

## **Farmer's economic change after participating vegetable cultivation using solar cell supported by the private sector**

**Krailert Taweekul<sup>1</sup>**

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**Abstract:** The paper examines: 1) utilization of solar cell system for water supply and irrigation for vegetable cultivation, 2) the farmer's economic change after participating the project and 3) the model of promoting organizations involved the project for sustainable development. Questionnaires and focus group had been used for collecting data. Four villages in Khon Kaen province, Northeast Thailand were selected for study area since the project located in this province and 135 participating farmers had been interviewed. Research period was conducted in July 2017- June 2018. Results found the water supply system for vegetable cultivation consisted of water pond, solar cell, submersible pump, water tank, water pipe and water meter. Before joining the project, water supply used electricity to pump water. Water costed 5 baht/cubic meter that farmers paid before project started, after joining the project, water costed 2 baht/cubic meter. 135 farmers in 4 villages participated cultivated free-chemically vegetable occupied 100-150 square meters per member. They gained annual income from vegetable cultivation 26,563 baht and totally 3,586,758 baht/year, while project cost for building water system was 3,238,000 baht. The present study also found that a developing model of promoting organizations involved in a solar cell project was four main organizations involved: 1) Private sector and NGO : Coca Cola and Population and Community Development Association, 2) Markets : Tesco lotus department store, local markets 3) Academic institution: Khon Kaen University and 4) People organization: Farmer group.

**Key words :** solar cell, farmers, income, model

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<sup>1</sup> Agriculture Extension and Agricultural System, Faculty of Agriculture, Khon Kaen University, Khon Kaen, Thailand 40002

## Introduction

Rural development is very important for improving the quality of life of grassroots groups in Thailand. The aim of rural developments is to improve the economic and social livelihood of special target groups, in particular the poor in rural areas. In the past, the traditional thinking had been that only government must attend to the welfare of the villagers. However, at present, the role of Non Government Organisations (NGOs) and public sectors in Thailand have dramatically increased and become significantly established.

Rural development in Thailand was facing a difficult task due to two main reasons: 1) its image as a prosperous country has led donor agencies to categorise Thailand as a non-recipient and 2) Thailand's economic is headed recession (Parasak, 2019), this has meant the governmental budget for various developing programmes has declined. Moreover, the main problem that Thai NGOs currently face is rapidly diminishing support from international donor agencies. Thus, to find out partners joining development projects in the country such as private sectors is very important.

### Significance of NGO and private sector in rural development

NGOs tend to work with and have better access to grassroots groups and villager organisations who lack opportunity in terms of standard of living in society. NGOs usually transfer their appropriate skills to their target groups. They can also contribute the needed innovation, flexibility and dedication, which are necessary to the rural development activities. By doing this, NGOs are well placed to bring the marginalized and the poor within the mainstream of development. NGOs fundamentally still use the villager participatory approach in their development process.

NGOs tended to have various approaches to rural development programmes. The development agencies attempt to design an approach that will create an appropriate model depending on the circumstances. Actually, the models can help NGOs to decide where they can make the greatest contribution in rural communities. Viravaidya and Techanun (2018) mentioned four main approaches adopted by NGOs: 1) relief and welfare,

2) community development, 3) sustainable development, and 4) villager movements.

Development programmes have both advantages and disadvantages to the country. Undoubtedly, the remarkable economic of from development programmes has resulted in various social changes. The economic and social development programmes are having a substantial impact on many issues related to demography and health, education, urbanization, natural resources, and the response to change

The concept of promoting private company involvement in rural development in Thailand has been created and developed by the Population and Community and Development Association since 1986. Demonstrate that the basic idea is to mobilize the relatively untapped private companies to participate actively in rural development, especially to help develop the business skills of villagers, create new jobs, and provide market opportunities. As Kaplan and Herforth (2019) mentioned since the mid-1990s, the importance of the private sector as partner in development co-operation has been growing. Furthermore, the private sector should be incentivized as they serve as information aggregators and render post-production service to farmers (Dey, 2000). Public-private partnerships (PPPs) are being promoted as important institutional mechanism for gaining access to additional resource, sharing risks and adding other constraints in pursuit of sustainable and inclusive development (Rankin and Santacoloma, 2013).

NGOs are effective in promoting social development, but in general, they lack business knowledge, skill, and experience to transfer this to the villagers. Neither NGOs nor Government Organizations (GOs) have well developed business skills in organization, production, financial management, and marketing to provide for target groups. However, villages do need these skills to earn cash incomes. Furthermore, NGOs have small staff numbers hence they can only cover a small percentage of the population. In contrast, government agencies have large number of officers but they still lack the experience to provide the business skills for the rural villager.

Therefore, there is a need for NGOs and GOs to find a partner capable for providing and transferring business and academic skills to the

poor in villages. Particularly, NGOs can play an important role by persuading the private companies sponsoring the villages, and harnessing of their business experiences to village needs. This was an innovative approach to a rural development programmers' in the country.

### Objectives

The objectives of this study were: 1) utilization of solar cell system for small irrigation management system, 2) the economic of farmer change after farmers participating the project and 3) the model of promoting organisations involved the project for sustainable development.

### Research methods

This research was carried out during July 2017- June 2018 since the water using solar cell just finished and donor needed to know the result from implementing new project and farmers also cultivated vegetable more than one year.

Four villages: Nongya, Nonghee, Hinhov and Nongpho villages located Khon Kaen province had been selected for study area and 135 farmers that was 100 % of member of vegetable farmer groups were interviewed. Furthermore, 49 committee members participated focus group.

### Results and Discussion

#### 1. Utilization of solar cell system for water supply and irrigation management

The small irrigation using solar cell as a source of energy to pump water from pond. This was a village-based irrigation system for the purpose of year - round, intensive production of high - value crops, in particular of vegetables. The water system consisted of physical infrastructure to utilize existing water resource using the solar cell system for irrigation as well as a related organisation structure to manage the small irrigation system as shown in **Figure 1**.

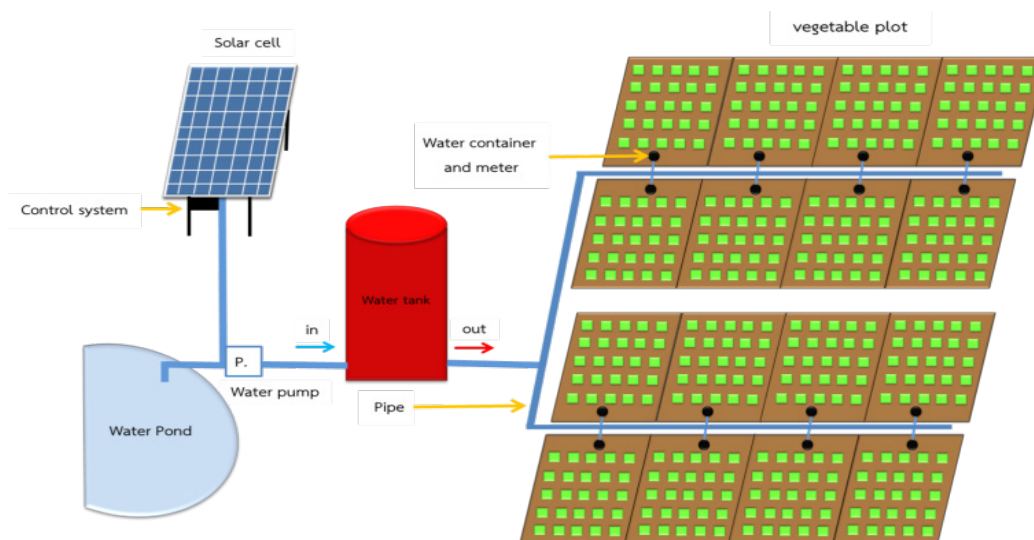


Figure 1: Water system using solar cell for vegetable cultivation

The study found that the small irrigation system consisted of four main components: i) A water pump: 1.5 Horse power (HP), needs 1,500 watts and control system to extract water from the pond, it was deep 5 meters, ii) holding tanks to store the water: capacity 20,000 liters, iii) a network of pipes with taps and small tank reservoirs at each member outlet, and iv) solar panel : 9 panels producing electricity 2,700 watts to be sources of energy.

The small irrigation systems in four villages were managed by Village Water Management Committees (VWMC) specifically set up for this purpose. The 11 persons were elected to be committees of the assembly of members and had the specific task of collecting water fees from members, executing system maintenance works as well as assisting members on agricultural and marketing matters. Interestingly, woman must be represented to at least 50 % of the member committees. This provided the opportunity for women in the rural area to manage their resources and took place to manage the groups.

Membership in the project was voluntary and principle opened to all village residents. The project targets particularly was the poor villagers first and encourages their participation. Each member had to make both financial and in-kind contributions to the project. With regard to the

financial contribution, they committed themselves to pay for water cost 2 baht per cubic meter, on a monthly basis, based on how much water was used. Members also contributed to their own labour to help in the system construction. These local contributions ensured that the project addressed member needs and was economically viable. More important, water system using solar cell had been built one month, group member spent labour, the private sector provided the budget while NGO supported the technician.

## 2. The economic change after farmers participated the project

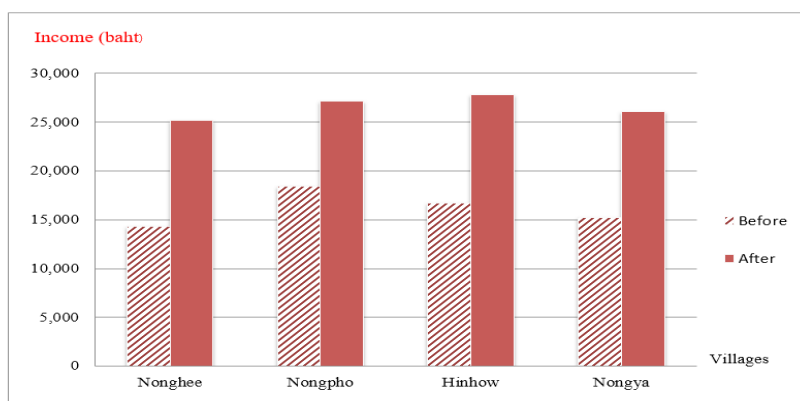
Each farmer who participated in the project, usually they cultivated the chemical-free vegetable, has gained income top up from basic crops; rice, cassava and sugarcane. It can be seen that income from joining the project by cultivating the vegetable approximately 29.75 % of total farm income, while before joining the project they less income from vegetable since they did not have suitable land and available small irrigation (**Table 1**). This mean after participating the small irrigation by using solar cell project farmers earned more income.

**Table 1:** Income from chemical-free vegetable cultivation after joining the project (bath/farmer/year)

Village	No. of famers	Highest income (bath)	Lowest income (bath)	Average income (bath)	Total income (bath)
1. Nonghee	31	68,134	17,830	28,170	782,674
2. Nongpho	32	64,730	11,152	27,136	870,756
3. Hinhow	28	65,117	8,906	27,819	781,336
4. Nongya	44	63,063	13,268	26,127	1,451,992
Total	135	average	average	26,563	3,886,758
		65,261	12,789		

Total 135 farmers have jointed the project by cultivating the chemical-free vegetables. They gained money extra from cultivated basic crops: rice, cassava and sugarcane. **Table 1** illustrated all farmers in four village earned average income 26,563 baht per year per member, while they gained income from the same activity approximately 16,340 baht/farmer/year before

participating project. The **Table 1** also showed that all farmers in four groups gained 3,886,758 baht per year from chemical-free vegetable production, while Coca Cola company (known as Coca Cola Foundation) had supported four group approximately 3,238,000 baht to set up the small irrigation using the solar cell system.



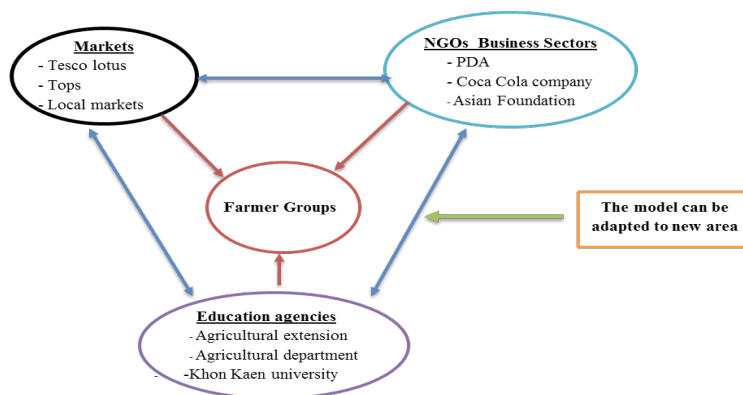
**Figure 2:** Comparison income from chemical-free vegetable before and after joining project (baht/farmer/year)

**Figure 2** illustrated the income of farmers had been changed before and after participating water solar cell project. Farmer in all four villages gained income from chemical-free cultivation higher than before participating project approximately 10,223 baht/farmer/year about 62.56 % increased. This also showed that chemical-free vegetable was easy for farmers to sell in the markets and to get high price as Suindrmedhi, Tokuda, and Ehara (2016) found that organic vegetable was a target vegetable of people both in Thailand and Japan this led to a big market.

### 3. The model of promoting organisations involved in water development.

Farmers had learnt sufficient water use and small irrigation management after participating

project since there were various organisation getting involved. The projects provided opportunity for farmer with participating approach every step for planning, constructing, operating, selling, managing and ownership. These small irrigation systems belonged to farmer groups after construction finished. Especially, the project stimulated them to learn how to repair all equipment. This was one factor leading the projects sustainability. Another factor to lead sustainable project was the markets both in the local markets and outside the communities such as department stores, agro-processing factories. The present study also investigated a developing model of promoting organizations involved the project, four main organizations involved in the solar cell project: 1) Private sectors: Coca Cola company and NGO:



**Figure 3 :** A developing model of organisations getting involved in network building to move activities.

**Table 2 :** Responsibilities of organisations involved in a development model

No.	organisations	Responsibilities
1	<u>Private sectors:</u> Coca Cola company and NGOs (PDA and ASEAN Foundation)	- support budget - support training - technical for construction system -follow up activities - Community preparation
2	<u>Markets :</u> Tesco lotus depart, Tops supermarket, Local community markets	- place for selling vegetables - buying vegetables - packaging design - marketing plan
3	<u>Academic institution:</u> Khon Kaen University	- training on vegetable cultivation - Good Agricultural Practice(GAP) product - group management
4	<u>People organisation:</u> Chemical-free vegetable farmer groups	- member preparation and cultivate vegetables -operation and manage irrigation system -system ownership

Population and Community Development Association (PDA), 2) Markets: Tesco lotus department store, Tops supermarket, Local markets, 3) Academic institution: Khon Kaen University and 4) People organization: Chemical-free vegetable farmer groups. The connection and relation to implement project and built up the network to be a model for development was shown in **Figure 3** and **Table 2** below.

Farmers in four groups from four villages implemented activities follow the Sufficient Economic Philosophy that stresses the middle path as an overriding principle for appropriate conduct. The three components are *reasonableness* (or *wisdom*), *moderation*, and *prudence*. Two essential underlying conditions are *knowledge* and *morality* have been modified by farmers. They learnt how reduce cost, how to increase income, how to work together and support each other including how to find opportunity, this similar to Phuripanyo (2016) founded that farmers implemented activities by following Sufficient Economic Philosophy led them gaining and sharing knowledge for improve their activities.

### Conclusion

The farmer group had an important role to promote and produce chemical-free vegetable by stimulating the 135 members learning from each other. Farmers cultivated the chemical-free vegetable production, has gained income top up from basic crops; rice, cassava and sugarcane. It can be seen that the income from joining the project by cultivating the chemical-free vegetable approximately 29.75 % of total farm income. Total 135 farmers in four groups gained 3,586,758 baht per year, while Coca Cola company had sponsored 3,238,000 baht to set up the small irrigation systems in four villages. Farmers exactly gained money more than the investment cost in only one year. The research also found that the developing model of promoting Private sectors, NGO, Farmer group and the University getting involved in a solar cell project has been developed for sustainable development 1 model.

### Limitation and Recommendation

- 1) During the research period, some months had heavy rain, this made farmers could not cultivated vegetable and also rain drop destroyed vegetable leaf.
- 2) Farmers worked on rice farms thus it was difficult to meet them.
- 3) The greenhouse should be promoted to protect rain.
- 4) Many alternative energy technology and agricultural digital technology using a solar cell should be promoted to farmers to reduced their cost from electricity and pretrial.
- 5) Agricultural digital technology using a solar cell as power sources should be implemented to reduce water, labour and cost.

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