

Development of Indicators Affecting Sustainability of Community Forest Management in Upper Northern Thailand

Jukkaphong Pong-ngamchuen, Nakarate Rungkawat, Savichaya Supa-udomlerk Trirat, and Jirapong Chaichawwong

Abstract—The study aimed to study the success in sustainable community forest management, to develop an indicators and factors affecting sustainability of community forest management, and a guideline for the development of potential in effective community forest management under the conceptual framework of sustainable development. Four successful community forests in upper northern Thailand receiving award at the national level were investigated. Interview was used for data collection and participatory action research (PAR) was employed in this study. Informants consisted of 20 community forest core leaders and 345 people in the 4 community forest areas. Obtained data were analyzed by using descriptive statistics and inferential statistic. Finding showed that, the success in sustainable community forest management was found at a low level. Regarding the development of indicators affecting sustainability of community forest management, it was found that 4 indicators affecting it included the following: 1) attachment to the community; 2) co-activities with other organization; 3) environmental information perception; and 4) community organization networks. A guideline for effective potential development in community forest management focused on the development of operational process and appropriate personnel management.

Index Terms—Indicators, sustainability, community forest management.

I. INTRODUCTION

The world has been changing a lot in past 20 years up to the present in terms of social, economic, and environmental aspects. An important driving force of these changes is the progress of science, technology, and economic growth making change of the relationship between man and nature. In addition, change of economic structure from agricultural to industrial sector results in deterioration and decrease in natural resources [1]. Natural resources as carelessly exploited and without equity. In other words, it can be said that the current world is rapidly progressive whereas the environment is deteriorated although there are a lot of people must rely on natural resources as water source, food, and medicine for existence [2].

Thailand development in the past mainly put an importance on economic growth. Indeed, natural resources were exploited due to the economic expansion particularly on agriculture, industry and service industry. This is without

careful planning and protection measures for environmental conservation. Besides, inappropriate production and consumption behaviors of people in the society cause their livelihoods lack of harmony with good environmental conditions [3]. Also, it results in a negative impact on various aspects e.g. social, mental, and environmental ones [4].

The management of natural resources and environment is another method which can help rehabilitated and conserve natural resources and environment. In the past, however, the rehabilitation and conservation was not so successful because it was mainly done by the public sector [5]. At present, the managerial administration of community forests is one issue in the current of natural resource and environmental development. A lot of communities of all regions in the country are aware of the conservation of forest resource around them. This can be said that community-based community forest management is the best method for appropriate natural resource and environmental conservation. This is because it is practiced by people in the community particularly in northern region where there is community forest conservation – either successful or successful [6]. Meanwhile, the success of sustainable community forest management in each area has the same or different condition. Therefore, a study on development of indicators affecting sustainability of community forest management in accordance with the conceptual framework of sustainable development is very essential. This is because the indicators will be a tool beneficial to the construction of capability in the management of forest resource and quality of life in long-term [7].

This research focused on community participation as well as the development of sustainability indicators for community-based forest management under the conceptual framework of sustainable development emphasizing on the construction of the 3 dimension of balance: society, economy, and environment [8]. This aimed to achieve 3 development goals: biology, economy, and society as well as to find a guideline for potential development to cope with effective community forest management.

II. RESEARCH METHODOLOGY

This study was the combination of qualitative and quantitative research having the following steps:

A. Population and the Sample Group

Population in this study consisted of communities in upper northern Thailand which were successful in the management

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The authors are with the Faculty of Agricultural Production, School of Tourism Development, and School of Administrative Studies, Maejo University, Chiang Mai, Thailand (e-mail: jukkaphong.mju@gmail.com, nrungkawat@yahoo.com, nutty291@gmail.com, notecmu@hotmail.com).

of community forest and were awarded at the national level:

- 1) Baan Thapapao community forest, Thapladuk sub-district, Mae Tha district, Lamphun Province. It was awarded outstanding community forest and got the trophy of Princess Sirinthorn in 2009 (Fig. 1).



Fig. 1. Baan Thapapao community forest.

- 2) Baan Sarmkha community forest, Huasual sub-district, Mae Ta district, Lampan province. It was awarded outstanding community forest at the national level in terms of The Project on “Man Conserve Forest – Forest Loves the Community” in 2010 (Fig. 2).



Fig. 2. Baan Sarmkha community forest.

- 3) Baan Rongbon community forest, Moo 12, Muangkham sub-district, Phan district, Chiangrai province. It was awarded “The Flag Protects Forests for Healing the Life” of Queen Sirikit in 2011 (Fig. 3).



Fig. 3. Baan Rongbon community forest.

- 4) Baan Nongpook community forest, Puea sub-district, Nan province. It was awarded outstanding community forest based on “The Youth Conserves the Forest Project” in 2011 (Fig. 4).

The sample group was divided into 2 groups: 20 community leaders, community committee, community forest committee, core leader for community forest management, 5 persons for each community and 345 people in the communities out of the population of 2,515 which were obtained through Slovin’s formula [10].



Fig. 4. Baan Nongpook community forest.

B. Data Collection and Research Instrument

- 1) Collected data related to the capability in community self-reliance, attachment to the community, and indicators and sustainable success in community forest management. This was in accordance with the conceptual framework of sustainable development. The data were collected from 20 community leaders and core leaders for community forest management by using interview schedule.
- 2) Collected data related to community participation in the management of community forests in the 4 areas based on 3 aspects: social, economic, and environmental ones. Data were obtained through observation and interview schedule conducted with household heads and people in the communities.
- 3) The data were collected to find a guideline for developing the potential in effective community forest management. This was under the conceptual framework of sustainable development by using Participatory Action Research technique. Colloquium venue was held for finding conclusions and the guideline among community leaders, core leaders on community forest and natural resource conservation, representatives of people in the communities, and the team of researchers.

C. Data Analyses

- 1) Basic data of the sample group were analyzed by using descriptive statistics i.e. percentage, frequency, mean, standard deviation, and weighted mean score.
- 2) Capability in self-reliance of community members. Six question items (10 scores each) were employed and an average mean score of each item was computed based on the detail below.

| Scale Limits | Level of Self-reliance |
|--------------|------------------------|
| 08.01-10.00 | Highest |
| 06.01-08.00 | High |
| 04.01-06.00 | Moderate |
| 02.01-04.00 | Low |
| 00.00-02.00 | Lowest |

- 3) Data on attachment to the community members and community participation in community forest management. Five rating scales were as follows:

| | | |
|----------|---|---|
| Highest | = | 5 |
| High | = | 4 |
| Moderate | = | 3 |
| Low | = | 2 |
| Lowest | = | 1 |

Besides, the interpretation of an average mean score and community participation in community forest management was limited to 3 levels:

| Mean | Attachment to the Community |
|-----------|-----------------------------|
| 3.68-5.00 | High |
| 2.34-3.67 | Moderate |
| 1.00-2.33 | Low |

4) Seven indicators on sustainable successful community forest management were limited to 3 aspects as follows:

Social aspect

- Percentage of training attendance per total population of the community.
- Percentage of local people to join educational tours in one year.

Economic aspect

- Percentage of an increased income of local people compared with the previous year.
- Percentage of a number of times to collect forest products in one year.
- Percentage of increased savings compared with the previous year.

Environmental aspect

- Percentage of a number of times to cut wood for fuel.
- Percentage of a number of times to apply agricultural chemicals.

Obtained data were analyzed by using descriptive statistics i.e. percentage, mean, standard deviation, and weighted mean score for an analysis of sustainable success in community forest management based on the detail below.

| Scale Limits | Level of Sustainable Success |
|--------------|------------------------------|
| 08.01-10.00 | Highest |
| 06.01-08.00 | High |
| 04.01-06.00 | Moderate |
| 02.01-04.00 | Low |
| 00.00-02.00 | Lowest |

5) Factors affecting successful community forest management under the conceptual framework on sustainable development. Stepwise Multiple Regression was employed based on 3 equations: social sustainability, economic sustainability, and environmental sustainability.

III. RESULTS AND DISCUSSION

A. Basic Data of the Sample Group

1) Community leaders and core leaders for community forest management in 4 areas

Findings showed that most of the informants (80%) were male, 44 years old on average, elementary school graduates (45%), and had 5 family members on average. All of the informants' main occupation was agriculture and most of them (70%) did not have part time job. Their average annual income was 55,900.87 baht on average which mostly earned from agricultural sector. All of the informants used to perceive data on forestry and natural resource conservation and participation through the public sector. Also, there was networking and they were supported on community forest management by the public sector, too such as a training on knowledge about community forest management. Almost all of the informants (90%) were local people in the

communities.

2) Community member in the 4 areas

Almost of the informants (91.67%) were male, 43.08 years old on average and lower elementary school graduates (66.51%). The informants had 4.98 family members on average. More than one-half of the informants (66.51%) engaged in agriculture as a main occupation and one-half of them were also hired workers as a part time job. Less than one-half of the informants (41.51%) had an average annual income for 55,900.87 baht. All of the informants perceived data or information about environment and community forest in the past 2 years through the village broadcast tower and through the village meeting (80%)

B. Self-reliance of Community Member

Finding showed that community members gained an average mean score of each item at a highest level (9.88); particularly on an awareness of community forest cherishing and capability in doing various activities within the community (9.97). However, they gained a lowest level on capability in co-community forest management planning when compare with other items (8.04) as shown in Table I.

TABLE I: CAPABILITY IN SELF-RELIANCE OF COMMUNITY MEMBERS

| Capability in self-reliance | An average mean score (10) | Description (Level) |
|---|----------------------------|---------------------|
| 1. Helping one another and generosity of community members | 9.32 | Highest |
| 2. Capability in co-community forest planning | 8.04 | Highest |
| 3. Capability in team work | 9.13 | Highest |
| 4. Capability in appropriate natural resource and environment using | 9.76 | Highest |
| 5. Awareness of community forest cherishing | 9.88 | Highest |
| 6. Capability in doing various activities within the community | 9.78 | Highest |
| Mean | 9.32 | Highest |

C. Attachment to the Community

As a whole, findings showed a high level of attachment to the community of the community members (\bar{x} =3.87). Based on its details, willing to always participate in community activities was found at a highest level (\bar{x} =4.39). This was followed by trustworthiness among community member (\bar{x} =4.29). However, the following were found at a moderate level: doing assigned tasks (\bar{x} =3.66); helping others who cannot do assigned tasks (\bar{x} =3.50); and group separation in the community (\bar{x} =3.44) as shown in Table II. This is markedly visible in the high mean ratings obtained affirming the people got along well with most other people and wants to spend the rest of their lives in the community. Pong-ngamchuen and Namvises [11] reported that people generally felt positive about their community, which means they had greater capacity to make the community a better place to live in. On the other hand, one is well to keep in mind O'Brien and Hassinger [12] observed that locals with a strong sense of fit are less likely to search for new alternatives. Following authors' argument, the respondents run the risks of getting attached to the community in ways that inhibit search for extra-development option.

TABLE II: A LEVEL OF ATTACHMENT TO THE COMMUNITY

| Attachment to the community | Mean | Description |
|---|------|-------------|
| 1. Trustworthiness among community members | 4.29 | High |
| 2. Respect opinions of others | 3.74 | High |
| 3. Support one another in doing various activities | 4.00 | High |
| 4. Helping others in the case that they cannot do assigned tasks | 3.50 | Moderate |
| 5. Always show opinions in various activities | 3.99 | High |
| 6. Putting the importance on doing activities in order to achieve the goals | 3.95 | High |
| 7. Doing team work for solving various problems | 3.75 | High |
| 8. Doing activities as designated | 3.65 | Moderate |
| 9. Willing to always participate in community activities | 4.39 | High |
| 10. There is no group separation in the community | 3.44 | Moderate |
| Mean | 3.87 | High |

D. Community Participation in Community Forest Management of the 4 Areas

As a whole, it was found that community members participated in community forest management at a moderate level (\bar{x} =3.58). Based on its details, they participated in decision-making most (\bar{x} =3.95). This was followed by assessment (\bar{x} =3.76), implementation (\bar{x} =3.65), and community forest utilization (\bar{x} =2.96) respectively (Table 3). Nonetheless, the finding support study of Kowprasert [13] which showed that community participation in the various phases of community forestry development project was generally of the cooperation type. However, it was slightly higher in decision making than in implementation. In contrast, Sriraunggrith [14] Baltazar [15], and Thongma [16].

After being awarded at the national level on community forest management, the communities did not discuss about community forest condition. In contrast, community forest was exploited too much regardless of the goal of sustainable community forest management. Moreover, there was no activities and people responsible for the maintenance of the abundance of community forest. All of these led to a decrease in the importance of the participation in community forest management. Nevertheless, the 4 community forest still be abundant due to strength of the community and community leaders as well as support of external public and private agencies. In addition, people in the communities claimed that they did not want to have a hard life facing natural calamity like before. Thus, they tried to participate in various activities related to community forest management and natural resources/environment at the community, sub-district, and district levels.

TABLE III: COMMUNITY PARTICIPATION IN COMMUNITY FOREST MANAGEMENT OF THE 4 AREAS

| Participation | \bar{x} | S.D. | Description |
|--------------------|-----------|------|-------------|
| Decision-making | 3.93 | 0.87 | High |
| Implementation | 3.65 | 1.04 | Moderate |
| Forest utilization | 2.96 | 0.98 | Moderate |
| Assessment | 3.76 | 1.24 | High |
| Mean | 3.58 | 1.06 | Moderate |

E. Indicators on Sustainable Success of Community Forest Management of the 4 Areas

Regarding social aspect, the following were found: 1) most of the community members (95%) attended a training on

forestry and environment 2) most of the community members (85%) joined educational tours 3) all of the community member (100%) joined community activities 4) most of the community member (75%) had knowledge exchange with other community 5) most of the community leaders (75%) were knowledgeable and able to be a resource person for other community and 6) there was a quarrel about community forest management among the community members (85%).

Regarding economic aspect, the following were found: 1) one-half of the community members (50%) had an increased income due to their community forest utilization 2) most of the community members (75%) had a chance to collect community forest products more than ever and 3) one-half of the community members (50%) had more savings. For environmental aspect, it was found that all of the community member (100%) conserved plant varieties and reduced cutting wood for fuel. Most of the community members (75%) reduced agricultural chemical using.

F. A Level of Sustainable Success in Community Forest Management of the 4 Areas

Results of the study revealed that, as a whole, the sustainability in social success was found at a high level (\bar{x} =62.49) while the percentage of training attendance was successful at a highest level (\bar{x} =90.05). However, the percentage of educational tours was successful at a low level (\bar{x} =34.04). This was because it needed a big sum of money to spend for educational tours and those who were selected to join the tours must be ready in terms of knowledge and budgets.

Regarding the sustainability in economic success, it was found at a lowest level as a whole (\bar{x} =19.93). Based on its details, it was found that there were 2 indicators having a lowest level of sustainable success: increased income compared with that of the previous year (\bar{x} =14.71) and increased percentage of savings compared with that of the previous year (\bar{x} =11.90). This was because Baan Thapapao community forest was a very abundant forest and many activities were held there. Besides, there was homestay for tourists which could earn much income. For Baan Sumkha community forest, Baan Rongbon community forest, and Baan Nong Pook community forest, it still need an increase in abundance so there was a limitation in forest product collection which had an effect on decreased income and savings.

According to the sustainability in environmental success, as a whole, it was found at a low level (\bar{x} =36.08). Based on the indicators, the percentage of a number of times to cut wood for fuel had a low level of success (\bar{x} =25.50) whereas the percentage of a number of times using agricultural chemicals was found at of moderate level of success (\bar{x} =46.67). Based on an interview, it was found that all of the 4 areas had rules and regulations of the community forests in terms of wood cutting for household utilization. Interestingly, it could be observed that the percentage of agricultural chemical using still existed (Table IV)

G. Factors Affecting Successful Community Forest Management under the Conceptual Framework of Sustainable Development

According to the study on 7 factors effecting successful community forest management, there were 4 factors having

an effect on the success in sustainable community forest management at a significant level (F value = 9.139): 1) attachment to the community; 2) co-activities with other organizations; 3) environmental information perception; and 4) community organization networks. All of the variables could explain variance of the sustainability of successful community forest management for 41.9 percent (R2 = 0.419) as shown in Table 5. Regarding social factors, 4 factors had an effect on the sustainability in successful community forest management at a significant level (F value = 21.279): 1) educational attainment; 2) attachment to the community; 3) co-activities with other organization; and 4) environmental information perception (R2 = 0.532)

TABLE IV: SUSTAINABLE SUCCESS IN COMMUNITY FOREST MANAGEMENT OF THE 4 AREAS

| Indicators on sustainable success | \bar{x} | S.D. | Description |
|--|-----------|------|-------------|
| Sustainability in social success | | | |
| 1. Percentage of training attendance per all people in the community | 90.95 | 0.52 | Highest |
| 2. Percentage of success of educational tours in one year | 34.04 | 0.31 | Low |
| Pool mean | 62.49 | 0.42 | High |
| Sustainability in economic success | | | |
| 3. Percentage of increased incomes compared with the previous year | 14.71 | 0.64 | Lowest |
| 4. Percentage of a number of times collecting forest products | 33.20 | 0.42 | Low |
| 5. Percentage of increased savings compared with the previous year | 11.90 | 1.01 | Lowest |
| Pool mean | 19.93 | 0.31 | Lowest |
| Sustainability in environmental success | | | |
| 6. Percentage of a number of times cutting wood for fuel | 25.50 | 0.26 | Low |
| 7. Percentage of a number of times of agricultural chemical using | 46.67 | 0.13 | Moderate |
| Pool mean | 36.08 | 0.54 | Low |
| Success in the 3 aspects | 39.50 | 0.41 | Low |

For economic aspect, 3 factors had an effect on the sustainability in successful community forest management at a significant level (F value = 11.427): 1) educational attainment; 2) attachment to the community; and 3) community self-reliance (R2 = 0.471). For environmental aspect, 5 aspects had an effect on the sustainability in community forest management at a significant level (F value = 14.293): 1) educational attainment; 2) attachment to the community; 3) environmental information perception; 4) assistance from government agencies; and 5) community organization networks (R2 = 0.552)

H. A Guideline for Potential Development in Effective Community Forest Management under the Conceptual Framework of Sustainable Development

According to the colloquium venue held for finding a guideline for potential development in effective community forest management. This was under the conceptual framework on sustainable development. Problems encountered and a guideline for potential development could be concluded as follows:

1) Implementation process

Various rules and regulations were too much strict and obtained budgets for each activity of community forest management were inadequate. Besides, budget management

was not fair and accountable as viewed by community members. Some groups of community members and outsiders encroached the community forests. Thus, the community forest committees of the 4 areas should review rules and regulations in order to be consistent with changing environmental condition. Also, public agencies should be asked for cooperation to support budgets and manage the budgets accountably. In addition, community forest patrolling must be done continually to prevent forest encroachment and violation of community rules and regulation. Importantly, it should have understanding and application of the concept of sufficiency economy to community forest management.

TABLE V: STEPWISE REGRESSION ANALYSIS OF INDEPENDENT VARIABLES AND THE SUSTAINABILITY OF SUCCESSFUL COMMUNITY MANAGEMENT AS A WHOLE

| Attachment to the community | Level of sustainable success | |
|---------------------------------------|------------------------------|-------------------|
| | Beta | t-value |
| Constant | | 6.604 |
| Educational attainment | -0.875 | -2.413 |
| Attachment to the community | 1.137 | 3.025** |
| Co-activities with other organization | 0.716 | 2.561* |
| Environmental information perception | 0.736 | 2.613* |
| Assistance from government agencies | -2.039 | -1.387 |
| Community self-reliance | -0.122 | -0.240 |
| Community organization networks | 0.997 | 4.061* |
| R ² = 0.419 | | F value = 9.139** |

2) Human resource management

There was no concrete youth training to be ready for the task of community forest management. Some groups of community members could not be able to attend a training on community forest management. There were external agencies visiting community forest of the four areas and this caused concerned personnel did not improve the community forest because they perceived that it was good enough.

However, the communities in the 4 areas should hold activities to select the youths in the communities to participate in activities continually. They should be given an opportunity to take part in roles of community forest management based on the application of the philosophy of sufficiency economy. In addition, community members must be encouraged to discuss about new data or information on community forest management such as eco-tourism in community forest.

IV. CONCLUSIONS

Results of the study indicated factors supporting the success of the community forest in the 4 areas in terms of sustainable community forest management. Regarding social success, it was found that main factors affecting the sustainability of successful community forest management comprised the following: 1) educational attainment of the community members; 2) attachment to the community of community member; 3) having co-activities with other organization; and 4) environmental information perception of community members. For economic aspect, there were 3 factors: 1) educational attainment of community members; 2)

attachment to the community of community members; 3) community self-reliance. Based on environmental aspect, there were 5 factors: 1) educational attainment of community members; 2) attachment to the community of community members; 3) environmental information perception of community members; 4) assistance from government agencies; and 5) having community organization networks.

It could be observed that there were 2 factors affecting the success in the sustainability in successful community forest management. This was based on 2 aspects: 1) educational attainment; and 2) attachment to the community. That was, education is an important basis for various aspects of development like community forest development as well as natural resource and environmental conservation [6]. Although people in the community had not a low level of educational attainment but they had a chance to attend trainings held by the public sector. Meanwhile, attachment to the community of community members was like force consolidation among community members based on passion, unity, and generousness. In addition, the perception of data or information about environment of the community was one factor having an effect on the sustainability in successful community forest management in terms of social and environmental aspects. Indeed, data or information was like a channel to acquire knowledge, understanding, and improvement of a modern model of forest management.

Regarding the sustainable in successful community forest management, it was found that there were 4 factors affecting sustainable success in community forest management: 1) attachment to the community; 2) co-activities with other organization; 3) environmental information perception; and 4) having community organization networks. Based on the consideration of each factor, it was found that all of the 4 factors had an effect on sustainable community forest management. However, what is essential to community forest management is the conceptual framework on sustainable development leading to correct management of national resources and environment and in the same direction [7] as shown in Fig. 5.

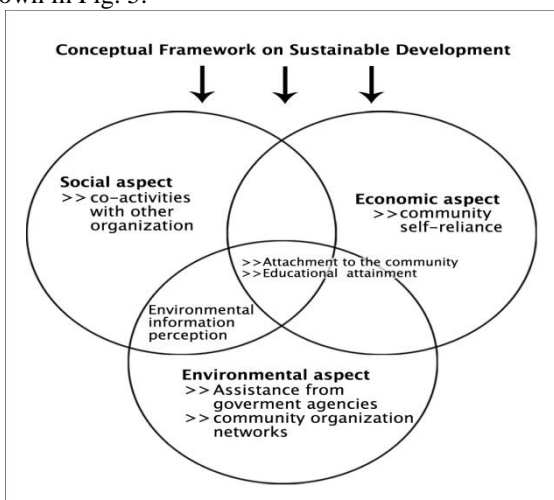


Fig. 5. Factors affecting successful community forest management under the conceptual framework on sustainable development

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Jukkaphong Pong-ngamcuen was born in Bangkok, Thailand in 1977. He received his bachelor degree in marketing from Faculty of Business Administration, Ramkhamhaeng University, Bangkok, Thailand in 1999; followed by his master degree in social development from Faculty of Social Development, National Institute for Development Administration (NIDA), Bangkok, Thailand in 2004. His major field of study was social planning and evaluation. And he got his doctoral degree in rural development from Central Luzon State University, Nueva Ecija, Philippines in 2007. He has been teaching in Maejo University, Chiang Mai, Thailand since August, 2007. He is currently associate professor at the Faculty of Agricultural Production, Maejo University. His research interests include rural development, social development, and agricultural extension.



Nakarate Rungkawat was born in Nakon-Ratchasima, Thailand in 1966. He received his bachelor degree in agricultural extension from Faculty of Agricultural Business, Maejo University, Chiang Mai, Thailand in 1990; followed by his master degree in agricultural

extension from Faculty of Agricultural Business, Maejo University, Chiang Mai, Thailand in 1992. His major field of study was agricultural communications. And he got his doctoral degree in agricultural extension and rural development from Chiang Mai University, Chiang Mai, Thailand in 2014. He has been teaching in Maejo University, Chiang Mai, Thailand since August, 1992. He is currently associate professor at the Faculty of Agricultural Production, Maejo University. His research interests include agricultural extension, agricultural communications and rural development.



Savichaya Supa-udomlerk Trirat was born in Bangkok, Thailand in 1977. She received her bachelor degree in finance and banking from Faculty of Business Administration, Payap University, Chiangmai, Thailand in 1999; followed by her master degree in business administration from Fareasthern College, Chiangmai, Thailand in 2004. And she got her doctoral degree in development communication from Central Luzon State University, Nueva Ecija, Philippines in 2009. She has been teaching in Rajamagala University Lanna, Chiang Mai, Thailand from 2009 - 2010, and Maejo University since 2010. She is currently a lecturer at the Shool of Tourism Development, Maejo University. Her research interests include tourism development, social development, and communication development.



Jirapong Chaichawwong was born in Chiang Mai, Thailand in 1981. He received his bachelor degree in political science with first class honor from Faculty of Social Sciences, Chiang Mai, Thailand in 2002. He was granted a scholarship from Japanese Government and received his master degree in International Development from Nagoya University in 2008. He has been a full-time lecturer in Political Science of School of Administrative Studies, Maejo University since 2008. His research interests are ASEAN integration and politics and development in southeast Asia.