Sustainable Rural Development in Greater Phnom Penh:

Promoting Eri-Culture in Cambodia

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ABSTRACT

DESCRIPTION

This learning case surrounds the promotion of eri-culture in the Greater Phnom Penh of Cambodia as an alternative to the utilization of chemical pesticides on the farmland. Eri-culture raised the environmental awareness amongst local farmers, especially with regards to the environmental and health benefits gained from reduction of applied chemical pesticides. This learning case focuses on Education for Sustainable Development (ESD) as an approach towards sustainable rural development and evaluates the farmers' level of participation as well as the sustainable development issues surrounding eri-culture.

Learning objectives:

To evaluate the participatory level of local farmers in the eri-culture programme.
To assess the sustainability dimensions related to the effects of promotion of environmental awareness.

Subjects covered:

Eri-culture; Sustainable rural development; ESD; Environmental awareness

Setting:

- local villages in Kampong Cham province, Greater Phnom Penh, Cambodia

DISCLAIMER

Cultivation of eri silkworms, known as "eri-culture", was introduced by the Institute of Environment Rehabilitation and Conservation, ERECON, to local villages in Kampong Cham province in October 2010 as part of the activities of RCE-GPP, which is aimed at promoting Education for Sustainable Development (ESD).

INTRODUCTION

Greater Phnom Penh consists of Phnom Penh city and six surrounding provinces: Kampong Cham, Kandal, Prey Veng, Kampong Speu, Kampong Chhang, and Takeo provinces. The total population of these areas combined is 7,250,881, and the area of Greater Phnom Penh is 34,641 km^2. More than 70% of population is engaged in agriculture and related sectors.

In rural areas, the majority of farmers apply agricultural chemicals, such as chemical fertilizers or pesticides to achieve and maintain high level of yields. However, since the year 2000, the overuse of agricultural chemicals released from farmlands downstream has caused severe problems, including degradation of the soil and water environment and damage to the health of farmers. Therefore, Education for Sustainable Development (ESD) is necessary for sustainable rural development.

Regional Centres of Expertise (RCE) is a network for existing formal and non-formal organizations to deliver ESD to local communities in the respective countries. RCE Greater Phnom Penh (RCE-GPP) has been established to promote ESD through food, agriculture, and environmental education for sustainable development, in the area of Greater Phnom Penh, and was officially acknowledged by the Global RCE Centre of the United Nations University, Institute of Advanced Studies (UNU-IAS) on December 26, 2009. RCE-GPP aims to enhance education on food, agriculture, and environment, not only for primary schools, but also for local communities, through organic farming activities, with cooperation from the government, university, local NGOs, and local community in Greater Phnom Penh.

Cultivation of eri silkworms, known as “eri-culture”, was introduced to local villages in Kampong Cham province in October 2010 as part of the activities of RCE-GPP, which aims to promote Education for Sustainable Development (ESD). However, in order to promote sustainable agriculture by ESD, it was necessary to provide an incentive for local farmers. As the poverty level was quite high, these farmers were eager to take on new jobs for income generation, other than farming. Especially during a dry season, farmers would find other kinds of work in urban areas. Hence, providing workshops or seminars regarding sustainable rural development, and also providing an opportunity for income generation was an essential factor to motivate local farmers to initiate and adopt sustainable rural development as part of their daily life.

ERI-CULTURE PROGRAMME IN KAMPONG CHAM PROVINCE, CAMBODIA

The eri silkworm, *Samia Cynthia ricini*, is a kind of wild silkworm that is found in South Asia (Photos. 1-3), with its origin in Assam province, India. Now, besides in India, eri-culture is also cultivated in various countries, such as Thailand, Vietnam, China, the Philippines, Nepal, Ethiopia, and Cambodia. Wild silkworms inhabit habitats all over the world in more than 20 varieties, and each one of them has a very different unique character. Not only eri silkworms, but other kinds of wild silkworms as well, have very unique characteristics with cocoons, so called 'nano-tube structure'. This nano-tube structure makes eri silkworm very unique with high functionalities for materials, such as high ultraviolet protection and high moisture absorbency. Eri silkworms have a very high potential to be used as hybrid yarn with other materials, such as domestic silk, cotton, and others. As the fiber of eri silkworms is very soft like wool or cashmere, these cocoons have caught the attention of businesses around the world.

Photo 1. Eri silkworm

Photo 2. Castor leaves as host plant

Photo 3. Eri cocoon

The eri silkworm is multivoltine in nature, and it hatches around 6 times per year (Kawabe, 2010). One lifecycle is about 45 to 50 days. One female moth produces more than 200 eggs per time. Host plants of eri silkworm are leaves of castor (*Ricinus communis*), cassava (*Manihot esculenta*), papaya, and other few kinds of leaves which can be found in rural areas of South Asia, and which are normally considered as "just leaves" with no use. Without the need of any input or special care, these leaves can grow naturally, especially near rivers or dumping sites. Farmers could easily start eri-culture without any change of their land use.

The target areas for the eri-culture culture programme are located at Wat Chas village and Roung Kor village in Baray commune, Prey Chhor district in Kampong Cham province, Cambodia (see Figure 1). Since October 2010, eri-culture has been introduced and promoted in Wat Chas village and a little after, in Roung Kor village.

In Wat Chas and Roung Kor villages, the main economic activity of farmers is rice cultivation. Some vegetables are also cultivated in upland fields. There are some serious problems related to the agricultural situation in the area. Average area of farmland is around 0.45 ha in Wat Chas village and Roung Kor village; which is below the average area for farmland in other areas of Kampong Cham province. Thus, the amount of agro-production is very limited in the small land and the poverty level is higher than in other areas (see Table 1). In order to yield larger amounts of crops, it is common to apply chemical fertilizers and chemical pesticides onto farmlands, although this causes severe degradation to the soil and water environment in farmlands and serious health problems for the farmers (Mihara and Fujimoto, 2007).

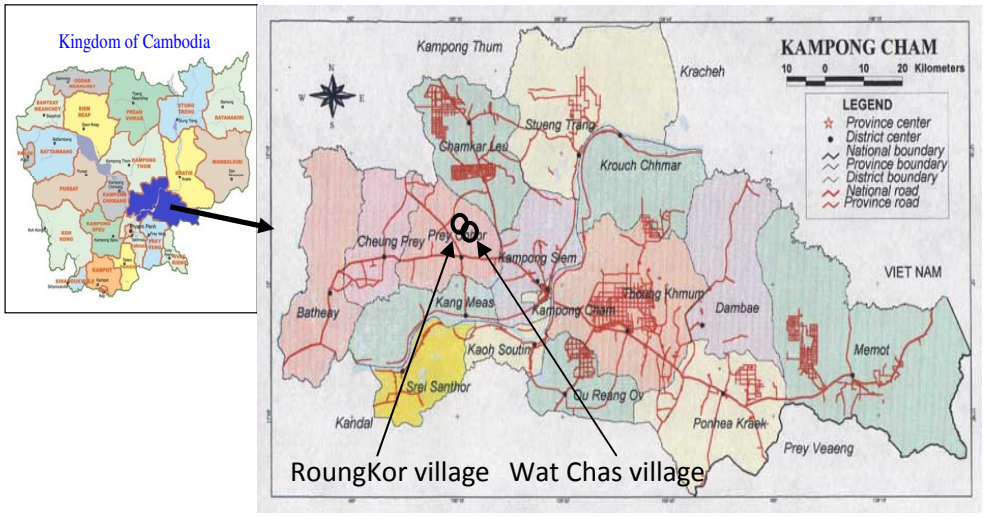


Figure 1. Location of Wat Chas and Roung Kor villages in Baray commune, Prey Chhor district in Kampong Cham province

Table 1. Agricultural land per rural household in Kampong Cham (MAFF 2004)

Agricultural land per rural household (ha)	Cambodia	Kampong Cham	Wat Chas	Roung Kor
No agricultural land (landless)	15%	17%	7%	3%
0.01 ha≦a <1.0 ha	49%	55%	80%	82%
1.0 ha ≦ a< 3.0 ha	30%	23%	13%	15%
a ≧ 3.0 ha	6%	5%	0%	0%

Three workshops, including a demonstration of eri-culture, were organized for local farmers, in October, November, and December 2010, before the first questionnaire survey was conducted in March 2011 (see Photos. 4, 5). Training on eri-culture was conducted for each local farmer who started rearing eri silkworms. Six months after the introduction of eri-

culture in Kampong Cham province in Cambodia, the first questionnaire survey was conducted in March 2011, to evaluate the effects of eri-culture on promoting environmental awareness of local farmers. The questionnaire includes the following questions:

1. Have you already initiated eri-culture?
2. Have you ever participated in the workshop on eri-culture?
3. Compared to the conventional farming approach, how much would you want to reduce the use of chemical pesticides?
4. Compared to before starting eri-culture, how much have you enhanced communication with others?
5. How much do you expect eri-culture to contribute towards your income generation per year?

A second questionnaire survey followed in October 2011, one year after eri-culture was introduced to the local farmers.

ERI- CULTUREAND ESD

The first workshop conducted in October 2010 was very small and only two farmers participated. Although the two farmers had no idea about eri-culture, they attended the workshop as they were requested to do so by the village leader. By observing and touching eri-silkworms, farmers understood the process of rearing and active discussions emerged naturally.

The second workshop conducted in November 2010, was much bigger than the first one, because more farmers were motivated by the first trial farmers, and many came to see their rearing method. Even though they were not requested to attend the workshop by the village leader, many farmers attended to observe the eri silkworms and to understand what eri-culture is all about. Since one farmer succeeded in the first trial, she was acknowledged as a model for “Good Practice” in the village. Although another farmer did not rear successfully, due to cigarette smoking and feeding the silkworms the wrong type of plant (Jatropha) the farmer took this moment as an opportunity to understand how chemical substances affected eri silkworm, which led to the fatal event.

In total, 45 farmers participated in the second workshop and among the participants, four farmers started eri-culture. Most of them failed to rear in their first attempt and many worms died due to contamination from the chemical pesticides in the rearing net. New rearers tried to figure out the reason for the silkworms’ sudden death. Naturally, communication amongst

the farmers became more active than before, in order to exchange and share knowledge and experiences on eri-culture, and it seemed their awareness of the impacts of chemical substances improved. They started asking whether perfumes were dangerous to worms or not, since young women use perfumes in their day-to-day work life in Cambodia.

Photo 4. Rearers in Wat Chas village

Photo 5. Eri-culture demonstration in a workshop held at Wat Chas in November, 2010

Farmers implemented ESD (Education for Sustainable Development) by themselves without being ordered to do so. Moreover, many other farmers from other villages in Kampong Cham province showed strong interest in starting eri-culture; they consider it work with high potential, which could be easily conducted in their villages. Farmers from a village as far as 40 km from the workshop site participated in the third workshop. After the second and third workshops, communication level became high and a network formed naturally; consequently, the information and knowledge on eri-culture spread. Even with no support of materials, many farmers wanted to start eri-culture.

ERI-CULTURE AND ENVIRONMENTAL AWARENESS

As shown in Figure 2, the results of the first questionnaire survey showed that local farmers who reared eri silkworms were interested to reducing 92.5% of chemical pesticides used on the farmland, compared to the previous conventional approach (Kawabe, et al. 2012). In comparison, local farmers who only participated in the workshops, or who have never participated in the workshops, were interested in reducing less of the chemical pesticides applied: 72.3% and 66.9% respectively. Hence, the expected percentage of chemical pesticides to be reduced by local farmers who reared eri silkworms was significantly higher than that by local farmers who just participated in the workshops or who had never participated in the workshops. Accordingly, eri-culture provides an avenue for education for local farmers with regards to their willingness to reduce the use of chemical pesticides.

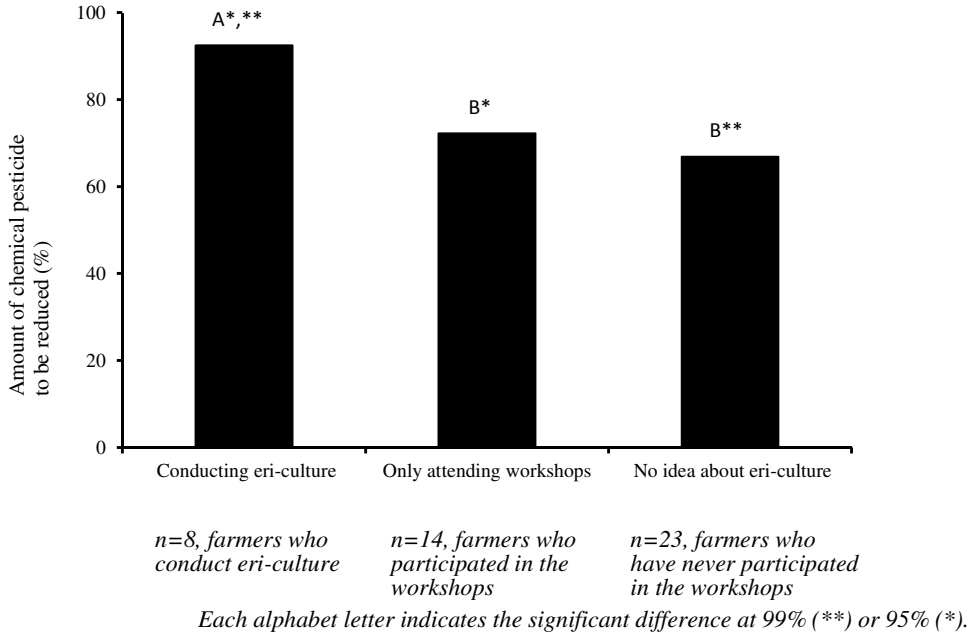


Figure 2. The expected percentages of chemical pesticides to be reduced by rearing and non-rearing farmers

The second questionnaire survey conducted in October 2011, one year after eri-culture was introduced to the local farmers in October 2010, revealed how much farmers had reduced the amount of chemical pesticides.

As shown in Figure 3, the results showed that farmers rearing eri silkworms succeeded at reducing the amount of chemical pesticides by 69.5% compared to the conventional approach, while farmers who only participated in the eri-culture workshops or who never participated in the eri-culture workshops, reduced only 7.5% or 5%, respectively (Kawabe, et al. 2012). In terms of the amount of chemical pesticides reduced by rearing farmers, 35% of rearing farmers reduced the amount of chemical pesticides at 80 to 100%, 45 % of them reduced at 60 to 80%, while only 5 % reduced at 20-40% and 0-20%, respectively. (see Figure 4).

While using the natural resources in the villages, the farmers found themselves acknowledging that their farming practices gradually changed towards sustainable agriculture. In order to conduct eri-culture, farmers needed to quit using chemical substances or at least, reduce the amount of its usage. Due to the sensitivity of eri silkworm to any kinds of chemical substances, farmers started to realize the harm of chemical pesticides, smoke from burning cigarettes, or burning plastics. Deeper perceptions on the harm of chemical pesticides made them change the stocking place of pesticides and herbicides from within homes to stocking cabins located far from their homes. They paid more attention to chemical

substances and became more sensitive of their effects. Hence, eri-culture demonstrated its potential in promoting environmental awareness.

Consequently, farmers rearing eri silkworms succeeded in reducing the amount of chemical pesticides used through eri-culture, and eri-culture has become an educational tool to increase the environmental awareness of local farmers, especially in terms of reducing chemical pesticides used. Moreover, eri-culture left a strong impact on local farmers who raised eri silkworms, to move towards sustainable rural development.

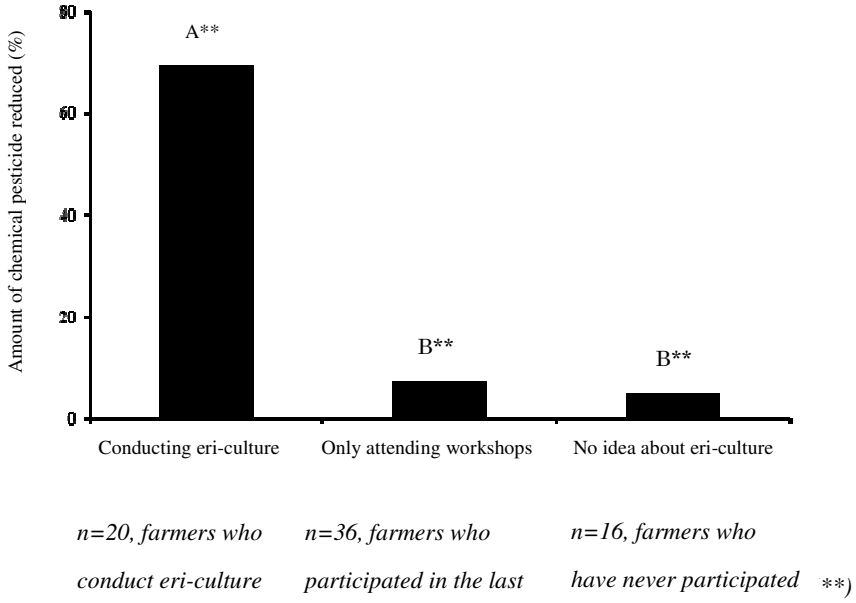


Figure 3. Actual percentages of chemical pesticides reduced by rearing and non-rearing farmers

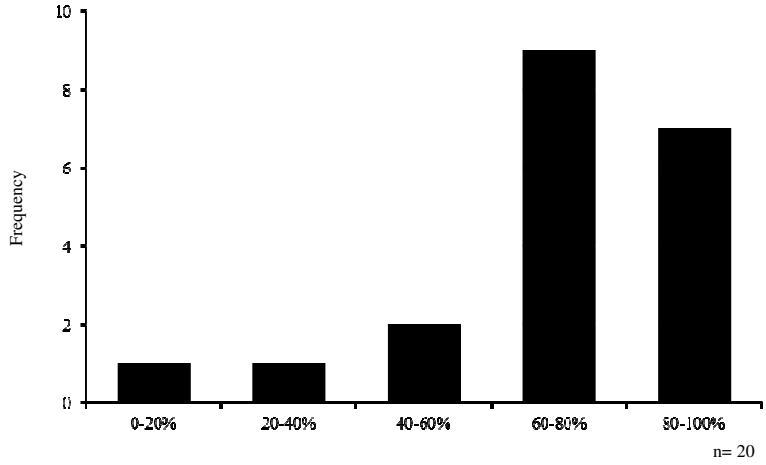
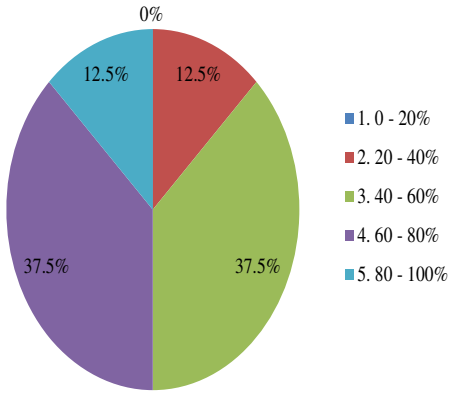


Figure 4. Percentages of chemical pesticides reduced by rearing farmers

ERI-CULTURE AND RURAL DEVELOPMENT

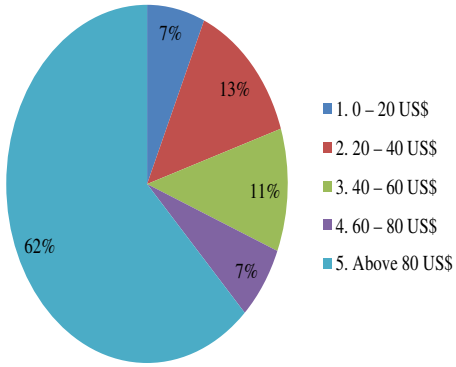
Through the second and third workshops in November and December 2010, which included demonstrations on eri-culture, many farmers were motivated and showed high interest to start eri-culture. They conducted eri-culture, and formed local networks which allowed them to communicate and share their experiences and knowledge on eri-culture at a deeper level. As shown in Figure 5, 38% of rearers acknowledged that communication increased 40 to 60% compared to before starting eri-culture, 38% of rearers reported an increase of 60 to 80%, while only 13% acknowledged an icrease of 20-40%. Accordingly, it was evaluated that the communication in the farmers' network, had increased through eri-culture. Unlike other Asian countries, in Cambodia, historically and culturally, it used to be difficult to promote communication amongst the villagers. Many villagers were afraid to forge close relationships with their neighbours due to the negative experiences during the 1975 - 1979 Pol Pot regime era.

In addition, Figure 6 shows the expectation of income generation through eri-culture. Over 62% of eri-culture farmers expected an increase in their income, with an income generation of more than 80 US$ per year. This expectation acts as an incentive to promote eri-culture in the villages.



n=8, only farmers who conduct eri-culture

Figure 5. Percentages of increased in communication after starting eri-culture



n=45, all responded farmers

Figure 6. Expected income generation per year through eri-culture

There are two key issues which needs to be evaluated, with the first being the participatory level of local farmers in the eri-culture programme. In the first workshop on eri-culture, only

two farmers attended, as they were requested by the village leader. However, the attitude of local farmers on eri-culture changed over the next few workshops. High level of participation from local farmers is indispensable in the long run, even after completing the term of the programme. The second issue relates to the three sustainability dimensions: economic performance, environmental performance and social performance, in regards to the effects of eri-culture on promoting environmental awareness.

Working session 1: Participatory Level Assessment

Referring to Appendix A: The typology of participation (Appendix A), the change in farmers' attitude could be evaluated based on their degree of participation. Specifically, in worksheet 1, evaluate the degree of participation of local farmers as well as motivational factors or barriers towards participation in the programme.

Worksheet 1: Participatory level assessment

Level of participation	Issues of participation	Motivational factors	Barriers

Working session 2: Sustainability Assessment

For a sustainability assessment, we have to pay attention to the following 3 dimensions: economic performance, environmental performance, and social performance. Specifically, in worksheet 2, evaluate the level of contribution of eri-culture programme towards each sustainability dimension. The possible level of contribution to each sustainability dimension is as follows: 1.Very low, 2. Low, 3. Medium, 4. High, and 5. Very High. In addition, please describe specific sustainability issues and reasons for them.

Worksheet 2: Sustainability assessment

Sustainability Dimension	Specific Sustainability Issue	Level	Evidence or Reason
Economic Performance			
Environmental Performance			
Social Performance			

ACKNOWLEDGEMENT

We would like to express our special thanks to Professor Dr. Mario T. Tabucanon for guiding us on the development of the learning case, and ERECON, Institute of Environment Rehabilitation and Conservation, Japan, for kindly allowing us to use the results of questionnaire survey conducted in Kampong Cham, Cambodia.

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APPENDIX A TYPOLOGY OF PARTICIPATION

Typology	Characteristics of Each Type
1. *Passive participation*	People participate by being told what is going to happen or has already happened. It is a unilateral announcement by an administration or project management without any listening to people's responses. The information being shared belongs only to external professionals.
2. *Participation in information giving*	People participate by answering questions posed by extractive researches using questionnaire surveys or similar approaches. People do not have the opportunity to influence proceedings, as the findings of the research are neither shared nor checked for accuracy.
3. *Participation by consultation*	People participate by being consulted, and external agents listen to views. These external agents define both problems and solutions and may modify these in the light of people's responses. Such a consultative process does not concede any share in decision making, and professionals are under no obligation to take on board people's views.
4. *Participation for material incentive*	People participate by providing resources, for example labor, in return for food, cash, or other material incentives. Much on-farm research falls in this category, as farmers provide the fields but are not involved in the experimentation or the process of learning. It is very common to see this called participation, yet people have no stake in prolonging activities when the incentives end.
5. *Functional participation*	People participate by forming groups to meet predetermined objectives related to the project, which can involve the development or promotion of externally initiated social organization. Such involvement does not tend to be at early stages of project cycles or planning, but rather after major decisions have been made. These instructions tend to be dependent on external initiators and facilitators, but may become self-dependent.
6.*Interactive participation*	People participate in joint analysis, which leads to action plans and the formation of new local institutions or the strengthening of existing ones. It tends to involve interdisciplinary methodologies that seek multiple perspectives and make use of systemic and structured learning processes. These groups take control over local decisions, and so people have a stake in maintaining structures or practices.
7.*Self-mobilization*	People participate by taking initiative independent of external institution to change systems. They develop contacts with external institutions for resources and technical advice they need, but retain control over how resources are used. Such self-initiated mobilization and collective action may or may not challenge existing inequitable distribution of wealth and power.

Source: Pretty (1994), adapted from Adnan et al. (1992)