

Inventing Seeds beyond Neoliberalism?

Small-Scale Farmers in a Nexus of Socio-Environmental Movements in Nan Province, Northern Thailand

Sakkarin Na Nan

Faculty of Social Science

Chiang Mai University

na_nan082@yahoo.co.th

Abstract

The emergence of community-based resource management cannot be simply understood, especially in the recent shifting seed regime of Thailand in the neoliberal era. By employing the concept of neoliberalization of nature, this paper turns to see the connection between neoliberalism, environmental change and environmental politics in order to understand how small-scale farmers in Northern Thailand are integrated into contract farming for hybrid seed production under global seed companies and conservation of agro biodiversity under socio-environmental movements. By this, an emerging question for socio-environmental movements with anti-neoliberalism is whether the community-based seed management in such circumstances can be grasped as the “commons versus private.” To say more, there are ambivalences of common and private domains in seed management as well as the invention of natures amongst actors like seed companies, state agencies and NGOs under the neoliberal era. The main discussion of this paper is that the socio-environmental movements might help in re-claiming the farmers’ rights to access to plant genetic resources by raising the value of the commons and sustainability; however, the movements, in some ways, still position farmers in the opposition of “public versus private.” Thus, it leads to the limits of understanding how farmers conserve and utilize the plant genetic resources in multiple political spaces in the neoliberal era.

[Thammasat Review, Volume 17, No.1, 2014]

Keywords: Neoliberalization of Nature, Globalized Seed Industry, Contract Farming, Socio-Environmental Movements, Northern Thailand

Sakkarin Na Nan is grateful for the Office of the Higher Education Commission for granting a PhD scholarship. The Challenges of Agrarian Transition in Southeast Asia (ChATSEA) Project and Assoc. Prof. Dr. Robin Roth are appreciated for supporting research grants. The researcher would like to thank Assist. Prof. Dr. Chusak Wittayapak, Assoc. Prof. Dr. Robin Roth and Prof. Dr. Yos Santasombat for their academic and personal advices during this research.

Introduction

“Why is conserving seeds so important? Seeds are carriers of genetic diversity that contains the building blocks required for plant breeding and thus constitutes the basis of all food and agricultural production in the world.” (The Development Fund, 2011, p. 4)

“A central icon of our time, the gene is simultaneously a material object and an ideology, full of political, economic, spiritual, individual, and societal content.” (Hubbard, 2003, p. 8)

Although “peasant societies” cannot be used as a model to explain the modern societies, in particular here the Southeast Asian countries (Elson, 1997), many social science studies illustrate the capacity of people in managing plant genetic resources in relation to biodiversity in different ecosystems (see Conklin, 1957, Dennis, 1987, Lowe, 1999, Laungaramsri 2001, Tanabe, 1981, Santasombat, 2003, Santasombat, 2008, Zimmerer, 1996). Seeds and plant varieties are, in fact, related to people in many social aspects such as class, gender, local knowledge and environmentalism. The management of some plants like rice, corn, rubber and coffee is, if not always, experienced as a part of the population governing projects under the state before the rise of neoliberalism in the West around 1970s. This aspect can be shown in many studies (see Daniel et al., 1992, Geertz, 1963, Scott, 2009).

In Thailand, Rosset et al (1999) studied about small-scale farmers in the Northeastern region becoming contractual producers for hybrid ⁽¹⁾ tomato seeds under rural restructuring. Significantly, he notes that, in contrast to scientific studies of hybrid seeds, there are fewer critical social science studies focusing on the growth and control of the agri-business, in particular the transnational hybrid seed industry on farmers, while Thailand is one of the production sites for high value commodities, such as processing food and seeds for the world market. Under the political economy perspective, it seems that Rosset et al (1999) do not concentrate on the environmental changes and socio-ecological movements.

However, when attempting to explore social science research on the commons in order to explain about seed management of farmers, this study found few works. This phenomenon seems different from the amount of research in the common pool resources like land, water and forest and the calling for “community’s rights” as the alternative model for sustainable resource management, not just the state and private regime. Furthermore, seed management is rarely found to be a main research issue of Thai social scientists who are interested in the commons even though the conflict on genetic resources, like the intellectual property rights and biopiracy has been a hot issue for decades (see Robinson, 2007).

This study employs the political ecology perspective in order to grasp farmers’ seed management under the process of neoliberalization of nature (see Bakker, 2005, Castree, 2008, Heynen and Robbins, 2005). Neoliberalism is criticized in terms of primitive accumulation or accumulation by dispossession, by many scholars (Glassman, 2006, Hall, 2012, Harvey, 2005). Yet, as McCarthy and Prudham (2004, p. 275) note, the connections between neoliberalism, environmental change, and environmental politics are less investigated while neoliberalism is criticized in political, economic and environmental problems. By this, ‘nature’ under neoliberalism exists, not outside, but inside the capital accumulation. Undoubtedly, plant genetic resources as part of biodiversity can be seen as a space for new forms of governance under both logics: commodification and conservation (Lockie, 2009, McAfee, 1999). For example, when neoliberal states implement their conservation programmes, the process contributes to a space of unevenness, transforming some resources to specific commodities and excluding some social groups from access under the market environmentalism (Harvey, 2006). Not only can expansion of the agri-business to the rural areas show accumulation at the landscape level, but claiming ownership in new plant varieties can also illustrate the capital accumulation at a deepening scale – genetic level of living things (Kloppenborg, 1988, McAfee, 2003, Peekhaus, 2011, Prudham, 2007).

Control of resources and privatization of plant varieties do not take place without any critiques and resistance. This can be conceptualized under what Polanyi called double- movement, when social groups rise up against the market logics. Significantly, seed diversity becomes a political assemblage recently found in many socio-environmental movements against the agro-industrial model (DaViÀ, 2012, Zimmerer, 2009). However, the socio-environmental movements are found, in part, to share some direction of neoliberalism – the efforts to reduce state intervention under socially embedded regulations (McCarthy and Prudham, 2004). One of

contradicted aspects, according to Zimmerer (2009), is found in the community-based resource management and participation programmes applying the neoliberal tools like financial mechanisms increasing the incentive of farmers to behave as a commodity producer and, at the same time, an environmental conserver. Zimmerer sees this aspect found in the socio-environmental movements as soft neoliberalism.

On the ground, seed manipulation of farmers under neoliberal era shapes their livelihood landscape and thus re-shapes the linkage of the seed industry and plant variety conservation at the same time. In this space, imageries of seeds and peasantry are also contested amongst actors with different values, knowledge and power. Seeing neoliberalism as a process in relation to socio-natural changes can help in investigating two important phenomena simultaneously shaping the seed manipulation of local farmers: (1) integration of farmers into a contractual labor under the globalization of the seed market and (2) the rise of socio-environmental movements that construct the environmental subject. Thus, in response to socio-environmental movements, seeing the seed management of small-scale farmers under opposition between private and common regimes is too simple to understand the resource management of farmers in the neoliberal era. This, in fact, involves a multi-scalar, place-based historical process interacting with a broader context in which neoliberal schemes and resistance are embedded.

A village in Nan Province, Northern Thailand was selected for this study. The village becomes integrated into contract farming for vegetable seed production under global seed companies. Under this condition, global seed companies can shape production in the rural landscape. In the same village, NGOs are linking the farmers to socio-environmental movements for farmers' rights advocacy to plant genetic resource management. The initiative of NGOs in Nan is part of international socio-environmental movements for seed conservation and re-claiming seeds as commons (see Navdanya, 2012, p. 116). In this sense, the changing rural landscape of seed manipulation cannot be understood just only for local subsistence. In fact, understanding of seed management in this circumstance can help us in seeing Thailand's rural areas in terms of economical, political and environmental changes under the neoliberal era.

With the political ecology approach, this study focuses on the small-scale farmers' production of seeds in circumstances of both conservation and commoditization as the contradictory neoliberal environmental governance. The study relies on several sources of both quantitative and qualitative information, such as field observation, questionnaires, interviews, texts, and online databases. The

intensive fieldwork was conducted during 2011-2013. For collecting baseline data, a village survey was conducted and 56 households were randomly selected. Then Microsoft Excel was used to compile the data sets for the descriptive statistics and simple cross-tabs. Some farmers were also interviewed for better understanding about their response to market integration and socio-ecological movements. This data is useful, as the empirical evidences, in understanding the limits of neoliberal development and the politico-ecological possibilities as well as constraints of small-scale farmers to engage with other actors. The names of some people and places have been changed to create anonymity to protect them.

There are four main parts in this paper. First of all, the growth of the globalized seed industry is contextualized for understanding the existing neoliberalism in Thailand. Secondly, the case study village is brought into light in order to show how farmers are integrated into the space of the global seed market. In this production landscape, property relations are shaped and reshaped among actors such as farmers, field staff of seed companies, and nonhumans like crops. Then, influences of the socio-environmental movements on the rural landscape and seed manipulations in relation to invention of plant varieties and construction of peasantry will be explained. Lastly, the ambivalences of seed management and tensions found in farmers' livelihood are discussed and concluded.

The Growth of Hybrid Vegetable Seed Industry and the Shifting Seed Regulations of Thailand

World history of hybrid vegetable seeds can be seen in 2 transitional phases (see Tay, 2002, p. 131 - 133); (1) the post second war world period: in this period, the success of F1 corn in USA and then F1 technologies expanded from USA and Japan to the other countries through the joint venture and (2) from early 1980s to present: when seed industry in the developed countries expanded to other countries with lower cost of production, such as Thailand, Mexico and China. At the present, there are two distribution systems of hybrid vegetable seeds in the world, when considering it as a specific commodity, that make the global seed industry require the appropriate production conditions (Tay, 2002, p. 130). Each system needs different production conditions while the extraction of the hand-pollinating farmers is mainly established in the developing countries for cutting the cost of production (see Table 1). Thus, the later phase implies the global division of labor embedded in the global seed industry since the early 1980s. According to Tay (2002), Northern Thailand is chosen because of the colder weather in the highlands, although there are many hybrid vegetable seed production sites in the Northeastern region.

Table 1 Vegetable Hybrid Seed Production Systems in the World

Production System	Regions Mostly Chosen
The hand-pollinated F1 hybrid seed production	● East Asia: China and Taiwan ● Southeast Asian highlands: Northern Thailand and Northern Philippines ● India : Karnataka and Andhra Pradesh ● America : Mexico and Chile
The gene-controlled pollinated seed production	● USA (California – brassicas, onion and radish; Idaho – brassicas, onion and radish; Oregon – brassicas, onion, radish and turnip; and Washington State – brassicas, carrot, onion, radish and turnip) ● Canada (British Columbia – crucifers) ● Denmark (crucifers) ● Australia (Southeast Australia including Tasmania – crucifers and onion) ● New Zealand (crucifers) ● China (Northeast, North and Northwest China - crucifers, Central China and Southeast China) ● Korea –crucifers ● Japan – crucifers ● Taiwan – crucifers

Source: Tay (2002, p. 130-131)

Actually, Thailand's modern seed industry started in the early 1970s when hybrid corn cultivation was promoted for Thai farmers (Saisawat, 2005). Then, since the late 1970s, the growth of agro-food industry has gradually integrated Thailand into the world market (Christensen, 1992), meanwhile the hybrid seed industry benefits this path as a sub-business of the agro-food industry. In the case of hybrid tomato seeds, for example, the hybrid tomato seed industry enjoyed the success of processing tomato industry since Thailand benefited the low-cost product lines, such as the canned tomatoes exported to the West in the 1980s (Pritchard and Burch, 2003, Rosset et al., 1999).

Moreover, to promote the private seed sector, it was stated in the first national seed development project paper that the government seed programme would not compete with, but enhance, the private sector (Saisawat, 2005). With the effort to increase the competitive capacity in the global and regional market, Thailand has promoted the role of life-science institutes as well as the private seed sector. For this, the seed production strategies of Thailand were then shifted from the public sector to the private sector for the new direction of the national agro-industrial development to move from low value to high value commodity production when the Government of Thailand decided to liberalize the vegetable seed industry by inviting foreign investment during the last few decades. It was reported in 1999 that the liberalization had resulted in significant growth of the private seed industry as the vegetable seeds of both open pollinated varieties and hybrids in Thailand were supplied by about 50 private seeds companies, accounting for 75%, whereas only 5% percent was supplied by the public sector (Nath et al., 1999). And now it can be said that nearly 100% of corn and sorghum, as well as vegetable crops, are replaced by hybrid varieties (Seed Association of Thailand, 2007). Recently, with the neo-liberal regulations like the national strategic plans to make Thailand the Seed Hub of Asia in the year 2016 (Naewna Newspaper, 2010), the role of the private sector is more emphasized to produce the hybrid seed under a brand name for the Thai seed industry (see National Center for Genetic Engineering and Biotechnology, 2008).

At present, there are over 100 seed companies in Thailand, with six to seven large-sized producers, mostly from foreign brands, while seed exports in Asia-Pacific run at about \$450 million annually, with Japan, China, Thailand, Australia and New Zealand being the top players respectively (Bangkok Post, 2009). It was reported that during 2000-2005 (see Figure 1), the volume of hybrid seed production continuously increased and that these seeds were exported to 53 countries (Seed Association of Thailand, 2007). In 2006, the seed companies employed more than 28,000 families in Thailand, and, in order to move the seed industry to next level, the strategic plan for the development of the seed industry would focus on the seed production in the following vegetables: cucumber, chili, tomato and corn (National Center for Genetic Engineering and Biotechnology, 2009).

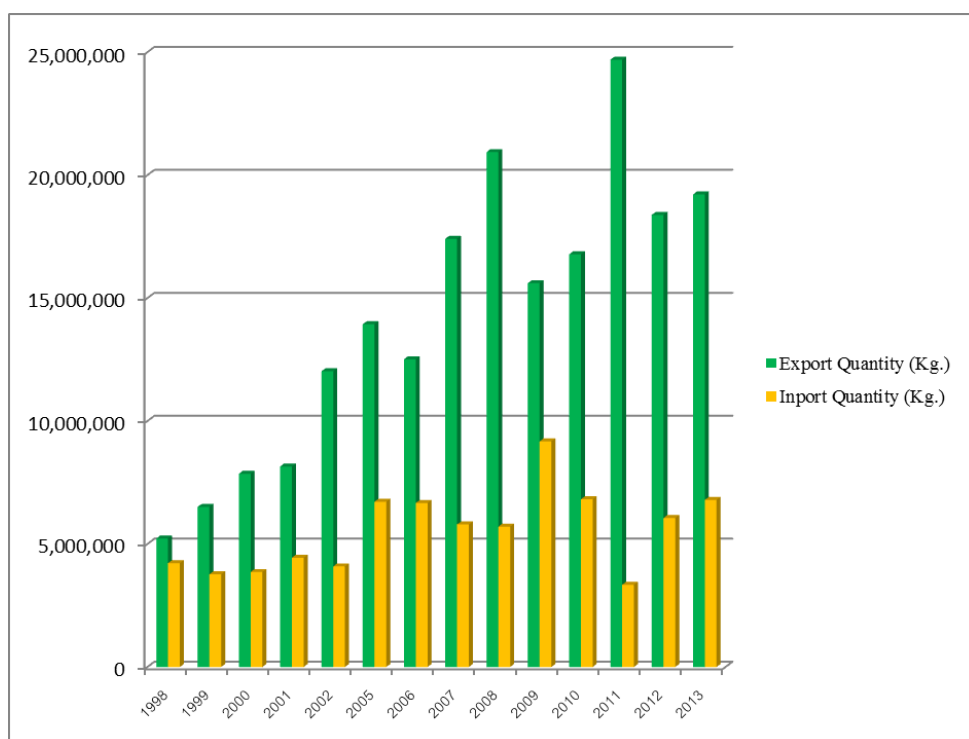


Figure 1: The Vegetable Seed Import-Export Statistics of Thailand in 1998-2013

Sources:

1998 – 2002 from Sagwansupyakor, et al (2003, p. 7 - 9)

2005 – 2013 from Thai Seed Trade Association (2014)

In 2012, based on Thai Seed Trade Association (2014), it was reported that Thailand exports vegetable seeds to 97 countries. From the top ten countries on the export list, Vietnam is in the first position. This can imply that ASEAN, as a regional market, is increasingly important for Thailand's seed industry, although Europe and America will still be a competitive market (see Figure 2).

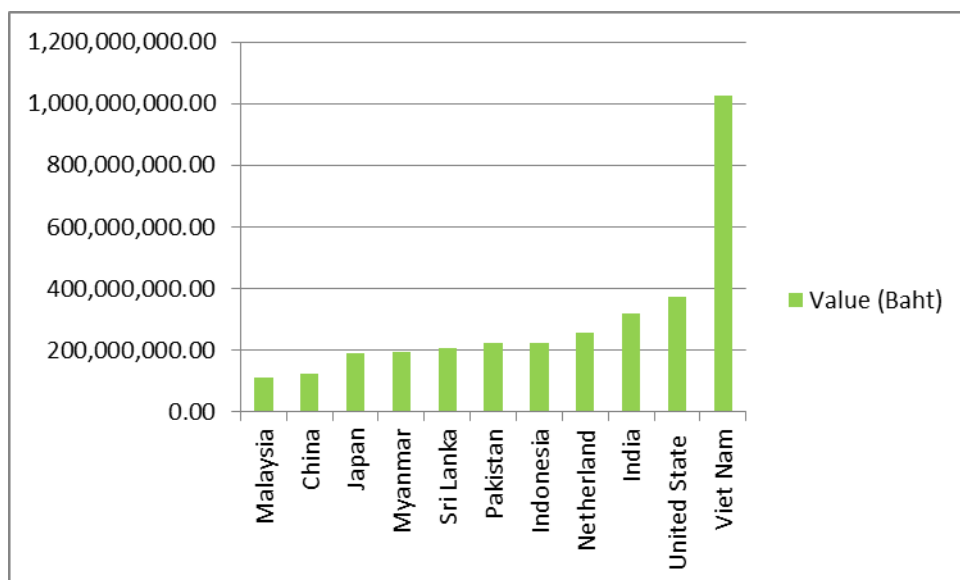


Figure 2: The Export Value of Vegetable Seed of Thailand in 2012 Classified by the Top Ten Countries

Source: Thai Seed Trade Association (2014)

Also, the restructuring of the national regulations is implemented in order to establish the proper policy environment for the growth of the globalized seed business. For example, there are several legal acts in Thailand for promoting the breeder's right, plant breeding science, seed trading, and the intellectual property protection, such as Patent Act B.E. 2522, Copyright Act B.E. 2537, Trademarks Act B.E. 2534, Plant Variety Protection Act B.E. 2542, Trade Secret Act B.E. 2545, and Protection of Geographical Indications Act B.E. 2546. Thus, the shifting of seed production strategies of Thailand reflects the government preference of the private sector to boost the seed trade of the country. Especially for the Plant Variety Protection Act as noticed in other countries, it is noted that the act is influenced by WTO with agreements like TRIPS (Trade Related Aspects of Intellectual Property Rights) (Harvey, 2005, p. 160).

According to the strategic plan of the Ministry of Agriculture and Cooperatives aiming to make Thailand the Seed Hub of Asia and World Kitchen, the seed companies response to these policies in an optimistic manner. In 2012, a keynote speaker from Monsanto Thailand in the 9th National Seed Conference held in Nan Province explained about the necessity for Thailand to upgrade its seed industry and life science. She stated that “Thailand is one of five powerful countries for food production in the world. The challenge for Thailand is not the food scarcity, but how to increase the potentials of the country to feed 250-300 million people in the world especially ASEAN. Based on the 11th National Economic and Social Development Plan, [Thailand] must compete, and Thai people have their specialty in agriculture...Biotechnology is the new wave for changing the world. In the coming WW III, it will be a bio-warfare, no more fight, but [each country] compete to gain the well-being. It is up to the one who can firstly know and understand the nature.”

All said, as NACs (Newly Agricultural Countries), Thailand’s seed industry since the 1970s has benefited agricultural restructuring for decades. The private seed sector is supposed to play a key role to push the country to a new direction under a national vision, Seed Hub of Asia. To achieve this, not only restructuring the seed regulations is required but also the industry has to expand to the countryside, contributing to intensification of land use and the labor extraction in some rural areas where the proper conditions are found. The changing livelihoods of people and their seed production will be shown in the next part.

Changing Livelihoods in a Village under Globalization and Hybrid Seeds as Property Relations

The fieldwork was conducted in a lowland village called TW in this paper. This village is located in a northern valley of the Nan Province, Northern Thailand. In this village, there are about 510 villagers and 129 households. Based on their oral history, the headman told me that their ancestors had migrated for centuries from Southern China to the village’s modern day location surrounded by rice paddy fields and other ethnic groups. Like most farmers in Nan Province, TW farmers grow glutinous rice one crop per year mostly for their annual consumption because there is not enough water for the second crop. Thus, most farmers prefer the early maturing rice varieties, although the long maturing rice varieties are also found in use.

The problem of rice and water shortages were solved when the government had promoted the new rice varieties with high yielding characteristics and the construction of concrete irrigation structures in 1965, contributing to more water supply for the production of cash crops after rice harvest season. The main post-rice-harvest crops are tobacco and chili. The former can imply that TW villagers become familiar with the contract farming under the tobacco industry before the global seed companies established their contract schemes here. Seeing from the contemporary chili cultivation, farmers in the area were introduced by the Agricultural Extension Center of Tha Wang Pha district, Nan Province, to utilize the hybrid chili seeds from different seed companies (see Table 2). This indicates how state extension schemes are still important in the neoliberal era.

Table 2 Hybrid Chili Varieties Promoted By Tha Wang Pha Agricultural Extension Center in 2013

Variety Names	Company
Mae Ping	Know-You Seed (Taiwan rooted company)
Yok Siam, Yok Sawan	Chai Tai (Thailand rooted company)
Nom Kiew 24, Nom Kiew 51	Syngenta (Switzerland rooted company)
Wieng Sa 01	Thai Northern Seed (Thailand rooted company)

Source: field survey by this study

After 2001, contract farming for hybrid seed production was gradually accepted by TW farmers to earn income after rice harvest. Chia Tai is the first seed company starting its contractual production scheme in TW village. It is noticed that there were a few households gaining entry into this business under Chia Tai Company. Then two new comers, Monsanto Company and East-West Seed Company, reached out to TW village after 2011. At present, there are 44 households getting entry of contract farming for vegetable seed production for the global seed companies, while 46 households grow the processing chili for export chili sauce industry (see Table 3).

Table 3 A Survey of TW Village in 2013

Crops	Total production HHs	HHs Keep Only one production	HHs Keep Both production at the same time	HHs getting entry of commercial crop production	HHs not getting entry of both commercial crops	Total HHs
Processing Chili	46 (35.65%)	22 (17%)	24 (18.6%)	66 (51.16%)	63 (48.83%)	129 (100%)
Contract farming Seeds	44 (34.1%)	20 (15.5%)				

Source: field survey by this study

In academic debates, the contract farming is criticized for its burdened risks on producers and is seen as beneficial in terms of its providing of seed money, technologies, knowledge (Kirsten and Sartorius, 2002; Patrick, 2004; Singh, 2002). However, according to some farmers, contract farming is also meaningful for them, perhaps differently from the perspectives of people who have other job opportunities. A 50-year-old plus male farmer, Por Yai, told me that contract farming contributes to a chance for farmers to work in their own village so they can stay in their own house together with their families. Although he has small paddy rice fields (0.64 hectares⁽²⁾ in total), he uses it intensively for producing the hybrid seeds under the contract scheme of Chia Tai Company.

In 2011, with a higher guaranteed price offered by Monsanto Company for hybrid tomato seeds, 22 farmers in TW village turned to change their contracts from Chia Tai Company. The guaranteed price of hybrid tomato seeds is 15,000 Baht per kilogram. The farmers will get their money as a return around five months after one crop. Some farmers can nearly earn 100,000 Baht by using a 0.12 hectare plot, based on a farmer who was interviewed in this study. In 2012, there were 9 farmers, who began their contract for hybrid cucumber seeds under the East-West Seed Company. Under the competition of seed companies, there was a different guaranteed price, as this study found that farmers can earn 950 Baht per kilogram of hybrid cucumber seed in the East-West Seed scheme, while they were offered 1,000 Baht per kilogram by Chia Tai Company.

The production and labor process in TW farmers can be seen in 3 stages according to crop growth, including the vegetative stage, the flowering stage and the harvesting stage (see Figure 3). In the first stage, farmers take the seedlings from the companies to be grown in the prepared plots. In the second stage, farmers cross the prepared flowers for producing the hybrid seeds by pollinating thousands of flowers in the short blooming period. The last stage is seed harvest, in which farmers gather only seeds and mostly throw the flesh away if they cannot utilize for any purpose. These stages require certain agricultural practices, not just responding to the company schedule, but also the crop's life cycle. To say more, farmers have to adjust their life to the different life cycle stages of each crop. For example, for pumpkin pollination (see Figure 3), farmers need to cut the male flowers and pinch the female flowers from late afternoon around 2 pm to late evening around 8 pm. Then, in the early morning of the next day, farmers make the cross pollination from 4 am until 9 am. A large number of flowers mean an increased workload for the pollinating farmers as well as higher income from seeds.

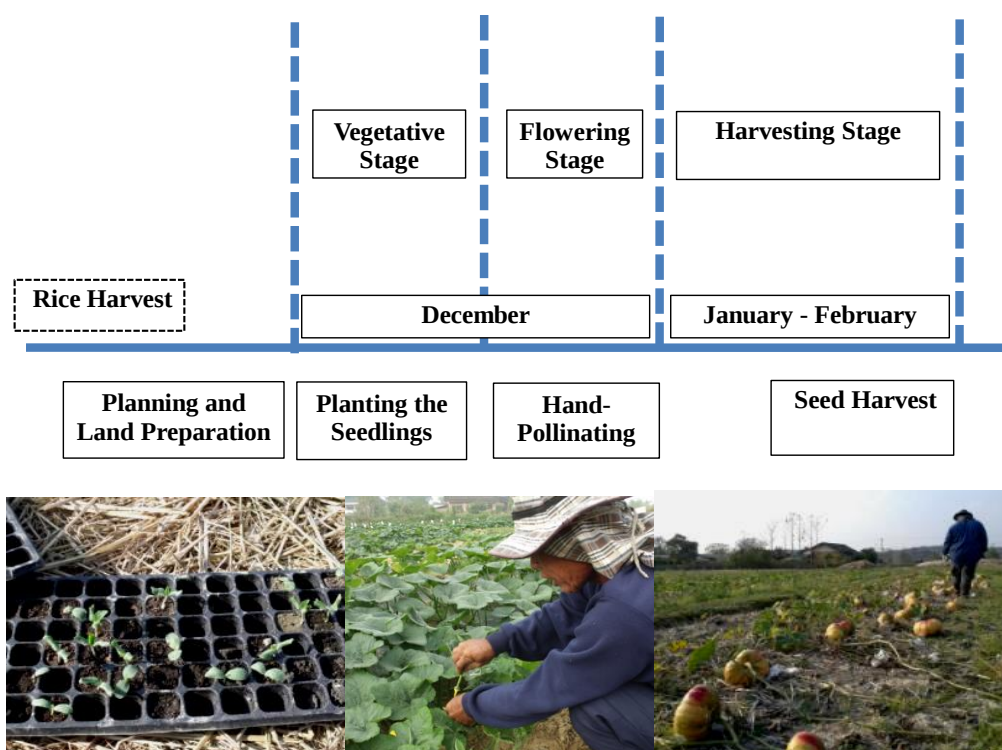


Figure 3 Three Main Stages of On-Farm Hybrid Vegetable Seed Production

The intensified labor is in contrast to the number of farmers in the village. Based on the household survey in 2013 by this study, the average number of family members in all household groups (wealthy, middle, poor) is 2.5 in contrast to 1.5 in the wealthy household group. In the middle income household group, they rely mainly on labor force within their own households, like parent and child laborers, but in many families the young people migrate to live in other provinces for off-farm jobs and to further their education at university level. The labor exchange among households is still in use for rice cultivation but not in the romantic sense. Based on the market force, farmers have to rely on this institution in order to reduce their cost of rice production in the context of increasing wage in the present. In contrast, activities in hybrid vegetable seed production, like hand-pollination, rely on paid laborers if there are not enough household laborers. This can illustrate the condition of de-agrarianization in TW village when new generations move to other sectors, leaving their households containing their parents and children. In other words, we cannot totally equate rural with farms, as well as farmer population, because there are more social differentiation in the rural population under globalization (see Table 4).

Table 4 Major Occupations of Households of TW Village

Major Occupations	Number of households
Farming (rice cultivation, cash crops)	87
Wage labor (on-farm and off-farm jobs)	13
State officials	6
Merchants	6
Business (garage, construction)	3
HH with members working abroad (factory workers in Taiwan, Thai restaurant owner in Singapore)	4
Unemployment (handicaps)	6
Others (retired state official)	1

Source: field survey of this study in 2013

After collecting, drying and applying the fungicide for the seed treatment, the seed company staff will take them from TW farmers to seed testing stations located in other places to check seed quality in terms of purity and germination rate. Then, farmers will get money as a return after this process. It takes around two to five months after seed harvest in the village. Moreover, if farmers can produce their seeds to meet the high standard, they get bonus money.

After the companies received the testing results from laboratories, money will be sent to farmers through their bank account. Significantly, as it was seen in this study in 2010 in TW village, the amount of revenue of each farmer was shown on a paper name list stuck on a board in front of an office rented by a field staff of the Chia Tai Company. In 2013 the researcher met him again in TW village. He explained about the rationale of showing the record. It was, according to him, to help in increasing incentive for farmers to compete with each other to break the record of the others as well as their own.

However, farmers cannot always meet the seed quality standards and get the bonus money all the time, even some farmers who have been in this work for more than a decade. A 54 year old female farmer complained that it is because the companies usually change the vegetable varieties – varieties that farmers have never grown before, thus they have no experience to understand the specific traits. And then, when farmers have more experience about some varieties after many crops, other new varieties are introduced to be grown. For example, a lot of TW farmers failed to produce the hybrid tomato seeds for Monsanto Company when a new variety was introduced to them in 2013 so they did not get paid for their labors and time spent for months.

Companies will, moreover, cease the contract in cases when farmers are considered to be unable to produce the qualified seeds. The most serious concern that the companies are afraid of is farmers stealing the seeds. Although a number of farmers in TW never read about the seed regulations (referring to laws that protect the breeder's rights on new plant variety, like Seed Act 2518 and Plant Variety Protection Act 2542), they perceive the rights of seed companies over the plant varieties through hybrid seed production. To say more in this circumstance, companies not only have the power to cease the contract, but they can use production contract and the seed law to determine their relations between farmers and themselves to define the property rights on seeds. Some farmers told that the companies will sue them if they steal the seeds bound by the production contracts. "It is their intellectual rights," one farmer told me when asking whether farmers can

save the seeds produced for seed companies. But, until this point in time in TW village, based on interviewed farmers, no farmers have been sued by the seed companies in case of intellectual property rights.

Actually it's like playing catch-up. This depends on the capacity of companies to enforce the contract and legitimize the power to control over the producers. Some farmers have tried to do things that seed companies don't want. In this sense, it illustrates that property relations between the companies and farmers are not absolutely fixed and that the breeder's rights to exclude others from access to propagating materials is not completely enforceable everywhere, as it was found that the seed companies cannot govern every farmer in every degree. Under the compromising atmosphere, there is still some room for farmers to negotiate in access to seeds and plants under private regime; especially, it can be seen from the efforts to save seeds and some parts of plants by the farmers. It should be noted that the cases here are just provided as a clue for seeing some relations occurring beyond the contract, but it does not mean that all farmers in TW village do these things.

To save seeds from the parental lines. One farmer told me that when some farmers want to keep the desired fruits and save the seeds from the parental lines, they cover them with rice straws or plastic sheets already utilized in vegetable beds. By this, they can hide them from eyesight of the inspectors. But this way is not famous nowadays because the company staff is aware of this strategy, so they destroy the male lines by uprooting them after hand-pollination is completed in order to cease the maturing stage of seeds contained in the fruits.

Another way that companies cease the seed saving practice of farmers is destroying the opened-pollinated female fruits that are left by farmers on the beds beside the hybrids. But this is explained by companies as quality control instead. As in one day, a staff of the East-West Seed Company was seen while using a long knife to cut some pumpkins and spraying red color on others in a small farm. According to his explanation, the destruction of OP seeds contained in the female plants is necessary for keeping the quality of the product by protecting the hybrids from mixing with the OP seeds.

Some farmers told that they don't utilize seeds but instead utilize some parts of plants from which they gather hybrid seeds to send to companies. This can be found in different vegetable parts like pumpkin stems, young cucumbers on male plants and flesh of cantaloupes. These plant parts are utilized as food in households and sold as fresh vegetables in local markets. These practices at the beginning were not allowed by the staff of companies, who not only said it might impact the seed quality but also claim on the rights of companies as the owner of the plants under the intellectual rights and seed production contract. However, farmers claim on a point that they do not sell the seeds, which are kept and sent to the companies. Several parts of plants are still useful by farmers in terms of food and extra income in the condition that they do not have any salary but have to wait for months for the companies to send them money from hybrid seed production. Lastly this conflict is compromised on the ground while, in the seed law, the plants belong to companies.

To sum up this part, this study illustrates a village in the rice production landscape. It seems that TW villagers still attempt to maintain their livelihood on the rice subsistence economy. However, it will be misleading to keep saying that TW village is still a rural peasant society in the model of the moral subsistence economy, positioning TW village outside globalization, thus the capitalist market. What we see is that the changing livelihood landscape of TW is overlapped with the changing macro-economic structure of Thailand where the high value commodities are produced and exported to the national, regional, and global markets. Farmers, as a petty producer under the contract farming, are engaging with flexible production. They get the risks of production while getting higher income from producing the specific commodities like hybrid seeds and processing chili. Thus, the seed management of the farmers in this circumstance cannot be fitted into the nostalgic image of rural peasants just simply staying in peaceful surroundings, year by year sowing seeds and waiting for the harvest season. In fact, they are, if not all of them, a contractual producer whose labor is extracted to make hybrid seeds exported to other countries. The sowed seeds and seedlings they grow are protected by the seed regulations under the private regime. This property regime helps the companies and plant breeders possibly claim on the ownership over commercial plant varieties in order to integrate Thailand into the global seed market. The privatization of plants is investigated in advocacies of activists and farmer leaders in the next part.

Socio-Environmental Movements: Inventing Peasant's Varieties and the Re-peasantry in the Community-Based Genetic Resource Management

As neoliberalism is too complex to be grasped in the opposition of private versus commons, in this part, this study takes the socio-environmental movements into the light. Just like assessing the existing neoliberalism, the socio-environmental movements need to be analyzed through empirical evidence – evidence of how the movements also influence contingently on the seed management of farmers. By this, both neoliberalism and the socio-environmental movements cannot be understood from above. Rather, their different formulations and governance emerge out of a multiplicity of political forces always in competition with one another, producing unintended outcomes and unexpected directions (Larner, 2000). According to Larner, this study proposes that the seed management of the farmers in this circumstance is complex, never complete, and part of an on-going process in relation to political rationalities, programmes and identities among actors. By this, it helps us in understanding that neoliberalism is far from the monolithic, full control of the "New Right" (Larner 2000). Thus, to understand farmers' plant genetic resource management, influenced by the global seed companies in the neoliberal era alone is not enough and becomes itself a hegemony – a hegemony that elites can possibly use to keep stabilizing their ideology and imagery of peasantry and nature.

TW village is a significant case as it is linked to many development agencies. Like in other villages since the beginning of the 8th National Development Plan in 1997 – the year of economic crisis of Thailand, the state-led development schemes are mainly implemented under the self-sufficiency economy ideology of His Majesty King Bhumibol Adulyadej. In TW village, there are buildings and signs, representing the villagers are already directed to such ideology. Not only have self-reliance and participation become buzzwords in the schemes of the state but they are also found among NGOs as well. The study concentrates on a project called "Farmer Field School" (FFS) launched by Joko Learning Center, under the Hag Muang Nan Foundation in TW village around 2004.

Actually, the initiative of Joko Learning Center is part of a regional collaborative programme called Community Biodiversity Development and Conservation - CBDC (CBDC, 2003). This programme is an international collaboration amongst GOs and NGOs in the global South since 1994, while there were 4 donor organizations from the global North including IDRC (Canada), Hivos (the Netherlands), SIDA (Sweden) and the Development Fund (Norway) (see CBDC 2003). Under CBDC, the researcher used to be a staff member of the Joko Learning Center in 2008-2009. This position provides the researcher chances to visit TW village together with staff from Joko Learning Center and other staff from partner organizations. In the CBDC partner network, there are NGOs and GOs from countries like Thailand, Lao PDR, Vietnam, Bhutan and Philippines. A Philippines-based NGO, SEARICE, is the regional coordinator of the CBDC programme in Southeast Asia. In the network, a representative of SEARICE explained about the agenda of CBDC that “through participatory plant breeding, SEARICE and the CBDC-BUCAP network in Southeast Asia have been able to promote farmers’ knowledge and innovations and to raise farmers’ concern in national and global policy processes. At the local level, field evidence provided proof to researchers and local government that farmers have the capacity to breed plants. Moreover, SEARICE provides farmers with simplified information on policies that affect them and report on farmers’ feedback on these laws at policy level. From SEARICE’s experience, the key to success for bridging knowledge gaps is a multi-stakeholder approach” (Hivos-OxfamNovib, 2013, p. 18).

In Thailand, CBDC Nan project hosted by Joko Learning Center explained about its focal agenda that “Joko Learning Centre in Thailand encourages farmers (and their families) to share their tacit knowledge – the unspoken knowledge that everyone has within, which becomes a source for learning only when shared with others, for example when transformed to written, documented knowledge. Farmers teach and learn from each other through Farmer Field Schools (FFS) on participatory plant breeding, participatory variety selection and organic farming” (Hivos-OxfamNovib, 2013, p. 16). In the other words, under the agenda of Joko Learning Center, the farmers in the project are expected, after training, to be able to rely on themselves in term of seed/food security while the agrobiodiversity is conserved via practices of organic farming. It is clear then that TW FFS is not established just to technically support farmers to conserve seeds but also to produce the environmental subjects that farmers are aiming to “learn and tech” each other. In this sense, the imageries of desirable farmers and natures are linked to sustainable development and biodiversity discourses of the 1980s (Escobar, 1998). Consequently, it makes possible the flow of materials, funds, knowledge and ideologies. Some

farmers from TW village were selected based on their breeding success to participate in the regional and global meetings such as experience sharing.

Not just NGOs, but TW FFS was integrated into secondary schools in 2004, this when a teacher and some students joined the TW FFS activity called the Farmer Field Day (FFD) being held in the village temple. Actually, as a Buddhist village, TW also has the annual rice celebration festival called Boon Kao Mai (Merits of New Rice) held in the rice harvest season. In the context of CBDC, the farmers in TW FFS and NGO staff used this event to present their work, including materials such as traditional rice varieties, stable lines and segregating materials to the public. FFD, in this way, is a mainstreaming activity of TW FFS in order to distribute their varieties and publicize their project outcome. On such an occasion, a school teacher joined the event and was attracted by the FFS activities. She then discussed her idea with the school principal. Both of them agreed to send students to participate in TW FFS throughout the years until now.

After conserving and maintaining several rice varieties, including Sa-tern, Kao Thon-Tham, Dor-Ma-Lae, Dor-Doonma, Teoy and RD 6 (CBDC, 2003), in 2004 the TW farmers were introduced to the cross-breeding technique in order to develop their own rice varieties adaptable for the TW agro-ecosystem. By making 6 crosses from different parental varieties, a lot of segregated materials had been selected by TW FFS farmers for more than 5 crops so as to ensure that they got the stable lines according to the breeding objectives to develop the desired variety. The 2 main terminologies promoted by NGOs in the plant genetic conservation and development include (1) the participatory plant breeding (PPB)⁽³⁾ and (2) the participatory variety selection (PVS). Among many segregated materials, the seemingly successful one is named later as TW1⁽⁴⁾ variety by TW FFS farmers, discursively representing the variety from selection of farmer-breeders. The TW1 variety emerges from crossing the ‘traditional’ variety Dor-Ma-Lea, and the ‘modern’ variety, RD10. Historically, the RD10 variety can be traced back to IRRI’s IR8 variety developed in the Green Revolution of the 1960s.

Apart from rice breeding, TW village is promoted in terms of a community seed bank (The Development Fund, 2011, p. 11). In 2008, some TW farmers and Joko staff joined the seed movement called “Seed Freedom Network” (SFN), mainly established by farmers and activists mostly from the Sustainable Agriculture Foundation and the Alternative Agricultural Network (AAN) in the Northeastern region of Thailand. Then, SFN visited the National Gene Bank located in the central region to ask for access to some “traditional” rice varieties. In 2009, five “traditional” varieties were brought to be grown in a field trial of TW FFS by the Joko Learning Center. Those rice varieties included Jao Dor (เจ้าดอ), Ma Nam Pua (มะน้ำปัว), Fha Kong Noi (ฝ่าโง่งน้อย), Nang Kao (นางเก๋า) and Kii Tom Kao (ขี้ตมขาว). In 2009, there were 103 rice varieties in the TW FFS seed bank, which were not only conserved and developed by TW farmers but are also provided by the seed sharing networks of farmers, GOs and NGOs. Thus it seems that the NGO initiative for rice genetic development and conservation in the community-level was successful while the FFS farmers were respected as GOs, specifically the Rice Department saw them as a successful example of the active farmer group who defended Thai rice from the genetic erosion as well as the farmer-breeder who could develop a new rice variety by applying ‘modern’ breeding techniques.

However, the number of farmers in FFS gradually decreased. In contrast to the beginning of the programme with nearly 30 farmers, at present only 3 farmers still engage with FFS in TW village. TW1 was not accepted, even by TW farmers, because of its long maturity did not serve well the land use pattern in contract farming, and many farmers said that they cannot earn their income from selling the rice seeds. Some even complained that NGOs emphasize seed saving and sharing, so it in turn caused farmers less chances to sell the seeds. Ironically, based on a staff member of the Joko Learning Center, who the researcher interviewed, TW FFS has the highest number of rice diversity in comparison to other FFS villages where the Joko Learning Center established the rice conservation. The main contributing factor is the integration of FFS into a formal school. In this sense, rice diversity utilization becomes part of teaching aids for a formal school but cannot be increasingly utilized in farmers’ paddy fields. In 2010, CBDC-BUCAP was continued into a new phase and changed its title to the Democratizing Agricultural Research and Extension (DARE). The new state agency, Agricultural Land Reform Office (ALRO), and a NGO, Alternative Agricultural Network, were included. The main agenda of ALRO emphasized on the organic rice farming in order to produce organic rice under the standard of International Federation of Organic Agriculture Movements (IFOAM). TW village is then excluded because farmers cannot leave the contract farming which

rely on chemical inputs. In response to DARE, two TW FFS farmers ended their participation in FFS activities in the village. However a 50-year old female farmer still implements the activities together with school students today. The future of rice diversity in TW FFS now depends on this farmer who has provided her paddy field for the FFS field trial for years.

So far as the scenario of Green Revolution is still re-produced in the socio-environmental movements, the researcher wonders about it, especially when seeing the changing circumstances of TW village. Do the farmers encounter the crises of culture and nature? Or is this just a change that can be found elsewhere? Perhaps “the problem” sometimes depends on different values and interpretations. As the researcher observed from reports produced by the Joko Learning Center and partner organizations, the changing livelihood of TW farmers, especially in the area of contract farming for hybrid seed production under global seed companies, is hardly mentioned (The Development Fund, 2011, Hivos-OxfamNovib, 2013, CBDC, 2006).

Another thing that seems to be in contrast to the extinction scenario of plants and society is found when observing from the perspective of rice variety utilization. In TW village, based on the survey data the researcher got from the accompanying Joko staff surveying the history of rice variety utilization in 2012, it was found that during the last 30 years there have been changes in the flow of rice varieties. The improved seeds from the state were introduced around two decades ago (seeing RD varieties in Table 5. RD stands for Rice Department). In the last decade, there were still traditional varieties found in use.

Table 5 Utilization of Rice Varieties in 30 Year Period in TW Village

30 Years ago	20 Years ago	10 Years ago
Dor Mock (ดอหมอก)	Dor Boon Ma (ดอบุญมา)	RD 4 (กข 4)
Noke Kaen (นกแก่น)	Dor E-San (ดออีสาน)	RD 6 (กข 6)
Mai Nong (เหมยนอง)	Dor Satern (ดอสะเทิน)	RD 10 (กข 10)
Dor Mae Lea (ดอหม่าละ)	Dor Muang Lei (ดอเมืองเลย)	RD 14 (กข 14)
Koa Deang Luang (ข้าวแดงหลวง)	Dor Chiang Rai (ดอเชียงราย)	RD 72 (กข 72)
Nang Kao (นางเก๋า)	RD10 (กข 10)	Mali 105 (มะลิ 105)
Nang Naun (นางนวล)	RD6 (กข 6)	Hom Sakon (หอมสกล)
Kao Keaw (ข้าวแก้ว)	RD8 (กข 8)	Neaw Mali (เหนียวมะลิ)
		Loa Take (เล้าแตก)
		TW1

Source: field survey by the researcher in 2012

Based on the history of rice variety utilization, this study found that there were several conditions that farmers considered in rice selection and cultivation, such as ecological conditions, yields, maturity traits, cooking quality and trade. Based on the above Table, it can be seen that there was dynamism in the last 30 years for rice utilization in TW village. The turnover, according to Srang-iam (2009), is high, of course, but it can be pointed out that farmers have also experimented with utilizing new rice varieties and comparing them to the varieties in their current possession. By this, it made rice varieties flow in paddy fields and thus contributed to the dynamism of rice diversity in TW village.

To sum up this part, although farmers in TW village are integrated into the contract farming for hybrid seed production under the global seed market, it does not mean that farmers passively manipulate their rice diversity. It is too risky to judge if nature and people are in crises: if their cultural values have collapses and on-farm biodiversity is inevitably lost. In other words, farmers are represented as “victims of Green Revolution” while “Nature,” once seemed like the norm, has been privatized and commoditized after farmers were integrated to modernize production under an industrial model. This issue needs to be re-considered in the next part.

Conclusion

This study shows that there is a shifting of the seed regime in Thailand under the neoliberal era. However, the contestation of the regime is not finished yet. In 2009, seed companies put their pressure on the state for upgrading the seed regulation, especially the Plant Variety Protection Act 2542 (Bangkok Post, 2009). This Act is contradictory as it is combined with inter-governance, including The International Union for the Protection of New Varieties of Plants (UPOV) and Convention on Biological Diversity (CBD). In the other words, Thailand PVP Act contains both protection of new plant variety under the breeder's rights and state sovereignty over plant genetic resources within the state boundary. Under this law, "community" is constructed as a socially bounded unit that can claim on the plant varieties they conserve. However, it is a condition that such varieties have to be found only in that community (in contrast to the emphasis of sharing and exchange of seeds in the socio-environmental movements) and that variety must already be registered by the state. Thus, in practice, there hardly any such "communities" found who can conserve and register the plant variety so that they can claim it as their community property – the local commons.

As the researcher brings the idea from Sikor (2008) to see the public, private and public-private hybrids, the problem of considering seed in the private – public dichotomy seems similar to the problem of thinking about the situation of the shared natural resources, or the commons, in Thailand (Ganjanapan, 1998). This can be explained by 3 points: (1) the overlapping of access to new plants represents the plural private or "privates" in the case of farmers access to parts of plants in hybrid seed production; (2) there are "public" that do not just refer to the state governing the access to plant genetic resources, such as NGOs and farmer organizations; (3) however, the socio-environment movement still reproduces the position of community in the common/public-private dichotomy.

We can see that farmers can manage seeds as private and "commons" in the same manner. It means that they rely on both formal and informal seed systems in their livelihood landscape. To see the seed management of farmers in the destructive scenario of Green Revolution is problematic, although it might help in criticizing the triumph of neoliberalism (see Shiva, 1993, Yapa, 1996). In fact, the myths of Green Revolution need to be investigated, especially in the setting of industrialized agricultural areas (Brush et al., 2003). It is unable to simplify in terms of the fight of sustainable agriculture and high technology.

Last but not least, this study does not deny that farmers in the industrialized agricultural areas already encounter difficulties. However, they are conditionally constructed to be the others; meanwhile the socio-environmental movements propose the care of nature under the effort to promote organic farming. Thus, “seeds as commons” need to be seen in its place in order to understand more than just a defensive reaction to the rampant neoliberalism (McCarthy, 2005). If possible, the concept of the commons is to be reconceptualized in the broader political ecological perspective and differentiated in the multi-scalar politics, such as global, national and local levels.

Footnote

- (1) Hybrid seed is seed produced by cross-pollinated plants. A hybrid is a cross between two different plant varieties.
- (2) 1 hectare = 6.25 rai
- (3) PPB is an effort to reverse the convention of plant breeding and to bring the scientists and farmers together in the process of developing new crop varieties or improving existing ones (Cleveland and Soleri, 2002, p.10-11). PVS is sometimes seen as part of PPB as the segregated materials will be selected by bringing the scientists and farmers together in the process.
- (4) This variety name is anonymous. It is a cross by TW farmers.

References

- Bakker, K. (2005). *Neoliberalizing Nature? Market Environmentalism in Water Supply in England and Wales*, *Annals of the Association of American Geographers*, 95,(3), pp. 542-565.
- Bangkok Post. (2009). Seed firms push for protection, Retrieved January, 2011 from. <http://www.bangkokpost.com/business/economics/23235/seed-firms-push-for-protection>
- Brush, S. B., Tadesse, D., and Van Dusen, E. (2003). *Crop Diversity in Peasant and Industrialized Agriculture: Mexico and California*, *Society & Natural Resources* 16,(2), pp. 123-141.

- Castree, N. (2008). *Neoliberalising Nature: the Logics of Deregulation and Reregulation*, Environment and Planning A 40, pp. 141-152.
- CBDC. (2003). About CBDC. Retrieved February , 2010 from.
http://www.cbdcprogram.org/final/frames/about_cbdc.htm
- CBDC. (2006). *Pathways to Participatory Farmer Plant Breeding: Stories and Reflections of the Community Biodiversity Development and Conservation Programme Manila*, Philippines: SEARICE.
- Christensen, S. (1992). *The Role of Agribusiness in Thai Agriculture: Toward a Policy Analysis*, *TDRI Quarterly Review*, 7,(4), pp. 3-9.
- Cleveland, David A., and Daniela Soleri, eds. (2002). *Farmers, Scientists and Plant Breeding: Integrating Knowledge and Practice*. Wallingford, UK ; New York: CABI Publishing.
- Conklin, H. C. (1957). *Hanunoo Agriculture: A Report on an Integral System of Shifting Cultivation*. Rome: FAO.
- Daniel, E. V., Bernstein, H., and Brass, T., eds. (1992). *Plantations, Proletarians, and Peasants in Colonial Asia*. London: Frank Cass.
- DaViÀ, E. (2012). *Seed Diversity, Farmers Rights, and the Politics of Repeasantization*, *International Journal of Sociology of Agriculture and Food*, 19,(2), pp. 229-242.
- Dennis, J. V. (1987). *Farmer Management of Rice Variety Diversity in Northern Thailand*, PhD dissertation, Michigan University, USA.
- Elson, R. E. (1997). *The End of the Peasantry in Southeast Asia: a Social and Economic History of Peasant Livelihood, 1800-1990s*. New York: St. Martin's Press.
- Escobar, A. (1998). *Whose Knowledge, Whose Nature? Biodiversity, Conservation, and the Political Ecology of Social Movements*, *Journal of Political Ecology*, 5, pp. 53 - 81.
- Ganjanapan, A. (1998). *The Politics of Conservation and the Complexity of Local Control of Forest in the Northern Thai Highlands*, *Mountain Research and Development* 18,(1), pp. 71 - 82.
- Geertz, C. (1963). *Agricultural involution: the process of ecological change in Indonesia*. Berkeley, California: University of California Press.

- Glassman, J. (2006). *Primitive accumulation, accumulation by dispossession, accumulation by 'extra-economic' means*, Progress in Human Geography, 30,(5), pp. 608-625.
- Hall, D. (2012). *Rethinking Primitive Accumulation: Theoretical Tensions and Rural Southeast Asian Complexities*, Antipode, 44,(4), pp. 0066 - 1208.
- Harvey, D. (2005). *A Brief History of Neoliberalism*. USA: Oxford University Press.
- Harvey, D. (2006). *Neo-liberalism as Creative Destruction*, Geografiska Annaler: Series B, Human Geography, 88,(2), pp. 145 - 158.
- Heynen, N., and Robbins, P. (2005). *The Neoliberalization of Nature: Governance, Privatization, Enclosure and Valuation*, Capitalism Nature Socialism, 16,(1), pp. 5-8.
- Hivos-OxfamNovib. (2013). *Agricultural biodiversity for resilient farming systems: A synthesis report*. Netherlands: the Hivos-OxfamNovib Agrobiodiversity@knowledge Programme.
- Hubbard, R. (2003). *The Mismeasure of the Gene*, Rethinking Marxism, 15,(4), pp. 515 - 522.
- Kloppenborg, J. (1988). *First the Seed: The Political Economy of Plant Biotechnology, 1492-2000*. New York, USA: Cambridge University Press.
- Larner, W. (2000). *Neo-liberalism: policy, ideology, governmentality*, Studies in Political Economy, 63,(5), pp. 26.
- Lockie, S. (2009). *Agricultural Biodiversity and Neoliberal Regimes of Agri-Environmental Governance in Australia*, Current Sociology, 57,(3), pp. 407-426.
- Lowe, C. (1999). *Cultures of Nature: Mobility, Identity and Biodiversity Conservation in the Togean Islands of Sulawesi, Indonesia*, Yale University.
- Laungaramsri, P. (2001). *Redefining Nature: Karen Ecological Knowledge and the Challenge to the Modern Conservation Paradigm*. Regional Center for Social Science and Sustainable Development (RCSD), Chiang Mai University, Thailand: Earthworm Books.
- McAfee, K. (1999). *Selling Nature to Save It? Biodiversity and the Rise of Green Developmentalism*, Environment and Planning D: Society and Space, 17,(2), pp. 133-154.

- McAfee, K. (2003). *Neoliberalism on the Molecular Scale: economic and genetic reductionism in biotechnology battles*, *Geoforum*, 34,(2), pp. 203-219.
- McCarthy, J. (2005). *Commons as counterhegemonic projects*, *Capitalism Nature Socialism*, 16,(1), pp. 9-24.
- McCarthy, J., and Prudham, S. (2004). *Neoliberal Nature and the Nature of Neoliberalism*, *Geoforum*, 35, pp. 275-283.
- Naewna Newspaper. (2010). *Thailand to Become Asian Hub for Seeds*. In Naewna Newspaper on 18 Dec 2010.
- Nath, P., Papademetriou, M., Piluek, K., and Herath, E. M. (1999). *The Vegetable Sector in Thailand A Review*, Thailand: Regional Office for Asia and the Pacific, FAO.
- National Center for Genetic Engineering and Biotechnology. (2008). *Seed Research Program*. Pathumthani, Thailand: National Center for Genetic Engineering and Biotechnology (BIOTEC).
- National Center for Genetic Engineering and Biotechnology. (2009). *Biotechnology in Thailand: Take a closer look at Thailand...the land for bio-investment*, Pathumthani, Thailand: National Center for Genetic Engineering and Biotechnology (BIOTEC).
- Navdanya. (2012). *Seed Freedom: A Global Citizens Report*. India: Navdanya.
- Peekhaus, W. (2011). *Primitive Accumulation and Enclosure of the Commons: Genetically Engineered Seeds and Canadian Jurisprudence*, *Science & Society*, 75,(4), pp. 529 - 554.
- Pritchard, B., and Burch, D. (2003). *Agri-food Globalization in Perspective: International Restructuring in the Processing Tomato Industry*. Aldershot, Hampshire: Ashgate.
- Prudham, S. (2007). *The Fictions of Autonomous Invention: Accumulation by Dispossession, Commodification and Life Patents in Canada*, *Antipode*, 39,(3), pp. 406-429.
- Robinson, D. F. (2007). *Biodiversity-Related Traditional Knowledge in Thailand: Intellectual Property Relations and Geographies of Knowledge Regulation*, the University of Sydney.

- Rosset, P., Rice, R., and Watts, M. (1999). *Thailand and the World Tomato: Globalization, New Agricultural Countries (NACs) and the Agrarian Question*, International Journal of Sociology of Agriculture and Food, 8, pp. 71-94.
- Sagwansupyakor, C., Thongjium, M., Pileuk, K. and Sukprakarn, S. (2003). *The seed industry in Thailand. APSA Country Report No. 28*, presented at Asian Seed 2003, Bangkok, Thailand, November 2003. Retrieved February, 2014 from. <http://www.apsaseed.org/docs.php?cid=12>.
- Saisawat, P. (2005). *A Glance at Thailand's Seed Sector*, Seed Testing International, 130, pp. 25-26.
- Santasombat, Y. (2003). *Biodiversity, Local Knowledge and Sustainable Development*, Chiang Mai, Thailand: Regional Center for Social Science and Sustainable Development, Faculty of Social Science, Chiang Mai University.
- Santasombat, Y. (2008). *Flexible Peasants: Reconceptualizing the Third World's Rural Types*, Chiang Mai: Faculty of Social Sciences, Chiang Mai University.
- Scott, J. C. (2009). *The Art of Not Being Governed: An Anarchist History of Upland Southeast Asia*. USA: Yale University Press.
- Seed Association of Thailand, 2007. *Seed Industry in Thailand 2004 - 2006*. Seed Association of Thailand. Retrieved January, 2011 from. http://www.seed.or.th/english/documents_eng/news_eng/seed_industry_thailand2004_2006.pdf
- Shiva, V. (1993). *Monocultures of the Mind: Perspectives on Biodiversity and Biotechnology*. London: Zed book.
- Sikor, T., (ed). (2008). *Public and Private in Natural Resource Governance: A False Dichotomy?* UK: Earthscan.
- Tanabe, S. (1981). *Peasant farming systems in Thailand: a comparative study of rice cultivation and agricultural technology in Chiangmai and Ayutthaya*, University of London.
- Tay, D. (2002). *Vegetable Hybrid Seed Production, Proceedings International Seed Seminar: Trade, Production and Technology*, Pontificia Universidad Católica de Chile, Facultad de Agronomía e Ingeniería Forestal, Departamento de Ciencias Vegetales. October, 15-16, 2002. Santiago - Chile, 2002, pp. 128-139.

- Thai Seed Trade Association. (2014). *Quantity and Value of Export Classified by Country* in 2012. Retrieved February, 2014 from.
<http://www.thasta.com/pdf/2012/ปริมาณและมูลค่าการส่งออกฯรายประเทศ%202555.pdf>
- The Development Fund. (2011). *Banking for the future: Savings, security and seeds. A short study of community seed banks in Bangladesh, Costa Rica, Ethiopia, Honduras, India, Nepal, Thailand, Zambia and Zimbabwe*, Norway, The Development Fund.
- Srang-iam, W. (2009). *Rice Diversity and the Politics of Genetic Resources in Thailand*, PhD dissertation, Natural Resources and Environment, the University of Michigan.
- Yapa, L. (1996). *Improved Seeds and Constructed Scarcity, Liberation Ecology: Environment, Development, Social Movement*. R. Peet and M. Watts, eds. London: Routledge, pp. 69 -85.
- Zimmerer, K. S. (1996). *Changing Fortunes: Biodiversity and Peasant Livelihood in the Peruvian Andes*. Berkeley: University of California Press.
- Zimmerer, K. S. (2009). *Nature under Neoliberalism and Beyond: Community-Based Resource Management, Environmental Conservation, and Farmer-and-Food Movements in Bolivia, 1985–Present, Beyond neoliberalism in Latin America? : societies and politics at the crossroads*, J. Burdick, P. Oxhorn, and K.M. Roberts, eds. USA: Palgrave Macmillan, pp. 157-174.