

Year 5

Year 3

Climate Change, Trees and Livelihood:

A Case Study
on the Carbon Footprint of a Karen
Community in Northern Thailand



This case study was written by
Northern Development
Foundation (NDF)
and the Huay Hin Lad
community with support from
Oxfam-GB



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Introduction

Global climate change is increasingly affecting the agricultural sector of Thailand in various ways, manifested by worsening drought, floods, and irregular rainfall. All these are additional risks to livelihood activities, resources, food security, and thus may lead to an increase of poverty.

Thailand ratified the UNFCCC on 28 December 1994 and ratified the Kyoto Protocol on 28 August 2002. The Office of Natural Resources and Environmental Policy and Plan (ONREP) has been designated as the national focal point on climate change under the UNFCCC.

The Thai government designated the ONREP to draft a national master plan on climate change in the form of a ten-year work plan starting from 2010 to 2019 with the following three strategies:

- Creating the ability to cope and adapt to the effects of climate change
- Promoting involvement of all sectors in reducing greenhouse gas emissions and increasing carbon sinks based on sustainable development
- Integrated management of climate change

In this master plan, forest is one of the highlighted sectors, particularly in strategy number 2. A specific project under strategy 2 has direct reference



to the promotion of REDD plus activities. The Cabinet is yet to approve the master plan. Further, the ONREP is reviewing the master plan based on the demands of the civil society.

Traditionally, sustainable agricultural and natural resource management included integrated and organic farming, agroforestry, shifting cultivation, and community-forest management with the full and effective participation of the community. The highland peoples have promoted these activities as an alternative strategy to adapt to and mitigate the impacts of climate change, including enhancing food security for farming households, communities, and societies.

For decades, highland peoples have been accused of deforestation, destroying natural resources, burning grass and causing forest fires that is resulting in carbon emission. In addition, they are also accused to be “forest intruders” and to practice “backward” and “destructive” agriculture. Consequently, highland communities are increasingly subjected to government policies, guidelines and other measures that are formulated without their participation but with serious implications for them. These policies have thereby not taken into account their concerns and specific conditions, including their effective strategies to combat adverse impacts of climate change.

At present, several highland communities have attempted to establish cooperation with local governments to promote sustainable natural resource management through their age-old sustainable practices. The practices

include community forest and land management, agricultural development, and community forest fire control and prevention. These activities, which are still being practiced by highland communities, have enabled the continuous development of their traditional knowledge with capacities to manage their natural resources sustainably and to ensure food security.

This case study aims to cover two main topics:

- The production patterns in agroforestry, shifting cultivation, and community-forest management in relation to greenhouse gases, natural resources, and climate change
- The role and contributions of community practices of agroforestry, shifting cultivation, and community-forest management to mitigate global warming and impacts of climate change.

The villages of Huay Hin Lad community in Wieng Pa Pao district, Chiang Rai province were selected as a pilot area for the research.

Research objectives

- 1) To study production patterns in agroforestry, shifting cultivation, and community forest and their potential to ensure food security and sustainable livelihoods of highland communities
- 2) To study the potentials and capacity of community forests to absorb greenhouse gases in comparison to the emission of greenhouse gases from their production patterns
- 3) To conduct a comparative study of resource consumptions between Thai and other societies
- 4) To propose appropriate policy change that supports effective management of agroforestry and community-forest management to ensure food security of small scale farmers in the highlands while contributing to climate change mitigation

Research methodology

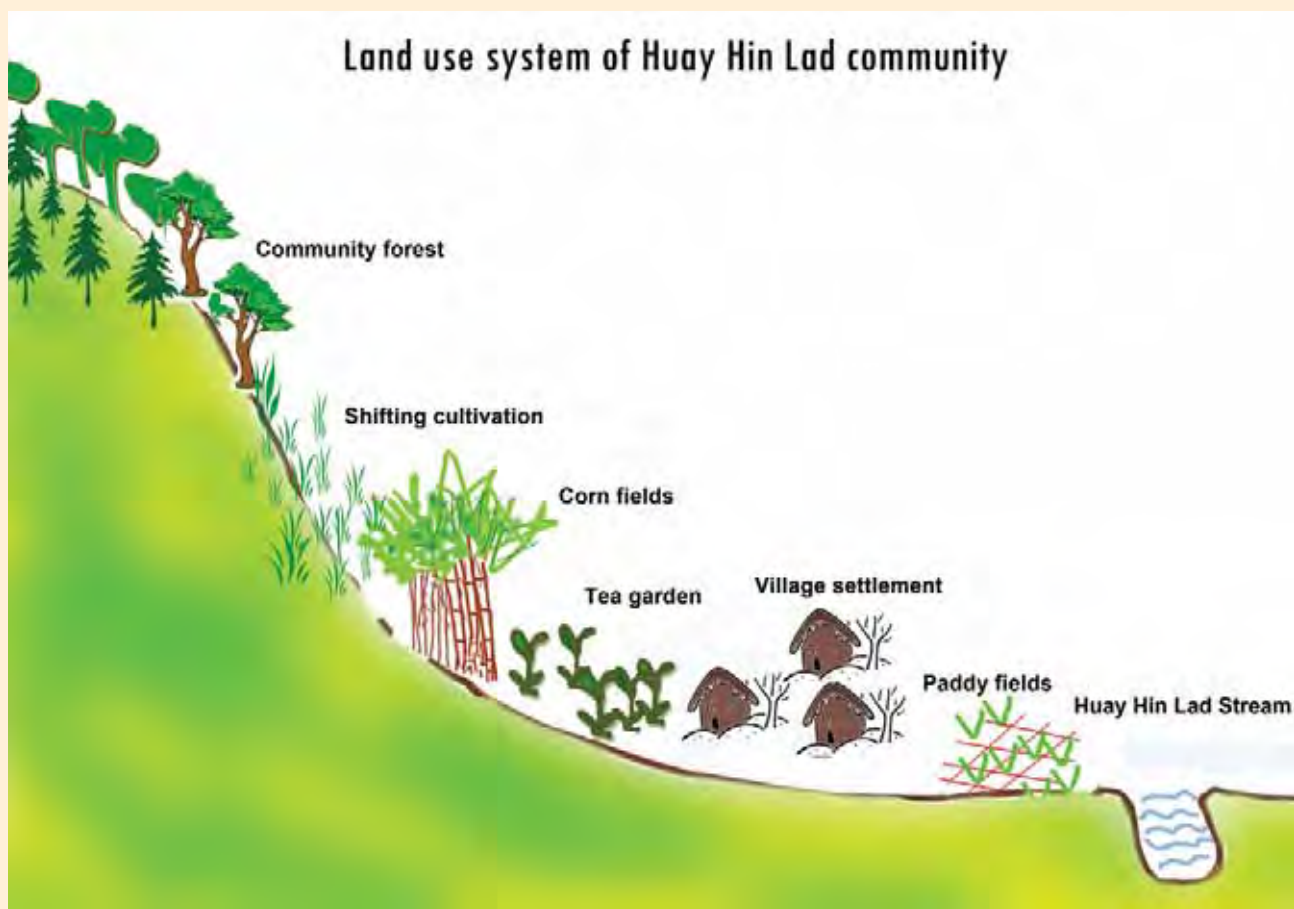
- 1) Review documents related to patterns, practices, and impacts of agroforestry, shifting cultivation, and community-forest management that help reduce the risks of climate change and food security in the research areas
- 2) Analyze the potentials of greenhouse gases from agricultural production and natural resource management in target communities by integrating reliable information and statistics
- 3) Analyze the benefits and potentials of sustainable agriculture in the form of shifting cultivation and community-forest management, which is an adaptable mechanism to mitigate climate change

Expected outputs

- 1) Comprehensive understanding of the advantages of sustainable agriculture to reduce the risk of climate change and increase food security
- 2) Alternative models of sustainable agriculture and investment for climate change adaptation and mitigation through sustainable agriculture and highland community-forest management
- 3) Recommendations for appropriate policies relating to greenhouse gases emission, climate change and promoting participation of highland peoples in forest management

Production pattern of the community in the research area

The Huay Hin Lad community lives in Moo 7, Pong sub-district under Wieng Pa Pao district, of Chiang Rai province. They belong to the Pgakenyaw, one of the Karen tribes. Their ancestors moved in the early 1990s from Mae Chang Kao watershed to Huay Hin Lad watershed and formed the Huay Hin Lad community. At present, the Huay Hin Lad community is organized into one administrative unit (called “Moo”) in accordance with the Thai local administrative system and is comprised of three hamlets: Hin Lad Nai, Pha Yuang, and Hin Lad Nok. The hamlets, with a population of 252 and 48 households, are located in between the National Forest Reservation area and



Khun Jae National park. It is a part of the upper Lao watershed. Huay Hin Lad is situated 30 kms to the South-West of Wieng Pa Pao town, or 130 km away from the provincial capital Chiang Rai. One can easily travel to the area through inter-provincial highway No. 1150, which links Wieng Pa Pao district to Prao district in Chiang Mai province.

The community is nestled in a hilly areas from where more than 14 small streams originate and flow into the Huay Hin Lad stream. Water from this stream flows into Mae Chang Kao river, which is a branch of the Lao river. For centuries, the Mae Chang Kao watershed was known as the old land of Pgakenyaw.

Upland rice farming is a substantial activity of the Huay Hin Lad community. Growing rice, tea and some commercial crops, and gathering forest products are their major economic activities. Community forest covers 19,498 rai¹ (3119.68 hectares), while agricultural land is approximately 3,547 rai (567.52 hectares). The community's livelihoods depend largely on natural resources; therefore, they have high respect for nature, which is the key to their peaceful living as well as sustainable livelihoods. Practices in sustainable natural resource utilization are based on valuable experiences and local wisdom of their ancestors as well as the awareness of the community members and organization that fully participate in the management.

In 1986, the Thai government allowed the Chiang Rai Tham Mai logging company to operate in the Khun Jae area, which included the Huay Hin Lad community. Sacred forests such as Deh Paw and the community's cemetery were destroyed in a span of few years. The villagers tried to restore their forest by constructing a fire break line and formulating community rules and regulations for forest management.

In 1992, the area was declared Khun Jae National Park and the villagers were ordered to leave their community. The villagers joined force with other ethnic groups who faced similar problems and formed the Northern Farmers' Network (NFN) to fight for their rights to retain their lands. As part of the national-level Assembly of the Poor, they conducted a series of protest actions until they were allowed to stay in their own villages.

From 1993 to date, the Huay Hin Lad community has maintained rules and regulations to manage their natural resources. They have a community-forest committee, community map and have carried out various activities on natural resource management, such as constructing fire break lines, for maintaining sustainable livelihoods.

Although the Huay Hin Lad community has not yet directly felt the impact of climate change, the emerging situation and response at the global level have compelled Thailand to form state policies and measures relating to climate change mitigation and adaptation. Aggressive policies and measures enforced by the Thai authorities have increasingly affected local production and community-forest management. These measures have put the community at the risk of losing their land and preventing them to continue their sustainable livelihood activities.

The Huay Hin Lad community, in cooperation with the Northern Development Foundation and Oxfam Great Britain, has initiated a study on “Climate Change, Trees and Livelihood: A Case Study on the Carbon Footprint of a Karen Community in Northern Thailand”. The study aims to raise public awareness on highland production patterns, which, as the study concluded, do not contribute to the problem of climate change. In fact, highland agricultural practices and community-forest management have strong capacities to help sequester greenhouse gases, and at the same time ensure food security and sustain the community’s livelihoods.



Shifting cultivation: Production pattern and sustainable livelihood

Shifting cultivation is primarily a production pattern that has been integrated and adapted to a particular ecology and culture. Generally, a shifting cultivation field in Thailand produces a variety of indigenous food crops for local consumption.

The Huay Hin Lad community plants various crops on a shifting cultivation farm. A farmland is cultivated for only one year, after that, the land is allowed to naturally restore the forest and the fertility of the soil and is cultivated again only after six to ten years. Therefore, the actual area cultivated in a year is very little compared to the total area available for farming. In a year, only 150 rai (24 hectares) out of a total 1,590 rai (254.4 hectares) of farmland in the community is used for shifting cultivation. Hence, it is only 10 % of the total farmland, or in other words, each family utilizes 4-5 rai (0.64 – 0.8 hectares) for shifting cultivation in a year.

According to the shifting cultivation calendar, every February a suitable piece of land is selected and the trees are cut to clear the land for farming. (Conventionally, the trees are cut but a 50 cm long stump is kept so that the trees branch out and bear fresh leaves after the harvest.) After the land is cleared, farmers let the woods and weeds dry under the sun. Then around late March to early April, when the woods and weeds are completely dry, the farmers set them on fire just before the first rain. It should be noted that a couple of days before burning, the whole community properly plans the fire. The right time to start the fire is from 3 pm to 5 pm when the sunlight is dimming; at this time, the woods and dry weeds burn easily and the fire is not too strong. The flame is directed downwards and inwards to the center of the farm plot in order to prevent the fire from spreading; the burning takes only about 1-2 hours. A week after burning, farmers collect the remaining woods from the burnt area for firewood. Initially, farmers grow short-term crops such as taro, tapioca, pumpkin, sugarcane, corn, etc. to secure enough food for the family during the rice growing period.

Rice as the main crop is normally sown in May. Traditionally, before sowing, farmers perform a particular ceremony to pay their highest respect to the Rice Spirit because they believe that doing so is auspicious and brings good harvest. Mixed seeds of rice and vegetables are dropped into holes. The vegetables have different bearing periods and farmers keep harvesting various kinds of food until rice is ready to be harvested towards the end of October and early November. After harvesting, the farmland is used for animal grazing where cattle graze on dry rice straw, grasses and herbs. Later, the soil and the forest are left to rehabilitate naturally with no agricultural activity for the next 6-10 years.



Varieties of crops from shifting cultivation fields



Cropping calendar of shifting cultivation in a year

Community forest: Conservation of natural resources – conserving a way of life

The Huay Hind Lad community's livelihood practices are closely dependent on natural resources and connected to their reverence for nature. Therefore, the forest is very important for their sustainable existence. Community forests provide the basic needs of the community, including food, herbs, firewood and timber for building houses. Additionally, it is also their source of income through means, such as collection and selling of non-timber products, including bamboo shoots and bamboo worms. Therefore, forest conservation means sustaining and securing the lives and livelihood of the community.

Ecologically, Huay Hin Lad is good for tea production, which is a major source of income for the community. Teas in Huay Hin Lad are naturally grown in the forest where the community has reserved a certain area for tea planting. It represents a sustainable production where farmers are able to collect tea leaves all year round. Each type of tea has its specific method of collection. For example, to collect green tea, farmers need to pick only three leaves from the tip, while for white tea, farmers need to collect only a leaf and sell the rest to produce Chinese tea. In the past, the community members were advised to replace their native tea with Oolong tea because it has more monetary value in the market. However, the community declined because such tea rely heavily on fertilizers and chemicals.





Traditional agroforestry farming has never destroyed the ecological balance because people have carefully used forest resources. For instance, they observe the life cycle of the native bamboos in order to sustainably use them. In traditional bamboo harvesting, farmers annually gather only the first two pairs of bamboo shoots exposed over the soil from each bamboo clump in July and August. They keep the last pair of bamboo shoots, which will bear in September, for reproduction in the next season. To ensure long-term usage of the bamboo worm, which is one of the favorite foods of the Northern people, farmers cut only the specific bamboos that have worms inside. In addition, there are defined protected areas for conserving the bamboo worm.

Another example is collecting honey. Normally, farmers collect honey from March to May. To collect honey, they quietly climb up a tree and collect honey without burning their honeycomb or killing the bees. One of the community regulations require community members to set aside a certain amount of their income from collecting and selling products as contribution to the community fund for community forest management.

From February to April, farmers collectively build firebreak to prevent seasonal forest fires.. They form a group of guards to collectively prevent fire and monitor the fire situation. Communities have also formed a strong network to oversee their watershed. Traditionally, highland peoples believe that the watershed area is a sacred and respectful place. People are not allowed to do farming in this area because they believe that the spirits reside in the



*Wildlife sanctuary area;
animals' residence, hunting is
prohibited*

area. Therefore, forest conservation is basically a community value that has been implemented until to date.

Besides agroforestry, shifting cultivation, and collecting forest products, farmers in Huay Hin Lad Nok have commercially grown corn for their income for more than 20 years now. To grow corn, farmers prepare land in March, sow in May, and harvest in September. After harvest, the land is not used for five months to allow the land to regenerate. According to corn production statistics, only about 20 kg of chemical fertilizers and 2.5 kg of herbicides are used on a rai of land (the total land area for corn plantation is 585 rai or 93.6 hectares). Of the three hamlets, Hin Lad Nai does not use fertilizers at all. Pha Yuang has started using some fertilizers, and Hin Lad Nok uses the most amount of fertilizers for commercial corn production.

Research finding on Food Security and Ecological Footprint: Low-consumption and low-emission community

Huay Hin Lad community's production is a mixture of self-sufficient and commercial agriculture. The community's major sources of income are from selling tea leaves, forest products, corn, and livestock. Annual average income per family is 43,783 Thai baht¹¹, while annual average expenditure per family is 35,540 Thai baht. It was also found that each family incurs an average debt of 15,474 Thai baht per year (see Chart 1). The main cause of debts is agricultural



Foods harvested from the village farms and surrounding forest



Foods imported from markets

investment, particularly for corn plantation for which farmers often need to take loans from businessmen.

Further, analysis of the structure of incomes and expenses in each hamlet revealed that Hin Lad Nai and Pha Yuang have annual savings (an annual surplus of income over expenditure) of 10,862 Thai baht and 6,488 Thai baht respectively, per family. However, in Hin Lad Nok, the famers end up with a deficit, i.e. they are indebted with an average of 22,827 Thai baht. This proves that even though Lad Nok had relied minimally on chemical inputs for commercial corn production, it is still harmful for the food and economic security of the community.

Food security in Huay Hin Lad is strongly based on a diversified production system and local livelihoods. Information related to consumption patterns demonstrate that 92% of the food comes from household production and natural sources, while the rest, 8%, comes from markets outside the community. The community is able to produce enough rice from both paddy and upland farms. The community also produces more than 100 different varieties of vegetables, out of which 90 varieties are from shifting cultivation. Farmers raise animals for household consumption and there are 28 kinds of meat available within the community. 70% of the source of meat is from within the community, while 30% is from outside the community (see in Chart 3). Out of the staple food (rice, tubers and vegetables), 53% is derived from paddy fields, while 34% is from shifting cultivation and the rest are from forest and tea plantation (see in Chart 2).

Table 1: Income, expense, and debts of Hin Lad Nok, Pha Yuang, and Hin Lad Nai in year 2008

Community name	Average (Baht/Year)					
	Gross Income	Gross expense	Gross Debt	Net Income	Saving per household per year	Saving per head per year
Hin Lad Nai	883,260	643,605	55,000	184,655	10,862	1,986
Pha Yuang	164,430	112,803	12,700	38,927	6,488	1,180
Hin Lad Nok	1,053,873	949,509	675,050	- 570,686	- 22,827	- 4,529
Total	2,101,563	1,705,917	742,750	- 347,104	- 7,231	- 1,377

Chart 1. Comparison of income, expense, and debt per family in Huay Hin Lad community (Hin Lad Nai, Pha Yuang, and Hin Lad Nok villages) in year 2008

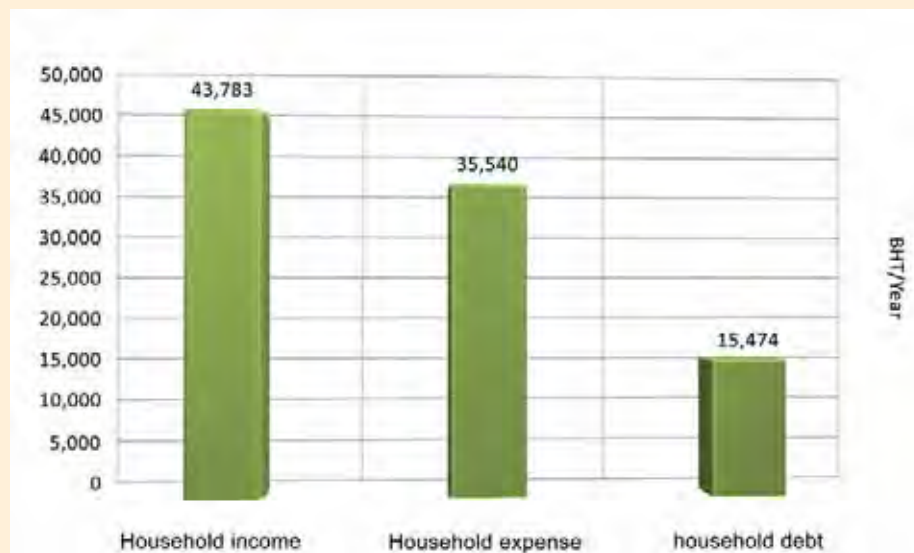


Chart 2. Source of staple food (rice, tubers and vegetables) in Huay Hin Lad community in year 2008

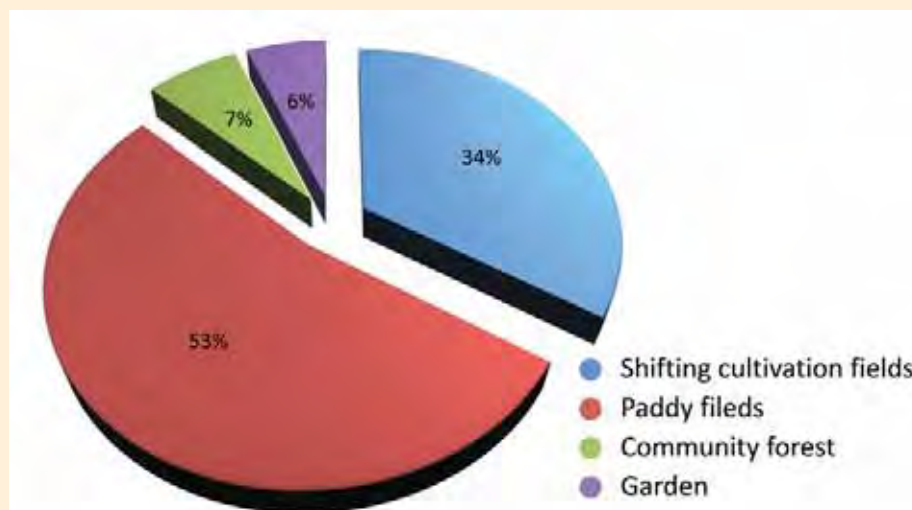
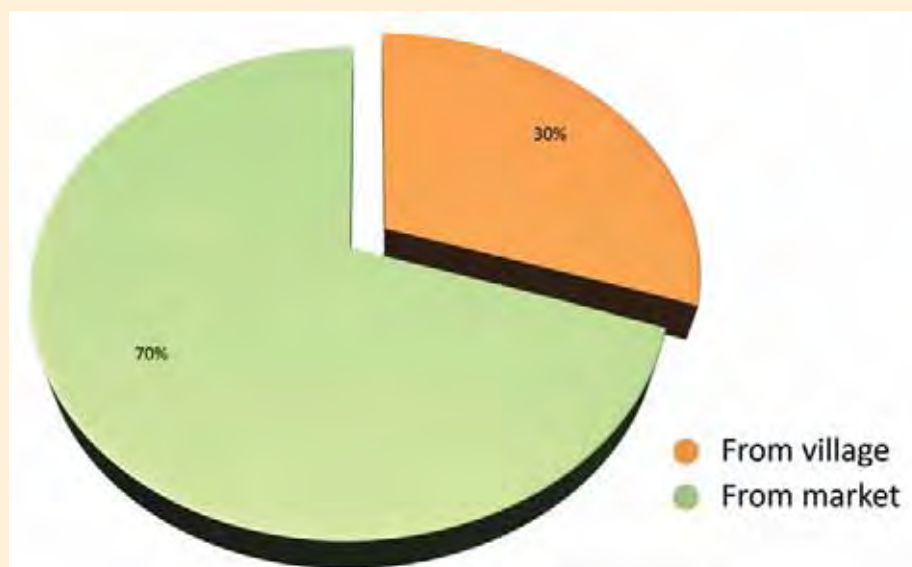


Chart 3. Source of meat for community consumption in Huay Hin Lad community in year 2008



In terms of energy consumption, the research found that the community consumed substantially less energy than urban communities. They use energy primarily for cooking and warming their houses during the cold season. The community is not connected to the public electric power grid but they have their own solar panels for electricity, although the supply generated is very limited. The villagers also require fuel for motorbikes and a few cars.

For cooking, most community members still use firewood, for which they collect dried branches or trunks from the forests. The ratio of firewood consumption is 2 cubic meters per head, per year. Meanwhile, timbers are cut for house construction, around 1 cubic meter per family, per year. Each family consumes about 24 liters of gasoline and 19 liters of diesel annually.

In total, the ecological footprint^{III} of Hin Lad Nai, Pha Yuang, and Hin Lad Nok are 3.80, 3.35, and 2.65 rai (0.61, 0.54 and 0.4 hectares) per head respectively. The available area for community consumption is approximately at 112.32, 139.67, and 49.28 rai (17.97, 22.35 and 7.88 hectares) per head respectively (see in Chart 5).

Accordingly, their consumption is much lesser than the resource carrying capacity of the villages. Hence, the community consumption has not been harmful to the ecological balance. The size of the ecological footprints of the Thai people in general is around 10.63 rai (1.70 hectares) per head. However, the area available to meet people's consumption needs is only about 6.88 rai (1.10 hectares) per head. It can be concluded that overall, the average Thai has a much higher consumption level than the villagers of Hin Lad Nai, Hin Lad Nok, and Pha Yuang. The ecological footprint of an average Thai is three to four times that of the Huay Hin Lad community. For further comparison: the average ecological footprint in the United States is 56.25 rai (9 hectares) per head, while the area can supply only 28.00 rai (4.48 hectares) per head (see in Chart 4). While certainly more pronounced in the US, empirical incidences show that there is over-consumption in both countries, which is destroying the ecological balance.

Chart 4. Comparison of ecological footprints of Hin Lad Nai, Pha Yuang, and Hin Lad Nok with Thailand and the United States



Shifting cultivation and community forest help to mitigate greenhouse gases



*Quality of rehabilitating farms
of shifting cultivation between
1-5 years*

Farm activities induce emission of greenhouse gases, which consist of Methane (CH_4) from paddy field, Nitrous oxide (N_2O) from applying chemical fertilizers, and carbon dioxide (CO_2) from burning. However, these gases are absorbed by green vegetation and agricultural plants.

According to international forestry expert Dr. Jurgen Blaser, typically during the period of restoration, forests require huge amounts of carbon to reproduce stems and new leaves. It is for this reason that rehabilitating forests have high capacity to sequester CO_2 . Therefore, shifting cultivation farms, rehabilitating plots in particular, definitely have high potential and capacity to absorb CO_2 . As they grow, plants transform CO_2 into atomic carbon, which is one of the main building blocks of plant tissue. When burned or decomposed, carbon is again released as CO_2 .

The study found that the community has effectively managed and utilized their forest based on community-forest management. The total forest area of the three hamlets is around 19,498 rai (3119.68 hectares). According to the standard calculation of capacity to store carbon, the whole community forest area is able to store 661,372 tons of carbon.

Out of the total agricultural area covering 3,548 rai (567.68 hectares), 1,590 rai (254.4 hectares) can be categorized as shifting cultivation farm, 226 rai (36.16 hectares) as paddy fields, 982 rai (157.12 hectares) for tea plantation, 132 rai (21.12 hectares) of fruit orchard, 585 rai (93.6 hectares) for corn plantation, and 33 rai (5.28 hectares) for animal grazing. The study found that the agricultural areas of Huay Hin Lad community are potentially able to store 59,255 tons of CO_2 . All together, both community forest and agricultural lands have the capacity to store as much as 720,627 tons of carbon (see in Table 2). On the other hand, about 0.8 ton of Methane is produced from paddy fields and 0.1 ton of Nitrous Oxide is produced from using chemical fertilizers in corn farms.

Annually, a total of 2,042.46 tons of CO₂ equivalents are released into the atmosphere from community agricultural activities. This is composed of 1,745.33 tons from burning shifting cultivation rice fields, 249.33 tons from burning corn fields, 16.8 tons from paddy fields, and 31 tons from using fertilizers in corn plantation (see in Table 3). In conclusion, CO₂ emission from community activities is very low as compared to the community's capacity to store carbon.

Further, burning of shifting cultivation farms is accused of causing air pollution in the Northern region and contributing to climate change. However, the research has proved that shifting cultivation farms, including active and rehabilitating farms aged 1 to 10 years, have actually stored 17,643 tons of CO₂ while burning produced only about 476 tons of carbon (which is equivalent to the 1,745.33 tons of CO₂ mentioned before). Furthermore, increasing fallow years increases the capacity to store carbon. For example, a one year old fallow is able to store 12 tons of carbon per hectare, while a ten years old fallow has the capacity to store 152 tons of carbon per hectare (see in Table 4).

Table 2: Capacity of carbon storage in Hin Lad Nok, Pha Yuang, and Hin Lad Nai

Area	Rai	Hectare	%	Capacity on Carbon Storage		
				(Ton of Carbon/ Hectare)	Carbon Storage (Ton)	%
Community forest area	19,498	3,119.68	84.25	212	661,372.16	91.78
Hin Lad Nai	9,527	1,524.32	41.17	212	323,155.84	44.84
Pha Yuang	4,323	691.68	18.68	212	146,636.16	20.35
Hin Lad Nok	5,648	903.68	24.40	212	191,580.16	26.59
Agricultural area	3,547	567.52	15.33	-	59,254.84	8.22
Paddy field	226	36.16	0.98	25	904.00	0.13
Shifting cultivation	114	18.24	0.49	25	456.00	0.06
Rehabilitating forest (age 1-10 years)	1,476	236.16	6.38	(See in Table 4)	17,167.00	2.38
Tea plantation	982	157.12	4.24	179	28,124.48	3.90
Fruit orchard	132	21.12	0.57	158	3,336.96	0.46
Corn plantation	585	93.60r	2.53	99	9,266.40	1.29
Animal raising field	33	5.28	0.14	-	-	-
Residential area	98	15.68	0.42	-	0.00	0.00
Hin Lad Nai	24	3.84	0.10	-	-	-
Pha Yuang	6	0.96	0.03	-	-	-
Hin Lad Nok	68	10.88	0.29	-	-	-
Total land area	23,143	3,703	100.00	-	720,627.00	100.00

Table 3: Emission of greenhouse gases from activities in Huay Hin Lad community in year 2008

Activity	Carbon Dioxide (Ton)	Other Gases (Ton)	Carbon Dioxide Equivalents Per Year (Ton)
Burning rice field	1,745.33	-	1,745.33
Burning corn field	249.33	-	249.33
Growing paddy rice	-	0.8 (Methane) ¹	16.80
Applying urea fertilizer in corn production	-	0.1 (Nitrous oxide) ²	31.00
Total			2,042.46

1234

Table 4: Comparison of the capacity of carbon storage and carbon emission by shifting cultivation in Hin Lad Nai, Pha Yuang, and Hin Lad Nok in year 2008

Year in cycle	Area		Carbon stored (above-ground and soil carbon) ³		Area burned		Carbon emitted (80% of above-ground carbon) ⁴	
	Rai	Hectare	(Ton / Hectare)	Ton	Rai	Hectare	(Ton / Hectare)	Ton
Active year	114	18.24	25	456	-	-	2.3	-
Fallow Year 1	199	31.84	12	382	-	-	-	-
Fallow Year 2	187	29.92	27	808	-	-	-	-
Fallow Year 3	172	27.52	43	1,183	-	-	-	-
Fallow Year 4	153	24.48	59	1,444	-	-	6	-
Fallow Year 5	135	21.6	74	1,598	-	-	11	-
Fallow Year 6	202	32.32	90	2,909	5	0.80	17	14
Fallow Year 7	93	14.88	106	1,577	69	11.04	22	243
Fallow Year 8	125	20	121	2,420	11	1.76	28	49
Fallow Year 9	101	16.16	137	2,214	14	2.24	34	76
Fallow Year 10	109	17.44	152	2,651	15	2.40	39	94
Total amount of Carbon stored				17,643	Total amount of Carbon emitted			476

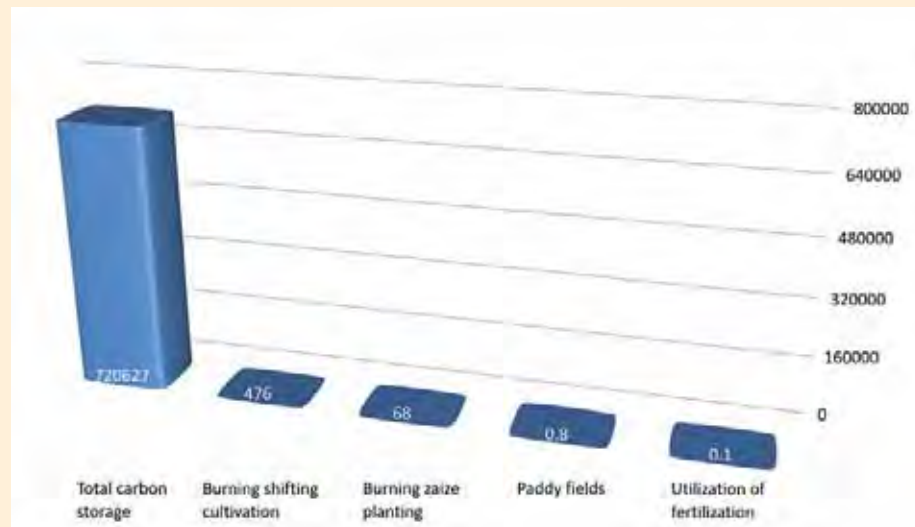
¹ 1 methane molecule can cause global warming equivalent to 21 CO₂ (IPCC, 1995)

² 1 nitrous oxide molecule can cause global warming equivalent to 310 CO₂ (IPCC, 1995)

³ The amount of carbon stored includes both above-ground and soil carbon. Values were calculated on the basis of the study by Thomas (2004). 3-year fallow: total 50.7 t/ha (47.8 soil, 2.9 above-ground); 6-year fallow: 76.2 t/ha (60.1 t/ha soil, 16.1 t/ha above ground); 10-year fallow: 158.4 (107.4 t/ha soil, 51 t/ha above-ground).

⁴ The amount of carbon emitted was calculated on the basis of an estimate of actual vegetation burned and thus above-ground carbon released, which was estimated to be about 80% of the total above-ground carbon. Soil carbon remains unaffected.

Chart 5. Comparison of carbon storage and carbon emission by farm activities in Hin Lad Nai, Pha Yuang, and Hin Lad Nokin year 2008



Conclusion



Ways of life and agricultural patterns of highland peoples do not contribute adversely to climate change. On the contrary, traditional livelihood practices of these peoples are helping to balance the ecological system, effectively mitigate the adverse impacts of climate change and maintain a sustainable food security. The research has proven three major points:

- Farming activities of the Huay Hin Lad community cause little carbon emission: only 476 tons of carbon (1,745.33 tons of CO₂) from shifting cultivation fields and 68 tons of carbon (249.33 tons of CO₂) from corn production. Rice fields release only 0.8 ton of Methane (16.80 tons CO₂ equivalents) and corn fields release 0.1 ton of Nitrous oxide (31 tons CO₂ equivalents) from using urea fertilizer. The community's capacity (total) to store carbon is 720,627 tons (equivalent to 2,642,299 tons of CO₂). Annual carbon emission therefore is only 0.08% of the carbon stored.
- Consumption pattern of the community is low, both in terms of food intake and utilization of natural resources for various purposes. Community consumption is properly managed through their sustainable resource management system that is regulated and guided by their beliefs, wisdom and community regulations. The community has respectfully and continually practiced and celebrated this way of life, which is manifested in their ceremonies. Therefore, the size of the ecological footprint of their way of life is very small and sustainable. Or it can be simply said that the community's consumption level is much below the carrying capacity of its natural resources. Such consumption pattern helps to balance the ecological system.
- Considering the ratio of food sources in households, it is seen that the community prefers locally produced food over commercially processed food. Most food and vegetables are locally grown through shifting

cultivation and other farming systems. There are many different varieties of plants grown in shifting cultivation fields. According to a study of Sombat and his team (2004), shifting cultivation has promoted food security of the highland peoples in three aspects:

- No chemical is used in shifting cultivation, all plants are grown naturally. Therefore, food products from these farms are safe for consumption and even healthier.
- Different harvesting periods for different crops in shifting cultivation ensure that families have adequate food throughout the year.
- Shifting cultivation is a self-sufficient system; the community is able to produce food on their own and minimize food expenses. Therefore, shifting cultivation is precisely the means of their food security and is highly valued by the highland peoples.



Recommendations

The research findings show that the highland peoples living closely with nature in the highlands have strong potentials and capacity to sustain their self-reliant economy and consumption pattern. This is achieved by effective management of their agricultural systems, forest and natural resources. The research team endorses the protection of the rights of the highland peoples to sustainable natural resource management, in accordance with the Thai Constitution, especially for communities with proven record of accomplishment. Also, the research team urges the establishment of creative mechanisms to resolve conflicts between the Government and indigenous communities with the participation of community and community-based organizations.

The research team recommends the following:

1) To build mutual trust with the community organizations of the highland peoples, the Government should reconsider and stop aggressive measures that negate the rights of the highland peoples like the expansion of National Park areas and arresting or eviction of the villagers who have originally lived there. They should improve accountability and involve the communities in decision making on projects that might adversely affect the local livelihoods.

2) Government and concerned authorities should respect and support the role of the communities in natural resource management by recognizing traditional farming systems and indigenous knowledge to sustain the ecological system. The rights to live on and utilize the land, including communal land tenure should be legally recognized to ensure community land security and reduce conflicts between Government and communities. These measures will also encourage highland communities to pay attention and adjust their production patterns that are moving towards commercial mono-cropping which will generate food insecurity and lead to destruction of natural resources.

3) Promote indigenous knowledge and techniques of sustainable agricultural practices of the highland peoples including agroforestry, sustainable shifting cultivation, and community-forest management. Also, allow the community to identify proper production patterns that suit their contexts and conditions in order to build food security, reduce poverty, and mitigate climate change.

4) For a long-term solution, laws relating to forest management should be reviewed towards the incorporation of the community rights of highland peoples. Communities and community networks should be able to manage and get benefits from their participatory natural resource management. Building cooperation through participatory process between the Government and the community is the appropriate way to build sustainable livelihoods.

5) A mechanism for the full and effective participation of the highland peoples in decision making on matters that affects them especially relating to their land and resources, livelihood activities, mitigation and adaptation measures and policies relating to climate change among others should be established at the local and national levels.

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Endnotes

- I 6.25 rai is equivalent to 1 hectare
- II 1 US dollar is equivalent to 30 Thai baht
- III The ecological footprint is a measure of human demand on the Earth's ecosystems. It compares human demand with planet Earth's ecological capacity to regenerate. It represents the amount of biologically productive land and sea area needed to regenerate the resources a human population consumes and to absorb and render harmless the corresponding waste. Using this assessment, one can estimate the sustainability of a given lifestyle or ecological pressure (footprint) it exerts on the environment of a given village such as in the case of Huay Hin Lad.

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Asia Indigenous Peoples Pact



Norwegian Agency for Development
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International Work Group for
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