

## Chapter 5

# Reconstruction of Farmer's Economy by Organic Agriculture: A Case of Na Huek Village in Chiang Mai

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This paper extracts tacit knowledge of successful farmers in Na Huek Village in Chiang Mai, Thailand on doing organic agriculture. Farmers who run organic agriculture may have to suffer from reducing profit for three years. After that, they will gain more than double profit compared to conventional agriculture. Successful farmers run their farms with well-organized plans to mix profitably agricultural products, crops and live stocks, through the year. Farmers use every output efficiently with almost zero waste. Seemingly unprofitable outputs are intermediate goods for other productions in the farms. The cycle of productions can repeat smoothly regardless of external shocks from both economic situations and natural disasters.

## 1. Introduction

Organic agriculture becomes a global trend in the 21<sup>st</sup> century. It represents a sustainable and ecological friendly process with pesticide free, natural balance and conservation of biodiversity. Prices of organic products are higher than that of conventionally agricultural products.

However, there are a lot of farmers who still work on conventional agriculture even though they know well about the harm of pesticides. Farmers use chemical pesticides more and more. Then, dangerous substances remain in the soil for several years afterward and lead to degraded soil. Consequently, farmers need to add chemical fertilizers to improve soil quality repeatedly. Thailand is the fourth largest importer of pesticides and sixth largest importer of chemical fertilizer in the world.

There were farmers who switched to organic agriculture but eventually gave up. For example, 29 out of 34 farmers in Na Huek Village in Chiang Mai have quit their operations of organic agriculture.

It is questionable when organic agriculture is good for both producers and consumers but why Thailand cannot transform the whole agricultural system countrywide from conventional to organic agriculture. A frequently given reason is when there is only a farm doing organic agriculture and it is surrounded by conventional farms, insects will all come to the organic farm. If this explanation is true, it is curious why organic agriculture still survives.

Piroon Doommai, a farmer in Na Huek Village, has experienced a better life after switching to organic agriculture even though conventional farms of other farmers surround his farm. He has accumulated the knowledge of organic agriculture for many years, suffering from being lost and achieving the higher income later. He runs his farm with a well-organized plan through the year. His story is a good example for farmers who would like to reconstruct their economy by organic agriculture.

Therefore, this study aims to extract the tacit knowledge of Piroon Doommai and other successful farmers in Na Huek Village about how to be successful in doing organic agriculture. The lessons could be guidelines for farmers to follow their suits to achieve good outcomes from organic agriculture and raise their well-being.

## 2. Literature review

In 2005, Ladbuakhao studied the transition from conventional to organic agriculture at the same site as investigated in this study. He did an elaborately qualitative study upon the determinants of participation in organic agriculture. He found several drives for farmers to switch from conventional to organic agriculture.

There are two knowledge gaps that Ladbuakhao (2005) has not filled is the quantitative analysis of the transition process. First, he did not explain the drives or reasons why many farmers quit organic agriculture. This might be too early for his study to observe the quits before 2005. Second, when he mentioned that outputs would drop in the first two years after the abandon of chemical substances, he did not figure out how much of the reduction of income and profit. Therefore, this study will fill these gaps.

This study will make it clearer by illustrating quantitative information to answer why around 85 percent of farmers who switched to organic agriculture decided to give up. Moreover, how much of the profits that the farmers in organic agriculture would earn at the end of the transition period.

### **3. Methodology**

This study applies a case study method in the investigation of successful farmers in organic agriculture. It separates transitional process from conventional to organic agriculture into 3 periods. They are periods of conventional agriculture (before 2001), transitional period (2001 – 2003) and full operation of organic agriculture (from 2004). It also calculates cost, income and profit for each period. It analyses the costs and benefits by making comparisons within each period.

### **4. Data**

Intensive interviews with Piroon Doonmai, a successful farmer in organic agriculture in Na Huek Village, were done in June 2012 although the authors have visited his organic farms several times since 2010. The estimation of costs and benefits of both conventional and organic agriculture are based on the story of Piroon.

### **5. Results**

The results include three parts. First it explains the transition from conventional to organic agriculture. Second, it describes problems of doing organic agriculture. Third, it shows the cost-benefit analysis of conventional and organic agriculture.

#### **5.1 Transition from conventional to organic agriculture**

This section describes the transition from conventional to organic agriculture in three parts. First, it shows the period before 2001 when farmers operated conventional agriculture using chemical substances. Second, it illustrates the transition period from 2001 to 2003 when farmers begins to switch to organic agriculture. Last, it reveals the

outcome of organic agriculture from 2004 when farmers start to gain from organic agriculture.

#### 5.1.1 Conventional agriculture before 2001

Before 2001, farmers in Na Huek Village operate conventional agriculture with two major crops, rice and soybean. Rice planting cycle begins in July and ends in November where as soybean planting cycle starts in December and lasts until April.

Rice planting cycle begins with land preparation including grass cutting, first herbicide spraying, land plowing and rice sprouts growing respectively. After that in the paddy-sown field, farmers start to plant rice.

During this waiting period, Pirun Doommai had free time. He purchased a tractor by loan. He used it for working as employee of other farmers for field ploughing and herbicide spraying. He had to pay wage for his assistant, tractor's fuel, the depreciation and maintenance. When he did not have enough money to pay the wage of the assistant, he had to do the entire job for 27-32 acres by himself. From time to time, the tractor's fuel and repairing costs were higher. His health condition also got worse.

Farmers control pest by the second herbicide spraying aiming to counter the narrow leaf weed and crowfoot grass. Major enemies of the rice are golden apple snail and plant-hopper. Farmers need to spray the specific insecticide to fight the snail and the hopper. They also need to spray chemical fertilizer twice. Before harvesting, farmers will spray insecticide again. Moreover, they will spray to prevent rice blast disease. Then farmers can harvest the rice.

After harvesting rice, soybean planting cycle begins with rice stubble burning. Then farmers plant soybean and spray herbicide twice. They also need to spray chemical fertilizer twice.

#### 5.1.2 Transition period 2001 – 2003

The Earth Net Foundation and the Foundation for Rural Study and Development support a group of farmers in Na Huek Village to operate organic agriculture. The project aims to promote initiatives related to production, processing, marketing and consumption of organic foods, natural products and ecological handicrafts. Piroon Doommai joined the group in 2001.

Piroon thought that he used too much chemical substances for agriculture. He concerned about his worse health. His debt went high because of the costs of fertilizers, herbicides and pesticides. More importantly, he wanted to find out whether organic agriculture can really reduce the costs.

Before Piroon jumped into organic agriculture, he spent a year to visit organic farms of other farmers. Once he decided to start, he began with a small field of two rais (one rai equals to around 0.40 acres).

In the first year, his production was not good. He gained smaller amount of yields. He consults the supportive foundations and got that he needed to put manure into the soil to improve the soil quality. Then he adopted three cattle from the Association of Cattle Breeding. Moreover, he brought ducks into the farm to fight against golden apple snail. He prepares manure from cattle's dung, hay and shells of soybean.

In the second year, his production was better. He expanded the organic field from two rais to five rais. He observed the economies of scale while expanding the outputs. Prices of organic products were also good. In 2002, Conventional rice was five to eight baht per kilogram but the organic one was seven to ten baht.

In the third year, he totally switched all his fields to organic agriculture. He studied how to grow rice in a style called single grain style. Single grain planting style is a use of only one rice grain in a hole. Conventional rice planting uses four to five rice grains in a hole. The yield of single grain planting style yields around 30 paddy shoots or rice sprouts in rainy season and 20 shoots in dry season whereas the yield of conventional style is not more than 20 shoots for a hole. A reason is that rice grains in the hole compete for their foods. Then each grain gets not enough food and does not grow well.

This single grain planting style helps him to reduce more costs. Conventionally, planting one rai of rice uses 12 – 13 kilogram of rice grains. Organic agriculture needs only 1.7 kilogram of the grain.

### 5.1.3 Full operation of organic agriculture from 2004

The cycle of organic agriculture is absolutely different from the conventional one. The rice planting cycle begins with letting cattle to go into the field. It needs two or three nights for an area of one rai. Cattle eat rice stubble and grasses. They will also drop manure into the field. After that, farmers will let water to flood the field. Ducks will wander in the field and keep their eyes at old grains from last year and eat them before the grains mix into the new batch of rice sprouts.

During this period, ducks yield eggs every day. Fifty ducks give around 30 to 40 eggs. These organic eggs are at high demand. Farmers sell the eggs out at four baht each. An alternative to selling eggs is to let the eggs to be ducks. Within one month and five days, farmers will have little ducks whose price is 25 baht each. Within three months, farmers earn from selling female ducks (born from round eggs) at 100 baht each and male ducks (born from oval eggs) at 40 baht each.

Ecologically, useful animals and plants appear and survive in the rice field. Frogs, catfish and snake-head fish eat plant-hopper. Water lettuce and water velvet fix nitrogen and transmit them into the soil. Nitrogen strengthens rice stems and increases the growth of the rice.

The second step in the cycle is plant establishment. It begins with rice planting using the single grain style. During this period, farmers do not let ducks to go into the field otherwise they will eat all the new grains. After three weeks, paddy sprouts will shoot from the ground. This is the turn of ducks again to fight golden apple snail and grasses in the field.

Farmers need to observe insects in the field. Insects divide into two groups, helpful and harmful ones. Assassin bugs and anastatus insects are useful. They eat animals that are enemies of rice. Plant hopper is harmful. Farmers can use wood vinegar, pyroligneous acid, to get rid of plant hoppers. Wood vinegar is a kind of liquor derived by condensation of smoke from burning rain-tree wood or bamboo in airless condition. By natural control of insects, farmers need no insecticides. All they have to do is waiting for harvesting.

## 5.2 Problems of organic agriculture

There are three major problems that farmers in organic agriculture may face as follows:

Problem 1. Only five out of 34 farmers of Na Huek Village continued doing organic agriculture while 29 farmers quit after 3 years. Problems that those giving up farmers faced were as follows:

- (1) Farmers rent paddy fields. They needed as many outputs as possible to pay rents. Therefore, they had to use chemical substances to boost up the outputs.
- (2) Organic farms surrounded by other conventional farms usually suffered from chemical substances that flew from non-organic farms. Farmers need to raise the height of their paddy field up at least 2 meters or separate their farms by digging small canals, planting some big trees such as hemp (*Sesbania aculeata*) or bamboos at the edge of the farms. Another option is to pave 2 meters from the edge and plant non-organic rice on this buffer zone. Unless the organic farm is strictly protected from externally dispersed chemical substances, farmers cannot sell products from the farm in the market for organic products. Once in six months, investigators will come to the farm. When a farm does not pass the investigation, the market will ban all products from the farm.

Problem 2. Farmers have more works to do in organic farms.

Farmers in organic farms need to take care of both rice and animals, i.e. cattle and ducks to control pests, snails and grasses. They have no time for out-of-farm jobs. Using chemical substances to kill all living things in the fields, farmers in conventional farms are not so busy in taking care of their farms. They have free time to find jobs out of the farm, e.g. spraying herbicides and pesticides, ploughing, etc.

Problem 3. Price of organic rice at the rice pawn project is not different from non-organic rice

Even though price of organic rice in the market, 21 baht per kilogram, is higher than conventional rice, the state-run rice pawn project pays the same price for both organic and conventional rice at 14 baht per kilogram. Farmers who need quick money, therefore, sell their rice to the project and gain less profit compared to farmers who sell conventional rice.

### 5.3 Cost-benefit analysis

Farmers in conventional agriculture have some advantages over those in organic agriculture. They have free time to earn more from out-of-farm jobs such as spraying and ploughing. However, they need to pay for tractor's fuel and maintenance.

Organic agriculture yields not only income from organic rice but also income from by-products such as eggs, cattle, and vegetables. Costs of production are lower than conventional agriculture because organic agriculture needs no chemical substances. Ecological balance in the field is also better such that vegetables and crops can grow well.

Total profit from organic agriculture surpasses that from conventional agriculture by four sources. Prices of organic products are higher than conventional products. An organic farm can offer varieties of organic products to the market. Costs of production are lower. Productivity in organic farm is also higher from better ecological balance.

Piroon Doommai mentioned that a farmer who buys a tractor will not gain so much after 10 years. In contrast, a farmer who buys a cow will have 10 calves in 10 years. At the beginning, he had three cows and got 3 calves in a year. After 3 years, cows of the first batch gave six more calves. Cows of the second batch gave three more calves. Totally he had 12 calves in 3 years. When the price of a cow is 10,000 to 50,000 baht each, he is sure that his cattle will help him to generate more income after he takes care of them.

The following tables display the costs of production (Table 1), income from conventional and organic agriculture (Table 2) and their profits (Table 3). The calculations are based on the organic agriculture on a 18-rai field. The interview with Piroon Doommaai took place in June 2012.

TABLE 1. Costs of production

Conventional agriculture (before 2001)	Transition period (2001 – 2003)	Organic agriculture (after 2003)
1. cost of rice grain Rice grains 25 baht per kilogram. Need 13 kilograms per rai. Total cost of rice grains is 325 baht per rai.	1. cost of rice grain Free rice grains from own field. Need 1.7 kilogram per rai. No cost of rice grains.	1. cost of rice grain Free rice grains from own field. Need 1.7 kilogram per rai. No cost of rice grains.
2. major activities Ploughing 1,000 baht per rai. Planting 600 baht per rai. Getting rid of grasses 200 baht per rai. Chemical fertilizer and pesticides 1,200 baht per rai. Harvesting 600 baht per rai. Wrapping and processing 500 baht per rai. Other costs 200 baht per rai. Total cost of major activities is 4,300 baht per rai.	2. major activities Ploughing 1,000 baht per rai. Planting 600 baht per rai. Getting rid of grasses 200 baht per rai. Harvesting 600 baht per rai. Wrapping and processing 500 baht per rai. Total cost of major activities is 2,900 baht per rai.	2. major activities Ploughing 1,000 baht per rai. Planting 600 baht per rai. Getting rid of grasses 200 baht per rai. Harvesting 600 baht per rai. Wrapping and processing 500 baht per rai. Total cost of major activities is 2,900 baht per rai.
Grand total cost 4,625 baht per rai.	Grand total cost 2,900 baht per rai.	Grand total cost 2,900 baht per rai.

Note: Interview with Piroon Doommaai, June 2012, based on operation of 18 rais.

TABLE 2. Income from conventional and organic agriculture

Conventional agriculture (before 2001)	Transition period (2001 – 2003)	Organic agriculture (after 2003)
1. Output 800 kilograms per rai	1. Output 600 kilograms per rai	1. Output 900 kilograms per rai
2. Price 14 baht per kilograms	2. Price 14 baht per kilograms	2. Price 21 baht per kilograms
Total income 11,200 baht per rai	Total income 8,400 baht per rai	Total income 18,900 baht per rai

Note: Interview with Piroon Doommaai, June 2012, based on operation of 18 rais.

TABLE 3. Profit from conventional and organic agriculture

Conventional agriculture (before 2001)	Transition period (2001 – 2003)	Organic agriculture (after 2003)
1. Income 11,200 baht per rai	1. Income 8,400 baht per rai	1. Income 18,900 baht per rai
2. Cost 4,625 baht per rai	2. Cost 2,900 baht per rai	2. Cost 2,900 baht per rai
Total profit 6,575 baht per rai	Total profit 5,500 baht per rai	Total profit 16,000 baht per rai

Note: Interview with Piroon Doonmai, June 2012, based on operation of 18 rais.

## 6. Discussion

The cost-benefit results are restricted to only inform from farms. Other sources of income such as out-of-farm jobs are not included. Moreover, the costs and benefits are compared within the same periods. The comparison of the whole periods between the conventional and organic agriculture in the long-run using net present value (NPV) is not provided yet in this study.

There are several dimensions awaited for further studies. First, the cost-benefit analysis of organic agriculture should be investigated more elaborately by including both environmental and health costs into the analysis. More samples of farmers can be included in the study. More years would be added to the length of the project. Net present value (NPV) should be applied to find the result.

Examples from other countries such as Japan can be learnt as farmers in these countries may have more experiences on organic agriculture than farmers in Thailand. The study will be able to gather information of what would happen next after five or ten years after farmers switched to organic agriculture. Major questions are whether organic agriculture is sustainable. Will plant diseases or plant enemies destroy the organic farm when farmers abandon the usage of chemical substances in the long-run? These are crucial information for a more elaborate cost-benefit analysis.

Second, in mathematical modeling of economic impact of organic agriculture, a broader partial equilibrium model may be used to find impacts among important linkages between organic agriculture and related sectors. Furthermore, the computable general equilibrium (CGE) model at the village level might be constructed to find both direct and indirect effects of organic agriculture for the economy of the whole village. Work of Suriya (2011) is an example of the construction of social accounting matrix (SAM) and CGE model at the village level that might be applied to this study. The results from the study of economic impact would answer whether organic agriculture is worth to be promoted in other villages.

Third, the size of promotion should be investigated. A main question is how wide or how much organic agriculture should be expanded in the country. Should organic agriculture replace all non-organic agriculture? Optimization techniques can be applied to answer these questions.

Last, a practical policy toward the promotion of organic agriculture is needed. It is to know where organic agriculture would work well and where not to promote it. Right types of plants and cattle should be recommended. Potential farmers for organic agriculture should be also targeted.

## **7. Concluding remarks**

This study was inspired by Piroon Doomai, a successful farmer in Na Huek Village in Chiang Mai and his story of organic agriculture. The authors wondered why only a small portion of farmers in the organic agriculture group of the village survived whereas many of them gave up. What were secrets of doing organic agriculture? What would happen next for organic agriculture? The study aims to extract tacit knowledge of Piroon Dommmai and his successful colleagues upon these secrets.

The study shows the transitional process from conventional to organic agriculture by separating three periods that are conventional agriculture, transition period and full operation of organic agriculture. It also illustrates planting cycle and agricultural activities in each period.

It also describes problems that farmers in organic agriculture faces. Three major problems are the need of quick money to pay rent of paddy field, more workload in organic agriculture than in conventional agriculture, and unfair price for organic rice in the state-run rice pawn project.

For the quantitative analysis, it compares income, costs of production and profits between conventional and organic agriculture. During the three years of transition period, farmers in organic agriculture suffered from around 16 percent drop of profit. After the transition period, the farmers gained more than double profit, around 143 percent higher, compared to the profit from conventional agriculture. The higher profits come from an increasing price of around 40 percent, an increasing output of around 13 percent and a decreasing cost of around 37 percent.

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