Assistance for Improved Cooking Stoves in Cambodia, this chapter confirmed that donor should show visible net benefits to potential beneficiaries at the early stage of assistance.

First, technological failure in the installation of the Vattanak stove in Thmey village gave the beneficiaries rooms for such opportunistic behavior as raising the selling price of their products to GERES. If they obtained the expected gains of the stove at the outset, they would have been willing to use it since the purchasing price by GERES was agreed upon when they purchased it. It also turned out that the higher local purchasing price in Thmey village made the problem complicated. Unfortunately, the current scale of the project is still too small to pay for the prohibitively high shipping cost. This made it difficult for GERES to find enough buyers to sell all the granulated sugar, resulting in increasing stock storage in the backyard. It also prevented them from raising the

purchasing price of the *granulated* sugar and thus to offer visible benefits to farmers.

Second, insufficient incorporation of childcare in the project design discouraged some people to use the Vattanak stove continuously. It is ironic that the scheme introduced to make the farmer's repayment easier turned into the deterrent factor.

Third, the constraints on the fuel type made some people feel that they could gain smaller benefits than before. Though the ultimate goal was fuel saving, such constraint on fuel availability discouraged farmers from using the stove and made its diffusion difficult. This finding underscores the somewhat paradoxical nature of the project's purpose.

Still, our field survey shows there is room for improving diffusion performance. First, donors can establish a quality control system at the preparation stage of the assistance. This would help gaining confidence of the users in the performance, and enable them to gain all the benefits at an early stage. Second, donors can adjust the diffusion program to minimize potential tradeoffs for the users. Such tradeoffs can be context-specific: in the case of ICS in Cambodia, childcare appears as a critical factor that determines whether farmers continue or abandon the Vattanak stove. Third, donors can make access to dry firewood much easier by expanding the project scheme from providing the firewood. Faced with the higher market price of dry firewood, some farmers dry their general firewood under the sun but others find this too troublesome. GERES has actually been trying to work on community forestry to provide the firewood to their ICS users in the future for their easier access to dry firewood.

International donors have a larger potential to tackle these challenges in terms of capital and technology, but are more likely to stop assistance when they observe a bad performance, since they have plenty of alternatives. International NGOs that have little financial resources have to pay more attention to external funding rather than costs and benefits of recipients. In this regard, GERES tried to obtain external funding by selling carbon emission reductions under the WWF-initiated "gold standard" scheme. It also examined to assist setting up farmers' cooperatives so that they could overcome some challenges in favor of the farmers. However, this has yet to be implemented because it requires more profound behavioral changes for them.

7. Conclusions

This chapter examines how the international donor community has committed to environmental rehabilitation in Cambodia, an Asian low-income country through foreign assistance, and analyzes aid performance, taking a case of ICS diffusion for rural poor farmers. The main findings are as follows.

First, international donors have gradually shifted their approach to adopt the sector-wide and common fund approach. The Cambodian government, in response, initiated a program on poverty

reduction and natural resource management in rural areas. But it covers only a tiny portion of government activities as well as of foreign aid (Table 4-2).

Second, transnational NGOs have been extensively involved in the ODA projects and programs in Cambodia for historical reasons: they started by assisting refugees and demining landmine areas in the 1980s and early 1990s, supported local people to organize NGOs and collaborate with them to initiate their own as well as donor agencies funded projects and programs. This is remarkable in Cambodia, given the government's strict control and the monitoring of NGO activities in the neighboring countries such as China and Vietnam, and the central government's strict control of ODA flow in the neighboring countries.

Third, NGOs also suffer from poor performance when the assistance entails behavioral and practice changes of potential beneficiaries who have little leverage to mitigate risks associated with the changes. Risk-averse persons adopt new technology only when they recognize that early innovators have obtained large gains. Our case study on the GERES's assistance for ICS proves that the failure on initial technological performances, coupled with donor's insufficient consideration of the local context, i.e., accessibility for suitable firewood and childcare requirements, prevented its widespread diffusion, thus constraining aid effectiveness.

Notes

1. Partly due to the global economic crisis, this share declined to 14% in 2008.
2. Craig Guthrie, "The end of an NGO era in Cambodia," Asia Times Online November 14, 2008.
3. For more specific information on the Vattanak stove, refer to http://www.hedon.info/docs/Vattanak.pdf and http://www.arecop.org/download/GLOW%2340.pdf
4. Generally, palm sugar harvest and refinery starts in November and continues until March. Farmers refer to these five months as one (production) season.
5. Author's interview with GERES (10, January 2011).
6. Author's interview with GERES (December 2010).

References

Barnes, Douglas F., Keith Openshaw, Kirk R. Smith, and Robert van der Plas (1994) "What Makes People Cook with Improved Biomass Stoves?," World Bank Technical Paper Number 242, Energy series, Washington DC: The World Bank.

Danish Ministry of Foreign Affairs (2004) "Evaluation: Danish Environmental Assistance in Southeast Asia: Annex F: Cambodia Country Programme," Copenhagen: Danida.

Danish Ministry of Foreign Affairs and UK Department for International Development (2006) "Natural Resource Management and Livelihoods Programme, Cambodia (2006-2010)"

Available at : < http://www.phnompenh.um.dk/NR/rdonlyres/B96143E9-B630-4428-9988-7FAF559E0077/0/FINALPROGRAMMEDOCUMENTdate070406passw.pdf> (Accessed on April 11, 2011)

Development Assistance Committee (1996) “Shaping the 21th Century: The Contribution of Development Co-operation,” Paris: OECD.

Gaul, Mirco (2009) “Subsidy Schemes for the Dissemination of Improved Stoves: Experiences of GTZ HERA and Energising Development,” Eschborn: GTZ.

GERES Cambodia (2009a) “Guidelines for Vattanak Stove Dissemination,” Phnom Penh: Community Development Unit, GERES Cambodia.

GERES Cambodia (2009b) “Vattanak User Satisfaction Survey and Baseline Study on Future Vattanak Users,” Phnom Penh: Research and Development Unit with Policy Study Unit, GERES Cambodia.

GERES Cambodia (2010) “Baseline Study for Vattanak Stove Dissemination: Final Report,” Phnom Penh: GERES Cambodia.

GERES and L’AFD (2009) “Dissemination of Domestic Efficient Cookstoves in Cambodia,” Phnon Penn: GERES Cambodia.

Gill, Jass (1987) “Improved stoves in developing countries: A critiques,” Energy Policy, 15 (2), 135-144.

Hirohata, Nobuo (2004) “Economic Development in Cambodia: Transition to Market Economy and Poverty Reduction,” Tokyo: Nihon Hyoronsha (in Japanese)

Kerndrup, Soren with Leo Baas, Noel Duffy, Ole Erik Hansen and Brendan Ryan (1999) “Sugar sector,” in Clayton, Anthony, Graham Spinardi and Robin Williams (eds.), Policies for Cleaner Technology: A New Agenda for Government and Industry, London: Earthscan, 161-185.

Min Kim, Sylvain (2008) “Research and Development on Fuel Efficient Stove for the Rural Micro Enterprises of Cambodia,” Phnon Penn: GERES Cambodia.

OECD-DAC (2010) International Development Finance Statistics 2009 CD-ROM, Paris: OECD.

Rouse, Jonathan (2002) “Community participation in household energy programmes: A case-study from India,” Energy for Sustainable Development, 6 (2): 28-36.

Shastri C.M., G. Sangeetha and N.H. Ravindranath (2002) “Dissemination of efficient ASTRA stove: Case study of a successful entrepreneur in Sirsi, India,” Energy for Sustainable Development, 6 (2): 63-67.

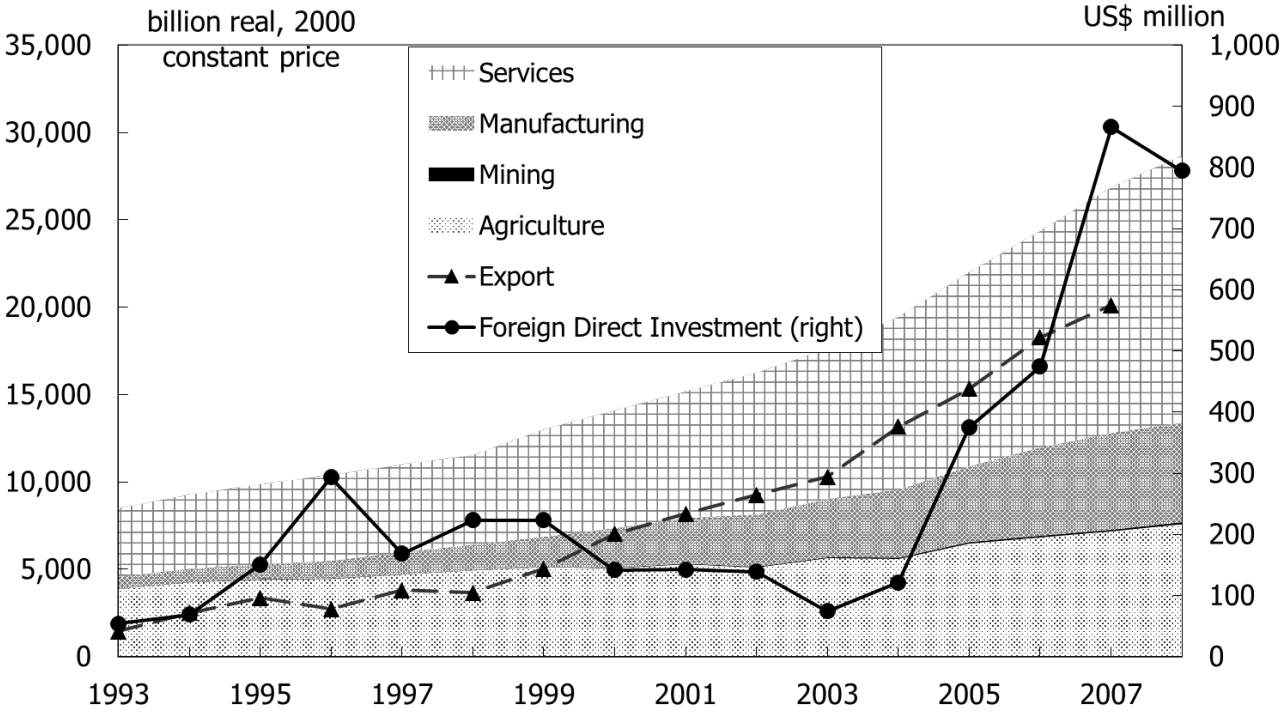
Simon, Gregory L (2010) “Mobilizing cookstoves for development: A dual adoption framework analysis of collaborative technology innovations in Western India,” Environment and Planning A, 42, 2011-2030.

Sunderlin, William D (2004) “Community forestry and poverty alleviation in Cambodia, Lao-PDR,

and Vietnam: An agenda for research," A position paper presented at the Regional Consultation Workshop for ADB-RETA 6115: "Poverty Reduction in Upland Communities in the Mekong Region through Improved Community and Industrial Forestry"

World Bank (1999) Pollution Prevention and Abatement Handbook 1998: Toward Cleaner Production, Washington DC: The World Bank.

Figure 7-1 Cambodia Economic Structure and Foreign Direct Investment, 1990-2008



Source: Asian Development Bank, Key Indicators for Asia and Pacific, each year.

Figure 7-2 Vattanak stove

Source: author, photo taken in the GERES project site (2009).

Figure 7-3 Five Provinces in Cambodia under GERES' Project Implementation

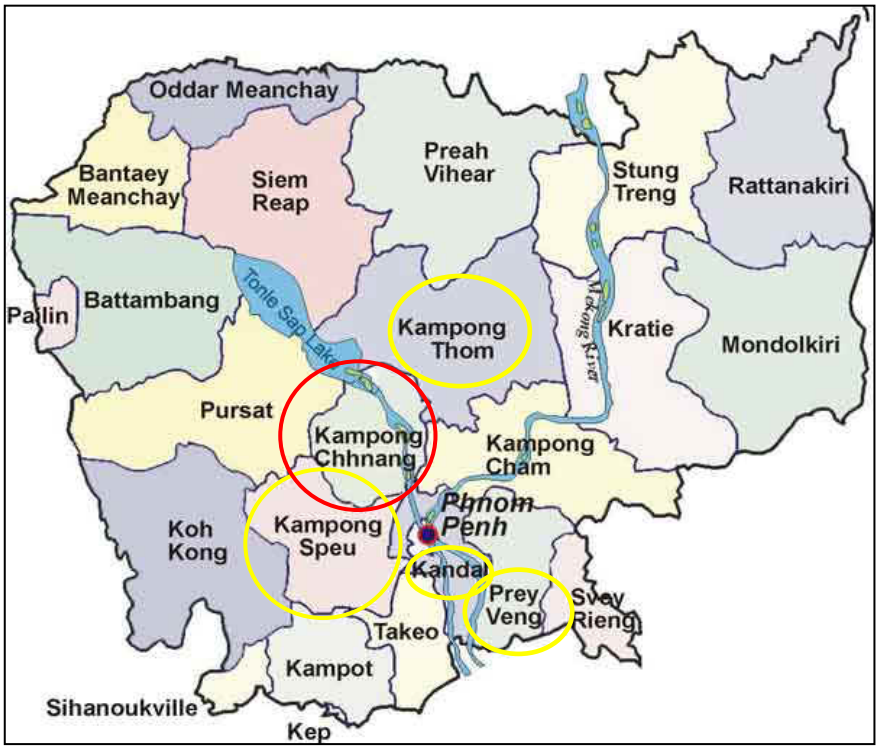
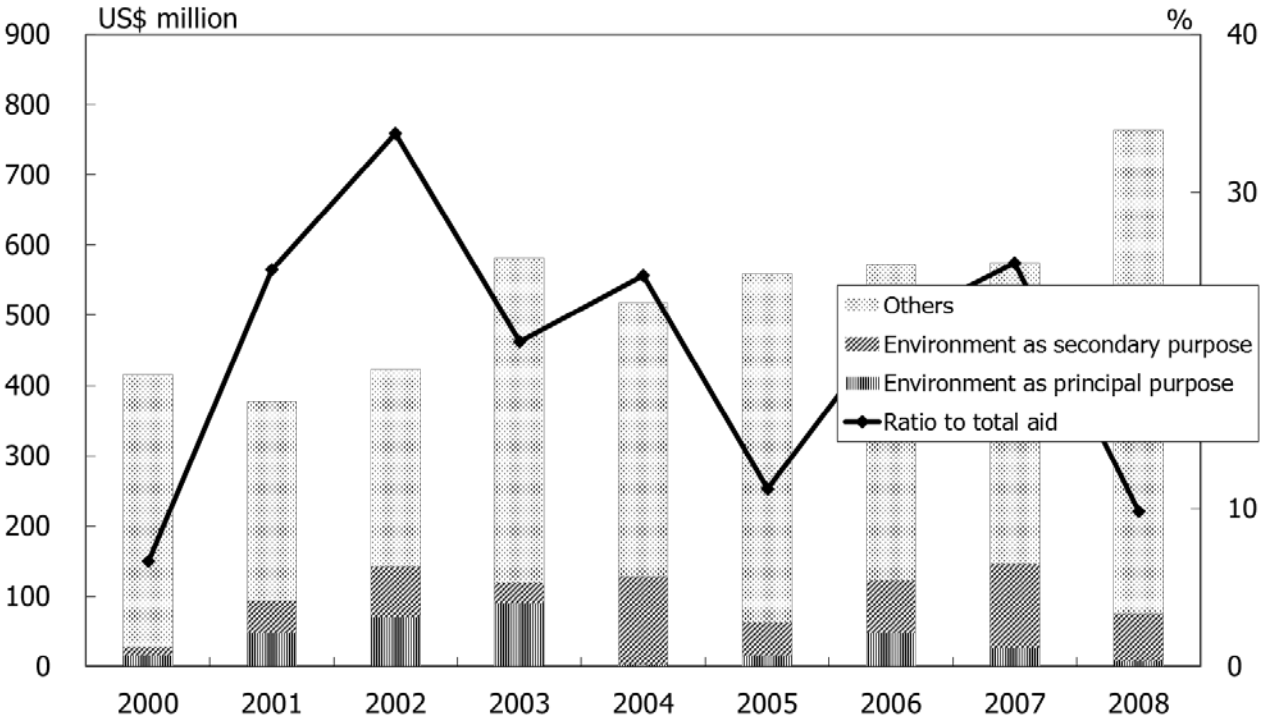
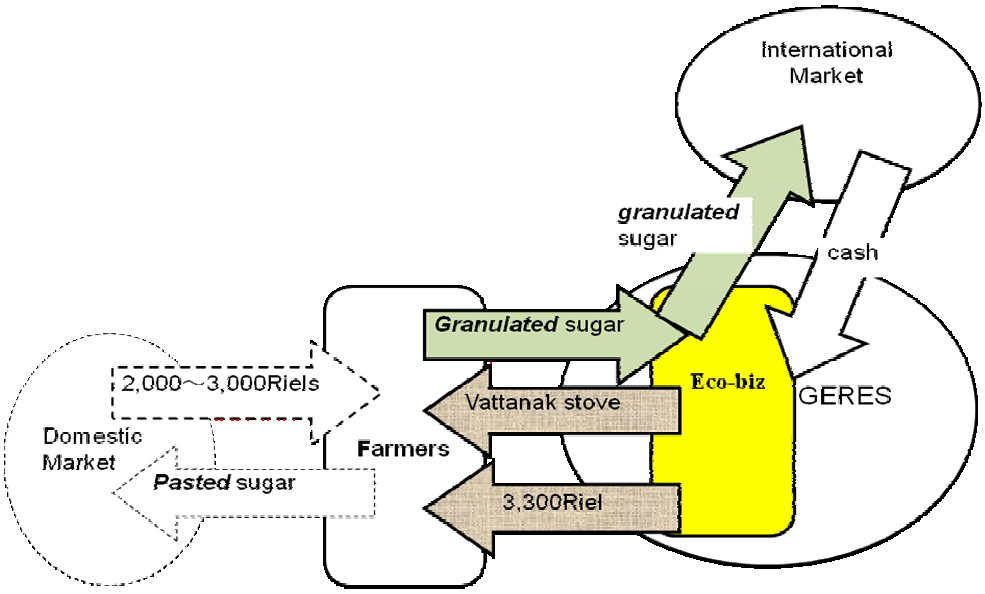


Figure 7-4 Environmental Aid to Cambodia



Source: Same as Table 7-1.

Figure 7-5 GERES Assistance Scheme



Source: author, based on the interview with GERES in 2009.

Table 7-1 Foreign Aid to Cambodia by Sector, 2000-08

Sector	Amount (US$ million)	
Government & Civil Society-general		685.1
Health		470.1
Population & Reproductive Health		418.6
Multisector		371.4
Transport & Storage		363.5
Education		338.7
Agriculture		330.3
Energy		301.2
General Budget Support		165.2
Emergency Response		165.2
Conflict, Peace & Security		162.3
Water Supply & Sanitation		152.4
General Environmental Protection		145.6
Environmental policy & admin	73.5	
Flood prevention/control	58.0	
Site preservation	7.3	
Biodiversity	3.9	
Environmental training & research	1.8	
Biosphere protection	1.1	
Support to NGO's		69.0
Forestry		9.6
Others		637.2
Total		4,785.2

Source: author’s calculation based on OECD-DAC (2010)

Table 7-2 Evaluation of the Enabling Factors on Vattanak Stove Adoption

(a) Technological design			Evaluation
Manufacture	Fuel saving	Save more fuel than baseline case	†
	Fuel condition	Not more troublesome than baseline case	
	Cultural aspect	Adoptable to the traditional cooking method	†
	Cooking time	Shorter than baseline case	
	Versatility	More function than baseline case	†
	Smoke	None or less than baseline case	†
	Durability	More durable than baseline case	†
	Safety	Safer than baseline case	†
	Impact on its end product	Better end product production than baseline case	†
(b) Diffusion program			Evaluation
Manufacture	**Ownership** of crafts		
	Quality control system		
	Local manufacture with local materials		†
Sales	**Price** is not too expensive and not free of charge		†
	Awareness raising is embedded in the promotion		
Usage	**After sales service** at free of charge (repair / user education)		†

Source: author's analysis

Note: † indicates the incorporation of the enabling factors into the project

Table 7-3 Attributes of Interviewees

Village	Rolean (RLG)		Trapaing Buon (TPB)		Hang Chhuouk (HCK)		Kraing Sramor (KSM)		Thmey (TMY)		Total	
	Number	Of which interviewed	Number	Of which interviewed	Number	Of which interviewed	Number	Of which interviewed	Number	Of which interviewed	Number	Of which interviewed
Stopped using	6	4	8	7	9	8	4	3	25	10	52	32
Keep using	5	2	17	3	23	3	11	3	2	2	58	13
Total Purchased	11	6	25	10	32	11	15	6	27	12	110	45

Source: author

Table 7-4 Deterrent Factors toward Vattanak Stove Adoption

Factors	RLG	TPB	HCK	KSM	TMY	Total
Longer cooking time	0	2	0	0	10	**12**
Too much trouble to look after children	0	4	3	1	2	**10**
Difficulty in getting dry fuelwood	2	1	2	0	1	**6**
Broken by rain, storm or fallen trees	2	0	0	0	1	**3**
Too troublesome to chop fuelwood	0	1	1	0	0	**2**
Problem on the design of fuel inlet	0	0	1	0	1	**2**
Cannot make the granulated sugar well	0	0	1	0	1	**2**
Too troublesome to function the post combustion	0	0	0	0	1	**1**
Wok does not suit to the size of placer	0	0	0	1	0	**1**
Illness of husband	1	0	0		0	**1**
Difficulty in finding poppel (tree skin to purify the juice)	0	1	0	0	0	**1**
Move of the house	0	0	0	1	0	**1**

Source: author, based on the interview with the stakeholders in 2011