Evaluating the Sustainability of Agricultural by Indicator that Appropriate to the Area of Ban Phaeo District, Samut Sakorn Province, Thailand

N. Talisa, K. Rungsarid, P. Chakrit

Abstract—The objectives of the research are to study the existing agricultural patterns, and to evaluate the sustainability of agricultural on economic, social and environmental aspects. The samplings were the representatives of the agriculturist group from Ban Paew district, Samut Sakorn province by purposive sampling method of 30 households. The tools being used were interview forms together with the Rapid Rural Appraisal (RRA) and the Participation Rural Appraisal (PRA). The information collected was analyzed with the principle of Content Analysis andusing Descriptive Statistics .After that all the information gotten was analyze the sustainability on the household level and village level. The research result can be concluded as follows: The agricultural Patterns: For most of the cultivation main crop was fruit trees planted and the supplement crop was around the patch or added other plants in the trenches. There were trenches for the cultivating water. The product distribution was by selling (97.5%) and the selling to middle man was the highest number (62.5%). Evaluating the sustainability of the agricultural by the indicators which were appropriate to the area: For the agricultural sustainability on the household level it was found that only one household had sustainable, others household had conditioned sustainable. For on the village level it was found that the sustainability on the issue of agricultural knowledge training had the lowest level (Sustainability index = 31.67%). Secondary was the acknowledging about soil information (Sustainability index = 35.0), and the household labors on agriculture, net return over cash cost (Sustainability index = 55.0%) respectively. Performance percentage is 48.81 %. It was brought to the conclusion that this area did not have the agricultural sustainability.

Keywords—Sustainability of agricultural, sustainability indicators, sustainability index.

I. INTRODUCTION

AGRICULTURAL sector was the sector affected by the development according to the National Economic and Social plan issue 1- 7 (during 1961-1996) which aimed at the economic aspect to increase the national income by highly emphasizing the industry development and services resulting in the expansion of the industrial factories into many areas causing natural resource decadence especially the soil resource which was the essential factor in the production of agricultural

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sector. Besides, there was a problem from the agriculture itself which was the commercial expectation on the highest production by using too much amount of the production factor such as chemical fertilizer, chemical pesticide which caused pollution and decadent environment. The higher production cost brought about the debt which caused the agriculture production a failure. The best solution for the agriculture was to promote the sustainable agriculture which was the cultivation that would not destroy the environment of the natural resource, not dangerous to the farmer's life and the consumer [1]-[3].

The sustainable agriculture was packed in the National Economic and Social Development Plan issue 6(1986-1990) and was continually promoted to issue 11 (2012-2016) of the present days. However, problems have still occurred which were the problems of the policy application to practice lacking integration inappropriate to the community context or lacking the participation from the farmers. The problem solving and the development did not respond to the real situations. The agriculture had long time been developed but the development by assigning was not successful because each area had physical and biological differences. There were differences on the cultivators such as their objectives, their purpose, or their need in living, etc. Therefore, there must be a change in the development by getting participation which would help solving the past problems.

Samut Sakorn province had the area of 872.347 square kilometers. It had a perfect geographic condition on geology with Ta Jeenriver as an important water source. There was irrigated area of 303,142 Rai or 55.60 per cent of the whole province which covered the 3 district of cultivating area giving the sufficient consuming water which was very appropriate for cultivating. The southern area was lowlands next to the seaside for 41 kilometers with prosperous sea economic resource and it was a province close to Bangkok for the distance of only 30 kilometers. There was a convenient transportation both on road and on water, so there was a rapid investment on industry which could support the development faster than other provinces. From the stated factors above it could be the cause of having three main occupations: fishery, industrious factory and agriculture. These indicated why there was a motto for the province as follows "Fishery town, dense factories, agriculture ground, and historic land". So that the strategic 1 of Samut Sakorn province is Changes kitchen of the world in the food and agriculture; however, from the success of the industrial sector development it was found that

in 2010SamutSakorn province had Gross Province Product (GPP) which equaled to 315,384 million baht and was considered the 6ᵗʰ highest of the country [4]. This caused problems to the agricultural sector such as the decreasing amount of land for agricultural, the farmers changed to labor in industry sector, pollutant residue in the environment, etc. especially in the area of Ban Paewdistrict which was the most important agricultural area of the province.

Ban Paew was one district of Samut Sakorn province with the area of 245.031 square kilometers. The geographic condition in geology was the same kind of soil as Dam Nern Saduak in highly fertile soil appropriate for vegetable and fruit tree cultivation such as coconut, lemon, orchid, etc. Therefore, it was the most important source of agricultural production. It had agricultural area of 76% of all the agricultural area of the province. But at the present there was a problem on the decreasing amount of cultivation land and some was deserted from many causes such as the industry development of the nearby provinces causing more cultivators changing into labors in industry sector, soil being less fertile, the outbreaks of pests including chemical residue in the soil and environment. Providing of not hurriedly solving the problem, the agricultural production would decrease and affect the stability of food locally and worldwide in the future. Because of the stated reasons and problems, it, as a result, was very necessary to evaluate the agricultural sustainability by integrating the knowledge interdisciplinary in the economic, social, and environmental aspect emphasizing the participation from communities in every step of the research. The result gotten from this research would be brought into used for the planning of sustainable agriculture management appropriate to the area and acceptable for the community in the future. This research would be very benefit to the implementation of the province to reach the strategy as the world kitchen in the agricultural aspect and it would be utilized as a model for other areas in the future. This would respond to the strategy of the country in making the agriculture sustainable on the basis of knowledge, sufficiency and by having the participation from people to bring about the sustainable development.

II. RESEARCH METHODOLOGY

In order to evaluate the agricultural sustainability by indicators that appropriate to Ban Peaw, Samut Sakorn province, where is a city located on central plain region of Thailand (Fig. 1) and the most important source of agricultural production. It had agricultural area of 76% of all the agricultural area of the province.

Fig. 1 The study area

A. Data Collection Method

The sample was the representatives of the agriculturist group by Purposive Sampling of 30 households. Tool used were interview questions together with Rapid Rural Appraisal (RRA) by walking for surveying, observing, interviewing the key informant, and Participation Rural Appraisal (PRA) with the group conversation (Focus Groups). Data collection information (Environmental, economic and social factors) was collected at farm household level and village level.

B. Data Analysis

Collected data were analyzed and classified into two parts: - Descriptive statistics such as percentage, mean, frequency were use to analyze economic, social and environmental aspects. -Agricultural sustainability has the following steps; Step 1.Indicator selection.

The collected data were gathered in order to select the sustainability indicators: economic, social and environmental issue [5]-[7], that selected by stakeholder in this area. (Table I).

TABLE I
SUSTAINABILITY INDICATORS

Economic	Social	Environment
-Net return over cash cost	-Household labors on agriculture	- Acknowledgement of soil information
-Debt	-Attitude towards occupation agriculture	- Environmental problems
-Holding land of agriculture	- The agricultural training	- Contamination of the lead in soil

Step 2.Classifying sustainability indicator.

The data of indicator was classified to non-sustainable (N) conditionally sustainable (C) and sustainable (S)

Step 3.Evaluating The Sustainability of Agricultural on the Household level:

The total score of all the indicator in household was classified to sustainability on the household. (Table II)

TABLE II
THE RANGE FOR EVALUATING THE SUSTAINABILITY OF AGRICULTURAL ON HOUSEHOLD LEVEL

Sustainability Level	Sum score
Non-sustainable (N)	Less than 28
Conditionally sustainable (C)	28-64
Sustainable (S)	More than 64

Step 4. Evaluating The Sustainability of Agricultural on the village level by the Sustainability index for each indicator.

The formula used the Sustainability index [8]:

Sustainable score = specific coefficient x the number of household:

$$\text{Sustainability index} = \frac{\sum \text{Sustainable score}}{\text{Maximum score}} \times 100 \quad (1)$$

Formula in the calculation of percentage showing the sustainable potentiality of all the indicators on the village level

$$\text{Performance percentage} = \frac{\sum \text{performance value}}{\text{Maximum performance value}} \times 100 \quad (2)$$

Performance value = Maximum score of indicator x Σ Sustainable score

III. RESULTS

A. The Existing Agricultural Patterns

For the present agriculture model it was found that the most was the mixed fruit tree plantation such as mango coconut, and dragon fruit. The reasons for those occupations were the better income and the fruit tree plantation like coconut would give continuous income all year round. the product selling were most at 97.5% and selling to the middle man. For the cultivating area it was found that patches were dredged with water trenches for the cultivating in order for the convenience to the cultivators to water the plants including for the transporting convenience such as the moving out of coconut from the patch.

The number of members in the household was in average of 5 persons ($\bar{x}$=5.20: s.d. = 2.05). Every household used their agricultural labor within the household. It was also found that there was an average of labors within the household ($\bar{x}$=2.70: s.d. = 1.11), and the households that used the labors outside the household at 60% with the outside labors of the average at 6 person ($\bar{x}$=6.33:s.d. = 6.85).

B. The Sustainability of Agricultural on Economic, Social and Environmental Aspects

On the Household Level

From the information of the cultivation year 2012/2013 of 30 households it was found that only one household had sustainable but the other household had conditionally sustainable. (Table III)

TABLE III
THE PERCENTAGE OF SUSTAINABILITY LEVEL ON THE HOUSEHOLD LEVEL

Sustainability level	Number (household)	percentage
sustainable	1	3.33
Conditioned sustainable	29	96.67
Not sustainable	0	0

On the Village Level

For the evaluating Sustainability of Agricultural by the Sustainability Index in three aspects: economic, social, and environmental it was found that the issue of the training of sustainable agricultural had the least sustainability (Sustainability Index= 31. 67%) Secondary was the acknowledgement of soil information (Sustainability Index = 35.05%) and the household labors on agriculture, net return over cash cost (Sustainability index = 55.0%) respectively. (Table IV)

TABLE IV
THE SUSTAINABILITY INDEX OF THE INDICATORS IN ALL ASPECTS

indicator	Sustainability index (%)
Net return over cash cost	55.00
Debt	84.17
Holding land of agriculture	84.17
Labor within household	55.00
Attitude towards occupation agriculture	98.33
The agricultural training	31.67
Acknowledgement of soil information	35.00
Environmental problems	60.83
Contamination of the lead in soil	45.00

For the evaluating Sustainability of Agricultural by Performance percentage is 48.81%. It was brought to the conclusion that this area should to planning for sustainable agricultural systems.

IV. CONCLUSION

Agricultural sector was the sector affected by the development, which aimed at the economic aspect. The expansion of the industrial factories into many areas causing natural resource decadence especially the soil resource was the essential factor in the production of agricultural sector. Besides, there was a problem from the agriculture itself which was the commercial expectation on the highest production by using too much amount of chemical products, which caused pollution and decadent environment. The higher production cost brought about the debt which caused the agriculture production a failure. The best solution for the agriculture was to promote the sustainable agriculture, which is sustainability in reference to agricultural production systems, invokes concern that in the future, also in the near future, current agricultural activities might endanger the continuity of agricultural production systems [9].

This research emphasized on the evaluating Sustainability of Agricultural by the Sustainability Index in three aspects: economic, social, and environmental. To achieve better results, further study should focused on the result gotten from

this research would be brought into used for the planning of sustainable agriculture management appropriate to the area and acceptable for the community in the future by using linear programmed model.

V. RECOMMENDATION

For the evaluating Sustainability of Agricultural by the Sustainability Index in three aspects: economic, social, and environmental it was found that the issue of the training of sustainable agricultural had the least sustainability (Sustainability Index= 31.67%). Secondary was the acknowledgement of soil information (Sustainability Index = 35.05%) and the household labors on agriculture, net return over cash cost (Sustainability index = 55.0%) respectively so the first step of the implementation plan was:

1) The related sections should study the need about the training to the cultivators and promote the continuous training. From studying on the topics of the training it was found that the topics were on the soil analysis in the agricultural patches and on the soil improvement that correspond to the soil information including the soil improvement method without using chemical substance of all forms.

2) The related sections should promote the soil quality assessment of every agricultural patches both as a follow-up assessment from the training and provision of a service team to analyze soil in the area that could be reached conveniently.

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