



Food Insecurity and Adaptation of Highland Communities in the North of Thailand

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Abstract

There had been an ongoing concern about food security. This article used document analysis to investigate the factors of food security, the risks of food security and adaptation to such risks, from research reports relating to food security of highland communities in Mae Hong Son Province, Thailand. The result indicated the four factors explaining food security: natural resources, local wisdom, beliefs in supernatural beings, and socio-culture of sharing. In contrast, the risks of food security consisted of the growth of commercial agriculture causing contaminated food, natural resource degradation and climate change affecting food accessibility and uncertain production, and the change of community livelihoods relating to sustaining food from generation to generation. The adaptation of highland people to these risks included focusing on more organic agriculture to protect natural resource and obtain safety food, managing food sources to access food sufficiently, and reviving and transmitting local wisdom for food sustainability. However, it required the encouragement of external agencies.

Keywords: Adaptation, Food Security, Highland Communities, Natural Resource Depletion

Introduction

Human depended on natural resources or ecosystems to serve basic needs; more than two million people live in the forests and use them as food sources, land used in forests for cultivation, and medicinal plants (Pye-Smith, 2005). Historically, traditional communities settled along the Rift Valleys of East Africa, notably in Tanzania, Kenya, and Ethiopia and has spread over virtually the entire land surface of the planet: Africa, Europe, Britain, Japan, New Guinea, Australia, North America, South America, Ireland, Caribbean, Polynesia, Madagascar, and New Zealand (Goudie, 1993). They were hunters and gatherers who learned how to exploit ecosystems to support their lives based on local knowledge and experience (Barrow, 1999). For example, indigenous people in Native America consumed animals for food and clothing (Howard, 2002) and traditional aboriginal people cultivated vegetables and plants to survive in their settlement (Pyle, 2003).

Globalization coming with development and increase of population accelerated inappropriate uses of natural resources to maximize income from natural resources for

replacing and insufficient use to satisfy basic requirements (Sponsel and Natadecha-Sponsel, 1995). Over-exploitation, deforestation, and commercial agriculture mainly caused degradation of natural resources which affected cultivation land, food production and food supply (Pinstrup-Andersen and Pandya-Lorch, 1998). Hence, food crisis was critical global issue; approximately one in eight people or more than 827 million people were likely to suffer from chronic hunger and health problem (FAO, IFAD and WFP, 2013). Food security has been also discussed since 1970 and will remain in challenges over the next fifty years (Rosegrant and Cline, 2003; Sajin, 2009). To protect food, agriculture, and natural resources, International Food Policy Research Institute (IFPRI) determines a 2020 Vision (Pinstrup-Andersen and Pandya-Lorch, 1998): a world where every person has economic and physical access to sufficient food to sustain a healthy and productive life, where malnutrition is absent, and where food originates from efficient, effective, and low-cost food and agricultural systems that are compatible with sustainable use and management of natural resources. This implies the need for change and adaptation, otherwise, food consumption, production,



and distribution will exacerbate community health and well-being (Feenstra, 1997).

In Thailand, traditional people in prehistory had subsistence livelihoods and produced variety of food based on natural resources (Santasombat, 2005). For example, the majority of early northern, ethnic people, moved in the forests on the highland for hunting, gathering, and growing rice and vegetable to support families (Rerkasem and Rerkasem, 1994). Then, the era of economic development forced the growth of commercial and industrial agriculture which affected food security. The insecurity of production system relating to the changes of policy, economy, society, and politics became national problems: increase of production cost, labor crisis, decrease of self-reliance from commercial agriculture, degradation of natural resource for production, gas imports, free trade agreement (National Health Commission, 2012). In addition, the abilities of agriculturalists to rely on self-food production were merely 29.74, less than self-reliance index in Korean and Japan (Chevavithee Foundation, 2010). Limnirankul et al. (2011) indicated that sufficient food and low nutritious diet concerned Thai people, especially in the countryside of the north and northeast. Most of them hold small cultivation land and lived in remote area and underdeveloped transportation. In Chiang Mai, the proportions of food security in plain and highland area were 32 and 59 per cent, respectively. The countryside people also had high proportion of insufficient nutrition, 30-60 per cent.

This article examined the experiences of food security and adaptation of highland people by documentary research. Focus was made in research reports relating to food security of highland people in Mae Hong Son Province, Thailand. Most highland people at Mae Hong Son province lived and relied on natural resources in the forests and valleys on highland. They also needed to adapt to the changes in food sources based on natural resources. The highland people mentioned here include ethnics: Tai Yai at Pang Moo Village, Muang District; Lua at Pa Pae Village, Mae Sa Rieng District; and

Pa Kwa Kur Yor at Ta Ta Fang Village, Mae Sa Rieng District. An explanation is sought as to: what factors explained food security, what were the factors explaining the risk of food security, and how did highland people adjust to the risk of food security.

Methods and Materials

Documentary research was used to address the aim of this article. It was the analysis methods of texts in any documents by categorizing, investigating, interpreting, and identifying (Mogalakwe, 2006). Research reports relating to food security of highland people in Mae Hong Son were examined, analyzed, and synthesized to describe the factors and the risks of food security, including the adaptation to the risks, as presented in this article. The concept of food security was reviewed and applied as conceptual framework for analysis and synthesis. World Bank (1986) defined food security as a state of individual access to sufficient food physically and economically to serve physical needs for great health and work. FAO (2006): also explained food security in four dimensions: 1) food availability-having sufficient food quality supplied through domestic production or imports (including food aid), 2) food access-the ability to access nutritious diet relating to economy, society, politics, right, and law in community, 3) utilization-adequate food, clean water, sanitation and health care in response to physiological needs, and 4) stability-the competency to access food sufficiently at all times or not risk in losing access to food as consequence of critical situation. However, national local communities provided various aspects of food security (Sustainable Agriculture Foundation, 2011): 1) self-reliance on food such as production, natural food sources, and food exchange, 2) sufficient food and water for feeding family especially core food like rice, vegetables, and meat, 3) dependence on natural resources such as forests, coastal, water sources, and land, 4) the security of occupation and income relating to buying food from market, 5) the production providing food safety and nutritious diet, and 6) culture



and sustainability of food. Hence, the concept of food security involved various definitions and perspectives. This article focused on food security for analysis and synthesis in the context of national local communities which included the ability to access food sufficiently from natural resources, the production for consuming food safety, and socio-culture and beliefs relating to food sustainability.

Results

1. The Factors of Food Security

To answer the first question, the factors explaining food security situation on highland communities at Mae Hong Son province included natural resources which provided food sources, local wisdom to access food, beliefs in supernatural being as natural resources protection mechanism, and socio-culture of sharing.

1.1 Natural Resources

Highland people were able to access food seasonally from natural resources such as forest and water. For example, villagers at Pang Moo Village, Pang Moo Sub-District, Muang District, collected (Passawararajkul, Cheepanich and Hatthawasukul, 2013); 1) fishery products: shrimp, crab, tadpole, fish, shell, local fern and vegetables; 2) forest products: mushroom, bamboo shoot, deer, boar, and herb; 3) rice field products: shell, fish, swamp cabbage, and bitter cucumber. In addition, soil fertility allowed people to grow vegetables and plants on backyard with fruitful products for household consumption: chili, tomato, pumpkin, and long eggplant. Wilderness areas in the forests were also rotated for rice farming for subsistence.

1.2 Local Wisdoms

Traditional knowledge and experience were transmitted to survive on highland area from generation to generation. Highland people knew how to collect food from natural resources in a sufficient and sustainable way. For example, tools for hunting and gathering could trap a small amount of fish and animals such as bare hand and bamboo net. Natural resources were protected and

conserved for further use; managing forest, building fire brake, collecting mature plants to allow young plants grow, and determining rules for using forest and water products. Lua people (Kreasui, Junpeng and Junyuang, 2009) also maintained traditional knowledge about food production especially growing rice, soybean, peanut, vegetable and fruit. They used several kinds of traditional rice seeds and learned how to select seed, prepare land, harvest and keep production, deliberately. In addition, Pang Moo Villagers (Passawararajkul et al., 2013) transmitted knowledge about food preparation, preservation, and processing. All ingredients could be seasonally found in forest, backyard, rice field, and garden. Some kinds of them provided healthy diet and medicinal herbs. For example, mushroom provided better absorption; garlic and pepper relieve flatulence; pandan leaves helped restore heart function and body.

1.3 Beliefs in Supernatural Beings

Food was a part of ceremonies for showing respect to supernatural beings or sacred power. Pa Kwa Kur Yor (Chopkhunkhao et al., 2013) believed that Ta, guardian spirit, was everywhere and needs to be appeased. They performed ceremonies for water, land, and forest in order to ask Ta for blessing their activities and protecting food sources. Lua also worship rice since they believed that rice was alive and sacred power gives them rice. They avoided rice and plant cultivation on the area of big trees especially Bhodi tree where supernatural beings resided. Beliefs and ceremonies, hence, functioned as a tool for protecting food sources to sustain livelihood.

1.4 Socio-Culture of Sharing

Highland people usually shared food and labor in the process of food production in order to serve household demand for food. Hunters and gatherers also hunted animals and collected plants together from forest and water. They sometimes prepared food and had dinner together. Family members of farmers also helped grow and harvest rice of other rice fields until finish season of growing rice. Moreover, culture embedded in societies



emphasized food sharing. For example, Pa Kwa Kur Yor (Chopkhunkhao et al., 2013), believed that visitors needed to have food and drink they provided in order to show honor to house owners. Pang Moo villagers (Passawararajkul et al., 2013) gathered to share jobs and food in social events at temples such as Thai Happy New Year, showing respect to sand pagoda, showering Buddhist statue, and offering food and gifts to monks. Socio-cultural activities and events, ultimately, promoted knowledge sharing and transmission about food while community members gathered and had conversation together. Hence, socio-culture of sharing encouraged more food accessibility and sufficient, including competency of highland communities to sustain food from generation to generation.

2. The Risks of Food Security

This section described the risk of food security on highland communities at Mae Hong Son province which included the growth of commercial agriculture, natural resource degradation and climate change, and the change of community livelihoods.

2.1 Commercial Agriculture

The acceleration of commercial agriculture like garlic, soybean, peanut, sesame, and maize affected agricultural practices on highland communities. The agricultural practices had changed to gain more income to support expense in daily life; from subsistent agriculture to more modern agriculture; from integrated farming to more mono farming, from organic cultivation to more chemical cultivation, and from using local seeds to more commercial seed products (Kreasui et al., 2009). It usually depended upon outside materials for production more than inside materials. To grow maize, seventy five per cent of agriculturalists bought seeds by partial repayment and more than sixty per cent used chemical fertilizers, herbicides and insecticides with monthly repayment (Sukpothiyarn et al., 2013). However, the commercial products and prices were uncertain and uncontrollable leading risky income or economic status of agriculturalists for buying essential food (Srimalee

et al., 2014). Contaminated food from production and natural resources by chemical substances also affected highland people health which caused losing money to cure illnesses (Jitsawang, Sirichart and Pinta, 2010a). Hence, the change to commercial agriculture implied the risk of highland people to access safety food sufficiently.

2.2 Natural Resource Degradation and Climate Change

Highland people tended to overuse natural resources to serve demand for income rather than sufficient use to serve household basic needs. Modern technology was extensively used to collect forest and water products. For example, chemicals substances were used to stun fish and cut plants at the end of its root. Consequently, food from natural resources was contaminated and soil contamination decreased the growth of plants for feeding families. Felling trees and burning forest for maize cultivation at Pang Ma Pa and Mae Lai Noi District also damaged thick forests which were the sources of food and water (Makawan et al., 2010). Mae Surin village, Khun Yuam district indicated that the decrease of food from natural resource was 62.5 per cent (Viangsang et al., n.d.b). In addition, climate change affecting rainfall implied the risk of food accessibility and sufficiency. For example, highland people at Pa Jareoan, Pang Ma Pa district and Mae Surin village, Khun Yuam district indicated that drought decreased agricultural products for household consumption and commerce providing income to buy food (Viangsang et al., n.d.a; n.d.b). In some areas, flooding damaged rice fields and orchards, for example, it occurred at Ta Ta Fung village, Mae Yuam sub-district, Mae Sa Riang District in 2010 (Srimalee et al., 2014). Ultimately, uncertain climate was able to diminish the ability of highland communities to feed themselves.

2.3 The Change of Community Livelihoods

In the era of development and urbanization, the livelihoods on highland communities had been changed to imitate more urban livelihoods. To earn more income to support more expenses, most highland people had



various occupations: performing agriculture, doing business, selling land, and working for wages. They would rather buy food than share and collect food from forest and cultivation land. At Pang Moo villagers, Muang District (Passawararojkul et al., 2013), the rate of buying food increased around 49.9 per cent while as the rate of using food from cultivation land decreased 25.5 per cent and the rate of collecting food from natural resources was only 13.2 per cent. However, uncertain economic status was not able to ensure sufficient food to feed families (Viangsang et al., n.d.b). Fifty five per cent of Mae Surin people also did not ensure whether food they bought was contaminated (Viangsang et al., n.d.b). In addition, focusing on earning income led more highland people to work outside communities especially young people which weakened beliefs relating to protect natural resource and socio-culture of sharing food. For example, Pang Moo village (Passawararojkul et al., 2013), Pa Jareoan village (Viangsang et al., n.d.a) were able to access food by socio-culture only 11.4 and 6 percent, respectively. Hence, the change of community livelihoods affecting beliefs, societies, and culture was the risk of food security including food accessibility, food sufficiency, and food sustainability.

3. The Adaptation to the Risk of Food Security

Document analysis indicated that the adaptation of highland people to the risks of food security included change from chemical agriculture to organic agriculture, food management, and revival and transmission of local wisdom relating to food. It involved the encouragement of external agencies. For example, Thailand Research fund (TRF) focused on collective learning process to empower the competency of self-problem solving in communities. Sustainable agriculture network, Mae Hong Son province, helped connect organic agriculturalists and marketing. Department of agriculture official educated agriculturalists about organic agriculture.

3.1 Changing to Organic Agriculture

Highland people gradually changed from chemical agriculture to organic agriculture, which focused

on using more organic fertilizers, herbicides and insecticides. It aimed to protect food sources from natural resources, to conserve and revival soil, water and forest for sustainability of food production, and to ensure having safety food for feeding family sufficiently. At Mae Sa Rieng District, sixty six agriculturalists reduced chemical substances for cultivating some kinds of plants like soybean and maize (Jitsawang et al., 2010b). To increase income relating to access safety food sufficiently, organic agriculturalists also required to make production plan like cost analysis and expected yield to predict yields and gain profits. In addition, they had to connect agriculturalists and several market places to sell products such as door to door market, local market, and wholesale market (Jitsawang et al., 2010b).

3.2 Food Source Management

The result indicated three strategies of food source management to ensure food security for survival on highland communities.

- ***Growing variety of plants for healthy household***

This strategy was found at Pang Moo Village, Muang District, where was promoted to cultivate local organic vegetables and plants for household consumption: chili, sweet basil, hot basil, tamarind, and cilantro (Passawararojkul et al., 2013). These plants provided various nutrition and therapeutic substance leading family members to be healthy. For example, chili was an excellent source of vitamin C and A, and it helped stimulate body function of digestive system. Basil was an excellent source of vitamin A and calcium, and it could relieve cold and headache. Importantly, organic practices helped prevent absorption of toxic substances into the body.

- ***Establishing guarding team***

At Mae Ukor Luang, Khun Yuam District (Chopkhunkhao et al., 2013), a guarding team was voluntarily established to monitor food from natural resources. This team kept recording plant and animal species which people usually collected for household



consumption. Each person responded to a plant or animal species, for example, Mr A – mushroom, Mr B – bamboo shoot, Mr C – reptiles, and Mr D – poultry. All data collected was used to plan and manage food accessibility and utilization of highland communities.

- **Natural resource management**

Since they realized that water, land, and forest were important factors of food security, some highland communities established a group of people to manage and conserve natural resources which encouraged the right of people to access food. For example, the Committee at Mae Ukor Luang Village, Khun Yuam District, organized regular meetings to share and discuss natural resource problems, to determine fishing zone and the rule for using natural resources, and to monitor the area of food sources (Chopkhunkhao et al., 2013). They also managed activities for food and natural resource conservation; a ceremony for water and fish house. In addition, the network of agriculturalists for natural resource management at Huay Poo Ling Sub-District, Muang District, prohibited mono-cultivation in order to sustain forest function and food source (Sukpothiyarn et al., 2013). They also emphasized maintaining local wisdom for subsistence well-being and sufficiency economy.

3.3 Revival and Transmission of Local Wisdom

The following strategies had been performed to revive and transmit local wisdom for food sustainability of highland communities.

- **Encouraging knowledge sharing**

At Ta Ta Fung village, Mae Sa Riang district (Srimalee et al., 2014), meetings were essential to motivate knowledge sharing about local heredity plants: seasonal cultivation, harvest, preservation, reproduction, cost and profit. These meetings were organized in three levels; household level which helped inherit knowledge within family members and relatives; community level which encouraged knowledge transmission among community members and; network level which provided knowledge sharing between community members and people outside community. In network meeting, people

were able to gather a group of local seed conservation to seek out and conserve endangered local seeds. In addition, these meetings helped stimulate awareness of valuing local heredity plants leading to cooperation in revival and conservation from generation to generation. At Pa Pae village, Mae Sa Riang district (Kreasui et al., 2009), schools cooperated with community members to help educate young people. They managed and designed learning activities local plants and gardens for students in particular subjects and courses. Ultimately, the more extensive use of local seeds from knowledge sharing reduced the risk of self-reliance on food since local seeds could provide more fruitful products.

- **Establishing educational center**

Highland communities established an educational center to revive and conserve community livelihoods relating to food sustainability. For example, Ta Ta Fung village, Mae Sa Riang district established the learning center of local heredity plants which provided directory and knowledge about local heredity plants for community members and people outside communities (Srimalee et al., 2014). This center allowed community members to borrow local seeds for cultivation from collection of local heredity plants. Other communities were also able to share and exchange their local seeds with community members in order to continue developing and transmitting knowledge of local seed. In addition, the villagers at Pang Moo, Muang district (Passawararajkul et al., 2013) developed the educational center for knowledge transmission about: local food, agricultural practices, collecting food in forest and water, food processing, natural resource management and conservation, local heredity plants, villagers' livelihoods, local beliefs and culture, and food management in farming area. They mobilized funding from community members and external agencies to supply local seeds for cultivation. A small farm was also organized in the area of a school where students were able to learn local cultivation, cooking and sharing food.



Discussions

Humans have constantly interacted with natural resources in order to survive since the settlement of primitive societies (Bennett, 2005; Stoffle, Toupal, and Zedeno, 2003). In this sense, household food security relied on hunters and gatherers (Burnet, 1970); early Aboriginal Australia followed seasonal experiences seeking out food: plants, vegetables, fruits, berries, and animals (Noorden, 1990). People also needed to show respect and appeasement to their natural settings (Drew, 1983), expecting reciprocity from sacred power for protecting natural resources as food sources. In Thailand, forest people in Nan and Phrae Province offered food to, and have spiritual practices for, forest spirits, ancestor spirits, and ghosts (Trier, 1981). The ceremony of “Phi Fai”, guardian spirit of dam who responds to ordain adequate water for rice cultivation, was a common tradition of northern farmers to ask for dam protection from “Phi Fai” to have adequate production through year (Lando, 1983). Sharing or exchange also underlined sufficiency of consumption rather than maximized for profit in Thai society (Norat, 2003). Before the era of development, Thai traditional villagers had informal social connections for food exchange, for example, rice and vegetables or fish and fruit between highland and lowland people (Teerasartsawas, 2003). They preferred to seek out food with a group in the forests and usually shared surplus meat or plants with relatives or neighbors (Satetakul, 2003).

This article indicated that highland communities in Mae Hong Son province maintained traditional livelihoods relating to the factors of food security; natural resources, local wisdoms, spiritual beliefs and socio-culture of sharing. They learned local wisdoms, from previous generation, about how to access and produce healthy food, for household consumption, based on natural resources. It included natural resource conservation and management for food stability. Transmitting spiritual beliefs was also found to ensure food stability; ethnic people believed that supernatural beings resided in

everywhere and they organized ceremonial performances to worship sacred power to ask for protecting water, land, and forest as food sources and cultivation. In addition, there was social dependence engaging with culture of food sharing which implied self-reliance on food and the ability to access food sufficiently and sustainably. Highland people usually shared activities to gather and produce food together. Social events also provided the space of social interaction among highland communities where highland community members were able to share jobs, food, and local knowledge about food.

However, the food security of highland communities in this article had been risky since the change of agricultural practices, natural resources and community livelihoods. The use of chemical substances to serve commercial cultivation contaminated food sources and overusing natural resources to serve demand for income accelerated degradation and depletion of water, soil and forest. Consequently, food accessibility and food production based on natural resources of highland people decreased leading to have insufficient healthy food for household consumption. This situation occurred in the northeast of Thailand, for example, deforestation caused the decrease of cultivation areas and aquatic animals in swamps of several village in Roi Et province decreased due to using intense chemical substances to grow cassava and sugar cane (Sustainable Agricultural Foundation, 2011). In addition, drought situation due to climate change affected the growth of some kinds of plants and caused economic problem, poverty and social conflict (Watkins, 2006). This article argued that climate change affecting drought and flooding in highland communities was able to exacerbate the risk of food stability; low food production affected insufficient food for household consumption and uncertain income for buying food. The change of highland community livelihoods from serving subsistence well-being to economic needs also diminished food accessibility and sustainability based on natural resources and agriculture. Highland people needed to buy more food while their economic status was unstable.



This tendency complied with a report (Sajin, 2009): the decrease of agricultural food products especially rice concerned Thailand and a half of Thai people in rural areas needed to pay more than 60 percent for food.

Importantly, humans are able to adapt to changes and problems in response to their needs (Inud, 2006); the adaptation to the risk of food security was found in this article. In this sense, highland communities in Mae Hong Son province expressed few performances inconsistency with local wisdoms which encouraged by external agencies. Some of them emphasized organic agriculture rather than chemical agriculture in order to revive and maintain healthy food based on natural resources and cultivation. Natural resources were also managed more efficiently since they realized the needs to ensure food accessibility and utilization from natural resources. Moreover, knowledge sharing and educational center were organized as tools for restoring and transmitting community livelihoods and local wisdoms about food from generation to generation. However, other communities adapted to insufficient food by several performances (Sustainable Agricultural Foundation, 2011); providing loan to improve economic needs for buying food temporarily, sharing food and labor in the process of food production, establishing food sources like fishing ponds in rice fields, and distributing food through temples and religious ceremonies.

Conclusions and Suggestions

Food security on highland communities in Mae Hong Son Province was vulnerable to external factors like chemical agriculture, climate change and urban livelihood. The degradation of water, land and forest from using chemical substances and overusing natural resources caused the risky of food accessibility, food sufficiency and food stability. The changing of community livelihoods weakened local wisdoms, beliefs and socio-culture which affected self-reliance on food from generation to generation. The climate change also exacerbated uncertain food products for household

consumption and economic status for buying more food. In response to these risks, natural resources were conserved by changing to organic agriculture while local wisdoms were revived and transmitted by the process of local knowledge sharing and the development of learning center. However, highland communities should consider other suitable performances that improved more efficient adaptation to the risks of food security especially the climate change and the change of community livelihoods. Their competency of adaptation should be strengthened by external agencies.

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References

- Barrow, C. J. (1999). *Environmental management: principles and practice*. London and New York: Routledge.
- Bennett, J. W. (2005). *The ecological transition: cultural anthropology and human adaptation*. New Jersey: Transaction Publishers.
- Burnet, F. M. (1970). Chairman's opening remarks: Human biology as the study of human differences. In S. V. Boyden (Ed.), *The impact of civilization on the biology of man, 11-12 September 1968* (pp. xv-xx). Canberra: Australian National University Press.
- Chevavithee Foundation. (2010). *Handbook of food (in) security and the solution of Thailand*. Bangkok: the Office of Promoting Reformation System for Life Quality of Agriculturalist, Community and Society.



- Chopkhunkhao, P., Mekcheunjai, A., Meeparangdee, N., Chopkhunkhao, C., & Mekcheunjai, P. (2013). *Investigating and restoring sufficient food management of Pa Ka Kur Yor at Mae U Kor Luang Village, Khum Yuam District, Mae Hong Son Province* (Research report). Bangkok: Thailand Research Fund.
- Drew, D. (1983). *Man-environment process*. London and Boston: George Allen and Unwin.
- FAO. (2006). Food security. *Policy Brief, 2*, 1-4.
- FAO, IFAD and WFP. (2013). *The State of Food Insecurity in the World 2013. The multiple dimensions of food security*. Rome: FAO.
- Feenstra, G. W. (1997). Local food systems and sustainable communities. *American Journal of Alternative Agriculture, 12*(1), 28-36.
- Goudie, A. (1993). *The human impact on the natural environment* (4th ed.). Oxford: Blackwell Publishers.
- Howard, G. S. (2002). *How should I live my life?*. Maryland: Rowman & Littlefield Publisher.
- Inud, T. (2006). *Adjustment as an impact of environmental change among residences Mae Tao, District of Mae Sot, Tak Province*. (Master's thesis). Silapakorn University, Bangkok.
- Jitsawang, P., Sirichart, M., & Pinta, S. (2010a). *Managing knowledge to establish partnership integration in the event of sustainable agriculture at Mae Sa Riang District, Mae Hong Son Province* (Research report). Bangkok: Thailand Research Fund.
- Jitsawang, P., Sirichart, M., & Pinta, S. (2010b). *The management of production system and alternative marketing of alternative agriculture network at Mae Sa Riang District, Mae Hong Son Province* (Research report). Bangkok: Thailand Research Fund.
- Kreasui, K., Junpeng, C., & Junyuang, P. (2009). *The transmission and use of heredity plants, Lua people at Pa Pae Village, at Mae Sa Riang District, Mae Hong Son Province* (Research report). Bangkok: Thailand Research Fund.
- Lando, R. P. (1983). "The spirit aren't so powerful any more" spirit belief and irrigation organization in north Thailand. *Journal of the Siam Society, 71*(1/2), 121-148.
- Limnirankul, B., Thong-ngarm, K., Promburom, P., Ekasingh, B., Saengchyoswat, C., Siribut, Y., & Kerdman, K. (2011). Assessment of food security line and poverty line of the rural household in Chiang Mai Province. *The seventeenth seminar report of national agricultural system, 8-10 August 2011* (pp. 346-355). Mahasarakham: Mahasarakham University
- Makawan, K., Phonjamreun, T., Viriyapranee, B., Yanakul, A., & Manotham, P. (2010). *Saving cost of soybean cultivation with alternative agriculture at Ta Song Kuae Village, Mae La Noi Sub-District, Mae La Noi District, Mae Hong Son Province* (Research report). Bangkok: Thailand Research Fund.
- Mogalakwe, M. (2006). The use of documentary research methods in social research. *African SXZociological Review, 10*(1), 221-230.
- National Health Commission. (2012). *Thai people health 2012: food security, money is illusion-food is real (Neugn Thong Khong Maya-Khao Pra Si Khong Jing)*. Nakornpathom: Institute for Population and Social Research, Mahidol University. Retrieved from <http://www.hiso.or.th/hiso5/report/report2012T.php>
- Noorden, P. V. (1990). *Contrasts in living conditions*. Cambridge and Melbourne: Cambridge University Press.
- Norat, C. (2003). *Community economy and welfare*. Bangkok: Thailand Research Fund.



- Passawararojkul, N., Cheepanich, P., & Hathawasukul, Y. (2013). *Food security relating to local food system and nutrition of Tai Yai at Pang Moo Village, Pang Moo Sub-District, Muang District, Mae Hong Son Province* (Research report). Bangkok: Thailand Research Fund.
- Pinstrup-Andersen, P., & Pandya-Lorch, R. (1998). Food security and sustainable use of natural resources: a 2020 vision. *Ecological Economics*, 26(1), 1-10.
- Pye-Smith, C. (2005). *Forests for people and the environment: CIFOR annual report 2004*. Bogor, Indonesia: The Center for International Forestry Research.
- Pyle, R. M. (2003). Nature matrix: reconnecting people and nature. *Oryx*, 37(2), 206-214. doi: 10.1017/S0030605303000383
- Rerkasem, K., & Rerkasem, B. (1994). Shifting cultivation in Thailand: its current situation and dynamics in the context of highland development *IIED Forestry and Land Use Series No. 4*. London: Faculty of Agriculture of Chiang Mai University and International Institution for Environment and Development.
- Rosegrant, M. W., & Cline, S. A. (2003). Global food security: challenges and policies. *Science*, 302 (5652), 1917-1919.
- Sajin, P. (2009). *Report submitted to UNDP Thailand*. Retrieved from http://sathai.org/story_thai/043-FOOD_SECURITY.pdf
- Santasombat, Y. (2005). *Human and culture. The third edition*. Bangkok: Thammasart University Publication.
- Satetakul, R. (2003). *A decade of community economy in the northern Thai village*. Bangkok: Thailand Research Fund.
- Sponsel, L. E., & Natadecha-Sponsel, P. (1995). The role of Buddhism in creating a more sustainable society in Thailand. In J. Rigg (Ed.), *Counting the costs: economic growth and environmental change in Thailand, July 1993* (pp. 27-46). PasirPanjang, Singapore: Institute of Southeast Asian Studies.
- Srimalee, S., Panyakon, P., Koha, Y., Srimalee, T., Panapraisakul., Y., & Samajitarporn., S. (2014). *Investigating and conserving heredity plants of Pa Kwa Kur Yor: a case study of Thai and Burmaat Ta Ta Fung Village, Mae Yuam Sub-District, Mae Sa Rieng District, Mae Hong Son Province* (Research report). Bangkok: Thailand Research Fund.
- Stoffle, R., Toupal, R., & Zedeno, N. (2003). Landscape, nature, and culture: a diachronic model of human-nature adaptations. In H. Selin (Ed.), *Nature across cultures: views of nature and environment in non-western cultures* (Vol. 4, pp. 97-114). Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Sukpothiyarn, S., Sangsanti, A., Wongkereeasakul, S., Chopkhunkhao, P., Klangthin, S., Makhom, S., & Ganthawang, S. (2013). *The development of field corn cultivation and the change of agricultural practices of agriculturalists in Mae Hong Son Province* (Research report). Bangkok: Thailand Research Fund.
- Sustainable Agriculture Foundation. (2011). *Final report: indicators of food security in communities*. Nonthaburee: The National Health Commission Office.
- Teerasartsawas, S. (2003). *Community economy in the north-east of Thailand: the history after World War II (1945-2001)*. Bangkok: Thailand Research Fund.
- Trier, J. (1981). The Khon Pa of northern Thailand: an enigma. *Chicago Journals*, 22(3), 291-293.



Viangsang, A., Sinsaithai, S., Sinsaithai, N., & Viratlertsakul, A. (n.d.a). *Food security within Thai context, Hong Son province. The third series, a case study of Pa Jareoan village, Pang Ma Pa sub-district, Pang Ma Pa district, Mae Hong Son province.* Retrieved from <http://www.sathai.org/autopagev4/files/WFqabBwFri34850.pdf>

Viangsang, A., Vantha, K., Thana, S., Taeonchawan, B., Taeonchawan, C., Varin, J., Wongjam, P., Samueasajjai, K., & Taeonchawan, P. (n.d.b). *Food security within Thai context, Hong Son province. The second series, a case study of Mae Surin village, Khun Yuam sub-district, Khun Yuam district, Mae Hong Son province.* Retrieved from <http://www.sathai.org/autopagev4/files/Egk00uMon20048.pdf>

Watkins, K. (2006). *Human development report 2006 – beyond scarcity: power, poverty and the global water crisis.* Retrived from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2294691

World Bank. (1986). *Poverty and hunger. – issues and options for food security in developing countries.* Washington DC: The World Bank.