Roles of Traditional Ecological Knowledge in the Context of Soil Conservation for Community-based Food Acquisition

Ekarin Phungpracha
Department of Anthropology, Faculty of Archaeology, Silpakorn University
Naphralan Rd. Phranakhon, Bangkok, 10200 Thailand
Tel 090 785 1663, Email: thachinriver@gmail.com

Abstract

The purpose of this paper is to explore roles of traditional ecological knowledge (TEK) in the context of soil conservation on community-based food acquisition for food security can deal with the dynamics of ecosystems. This paper employs both quantitative and qualitative research methodologies. The data was collected from primary sources: in-depth interviews, and participant observations; and secondary sources: published material, related policy documents, and literature reviews. The research methodology uses data from and discusses two case studies of community food systems in two villages in Dansai District, Loei Province, Thailand. The results of this study designate that the roles and capacities of TEK practiced by Dansai villagers is a necessary adaptation to unpredictable pressures. Whenever social and ecological diversity is reduced, food security is at risk. Whenever the flexibility offered by each TEK is curtained, community food acquisition suffers and the community loses its viability and ability to maintain sustainable food production. This study contributes to communities by helping to ensure a sustainable, secure, safe, and sufficient food security.

Keywords: community food systems, food security, traditional ecological knowledge (TEK), soil conservation

1. Introduction

In the early 1960s, many countries developed scientific tools and technologies to enhance grain productivity and agricultural efficiency. This "Green Revolution" led to considerable increases in returns to land, and hence raised farmers' incomes. Moreover, with greater income to spend, new needs for farm inputs and marketing services arouse and, farm families led to a general increase in demand for goods and services. This stirred the nonfarm economy in many areas, which in turn grew and generated significant new income and employment of its own [15]. Nowadays, however, many people around the world continue suffering from malnutrition, starvation, food contamination, and increasing food prices in the so called "food security crisis" [5, 6, 7]. The question that has come about is: What is wrong in the process of agricultural production and food systems, and its relation to food security

Emerging from human activities and natural phenomena, environmental and socio-economic changes are major factors and risks resulting in food insecurity [1, 10]. It is important to highlight also, that after the failure of the Green Revolution's top-down policy and its scientific methods, and policymakers' nescience of TEK, such a crisis manifested and became a prominent situation [15]. For example, the impacts of chemical fertilizer and pesticide use on farms brought about deterioration of soil quality and the health of farmers and consumers. One alternative method to solve the food security crisis, therefore, is TEK [2, 3, 4, 8].

Generally, the definition of TEK is unclear, connected to local knowledge, indigenous knowledge, and traditional knowledge [5, 6]. It is unquestionable that it is a collective learning or a knowledge-practice-belief complex (a tacit knowledge) for sustainability. TEK is concerned with know-how and practices maintained and developed by local people, who have ways of life and history with the natural environment [3]. The social practice of TEK contributes to understandings and interpretations that are part of local people's lifestyles, encompassing language, naming and classification systems, practices for resource utilization, rituals, spirituality, and a

worldview [3, 4]. It, hence, influences decision making of local/indigenous people in various aspects of their everyday lives such as hunting, fishing, animal husbandry, food production, water management, health, and agriculture [7, 12].

For this reason, this research synthesizes roles and capacities of TEK in the context of community food security and soil conservation, focusing on food acquisition, and combining environmental sciences and social sciences. The research methodology: in-depth interviews, participant observations, focus group, and household questionnaires on TEK, gathered data from two case studies of community food systems by sampling 50% of households in two villages, 30 Ban Naweing's households and 80 Ban Huaytad's households, in Dansai District, Loei Province, Thailand. Both communities have been faced by environmental pressures such drought and flood and socio-economic constraints such land use limited. Moreover, the both communities share a non-timber forest, Phu Anglang. In Ban Nawieng, almost all the local people plant wet rice and gather some food and medicine, such as local vegetables, trees, and herbs, from Phu Anglang; whereas many people of Ban Huaytad have switched their land from dry rice plantations to plant mono-crops like para rubber *(Hevea brasiliensis* (A. Juss) Muell. Argtree), and some people have sold some land for tourism reasons. Only a few people in this community continue to plant dry rice.

The methodology also applied secondary sources: published material, related policy documents, and literature reviews.

The aim of this research is to explore the roles of TEK in the context of soil conservation for community food acquisition in order to sustain food security. By looking at one part of the community food system, agricultural food, the research collected and analyzed data from agricultural activities and some ways of life of two communities faced by environmental changes, such as drought and flooding.

2. Conceptual framework

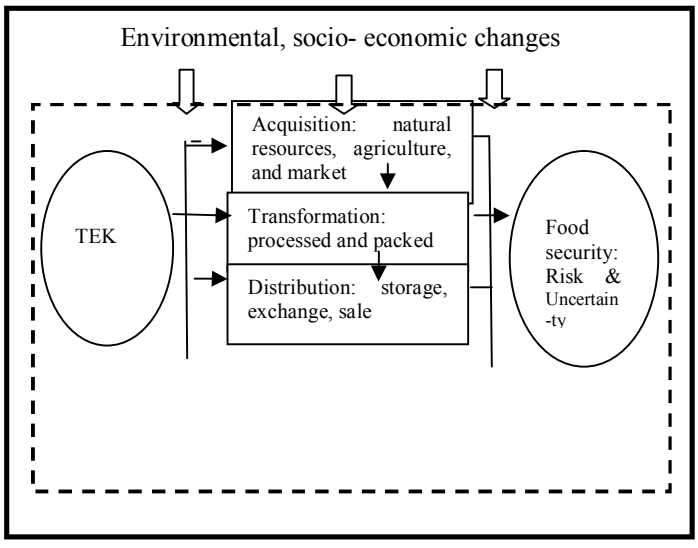
As its conceptual framework, this study applied a model of fuel systems of small scale, wood-based enterprises [14], concentrated on charcoal production and distribution systems from the approach of rapid rural appraisal (RRA). The study, however, adapted and used only the model of wood fuel production made up of three components: acquisition of wood; transformation of wood into charcoal; and distribution of charcoal to elucidate production methods that can contribute to the understanding of community food security.

To apply this framework, acquisition is defined as food resources of communities that local people can access from three sources: natural food, agricultural food, and food from markets. Natural food is food from forests, rivers, and fields and includes wild herbs, trees, vegetables, and animals. Agricultural food is food that local people plant in their communities such as (*Oryza sativa* Linn.), corn (*Zea mays* Linn.), black gram (*Phaseolus mungo* Linn.), and vegetables. Food from markets means food from market places, food trucks, and motorcycles. The process of transformation refers to the process of food ready for use or distribution. Once food is produced, it is either used by the household or transported for use elsewhere. Lastly, the distribution of food within a community and to other communities, and urban areas, storage, exchange, sale, and marketing, is examined. The three components of food production, as a community food system, are portrayed in the centre of Figure 1.

This study focused only on acquisition because the process contributes to the understanding and the basic idea of community food production and community food systems that could be linked with TEK and food security. The study also applies a concept of food security to develop a conceptual framework. The complexity of food security problems required consistent and thorough analysis of the mechanisms that underline specific populations' food security status [13]. Food security, portrayed in the right oval of Figure 1, is the product of many agroecological, socioeconomic, and biological factors, and the concept relating to the idea of risk and uncertainty of food acquisition that local people practised in everyday life such as management of soil, water, weather, agriculture, community forests, gathering etc. to enhance food security.

To integrate the idea of TEK with community-based food acquisition, this study applied Millennium Ecosystem Assessment to understand factors and drivers (environmental and socio-economic changes) which have direct and indirect effects on community, TEK, the process of community food acquisition, and food security [11].

Figure 1: Conceptual framework of TEK for community-based food acquisition [2, 11, 13, 14]



In summary from Figure 1, the left oval (TEK) represents local people's practices of community-based food acquisition. The central oval shows the activities of the community food system and food production. First, acquisition is a kind of food resource and ecosystem service divided into three sources: natural food production, agricultural food, and food from markets. Second, transformation is processed food and packaged food. Third, distribution is about food storage, exchange, and sale and marketing that local people involve in between households, within their community, and with outside communities. As mentioned above, however, this study focused only on the process of acquisition by raising examples of agricultural activities relating to agricultural food and cash crops. The right oval is food security in the context of a local meaning connecting to the idea of uncertainty and risk of food production in context of soil that local people practise.

If the community food system, such as food production, is forced by environmental and social-economic changes, it will directly affect not only community food security, but also the ways of life of local people. For this reason, TEK of soil conservation play import roles in communities by examining problems to help identify suitable practices for investigation, adaptation, and improvement, and to help build greater community food sustainability in the future with a focus on food acquisition.

3. Results and discussions

Ban Naweing and Huaytad villagers have practiced TEK in acquiring food and other ecological services from two main sources: natural forest resources and agriculture in the forms of knowledge systems applicable to diverse organizations, including for example, hunting and gathering, and community forest conservation, agricultural land and crop management, soil conservation, weather knowledge, agricultural activities, water resource management, and more. This study, however, focuses only on TEK relating to enhance the health of soil, one of the fundamental factors that impact directly on the number of crop yields.

As mentioned previously, soil is one of the essential features for the number of crop yields. If the soil of agricultural land is in good health, maybe it can enhance yields. However, the problem of soil fertility degradation results from many agents, particular in the new ways of agriculture of Ban Naweing and Huaytad that have been influenced by the Green Revolution.

In wet rice fields, the quality of soil of Ban Naweing could be seen when farmers transplanted rice seedlings in rice fields. If they are difficult to transplant, it implies that the soil has some problems such as condensed soil partition that poorly absorbs and stores water. Local people understood that this problem resulted from over using chemical fertilization.

After cash-crops became popular a few decades ago, Ban Huaytad villagers changed from their traditional practices to new technological practices. For instance, they used chemical fertilizers and chemicals for killing grasses in the process of planting corn (*Zea mays* Linn.) and they changed from hoes to plow soil to new technology like tractors. Tractors were popular machines that Ban Huaytad villagers used to plow the soil in their farmlands. Although tractors could save time and was convenient for farmers, they paid a lot of money for them (in cases of households that bought them) or paid to rent tractors (in cases where the household did not have tractors). Plowing soil by tractors impacted on the partition of soil, becoming tiny partitions resulting in condensed soil. Hence, when rain precipitates heavily, farmlands are prone to flood. They also tend to suffer from drought as well because the quality of soil deteriorates for water absorption. This situation brought about the degradation of soil fertility. Almost all of

households had suffered from this problem. For this reason, both villagers practice TEK relating to enhance the health of soil: rice terrace, crop rotation, and combination traditional ways and news ways.

3.1 Rice terrace

Owing to different geography, rice terrace could be practiced only in Ban Naweing because village had plentiful watershed and land had not slide too much such Ban Huaytad. Ban Naweing farmers conducted rice terraces in the upper-land. This knowledge contributed to cut down water current flowing from mountain during precipitation and store water from rain for using during the dry season. This practice could control levels of water in their rice fields during cultivation. If too much water flows in this area, farmers will drain the water from their rice fields. If farm lands are prone to drought, they will close clay doors like irrigation, built at the edge of rice fields, to stop water from draining. Obviously, Ban Naweing villagers had high capacity to practice rice terrace to reduce soil erosion and enhance agricultural gain food.

3.2 Crop rotation

Crop rotation was a practice in Ban Naweing and Huaytad. In both villages, some villagers, who had agricultural property in the lower land, also practiced crop rotation such as rice (*Oryza sativa* Linn.), corn (*Zea mays* Linn.), black gram (*Phaseolus mungo* Linn.), and vegetables. They planted these plants after harvesting the rice. They thought that nuts after the rice can improve soil fertility and conservation. The stem of nuts can increase soil fertility, partition of soil for air flow, and encourage earthworms. After nut harvesting, farmers plowed their fields in order to break up the stems to provide natural nutrients for the soil. They believed that this practice can increase soil fertility because from their experience after planting nuts the soil in the fields has a black color and they see increasing rice yields.

3.3 Combination of traditional ways and new ways

As regards soil conservation, Ban Naweing and Huaytad villagers practice many methods. Ban Naweing villagers had high capacity to build rice terraces in the semi-lowland and upper land to cope with soil erosion, employ crop rotations, and did not burn stems of rice after harvesting. Like Ban Naweing in some ways, Ban Huaytad villagers practiced crop rotation and organic farming. Some villagers supplying water all year round could practice crop rotations such as corn, rice, and black beans. For organic farming, a few households blend chemical fertilizers and organic material in their farmland. It is shown that Ban Huaytad villagers have low capacity to practice the knowledge to deal with modernized agricultures. Thus, this knowledge contributed to enhance nutrient soil, decreasing soil erosion, and decreasing of grain products.

As regards soil conservation, Ban Naweing and Huaytad villagers practice many methods. Ban Naweing villagers have built rice terraces in the semi-lowland and upper land to reduce soil erosion. They employ crop rotations such as rice, vegetables, including black grams that could enhance the health of soil. They do not burn stems of rice after harvesting and keep livestock such as cows in their rice fields. Cows eat the stems of rice, grasses, and local vegetables and give manure. These methods can enhance soil fertility because when they plant rice, stems of rice and cow manure are fermented at the beginning of rice cultivation.

Like Ban Naweing in some ways, Ban Huaytad villagers also practice crop rotation and. Some villagers supplying water all year round can practice crop rotations such as corn (*Zea mays* Linn.), rice (*Oryza sativa* Linn.), black gram (*Phaseolus mungo* Linn.), vegetables, etc. For organic farming, some households blend chemical fertilizers and organic material in their farmland.

Based on conceptual framework, hence, the roles of TEK to community-based food acquisition in Ban Naweing and Huaytad had capacities in different ways but they had core values in the same manner to deal with uncertainty situation such environmental changes: drought and flooding, and socio-economic pressures: intensive agricultural chemical using, that faced community food acquisition.

To understating food security, we must concern ecosystem services, such as soil, provided to communities by the ecosystem in which they live. At the same time, in order to enhance food security in a sustainable way, the communities must conserve and revitalize ecosystem services, in the context of soil, of the community just like that of the case of Ban Naweing and Huaytad. Based on

the experiences of the two traditional communities, this study has unveiled a set indexes for assessing its status, trends of, and threats to food security at the community level. As often being stressed by this study, TEK for enhance local food security is not to be seen as static but rather continuing and changing through time and a certain environmental context. TEK has played important roles in helping the communities to adequately examine the problems, identify suitable practices of investigation, adaptation, and improvement, build community food sustainability, develop sustainable ecosystem, and to ensure a sustainable, secured, safe, sufficient, and nutritious food supply.

4. Conclusion

All in all, the roles of TEK have played in securing food acquisition in the two study communities situated in different ecological settings, as discussed previously. It is an attempt to gain a more adequate understanding of the extent to which TEK could enhance an adaptive capacity of the two communities to sustain their food security, in the context of soil conservation. Furthermore, the diversity of TEK practiced by Ban Naweing and Huaytad villagers is a necessary adaptation to unpredictable and highly variable food security faced by environmental pressures and socio-economic changes. Whenever social and ecological diversity of knowledge of soil conservation is reduced, food security is at risk. Whenever the flexibility offered by each role of TEK is curtained, community food acquisition suffers and the community loses its viability and ability to maintain sustainable food production. Hence, TEK plays important roles in communities by examining problems to help identify suitable practices of investigation, adaptation, and improvement, to help build community food sustainability, and to develop sustainable agriculture.

5. Acknowledgements

I wish to thank Asst. Prof. Opart Panya, Ph.D, Assoc. Prof. Pattanee Winichagoon, Ph.D., and Kulvadee Kansuntisukmongkol, Ph.D., for providing suggestions and The Thailand Research Fund (TRF) for funding and grant.

6. References

[1] A.A. Misselhorn, 'What drives food insecurity in southern Africa? a meta-analysis of household economy, studies,' Global Environmental Change, 2005, 15(1):33-43.

[2] Berkes, F. and C. Folke, Linking social the Ecological Systems: Management Practices and Social mechanisms for Building Resilience, Cambridge: Cambridge University Press, 1998.

[3] Bicker, Alan *et al*. (eds.), Development and Local Knowledge: New Approaches to Issues in Natural Resources Management, Conservation and Agriculture, New York: Routledge, 2004.

[4] Bicker, Alan, Paul Sillitoe, and Johan Pottier, Investigating Local Knowledge:New Directions, New Approaches, Burlington: Ashgate, 2004.

[5] Clay, Edward, Food Security: A Status Review of Literature, London, ODI: Research Report, March, 1997.

[6] Collomb, Philippe. Food Security and Rural Development: Seventh World Congress for Rural Sociology in Population, 1990, 2: pp 29-36.

[7] Corway, Gordon R. and Edward B. Barbier, After the Green Revolution, London: Earthscan Publications, 1990.

[8] Grenier, Louise, Working with Indigenous Knowledge, Ottawa: International Development Research Center, 1998.

[9] Huhnlein, H. V., Introduction: Why are Indigenous Peoples' food Systems important and Why do They Need Documentation in Indigenous Peoples' food Systems: the many dimensions of culture, diversity and environment for nutrition and health, FAO: Rome, 2009.

[10] Lal, R. *et al.*, Climate Change and Global Food Security, New York: Taylor & Francis, 2005.

[11] Millennium Ecosystem Assessment, Ecosystems and Human Well-being, Chicago: Island Press, 2005.

[12] Nakashima, Douglas and Marie Roue, Indigenous Knowledge, People and Sustainable Practice, in Encyclopedia of Global Environment Change, Ted Munn (ed.), Chichester: John Wiley & Son, pp. 314-342, 2002.

[13] P. J. Ericksen, 'Conceptualizing food systems for global environmental change research,' Global Environmental Change, 2008, 18(1):234-245.

[14] Panya, Opart et al., Charcoal in Northeast Thailand: Rapid Rural Appraisal of a Wood-based, Small-scale Enterprise. Bangkok: FAO Regional Office for Asia and pacific, 1988.

[15] Shiva, Vandana, The Violence of the Green Revolution: The Third World Agriculture, Ecology, and Politics, Penang: Third World Net Work, 1991.