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Organic Agro-Ecosystem Management from Prototyped Organic Farmer Learning Processes

[1]Yuppayao Tokeeree, [1]Sunantha Laowansiri and [2]Sopit Vetayasuporn
[1]Faculty of Environment and Resource Studies,
Mahasarakham University, Mahasarakham 44000, Thailand
[2]Faculty of Technology, Mahasarakham University, Mahasarakham 44150, Thailand

Abstract: This research is aimed to study the organic agro-ecosystem management and synthesize the organic farmer learning processes of Mr. Kampan Laowongsri. The study period was conducted between November 2007 to September 2009. Mr. Kampan who is a prototyped organic farmer in the terms of an integrated farming system in Mahasarakarm province. Mr. Kampan's integrated organic farm structural has the concomitant of both inter-relevant of mutual management between physical and biological resources and waste utilization system. Farm wastes are degraded and converted to beneficial materials and use for farming process. The results showed that the accomplishment of his integrated organic farm has been arose from his self-learning process, local wisdom principle and advice which have been passed from generation to generation, trial and error, government and private advise, community discussion and in and out information. Mr. Kampan's integrated organic farm structural is initiated not only the optimization performance in the farm but also provided sustainable, economically viable, address his farmers' livelihoods, environmentally friendly and the agricultural products is safe to consumers. Moreover, the remaining agricultural products after his family consumption are making a sale and provide the income for his family lives.

Key words: Organic process, agro-ecosystem management, prototyped, farmer, learning process, Thailand

INTRODUCTION

Organic farming is an agricultural production system of foods and fibers in terms of environmental, social and economic sustainability. It concentrates on soil fertilization and paying respect to natural capabilities of plant, animal and agro-ecosystem (IFOAM, 2008; Arnut, 2006). The organic farming decreases external production factors and escapes the usage of synthetic chemicals.

It mainly emphasizes on the usage of plant refuses, manures, vetch plants (plants of pea family), green manures and other organic refuses for circulating nutrients and energy in farms (Rampaiprapa, 2005). This farming includes creating the environmental sustainability by maintaining natural balance and biological diversity that the organic agro-ecosystem management is similar to the nature and accompanies with using local wisdoms (Somkid, 2006). Therefore, the organic farming is an agricultural process relying on the nature with mainly using biological processes to increase products and prevent pests and accompanies with the circulation of resources using in farms for maximum benefit (Organic Agriculture Certification Thailand, 2005). Hence, the organic farming principle will conform to the local conditions in terms of economy, society, weather and culture (Green Net and Earth Net Foundation, 2008).

The organic agro-ecosystem management is an important factor leading to the sustainably agricultural development.

Regarding to this management, farmers must be diligent and patient in cultivation that there are methods as the followings: soil fertile management by main using of organic matters, circulating plants cultivation emphasizing on local plants, no usage of agricultural machines to maintain and curing soil structural properties, no usage of pesticides, herbicides and other chemicals and soil-covering plants cultivation instead of chemicals usage (Kuepper and Gegner, 2004). Besides, the land management is another factor that is very simportant to be the base of agro-ecosystem built. It regards with various plants cultivation, internal and inter-relative areas organism management and farm areas allocation that are necessary to have a good plan for creating a new agro-ecosystem of organic farms (Van Elsen, 2000). These managements actually are the ancient agriculture in local

Corresponding Author: Yuppayao Tokeeree, Faculty of Environment and Resource Studies, Mahasarakham University, Mahasarakham 44000, Thailand

communities of Asian countries. The mutual conditions in food chain and food web interaction including energy exchange have created the ecological sustainability for instances, resource units in farm production, rice cultivation, fish farming and horticultural cultivation can be used to circulate and mutual support in the dimension of resource and energy transferring. Mahasarakarm, a province in Thailand, supports activities of organic farming to farmers.

Farmers have started to cultivate plants and domesticate animals with creating the agro-ecosystem balance in farms. Many of them have succeeded in the organic farming management that helps to generate organic or green products creating health benefits to farmers and consumers as well as income to farmers in long term operation. A farmer who has been successful in organic farming and admired to be a local philosopher in the field of integrated agriculture is Mr. Kampan Laowongsri, a prototyped organic farmer. He has been working in the organic agro-ecosystem management in his farms at Kantarawichai district.

This management is an interesting topic and creates interdisciplinary knowledge as a principle in sustainably environmental conservation. The study of his organic farming performance from self-learning processes leaded to extract the organic agro-ecosystem farming knowledge for disseminating to other farmers and interesting people. This research aims to study the organic agro-ecosystem management from the prototyped organic farmer learning process and to extract lessons from his learning process experiences and knowledge of the organic agro-ecosystem management.

MATERIALS AND METHODS

To collect data of organic agro-ecosystem management by studying the agro-ecosystem component and analyze the ecosystem and resources circulation in organic farm.

To extract lessons of learning processes and organic agro-ecosystem management performances from the prototyped organic farmer. To generate the organic agro-ecosystem, management relation in organic farms based on the farmer learning and performance processes.

RESULTS AND DISCUSSION

Mr. Sampan Laowongsri is a local philosopher at Dondaeng village, Kantarawichai district, Mahasarakarm province, Thailand. He has been working on organic farming since, 2001 in the area of 1.05 ha until has been admired to be a local philosopher of integrated farming system in 2008.

Besides, he has been a wisdom teacher for promoting and educating other farmers since 2003. This prototyped organic farmer has worked on the basis of agro-ecosystem intention by allocating relevant resources and creating the organic agro-ecosystem in his farm appropriately with local conditions as well as emphasizing on the integrated management comprising the items as follows.

Land management: The prototyped farmer land has been allocated accordingly with the new agricultural theory of King Rama the Ninth (His Majesty King Bhumibol Adulyadej of Thailand). The theory has defined the land proportion of water source: rice field: horticultural field: accommodation as 30: 30: 30: 10, respectively. His farm land proportion was 24.8: 19.7: 45.8: 9.7 due to the performance and adjustment following the suitability of local ecological geography. When in-depth studying of land allocation, his land has been separated into 9 sub-areas i.e., rice field, mixed horticultural and vegetable field, circulating seasonal vegetable field, asparagus field, herbal field, rice filed and pool edges, water source, animal domesticating area and rice straw group. The highest amount land is the water source area for solving the lack of water in summer season. The rice field edge also consumes a large area by constructing the big size edges to protect water drainage from outside lands which contaminate chemicals and prevent flood. Besides, the edges can be used to cultivate plants especially perennial trees as shown in Table 1.

Soil management: The prototyped farmer has fertilized to improve the soil quality by using manures, green manures from vetch plants, fermented manure, biological fermented water, plowing without rice cob burning and reducing soil nutrients by low waste harvesting of products. Furthermore, there are the cultivation of circulating plants for maintaining nutrients balance, the conservation of soil benthos and the protection of soil erosion by cultivating plants on rice filed and pool edges and soil covered plants.

Water management: In northeast Thailand, most farmers have faced the drought problem and there is no sufficient water for cultivating plants, especially in summer season. Therefore, the prototyped farmer constructed the pools for water using sufficiently in throughout year. He has

Table 1: Area proportion of land use in the organic farm

Land use	Using characteristics
Water source (24.8%)	3 pools contain 10,453 m^3
Rice field (19.7%)	Rice cultivation is in the rice season each year. After harvesting, the field is used to cultivate vegetables. Before 2 months of the next round rice season, the field is left and fertilized by green and organic manures
Horticultural field (45.8%)	
Rice filed and pool edges (22.6%)	The edges are wide enough to cultivate plants such as mango, custard apple, jackfruit, bamboo, coconut, lemongrass, galangal, ginger and so on
Asparagus field (10.7%)	Asparagus filed is used to cultivate other plants such as dragon fruit, guava, yard long bean, basil, tomato and so on
Mixed horticultural and vegetable field (7.4%)	This filed is used to cultivate various plants mainly being long life plants such as fruit, herbal tree, papaya, banana and so on including some local vegetables such as sweet basil, basil and so on. Some bottom areas are also used to cultivate grass for feeding cows
Circulating seasonal vegetable field (3.7%)	This field is used to cultivate circulating seasonal vegetables i.e., winter season for cabbage lettuce, green shallot, coriander and yard long bean and raining season for bottle gourd, white gourd and cucumber. Some vegetables are cultivated all year round such as brazilian potato, eggplant, sweet basil, basil and Chinese chive
Herbal field (1.4%)	This filed is used to cultivate herbs such as Stemona tuberose Lour, Aloe vera, Fetidpassionflower, tamarind, Siamese neem tree, custard apple and so on. These herbs areprocessed to be herbal fermented water
Accommodation (9.7 %)	
House and pavilion (6.7%)	There are house, rice barn and pavilion
Animal domesticating area and rice straw group (3.0%)	There are cow stable, frog pond, small fish pond, poultry stable, rice straw group and so on

allocated the land for water resource about 24.8% that there are 3 pools total containing 10,453 m^3. In addition, he has managed water resource with water supply system by installing small water pumps, PVC pipe lining to cover farm area and installing water sprinkles having specific valve breaker. The breaker will be opened when watering plants at desired time and watering will be controlled suitably to disperse water and protect evaporation. Most sprinkles can easily move for comfortably water supply management and after harvesting they can move out for soil plowing.

Plant and animal management: The prototyped farmer emphasize on biodiversity and mutualism condition among organisms in his farm. There were 139 species and 56 families of plants i.e., 15 species of shrub, 45 species of perennial plant and 79 species of biennial plant. Each species taken to cultivate in the farm had been selected by mixing local wisdom principles with regards to benefits and science bases.

The plants were tested in the experimental land until receiving the appropriate species that are mutual basis in the organic agro-ecosystem. Besides, there is the cultivation of circulating seasonal plants accompany with vetch plants in the same field creating good products due to nutrients balance as well as nitrogen cycle (Berry *et al*., 2002).

The main characteristic of this farm is the neatly rice cultivation. He has cultivated by using a rice sprout in one hole that one rai (1,600 m^3) uses only 1 kg of seeds. The selected seeds have been cultured for 7 days that a rice sprout has the length about 10-15 cm. Then the sprouts have been transferred to cultivate in the prepared rice filed having sludge characteristic. They have been pulled out by using a spoon to scoop for maintaining the seed left. After that they are transferred to cultivate as soft sticking their seed roots to the field because the sprouts are still young.

In the first stage, watering them is like vegetable watering that soil is just soaked until the sprouts were split. In addition, it is necessary to release water out until the appropriate water level because if there is more water in the filed crabs will destroy rice but less water weeds will grow which is wasting time to get rid of them.

Therefore, farmers should pay attention in their cultivation and emphasize on the integrated farming system by no mono-crop cultivation and biodiversity consideration. The prototyped organic farmer gave the reasons for organic agro-ecosystem as the followings.

The organic farming emphasizes on cultivation for consumption and income circulation all year round. Due to the differences of harvesting period the cultivating plants can be circulated to give production throughout a year. Then, it can help to support farmers in terms of consumption and commerce throughout a year.

It helps to protect outbreaks of diseases and pests because pests cannot destroy the area of integrated plants in a wide range. Most cultivating plants are local species that can be found easily. These species are easy in curing and appropriate with annual water amount.

Farmers will cultivate herbs for getting rid of pests throughout a year without using from other chemicals.

These help to their self-assistance that farmers will use their resources in a sufficient way. Regarding to domesticating animals, there are 7 types i.e., cow, chicken, duck, cricket, frog, fish and pig. Most animals are local

species that are tolerant to environmental conditions and easy in domesticating with giving high products. These create income circulation throughout a year. Additionally, these animals help to circulate nutrients and be a source of organic manure.

Other natural animals such as earthworm, millipede, ground lizard, predator insect and so on are beneficial for organic decomposition and controlling pests in the fields.

Pest management: From the investigation, there were 52 species and 43 families of pests that were 38.46% of pest insects, 42.31% of predator insects, 3.85% of parasites and 15.38% of cross-pollination insects. These proportions show that the beneficial pespts found in the organic farm were higher than the pest insects. There are 3 methods of pest control and management i.e., using wood vinegar, using biological fermented water and cultivating pest controlling plants.

Wood vinegar is produced from charcoal burning and the biological fermented water is generated from the fermentation of herbs in the field.

These herbal plants are in local forest and have been using since the past such as tuba root (*Derris* sp.), Ebony, Nim, *Sarcostemma acidum* Voigt (Leafless medicinal tree), *Stemona* sp., *Cassia fistula* L., *Jatropha curcas* L. and so on.

For using, these plants must be dissolved in water and then sprayed into the cultivating fields as suitably with each type of plants. Regarding with the cultivation for pests controlling, the prototyped organic farmer has cultivated various types of plants, integrated plants, circulating seasonal plants and insect attracting-expelling plants such as marigold, sunflower, sympodium and so on.

These cultivations have created the biodiversities of species and disturbed the pests that cannot select the specific plant for living and eating as usual. Hence, they are an alternative choice to control pests naturally instead of using chemicals, including help to reduce risks of farmers (Mahmoud and Shively, 2004).

Waste management: The organic agro-ecosystem supports the waste management. The prototype organic farmer has used the occurred wastes to recycle for using in the production processes.

The study found that the production and household wastes such as animal manures, vegetable refuses, leaves and solid wastes have been totally recycled. If there are the decomposing wastes such as food refuses, vegetable refuses and leaves he uses most of them to produce the soil fertilizer and some of them to produce the biological fermented water.

The fresh vegetable refuses have been used for feeding cricket, chicken and goose. For the recycled wastes such as plastics, paper, glasses and bottles, he has used them as recycling or collecting for sale.

The management of organic agro-ecosystem components can introduce the linkage among the components.

These management characteristics are duplicated from the nature for producing foods and agricultural products as environmentally friendly system. The organic agro-ecosystem management of Mr. Kapan Laowongsri is a very good case study because he has created the organic farming system as mutual consideration under the limitations of area, soil, water and air to be appropriate with plants and animals.

His management has cooperated between physical and biological resources by emphasizing on soil fertility, water source, weather controlling with perennial plants, plant species selection for mutual conditions and so on. This relationship is from the selection and creation of the prototyped organic farmer with intention and harmonious mixing the new interdisciplinary knowledge and the local wisdom.

Each resource has then presented its roles and has linked with the others in the productive ways. Plants and animals in the fields have been arranged to use the physical resources as maximum beneficiaries. His management has helped to circulate nutrients and resources, allocate the selected plants as suitably, fertilize soil and maximize recycled wastes use in his organic farm. These are the interdisciplinary organization creating the knowledge of organic agro-ecosystem.

His self-learning processes have crated the understandings of the organic agro-ecosystem that he began from analyzing the ecosystem components in his farm by appropriately adjusting resource proportion, worker and investment.

After that he established the suitable methods accounting with worker and budget in his family and accompanied with learning the organic agro-ecosystem processes. He has been always learning from agricultural study trips, farmer talks and other agricultural academic sources. Then he has used gained knowledge to experiment, Trial and error test and adjust methods to suit with his farm conditions including resource, worker and budget until receiving the appropriate performances of his farm. These performances have generated good products

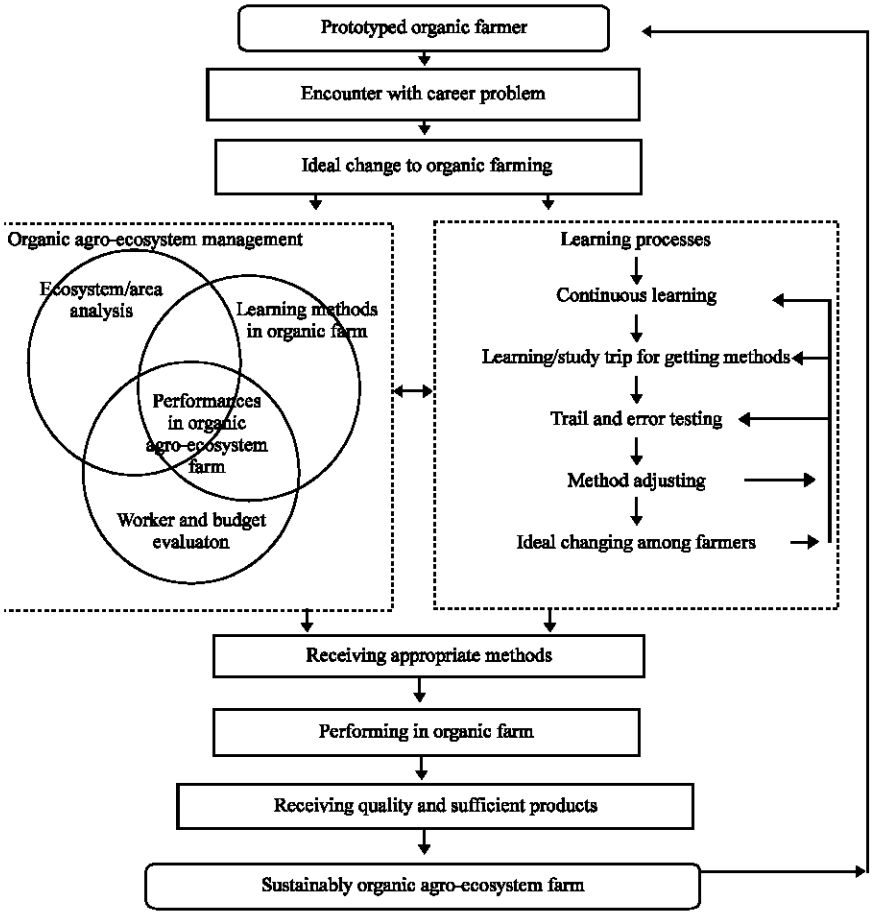

Fig. 1: Relationship of organic agro-ecosystem management from the prototyped organic farmer learning processes

sufficiently for consumption and incomes for circulating in his family and farm. His farm is then called the sustainable farm. Figure 1 shows the relationship of organic agro-ecosystem management from the prototyped organic farmer learning processes.

CONCLUSION

The operational management in this organic agro-ecosystem farm emphasizes on the relationship between physical and biological resources with regards to interdisciplinary ecological management. All occurred wastes have been changed to be beneficial resources for supporting production processes leading to highly increase products. This farm has generated circulating products that are sufficient for consumption and sale in local community throughout a year. All resources in the farm have mutualism relationship and are effectively circulated from one resource to the other. This management then is mostly suitable for agricultural ways of life in local areas.

However, the succession of the organic agro-ecosystem management relies on the diligent and patience of farmer performance. This management depends on agro-ecosystem practices and continuously learning processes from not only the local wisdom principles transferred by ancient people but also the new knowledge principles received from self-learning such as study trips, Trial and error tests, suggestions from governmental and private organizations as well as discussions among farmers. These have created the appropriate performances in the farm. Then this management has supported to generate good products that are sufficient for consumption and incomes for money circulation in family. The organic agro-ecosystem management of Mr. Kampan Laowongsri has been creating good beneficiaries until the present time.

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