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Sustainable Assessment of Highland Community by Developing Sustainable Indicators under the Mae Song Highland Development Project Using Royal Project System

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Abstract The focus group discussion could synthesis of sustainability indicators with community. It can be divided into 4 factors, total 35 indicators including 10 indicators of economic factor, 8 indicators of social factor, 9 indicators of environment factor and 8 indicators of infrastructure factor. The results of the community sustainability assessment from the developing sustainable indicators found that a community of the Mae Song highland development project using Royal Project system had a strong focus on 4 factors including 35 sustainable indicators. The overall sustainability assessment of the community was a moderate level. Except for the environment factor was a good sustainable of the community. However, this community of the Mae Song highland development project using Royal Project system would be accelerated by the development of the economy factor was the knowledge in career development, water resources for agriculture and income, the social factor was the strength of the community and farmers institutions, the environment factor was the natural disasters, community forests and external threats, the infrastructure factor was electricity, internet system and water resources for consumption. The problems found in the highland development were mainly related to the law. Most of the community area in the highland was in the conserved forest, wildlife sanctuary and National Park. Most of the areas were in the first and second floor watersheds. By the resolution of the Minister is not allowed to live or work, thus affecting the development of infrastructure such as electricity, road, water sources for consumption. It is suggested that in order to develop community should need the community into consideration. Also, in the development of the highland community, it is important to focus on working in integrated with relevant agencies.

Keywords: Sustainable indicators, Highland communities, Highland development project

Introduction

Thailand is characterized by high areas more than half of the country. Mostly in the northern and central regions covers an area of 67.22 million rai of

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land in 20 provinces including Chiang Mai, Chiang Rai, Mae Hong Son, Phayao, Lamphun, Phrae, Nan, Lampang, Tak, Phetchabun, Phitsanulok, Loei, Sukhothai, Kamphaengphet, Kanchanaburi, Uthaithani, Suphanburi, Ratchaburi, Prachuap Khiri Khan and Phetchaburi. Most of populations in the highland are 15 hill tribes. There are 851,282 people or 88.22% of hilltribes in the country (Chiangmai University, 2008). Current highland areas still have the necessary problems and need to focus on continuous improvement. The problem of highland areas may be classified as population in highland areas is generally poor, production system use of inappropriate agricultural chemicals, agricultural rotation, degradation area, intrusion problems to find new areas, conflict in the use of natural resource, majority of the population also has less education, there is a high rate of population increase, lack of knowledge of crop cultivation. The area is far away, receiving little help from various agencies.

Royal Project is a truly public organization, has a good system to make work more streamlined and efficient. The cooperation between government and private sectors has led to new research and development projects as a result, professional development, product development and product promotion from the Royal Project, social development and community on highland, as well to maintain the integrity of the environment. This leads to the sustainable development of highland watersheds in Northern Thailand (Highland Research and Development Institute (Highland Research and Development Institute, 2017). Currently, the Royal Project has 38 Royal Development Projects, covering 5 provinces in the Northern region, including Chiang Mai 27 centers, Chiang Rai 7 centers, Mae Hong Son 2 centers, Lamphun 1 center, and Phayao 1 center, including 22 districts and 1 sub-district. The total area is 2,688 square kilometers. There are 13 tribes of Thai and hill tribe people, 288 villages, 39,277 households and 168,445 people (Royal Project Foundation, 2012). Over the past ten years, opium has been depleted from the Royal Project area and most areas of the country. Hill tribe turned to cold winter crops (Noppakunwong, 2007). The market is supported. The Parallel development of education, health, social, awareness, and conservation of soil and water, has made life and better living of farmers in the Royal Project area (Office of the National Economic and Social Development Board, 2010).

Globalization is a free competition in the economy. Nowadays, the context of highland development has changed. There are new factors, related and affects the development of higher areas. The highland development process can sustainably drive research and the Royal Project has expanded its coverage of highland areas throughout Thailand. The Cabinet has set up Highland Research and Development Institute on 7 December 2004. The mission is to support the research and development of the Royal Project, to promote and

coordinate with the Royal Projects Foundation, government agencies, state enterprises, government agencies and related institutions, and the private sector. Study of research, develop, and the right transfer information and highland technology to community. The goal is to provide high quality living for the target community and good environment. Using the knowledge and learning process of the Royal Project combined with local wisdom in the development of highland communities under the philosophy of sufficiency economy and the way of the Royal Project with the participation of all sectors (Highland Research and Development Institute (Highland Research and Development Institute, 2017).

In 2007, Mae Song Sub-district Administration Organization, Tha Song Yang district, Tak province, has requested the promotion of new agricultural career in Mae Song sub-district from the Royal Project to help promote the career follow by the Royal Project. The majority of the population is a Karen hill tribe, working in metaphysical farming, general employment, a lack of sustainable careers, and lack of knowledge and care for the environment. The Royal Project Foundation has assigned the Highland Research and Development Institute (Public Organization), operates with development of economic, social and environment with the relevant agencies. Later, in the year 2016, the extended Royal Project of Mae Song has renamed the project "the Mae Song Highland Development Project Using Royal Project System". According to the Highland Research and Development Institute had 4 common operations: 1) Sufficiently 2) Products are quality and safe from chemicals and do not destroy the environment 3) Participatory community planning and 4) Restoration of natural resources, soil, water and forests (Highland Research and Development Institute, 2017).

Highland operations are multi-dimensional including social, cultural, economic, and environmental under time conditions, human resource, and the budget is limited. So it is important to select only the most important and easy to understand information, presentation in terms of sustainability indicators to prioritize appropriate factors for community development, to achieve a sustainable quality of life. Historically, the development of highland indicators has been studied as a tool to measure the quality of life in highland communities, for example sustainable assessment in land management of famers in the highland of district Mae Fah Luang, Chiang Rai Province (DLD, 1998), analysis of sustainability indicators applied to evaluate sustainability of farmers in the highland of Wat Chan sub-district, Mae Chaem district, Chiang Mai Province (Praneetvatakul *et al*., 2001), analysis of sustainability indicators of agricultural system and Natural Resources in highland areas to assess the community's potential for sustainable living (Ekasingh *et al.*, 2001).

Sustainability assessments make it possible to compare the needs and urgency of community development (Ekasingh and Promburom, 2010). The development of community sustainability indicators in highland areas is needed to improve indicators in relation to critical development, consistent and appropriate with the context of the community. It is also possible to assess the sustainability of highland communities. So that, researchers are interested in assessing the sustainability of highland communities by developing sustainable indicators under the Mae Song highland development project using Royal Project system, Mae Song sub-district, Tha Song Yang district, Tak province, for information on community development planning.

Materials and methods

Study area and sample size

This research collected data by focus group discussions with leader community such as sub-district headman, village headman, leader famer institute, president of sub-district administration organization, famers in the Mae Song highland development project using Royal Project system, Mae Song sub-district, Tha Song Yang district, in Tak province, to set the appropriate indicators for the community. It is also possible to assess the sustainability of highland communities. Data was collected by questionnaire from 46 famers. There was open end and closed end questions. The Mae Song highland development project using Royal Project system is a low level development area. Farmers were specific selected by experts of the Highland Research and Development Institute (Public Organization), who work with participate in all agriculture project activities and were sample farmers of the project. Data were collected during October to December 2017 and analyzed by using values of frequency, percentage, mean and standard deviation.

Data analysis

Data were analyzed using SPSS program. The statistics used in analyzing the data were descriptive statistics which was used to find the basic static value including frequency, percentage, standard deviation and means of minimum value and maximum value. As for analysis of the Sustainability assessment of highland communities based on importance values and assessment values of indicators had scores since score 1 was the less level to score 10 was the highest level. It used weight mean scores by importance value or assessment value as follow, 1.00-2.79 was the no importance or few level, 2.80-4.59 was the less importance or little level, 4.60-6.39 was the moderately importance or

the moderate level, 6.40-8.19 was very importance or good level, 8.20-10.00 was the most importance or very good level. Then, prioritize the development of indicators in each aspect. The results are analyzed. (Importance value of indicators - Assessment value of indicators = Significance in development of indicators). The greatest value is most important in the development of the indicator and the least value is of minimal importance in the development of the indicator. Comparative analysis of the importance of the indicators with the results of the assessment of the indicators was synthesis of relationships shown in the form of a graph of radar chart.

Results

Developing sustainable indicators under the Mae Song highland development project using Royal Project system

Results of study in the area by focus group discussions with leader community such as sub-district headman, village headman, leader famer institute, president of sub-district administration organization, famers in the Mae Song highland development project using Royal Project system, sub-district Mae Song, district Tha Song Yang in Tak province, to set the appropriate indicators for the community. The community-based indicators were used as a tool to evaluate community sustainability. The indicator was divided into 4 factors: economic, social, environment and infrastructure. There were 35 indicators as shown in Table 1.

Table 1. Development of sustainability indicators

Development of sustainability indicators	
A. Economic factors	
1. eating area	6 .access to finance
2 .food security	7 .knowledge in career development
3 .income	8 .product distribution channels
4 .debt	9 .water resources for agriculture
5 .saving	10. related integrated agencies: Department of Agriculture, Department of Agricultural Extension etc.
B. Social factors	
1. farmer institution	5. community rules
2 .strength of the community	6 .leader / board of directors
3 .drugs	7 .community involvement
4 .healthy people in community	.8related integrated agencies: District, rural Development, Department of Cooperative Promotion etc.

Table 1. Development of sustainability indicators (Cont.)

Development of sustainability indicators	
B. Social factors	
1. farmer institution	5. community rules
2 .strength of the community	6 .leader / board of directors
3 .drugs	7 .community involvement
4 .healthy people in community	.8related integrated agencies: District, rural Development, Department of Cooperative Promotion etc.
C. Environment factors	
1. abundant forest area	6. risk of natural disasters
.2increasing of forest area	7. community regulation on forest land management
3. soil and water conservation	.8external threats
4 .natural water source	9. related integrated agencies: Department of
5. community forest	National Parks, Royal Forest Department etc.
D. Infrastructure factors	
1. road	5. phone / cell phone signal
2 .water for consumption	6 .internet system
3 .electricity	7 .healthy center / hospital
4 .school	8. related integrated agencies: Local administration, Provincial Electricity Authority etc.

General conditions of highland communities under the Mae Song highland development project using Royal Project system

The result showed that the most of farmers were male (89.1%) with the mean age of the respondents was 44 years old. Most had never been educated (56.5%), farmers graduated from secondary school (15.2%). Most of the informant farmers were the leader family status. Famers (58.7%) had been settled habitation for more than 41 years. There were 3-4 children/household and 3-4 persons/household of number in house registration document. All farmers have their own land. Most of the famers (95.7%) participated in the Royal Project. The average of farmers earning income before joining the Highland Research and Development Institute were 16,905.43 Baht/year and after working were 26,569.57 Baht/year. Minority of famers borrowed money (21.7%). Famers in project were integrated agriculture both cultivating and raising animals. Most of the farmers (43.5%) planted the most Konjac plants, followed by rice, upland rice, and corn were 41.3, 23.9 and 6.5 %, respectively. In addition, pumpkins, grapes, avocados and coffee were also grown by 2.2%. For animal husbandry, famers (21.7%) had the most pig farming, followed by chicken, cow, fish, and buffalo were 17.4, 6.5, 4.3 and 2.2%, respectively.

Sustainable Assessment of Highland Community by Developing Sustainable Indicators under the Mae Song Highland Development Project Using Royal Project System

Sustainability assessment of highland communities under the Mae Song highland development project using Royal Project system from development of indicators of 4 factors such as economic, social, environment and infrastructure. When considering each indicator from total 35 indicators make it possible to know what the community needs to develop.

Economic factor

Participating farmers focus on eating area, food security, income, debt, saving, knowledge in career development, product distribution channels, water resources for agriculture, and related integrated agencies such as Department of Agriculture, Department of Agricultural Extension, at the highest level ($\bar{x}$ = 8.24-9.72), followed by the access to finance ($\bar{x}$ = 8.00). The results of the community assessment at the present time, it was found that the product distribution channels had scores in the high level ($\bar{x}$ = 6.48). For eating area, food security, income, debt, access to finance, knowledge in career development, water resources for agriculture and related integrated agencies related to indicators. The score was moderate level ($\bar{x}$ = 4.96-6.26) and the lower scores were savings ($\bar{x}$ = 3.89) (Table 2 and Figure 1A).

Social factor

Participating farmers focused on farmer Institution, strength of the community, drugs, healthy people in the community, community rules, leader / board of directors, community involvement and related integrated agencies such as District, Rural Development, Department of Cooperative Promotion, at the highest level ($\bar{x}$ = 8.76-9.50). The results of the community assessment at the present time, it was found that community rules, leader / board of directors was scores in the high level ($\bar{x}$ = 6.41-6.43), followed by the farmer institution, strengthening of the community, drugs, healthy people in the community, community involvement and related integrated agencies related to indicators. The score was moderate level ($\bar{x}$ = 5.52-6.37) (Table 2 and Figure 1B).

Table 2. Results of evaluation of importance and current conditions of economic, social, environment and infrastructure factors

Economic indicators	I[1/]	Meaning	A[2/]	Meaning	I – A	Order
Economic factor						
1. eating area	9.61	M	5.52	M	4.09	4
2 .food security	9.67	M	6.26	M	3.41	7
3 .income	9.72	M	4.96	M	4.76	2
4 .debt	9.17	M	5.35	M	3.82	5
5 .saving	8.74	M	3.89	L	4.85	1
6 .access to finance	8.00	V	5.28	M	2.72	8
7 .knowledge in career development	8.24	M	6.00	M	2.24	10
8 .product distribution channels	9.20	M	6.48	G	2.72	9
9 .water resources for agriculture	9.65	M	5.52	M	4.13	3
10. related integrated agencies	9.50	M	6.02	M	3.48	6
Social factor						
1. farmer institution	9.50	M	5.52	M	3.98	1
2 .strength of the community	9.30	M	5.93	M	3.37	2
3 .drugs	8.76	M	6.22	M	2.54	8
4 .healthy people in community	9.28	M	6.13	M	3.15	4
5. community rules	9.26	M	6.41	G	2.85	7
6 .leader / board of directors	9.33	M	6.43	G	2.90	6
7 .community involvement	9.30	M	6.37	M	2.93	5
.8related integrated agencies	9.48	M	6.15	M	3.33	3
Environment factor						
1. abundant forest area	9.33	M	7.09	G	2.24	7
.2increasing of forest area	9.24	M	6.67	G	2.57	4
3. soil and water conservation	9.24	M	6.96	G	2.28	6
4 .natural water source	9.20	M	7.11	G	2.09	9
5. community forest	9.24	M	6.54	G	2.70	2
6. risk of natural disasters	8.74	M	5.54	M	3.20	1
7. community regulation on forest land management	8.83	M	6.28	M	2.55	5
.8external threats	7.02	V	4.39	L	2.63	3
9. related integrated agencies	9.33	M	7.17	G	2.16	8
Infrastructure factor						
1. road	9.48	M	6.04	M	3.44	4
2 .water for consumption	9.61	M	6.13	M	3.48	3
3 .electricity	9.63	M	2.59	F	7.04	2
4 .school	9.48	M	6.70	G	2.78	8
5. phone / cell phone signal	9.82	M	6.70	G	3.12	7
6 .internet system	9.15	M	1.70	F	7.45	1
7 .healthy center / hospital	9.46	M	6.13	M	3.33	5
8. related integrated agencies	9.46	M	6.22	M	3.24	6

[1/] Importance Value (I): M = Most importance, V = Very importance
[2/] Assessment value (A): G = Good, M = Moderate, L = Little, F = Few

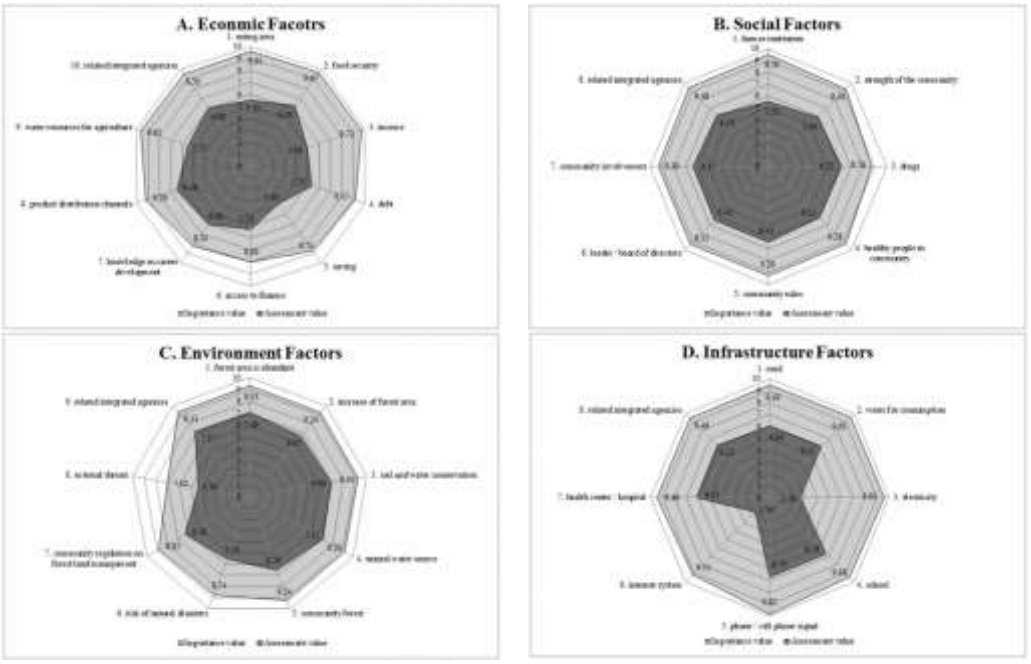

Figure 1. Results of evaluation of importance and current conditions of A. Economic, B. Social, C. Environment and D. Infrastructure factors of the highland development in the Mae Song Royal Project Area

Environment factor

Participating farmers focus on abundant forest area, increasing of forest area, soil and water conservation, natural water source, community forest, risk of natural disasters, community regulation on forest land management and related integrated agencies such as Department of National Parks, Royal Forest Department, at the highest level ($\bar{x}$ = 8.74-9.33), followed by the external threats ($\bar{x}$ = 7.02). The results of the community assessment at the present time, it was found that abundant forest area, increasing of forest area, soil and water conservation, natural water source and related integrated agencies was scores in the high level ($\bar{x}$ = 6.54-7.17), followed by the risk of natural disasters and community regulation on forest land management ($\bar{x}$ = 5.54-6.28) was scores in the moderate level and little level was the external threats ($\bar{x}$ = 4.39) (Table 2 and Figure 1C).

Infrastructure factor

Participating farmers focus all indicators on road, water for consumption, electricity, school, phone / cell phone signal, internet system, healthy center / hospital and related integrated agencies such as Local administration,

Provincial Electricity Authority, at the highest level ($\bar{x}$ = 9.15-9.82). The results of the community assessment at the present time, it was found that the score was at a high level in indicators of school and phone / cell phone signal (x = 6.70), followed by water for consumption, healthy center / hospital and the related integrated agencies of indicators ($\bar{x}$ = 6.04-6.22) and scores were low in electricity and internet system ($\bar{x}$ = 1.7-2.59) (Table 2 and Figure 1D).

Discussion

Developing sustainable indicators under the Mae Song highland development project using Royal Project system

Community-based indicators were syntheses by using intensive group-based conferencing methodology. The indicators were divided into 4 items: economic, social, environment and infrastructure. This was consistent with Ekasingh and Promburom (2010) reported that the development of high-altitude indicators is based on 3 main areas: development of economy, social and resources and environment in the highland. Bring the data to determine the indicators in the important sub-dimensions. The dimension is 6 items including 18 indicators as physic and infrastructure, natural resources, environment, finance, livelihood, human resources, and community strength.

General conditions of highland communities under the Mae Song highland development project using Royal Project system

The highland communities under the Mae Song highland development project using Royal Project system were integrated agriculture both cultivating and raising animals. Consistent with Praneetvatakul and Sirijinda (2005) suggested that highland areas should have a wide range of agricultural systems to produce sustainable agricultural practices. It should also support the activities to maintain the existence of folk wisdom and traditional knowledge of highland farmers in agricultural activities that do not affect the environment. Moreover, the planning of sustainable agricultural production system was under different conditions and context of community. It should take into account the technical and economic efficiency of activities, creation of self-reliant food for the household. There were a variety of plant systems both short-term and long-term for subsistence and sales. Production activities did not destroy the environment and degrade resources (Chaiwinit, 2009; Felix and Judith, 2010).

Sustainable Assessment of Highland Community by Developing Sustainable Indicators under the Mae Song Highland Development Project Using Royal Project System

Economic factor

Sustainable communities will be characterized by a better quality of life, a better ecosystem, more effective governance. It requires a meaningful and thorough participation from people in the community and a stable economic system. Consistent with the concept of sustainable development, the community participates in every step to be self-reliant (Thammajinda *et al.*, 2017). Sustainable communities can manage resources, finance, and responding on needs both current and future by ensuring that resources will be enough and can be shared with future generations of the community (Institute for Sustainable Communities, 2015). Farmers give priority to savings at the highest level. The results of the assessment showed that even though the farmer earns income from agriculture but there were very few, mainly grown for consumption. Nowadays, there were more expenses such as sending children to study etc. Farmers had no savings. The developmental approach must encourage the community to make household accounting, to know the revenue - the true cost, to analyze the solution to the problem.

Social factor

Farmers give priority to farmers institute at the highest level. The results showed that even though the project has a cooperative of the Mae Song highland development project using Royal Project system limited. However, the work area of the project had a very wide scope. Farmers were not able to reach the service of the cooperative. Development of cooperative will have to work more aggressively, entered the village to invite members to participate in cooperative activities.

Environment factor

Farmers give priority to natural disasters at the highest level. The assessment found that the community recognizes the importance of natural disasters, due to the steep mountain area, there was a clear agricultural area. The problem was often landslide water. The project needs to raise awareness for the community to reforest 3 forests, 4 benefits in steep areas to reduce the problem.

Infrastructure factor

Farmers give priority to the internet system at the highest level. It found that the area was experiencing a lot of problems including phone / cell phone

signal, which has some areas caused communication problems. Consistent with Bhandari and Grant (2007) reported that Community sustainability must be developed in all dimensions to suit the community and area conditions in the economic, social, environment. This research also focuses on infrastructure because the highland communities also have a growing need for infrastructure.

The Sustainable Development of the Mae Song highland development project using Royal Project system

The results of community Assessment of the Mae Song highland development project using Royal Project system found that the community needs to be developed in all factors, including economic, social, environment and infrastructure, in order for the community to develop sustainment (Table 2 and Figure 1). It can be divided into 3 phases.

Economic factor

Community development for sustainability in Phase 1: The project area was far away and transportation was difficult. Most of farmers grow rice for consumption and keep the forest for subsistence. Most communities still do not have access to a variety of career options. The project must promote new career choices for the community and be appropriate for the social environment of the community. However, most of the areas lack water distribution for agriculture. The project must prepare the community first to make the community income and save money to be immune to the community.

Community development for sustainability in Phase 2: Eating area was limited and the area was conserved forest. The project must develop a knowledge-based community in various occupations. Especially, the using of less space but very rewarding, for example planting in a greenhouse system, to make income and reduce debt by integrating with related agencies such as the Royal Forest Department.

Community development for sustainability in Phase 3: Encourage the community to gain continue knowledge of their careers, preparing about funding for career development. It also supports the knowledge of finding a product distribution channel of the community itself to achieve sustainability. Firstly, production for consumption and the output is sufficient to follow the market mechanism.

Social factor

Community development for sustainability in Phase 1: Community development was strengthened by promoting the establishment of farmers'

institutions such as Cooperative, Cooperative Group. The community can live by itself and can plan production, marketing and transportation through the group system and ask for support from outside agencies such as Cooperative Promotion Department, The Community Development Department etc.

Community development for sustainability in Phase 2: Focus on building leaders in the area to be strong and have the capacity to contribute to community development. The development must be from community leaders first to serve as a role model for the community. It also has to encourage the community to take care of their health. Although, the area to use the less chemical but area adjacent to neighboring countries are also many major diseases such as malaria, dengue fever etc.

Community development for sustainability in Phase 3: Focus on the community to strictly follow community rules and improving the rules keep up to date to prevent problems within the community. Especially, the drug problem is a major problem in the community. Although, it found the few in the community but the community is in the area adjacent to Omkoi district, Chiang Mai province. Opium cultivation is also found.

Environment factor

Community development for sustainability in Phase 1: The community area within the project is steep with high erosion. It is necessary to promote the planting of vetiver grass in risky areas. Promoting of community Forest Planting in degraded forest, especially 1st in 1A of conservation area by encourage farmers to have a better understanding of forest plantation. It also supports the community to help prevent external threats, especially those who illegally cut trees, set up a committee to oversee and divide the responsibilities of the forest inspection.

Community development for sustainability in Phase 2: Community should focus on soil and water conservation, increasing of forest area including the maintenance of natural resources and environment. These are the answer to sustainability in the highlands. The project has to continue to support, such as organizing activities 3 forests 4 benefits, forest plantation, forest village plantation etc.

*Community development for sustainability in Phase 3:*Most of the communities are in the Mae Moei conserved forest and National Park. The project must coordinate the integration between the community to create cooperation between residents in the area with law enforcement agencies to cooperate and help maintain the natural resources and the natural water sources.

Infrastructure factor

Community development for sustainability in Phase 1: The community in this area, although not electricity, using the alternative energy from solar cell, there is pone signals some area but the community is paying attention to the internet signals. Even though they are remote communities, they have access to the internet system. However, electricity and water for consumption are important. The project should be coordinated with responsible agencies such as Provincial Electricity Authority, Department of Groundwater Resources, to help the community meet the basic needs.

Community development for sustainability in Phase 2: The project should develop road for communication because most of the roads are 95%, characterized by soil roads, especially the transport of agricultural products. It is very important to work as well as to travel to the health center by integrating with the Local administration, Department of Rural Roads etc.

Community development for sustainability in Phase 3: Encourage the community to recognize and appreciate the importance of education. It is very important for community development both formal education and non-formal education.

Conclusion

Sustainability assessment of the highland communities from the developing sustainable indicators had a strong focus on 4 factors, including 35 sustainable indicators under the Mae Song highland development project using Royal Project system. Overall, the community was sustainable at a moderate level, except for environment factor sustainability. Except for the environment factor was a good level. The development of community in the highlands that should be considered in the planning of community development was the first as infrastructure. The second was the economic, social and environment, respectively. However, in the development process, it is very important to consider other related factors. So, it is suggested that community development should take into account the needs of the community that are essential. This will help the community to be stronger, manage itself and contribute to the sustainability of the community.

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