

THAILAND



Rice Best Practice in Thailand

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Introduction

Rice is not only a single-leaf grass-like plant that can be eaten or sold as a profitable export, which ranks Thailand as the world's biggest rice exporting country. The Thais regard rice highly as a deity called "Mae Bhosop (Rice Mother)". Rice has been deeply rooted in the Thai people's way of life. It is the origin of a variety of traditions and customs that are profoundly entwined with the economic, social and political aspects of Thai society. Rice therefore means much more than just a commodity or food. Rice is extremely important to the Thai people.

"Rice" is closely connected with the Thai's way of life and spirit. The Thais cannot live without rice. Rice is life. Nothing is more profound than rice. It is most sacred for people. Through rice, we can get in touch with thaen (or the Great Spirit). Rice was derived from heaven. The people of Bali believe that god gave rice, in four different colors, to people. The rice of one color was eaten by some ducks, which left the remaining rice in three colors to the people. Later on, the people had to dye rice with turmeric to make the four kinds of rice complete again.

In the southern and central regions of Thailand, there are legends about Mae Bhosop. Such connection with rice is very deep-set



but could be destroyed by a sense of alienation. At first, rice was a celestial substance. Then it became food to which some political dimension has been added since the country's early Rattanakosin period. During that period more than two centuries ago, the administration was based on the four-minister system - formerly known as the *wiang-wang-khlang-na* system whereby the four ministers of the interior, Royal Household, Finance and Agriculture ran the country. Under such regime, people were classified by their land entitlement designated by the state, which was known in Thai as the *Sakdina* system.

Commoners and slaves were entitled to only five rai of rice field. Rice fields, used only for planting rice, were inundated areas surrounded by dykes. Rice planted in upland areas is called upland rice while that planted in lowland areas is called lowland rice.

Because of their long and continued association with rice, the Thai people grew rice wherever they were. The *Sakdina* system was a proof of the country's political relations to rice as the system ranged its rice field entitlement from five rai to 10,000 and 100,000 rai. In the past, all the land throughout the country belonged to the king, who could permit his subjects to exploit it or revoke his permission whenever he wanted. Thus, rice and the rice fields have been related to the country's administrative system and served as a cultural foundation.

In the 12-month customs of the northeast, all was about rice and rice-related way of life. In times of national crisis, poverty and

hunger brought on by wars and other social incidents, the Thai people would refer to them as times of “scarce rice and expensive betel nuts”, which means that there were not enough rice to eat. When there was a severe drought and not enough rice to eat, people had to eat taro and yam instead. If you have no rice to eat, it means you are starving because rice is people’s staple food.” (Mr. Daycha Siripathra, director of the Khwan Khao Foundation based in Suphan Buri, interviewed in June 2006)

Culturally, rice has been and still is the Thai people’s root. The people of Suphan Buri province (in the central region of Thailand) did not eat buffalo meat because they regarded buffaloes as useful animals. When buffaloes were too old to work, they would be given to a temple. After death, their skin would be used for drum making. People would never kill buffaloes.

The Thai people performed four kinds of animal in a ceremony to strengthen their spirit (known in Thai as Tham Khwan) - elephants (for their role in national protection), horses (for their role in the war), cows and buffaloes. That was why these animals were commonly grouped as elephants-horses-cows-buffaloes.

In addition, everything related to rice, such the rice fields and threshing floors would need a ceremony to strengthen their spirit. Nothing else would ever be planted in the rice fields. Traditional prohibition barred people from pulling down their rice barns and rebuilding them as houses.

Such beliefs emphasize that rice is no ordinary matter, but the very essence of Thai culture, which intricately links to the country’s





systems of belief, administration, food and nationhood. “Nationhood is culture,” say some anthropologists. Therefore, at the center of Thai culture is the people’s strong attachment to rice, which is the nation’s life and spirit. Without our rice culture, we will lose our nationhood. Rice, rice farmers and rice fields are national security that we must preserve.

Economically, most of the Thai people are rice farmers, who still form the majority part of the country’s agricultural sector. Although farmers have planted rice for a long time, problems related to rice farming have evolved with time as well.

Mr.Suksan Kantree, technical officer of Kao Kwan Foundation points out that “Rice is Thai people’s daily staple food. From birth to death, rice plays a significant role in the Thai people’s way of life. Nearly all rice eaten in Thailand comes from the work of Thai farmers. Despite Thailand's huge industrial and technological progress, rice farming still ranks high among the country’s economic activities.

But so far, rice farming technology has considerably changed. Modern rice farming focuses on the heavy use of chemical fertilizers and other chemicals that affect the farmers’ way of life and production system. Take the new rice varieties for example. To meet the market demand, the development of the new rice varieties emphasizes most on their maximum yields per rai and capacity to be planted all year round. Thus, the farmers have to use more fertilizers with its prices rising every year. Moreover, new rice varieties are often susceptible to diseases, leading modern-day rice farmers to rely on chemical pesticides as their solution. These, of course, increase their

production costs and affect their health.

It is important to note that even if the modern innovations in rice provide the farmers with better varieties, their expenses on rice seeds also increase. The farmers are partly encouraged to buy these high-yielding varieties instead of preserving the rice seeds as done in the past. The development of rice varieties in this way aims at meeting the demand of the market and making production dependent on chemicals rather than serving the needs of the farmers. In addition, private companies are playing a leading role in monopolizing the rice seeds market so that they can make huge profits from their comprehensive sale of rice seeds and other production factors. So the farmers' production alternatives are limited while their self-sufficiency is also reduced. (Mr. Suksan Kantree, Training manual, Techniques on Improvement and Development of Rice Varieties, 2006, p.1)

There are other fundamental problems facing the Thai farmers. Such problems include limited farmland, lack of rights to land cultivation, shortage of water sources, low price of rice, environmental and ecological degradation, droughts and floods, and inadequate promotion of appropriate technology that will deal with high production costs and expensive petrol and farm machines. Such problems result in the farmers' loss of land, indebtedness, and deteriorating health.

A lot of farmers do not want their children to carry on rice farming because there's no future in it. They increasingly encourage their children to study and turn to other occupations. It is tragic that the rice-farming people have to live an impoverished life. The longer they carry on, the more indebted they become, not to mention their degraded health and need to turn into migrant workers.

All these came from the state's policy on "export-led production" and its emphasis more on economic growth figures than adhering to the plight of the farmers. The government is endlessly promoting unnecessary modern amenities that are causing the farmers to and long for such comforts that money can buy.

During the government's implementation of its first development policy over four decades ago, whereby the then government leader claimed that "work is money; money is work; it can bring happiness", the "Green Revolution" approach to increase agricultural production was adopted. The government encouraged the farm-

ers to use modern farm technologies. The Bank for Agriculture and Agricultural Cooperatives was established to lend money to the farmers to buy fertilizers and other chemicals for agriculture. Now, we need to keep a watchful eye on the government's drafting of the Rice Act, which apparently will further undermine the farmers' self-sufficiency.

Amid the farmers' continuing problems, the "farmers' paradigm shift" is important to contribute to the development of sustainable rice farming and promote it as a concrete alternative for the farmers. But to make the farmers back off, refrain from, and even end their modern farming and turn to sustainable agriculture system is a big challenge. It is a big question indeed, particularly when the farmers have to experience many rapidly changing impacts.

Realizing the goodness and significance of "Mae Bhosop," which has nourished our lives, the Foundation of Reclaiming Rural Agriculture and Food Sovereignty Action (RRAFA) in cooperation with the Alternative Agriculture Network (AANET) and Khao Khwan Foundation (KKF), Suphanburi, central, Thailand jointly supported a study, collection and production of this paper. The study focused on presenting a conceptual framework, approaches and technical methods that helped develop concrete alternatives of sustainable agriculture that will make the farmers' self-sufficiency possible. The case studies presented in this paper are examples of those who succeeded, to a certain extent, in fighting various obstacles. They still need further development while other relevant challenges are to be continuously considered and addressed (Montawadee Krutmechai, RRAFA).

BACKGROUND

General situation of agriculture sector in Thailand

It will be correct to say that the agriculture sector is the legacy for the Thai society. Its history showed that Thailand will never be depleted of food and agriculture is the main economic resource that will continuously generate income for the country. Thailand had claimed to be "the World Kitchen" in the world of neo-liberalization.

However, the government's development plan to improve the agriculture sector and become export oriented has imperiled the natural resources, such as land, forest, water, even the air and its ecological biodiversity. The green revolution has since changed the farmers' method of production, land and water management abandoning the farmers' traditional practice of rice farming. The farmers became dependent on the new technology being introduced to them. Small-scale farmers who do not own their land turned to the forest area to farm.

The irrigation system covers only 20 percent of the agriculture area and most of the farmers are relying on rain-fed farming. The green revolution resulted to conflicts among the farmers because some with large farm lands were monopolizing the water resources. The farms' dependence on chemical pesticides brought damage to the water supply as well. The commercial irrigation and dams built for the green revolution rapidly changed the production practice of the farmers also.

The soil's natural minerals have been severely affected by heavy chemical pesticide use. The mono-cropping system created adverse impact on the soil because of fast production cycle.

The transnational corporation's control over the seeds had reduced the biodiversity of the rice fields. The farmers used to take control of seed selection and seed conservation in the past.

The livelihood of small-scale rice farmers did not improve after 40 years since the implementation of green revolution and after rapidly changing their traditional practice of rice farming. They are facing huge debt problem and their wisdom and tradition were taken away from them. Their cultural practices and strong sense of community disappeared. The conflict among the farmers worsened leaving the farmer organizations weak and ineffectual.

The farmers' rice practice

Thailand is known as world's number one rice exporter for a long time. Jasmine rice has been the number one source of income from the country's exports.

Rice is the also the pilot project of the green revolution. Its introduction in 1966 was the turning point and the farmers has aban-



done the traditional rice varieties and shifted to the rice varieties that are since coming out from the laboratory of the International Rice Research Institute.

In the olden days, rice production in Thailand follows a distinct practice and process depending on the local culture and ecological state of each region. The central part is located in the river bank wherein the soil is really rich and full of the natural minerals. The people there are engaged only in rice production but also in vegetables, evergreen trees and fruit trees. They raise animals in the farm as well.

However, the region became the main source of rice for the country's exports. The Department of Agriculture Extension set its gear towards introducing new rice varieties that will guarantee increased yield and fulfill the demands of the export market. The farmers abandoned "na dum", their traditional practice of transplanting the paddy seedlings and began practicing "na wan" in which paddy is sown without transplanting.

The northeastern part of Thailand, on the other hand, focused on growing jasmine rice because this variety has very high demand in the export market. Most of the farmers shifted to planting jasmine rice to generate income for their family although most of the farmers still plant sticky rice for their household consumption.

Thailand's trade agreement with various countries may increase the demand for Thai rice and possibly result to increase in farmers' income. On the contrary, only the exporters and the middle men are gaining from the situation. The farmers are still in the losing end and continue to suffer from indebtedness. The country's export oriented agriculture threw away the farmers' identity and integrity associated with the traditional rice farming practices and worse, did not help improve the people's quality of life. (Supanee Thaneewut, RRAFA)

Situation and Problems of Rice Culture and Thai Farmers in Each Region

Thailand is divided among the four main regions, North, Central, South and Northeast. Each follows distinct rice farming practice and tradition that eventually was swept away by the onset of "modern farming" methods. The farmers in these regions practically followed the direction set by green revolution. They adopted the use of new rice varieties, technologies, such as chemical fertilisers, irrigation and sowing method.

The central region started adopting modern rice varieties for the cultivation of second rice. The farmers in can plant for 2 to 3 crops a year because most of the areas have irrigation system. However, the farmers are heavily indebted as a result of their new lifestyle. They invest and spend more than their income can afford. They engaged in unnecessary consumption and extravagant items.

The farmers need to cultivate larger plots of land and some have to rent the rice fields where they can plant. They have to cultivate at least, 40-50 rais to be able to sustain their cost of living. However, they had difficulty attending to a larger tract of land and extensively use chemicals and farming machines. Their problems are aggravated when the price of gasoline rises and the spending cost of fertilisers,

chemicals and machines also rise while their yield and the price of rice do not increase at all.

As a result of this, the farmers found it hard to resist the agri-business companies' offer to engage them in contract or integrated farming. The farmers had no choice but to join these corporations who in turn were able to corner a sizeable market for their new rice seed varieties, chemical fertilisers and other implements. Then the farmers sell the yield to the companies at an earlier agreed price. The companies buy and fix the price at an earlier agreed price. The farmers are trapped into signing the contracts in exchange for the support that will get from these companies.

The government and agri-business corporations are pushing for a law designating certain areas as rice growing promotion zone. The proposed bill allows the government to give financial support for the farmers' production in that zone while the companies will introduce integrated farming but essentially, promoting mono-cropping of rice. This bill has not been approved but will not give the farmers a better choice letting them fall into this cycle.

Hybrid rice seed variety and genetically modified organisms are also already entering the central region. The farmers will have to face a system of monopoly because these require intensive use of chemical fertilizers and can only be sold to the extension companies. These technologies sit well in the Central region due to widespread irrigation system and accessibility to the market.

Contract farming under these companies is already being introduced even in organic farming. It has a promising market but the supply is still low compared to the market demand and the price is a little higher. The government introduced its “policy on organic farming” instituting organic farming in the national agenda. Several provinces in the Central region adopted the policy to promote organic rice. However, organic farming has higher costs than chemical farming. The herbs and other raw materials for organic fertilizers also have costs, wage for farm workers to spray herbal solution, and even the soil. The state promotes greater volume but expensive organic fertilisers.

The other regions, such as the North, South and Northeast are rainfed areas. Fewer farmers are adopting organic farming and they are still using native rice varieties. These have already been selected and improved, such as the Mali 105. It has been improved to get Gor Kor 6 and Gor Kor 15 and has better yield that can meet the demand.

However, the number of farmers in these regions is lower than the farmers in Central. They do not have irrigation system and some are still using buffalo labour. They still use transplanting method of rice farming, compost and cow dung. They use a little chemical fertilizer because it results to more leaves unlike the hybrid seeds. The water supply in these areas is not as plenty as the Central region but there are certain times of the year when flooding is difficult to control that result to lower yield. It is difficult to cultivate new varieties because these lead the farmers to take higher risks.

The farmers in the Northeast shifted to “white rice” from growing “sticky rice”, from small grain to jasmine rice (Hom Mali). The land area planted to jasmine rice has grown and the farmers have also changed their way of production and eating habit. For example, some farmers grow jasmine rice for household consumption but some grow sticky rice for sale. Some grow only jasmine rice and have been using this for their household consumption also.

There is a trend of increasing use of chemical fertilizers and insecticides in Goo Ga Sing District, Roi-et where modern farming system has been done for a long time. The soil has become infertile and has degraded the environment.

Some farmers have also stopped transplanting and shifted to sowing method because they would rather do something else than spend their time in the field. The cost is higher because of the need to pay wages for farm workers. This kind of practice would create problems in the long run when the weeds spread out. Consequently, they need to use weed killers or more seeds. The yield is lower with sowing than transplanting method, the soil will be damaged, and the cost is higher because of more pathogens and increase in use of chemical fertilizers.

The rice lands in the South lessened or some farmers stopped planting rice completely and shifted to cash crops, like Para rubber and oil palm. At present, rubber gets good price for rubber latex or sheet at 95 Baht per kilogram.

The government provides support to farmers through the rubber welfare fund at 4,000 Baht per rai per family. The same goes for palm oil wherein the government provided several billions Baht as support to farmers for them to grow oil palm under the policy, "change idle rice field into oil palm". This project is implemented by the provincial governors, district and sub-district agricultural extension officers.

Around 100,000 rais of land are converted into oil palm plantation in three Southern provinces. Some farmers abandoned rice farming because it is not profitable and turned to oil palm cultivation. It is more suitable in plain areas like the rice field and needs more water unlike rubber that is not good for low land areas. At present, the price of palm oil is 3 Baht per kilogram.

Farmers who found their areas not suitable for rice farming shifted to Para rubber because it commands higher price in the market. However, it requires high cost in investment and grows slow. There is a trend that rubber cultivation would create more disadvantages because the price highly depended on market and the farmers suffered losses when the price fell. In addition, they have to buy rice for household consumption.

Another reason why the farmers have shifted to cash crops from rice farming is because it has stopped being profitable. The cost is high like in the Central region but has very low yield at 20-30 thangs per rai. The average yield in the Central region is over 80 thangs per rai with similar investment cost.

Rice fields in the rice farming belt in the South, such as Nakhonsithammarat, Pak Phanang, Pattalung have also been left idle. Southern farmers mainly grow native rice varieties that require long period of cultivation of about 5-6 months while rice in Central region is grown for 3-4 months only and produces with higher yield. That is why the farmers in South either left their rice farms idle or turn to chemical-intensive rice farming like in the Central region.

Another trend that needs to be closely monitored the promotion of integrated rice farming of jasmine rice or native by business companies. They rent abandoned or idle rice fields, expand further and hire farm workers to cultivate the land. The companies sometimes pay the rice farmers. The market has a good demand for native rice like the Sank Yod variety from the South because the people prefer it and commands a better price.

The North has a more serious problem on land because it is mountainous with smaller, expensive areas for cultivation. Land in watershed area, however is good. Land is scarce and the population is big. The competition for land is serious and most lands are in the hands of the rich families. The farmers have no security for land ownership because their land might be expropriated any time.

The tribal people in the mountain were driven off their land because live on slash and burn farming this resulted in soil, water and forest degradation. Rotation farming is needed to give time for the soil to rehabilitate itself for 5 to 10 years. However, the farmers cannot afford this and they need to plant in a short cycle of only 1 to 2 years and come back to their land. The massive use of chemical fertiliser and other chemicals further aggravated the soil condition.

Unlike the low land people who cultivate rice with transplanting method and grow fruit trees in their backyard garden, the tribal people do not practice this. However, some of them grow “Khao Rai” or highland rice with 5 to 10 years rotation farming to allow the soil to recover. This system cannot be done in areas where there are more people and the land is scarce.

Worse, some farmers who do not grow rice cultivate cash crops or mono-cropping, such as cabbage and ginger that require intensive use of chemicals. These are washed into the streams and rivers. At present, the farmers have more needs than they can afford from

their livelihood. They now have more needs, such as mobile phone, car, television, and so on because their way of life is like in the urban areas.

The problems of farmers from the North are similar to those from other regions. Whether they use traditional or modern rice varieties, they tend to use more chemicals and machines, emulating the practices in the Central region and getting similar agricultural extension from state agencies. However, they still keep rice seeds for consumption and cultivation unlike the farmers in the Central region who do not keep their seeds anymore, sell everything and buy their seeds later when they need it. (Montawadee Krutmechai, RRAFA).

Alternatives for farmer

Forty years of green revolution made the farmers suffer enough. Most of them had been searching for an alternative realizing that the way of production shouldn't be separated from their way of life. Sustainable agriculture is an alternative choice for most of them.

Sustainable agriculture focuses on the holistic knowledge wherein every part is significant to the others. The farmers' way of production should be suitable to the natural resources available and not based on the demands of the market. The ecological balance needs to be taken seriously as well.

However, shifting to sustainable agriculture system is not going to be easy. The farmers need not only inner strength and strong belief but also immense support by continuous learning process appropriate to their way of life. The main goal is not to be "the world kitchen" but to strengthen the farmers' full potential as human beings.

The cooperative and farmer organization strengthen the farmers in all levels including his community and nation as a whole. This will include the quality of life of the farmer who can live with nature peacefully and sustainably as well.

The lessons learned from each farmer are evolving as he gathers his very own experiences, discover its benefits and be able to develop and apply to the life of the other farmers. (Supanee Thaneewut,RRAFA).

History of the Best Practice

Inspired by the value and significance of this study, the Foundation of Reclaiming Rural Agriculture and Food Sovereignty Action (RRAFA) joined hands Alternative Agricultural Network (AANET) and Khao Kwan Foundation (KKF) to select cases of farmers and farmers organisations with direct experience in sustainable agriculture. It aims to study concepts, analyze and draw up operational guidelines to develop and strengthen different concrete alternatives towards “self-supporting” in production, living with sufficiency and happiness based on natural Thai way, wisdom and cultures amidst the growing liberal monopoly capitalism and globalisation.

The four cases in this study are partners of Chivit Thai Foundation and two other non-government organisations in Central and Northeastern regions. The following account describes the background and mission of these (Montawadee Krutmechai).

Local Rice Genetic-diversity in Northeastern Thailand

(Bhundhit Piyasilp & Areewan Kusanthia)

Geography

Northeastern Thailand has an area of 106 million rai (6.5 rai:1 hectare), including 39 million rai of rice field. Most part of the rice field is plain with water level lower than one meter. The rice field's topography is uneven due to shallow basin-land characteristic. The soil is not so fertile because it is sandy soil and gritty and some areas are salty soil. Generally, the northeast's climate is dry and almost the entire rice field depends on precipitation.

I-sarn culture

“Rice” has been a part of the I-sarn people's way of life, and merged into their culture and beliefs from birth through their death. Sumontha Hlaochai, a farmer from Saelapoom, Roi-et province said her mother would castigate and punish her if she could not finish the rice on her plate. Her mother told her that rice is sacred and precious.

They have several culture activities related to rice. First, the rituals of growing rice start with putting dust in the field, sacrificing and venerating the goddess of rice. This is followed by *Phi-ta-hag*, the ploughing ceremony and transplanting rice seedling ceremony. The rituals of harvesting rice include cremating the rice to show respect to the goddess of rice and earth. Before the farmers store the

rice in the storage, there is a ceremony of calling back the rice spirit.

The I-sarn people believe that “Ghost” is involved in the rice producing rites. This is related to “*Heed sib-song Klong sib-si*,” the northeastern tradition and culture that reflected the farmers’ philosophy about rice. The ceremonies include *Boon khun lan* on the 12th month, *Boon kow jee* on the 15th, waxing moon on the 3rd month. *Kob bor mee dak Naka bor mee hu-kee* is a way to consult the ancestor spirit wherein the chicken soup served indicated the expected water quantity for each year.

Boon bung fai and *Hae nang meaw* are the people’s ceremony to ask for rain. When the rain comes, there is the *Hag-na* ceremony to strengthen the people’s moral support and welcome the rice growing season. The 10th month brings in *Boon kaw sak* when the people flock to the temple to show their gratitude and bring rice back to the field for another prosperous harvest to come. During *Boon Auk-pun-saa*, the monks are out for the Buddhist Lent and the farmers light the lanterns and offer developing ears of paddy to the Buddha. The people has *Boon home kaw* after the harvest.

From generation to generation, the I-sarn people have retold several legends about rice such as the *Lan-Chang* chronicle, *Praya Than*, and *Hma-kaw hang* or the nine-tail dog. The legends may differ according to their local belief and culture. The I-sarn custom and relationship systems are distinctively benevolent and friendly to everyone. As a result of this, the rice genetic-diversity is able to exist. For instance, if rice is totally unproductive because of flooding in low land rice field or drought in the high land, the farmers can borrow, share, or exchange rice grain among relatives and neighbors among the communities.

These rice related tradition, ceremonies, legends, and beliefs are not only illustrated in the local community and people's way of life but also reflected in the benevolent relationship between man and nature. Consequently, these are able to influence the local rice genetic conservation and management system.

Rice Genetic-diversity

*Today is a good day, the brilliant luck millionaire day,
charming and good auspices.*

*This grain is Kaw Khlakhum. That is Kaw Ngun.
That thickness ear is Kaw Mahkgaug.
The edge dark grain is Kaw Mahkkur-ah.
That fine grain is Kaw Pongeaow.
The light ear is Kaw Kwangmet. That is Kaw Plalaht.
The large grain is Kaw Mahkbodhi.
The protrusive grain is Kaw Kheesang,
Kaw Soung and Kaw Khasan.
The long grain is Kaw Chaw. That is Kaw Haumdor.
That mature is Kaw Maehang.
The aromatic rice is Kaw Jaumnang and Kaw Nangnuan.
The central dark grain is Kaw Klum.
The dark grain is Kaw Ee-gah.
Please growing rice, all farmers.
The flatten ears is Kaw leaumkhang.
Rain is good for rice. That is Kaw Khawloung.
That fine ear is Kaw Poor. That is Kaw Kahkhen.
Let's walk into the field, growing entire seedling.
Come on, go forward, all grain should be gone!
(By Mr. Thongsuk Hapunna)*

Above is an I-sarn chant during the blessing ceremony for rice. The chant showed that each community acknowledged a lot of rice species. According to the elderly in I-sarn communities, each family would grow at least 3-5 rice species in the past. Rice selection depended on their culture, belief, local geography and other factors.

Even though so many rice species had been extinct during the past 30 years, the study of local rice genetic in northeastern Thailand in 2000-2001 indicated that the farmers still remember more than a hundred of rice species. These farmers were members of the Alternative Agricultural Network in the plain rice field areas in Surin, Roy-et, Yasothorn, Khalasin, Mhasarakarm, and Khonkhan provinces. Nowadays, more than fifty kinds of rice are still grown in these areas.

The farmers in northeastern could conserve these local rice species due to several factors and conditions as follows.

1. The suitability of the ecosystem to different rice varieties is most important for the farmers' choice of rice variety that is appropri-

ate to field locations. Field locations are characterized by five levels:

- **Flooding area or deep water field:** The rice varieties should have special characteristics that can withstand the water level. These are usually late-maturing-varieties and can be harvested in December, like *Chao-loy*, *Chao-nang-mao*, *Chao-nang-mon*, etc., and medium-maturing-varieties harvested in November, like the glutinous rice *Kow-diow*.
 - **Lowland field:** Most rice varieties for lowland field are medium-maturing-varieties that are for harvest in November like the glutinous rice *Kaw-khum*, *Kaw-khum-kab-bai-dum*, *Nang-nuan*, *San-pa-tong*, *Ma-kur*, rice; *Chao-Hom-mali-dang*, and *Chao-bong-kasatriya- Chao-dang*, etc.
 - **Mire-soil paddy field:** The proper rice species are late-maturing-varieties with harvesting in December like glutinous rice, *Ee-tom-kow* and *Ee-tom-yai*.
 - **Highland field:** The proper rice species are early-maturing-varieties to be harvested in October like *Dou-kaw*, *Dou-maung-laos*, *Hleung-boon-ma*, *Wit-nee*, etc., and medium-maturing-varieties like *Pla-siew*, *Mae-hang*, etc.
 - **Slopes of the hill or high paddy land:** The proper rice species are medium-maturing-varieties like *Ee-noi*.
2. The rice eating culture of I-sarn people is well-known for usually eating glutinous rice but different areas have different culture on eating rice. Most I-sarn people in central and upper northeastern part, such as Khonkhan, Mahasarakham, Roi-et, and Yasothon provinces, like to eat tender and fine scent, long-slim slender glutinous rice like *Hleung-boon-ma*, and *Nang-nuan*. Most I-sarn people in lower northeastern, such as Surin, Bhurirum, Srisaket provinces, like to eat small and fluffy cooking rice like *Chao-bong-kasatriya*, *Chao-nang-mon*, *Chao-nang-mao*. The Phu-Thai group in Kalasintu province likes to eat big grain glutinous rice, such as, *Mae-hang*, *Ee-noy*, and *Kow-diow*.
 3. Some people believe that eating some of the rice varieties is good for health. For example, people in Surin province and lower I-sarn believe that *Bong-kasatriya* glutinous rice and other rice variety such as *Chao-nang-mao* and *Chao-nang-mon* could

strengthen their body to work for longer period and cure bone diseases. On the other hand, some people believe that breeding rice species such as *Kor-Khor* rice that is so tender is not proper for diabetes patient because it can cause this disease. *Kor-Khor* is the Thai initial that stands for Rice Department.

4. Some special rice varieties used for cooking specific dessert during festivals or traditional ceremonies are usually ripe and ready to be harvested in time for the festival or traditional ceremony. For example, *Kow-khum*, *Kaw-khum-kab-bai-dum*, *Ee-tom-kow* glutinous rice are used for shredded rice grain *Kanom-hor*, *Sa-tho* and other delicacies. *Chao-dang* and *Chao-bong-kasatriya* are good for cooking *Kanom-jean*.
5. Many families grow early-maturing, medium-maturing and late-maturing-varieties that have different harvesting periods to ensure that they have rice supply all year long. In addition, since harvesting periods are different, they can manage and use every member of the family as workers wisely.
6. Some local rice varieties have higher demands than the others and have higher market price. These affect the farmers' decision on the varieties that will be grown in large part of their rice farms. Information from Tung-kula-ronghai, Surin, Yasorthorn, and Roi-et provinces indicated that the planting of jasmine rice, *Chao-hom-mali* and *Chao-hleung-oon* is directly related to the trend in rice prices. Consequently, the size of farm areas that will be planted with other rice varieties for families' and communities' have decreased.
7. Most local rice varieties are strong, resistant to insects and diseases resistant and have adjusted well to the environment. They produce high yield and require neither pesticide nor chemical fertilizer. The production cost of these varieties is lower and these are easy to cultivate.
8. Some farmers believe that they inherited the local rice varieties from their ancestors and these are not supposed to be lost from their rice field.

The Crucial Conditions Effect on I-sarn Local Rice Diversity

The genetic diversity of local rice varieties has dramatically decreased. Each family used to grow 3-5 rice varieties in the past.

Due to the government extension, the farmers have been gradually growing non-traditional rice varieties such as *Kor-Khor 6*, *Kor-Khor 8*, *Kor-Khor 15* and *Kow-dok-mali 105* (white jasmine). The two major reasons for the decreasing I-sarn local rice diversity are commercial and export rice extension and rice breeding research policy.

The Government's Extension Policy of Commercial and Export Rice Varieties

According to local rice varieties survey in Tung-kula-ronghai, Surin, Yasorthorn, and Roi-et provinces, there were more than a hundred of rice varieties in the past. Unfortunately now, most farmers in these areas are growing only one jasmine rice variety due to its higher demand and market price.

The government's policy, particularly the Agricultural Extension Department intends to expand to twelve rice commercial varieties throughout the country. These are the glutinous rice varieties *Kor-Khor 6*, *Kor-Khor 8* and *Kor-Khor 10*; seven jasmine rice varieties *Kor-Khor 7*, *Kor-Khor 13*, *Kor-Khor 23*, *Kho-Khor 25*, *Supanburi 60*, and *Supanburi 90*; and two local rice varieties *Sunpatong glutinous rice* and *Hom-dok-mali 105*, also a jasmine rice variety.

Local rice varieties were classified as low quality. Their sizes and shapes are the variant grains of fat, round, short or long that does not fit in the local rice mills. Almost all the rice mills have adjusted their machines to mill only long grain rice because of higher demand from market. In the end, many farmers gave up growing local rice.

The Government's Rice Research and Breeding Policy

The farmers stopped planting the local rice varieties because the government's policy related to rice research and breeding did not give importance on these as well. The research and breeding of new rice varieties responded mainly to market demand and modern agriculture systems that emphasize the use of chemical fertilizer and

pesticide substance. This resulted to diminishing use of local rice varieties that are more suitable to the particularities of the areas' ecosystem and community's food consumption.

Local Rice Genetic Conservation and Development

Since the last decade, the northeastern farmers have collaborated and established the Northeastern Alternative Agriculture Network seeking alternative agriculture systems to improve their quality of life. The farmers found that commercial agricultural system responded only to the foreign countries' demand for rice. Consequently, it became the main cause of poverty, indebtedness and other problems that confront the farmers.



The members of the network developed several alternative systems, such as integrated agriculture, agro-forestry, organic farming, and non-chemical agricultural system. Recently, they also discovered the local wisdom of medicinal plants and local food preservation. The farmers of the Northeastern Alternative Agriculture Network learned the need to improve the local rice varieties.

In 1997, the “Local Plant Varieties Improvement and Preservation Network” was established in association with several NGOs. The network's members came from Surin, Yasothon, Khonkhan, Mahasarakham, and Kalasintu provinces. The purpose of this network is to conserve and improve rice varieties that would specifi-

cally, provide for community needs. Many I-sarn farmers realized the importance of adjusting rice genetic conservation and development to suit the community needs for local knowledge and social changes.

The farmers recently initiated survey and collection of local rice strains that were being used before. Based on field experimentation, these strains would be selected and grown according to the areas' ecosystem. The network also plans to breed rice that provides for the community needs. The farmers' knowledge and experiences and technology from outside complemented to support the network's goals.

Local rice breeding with farmers' full participation is geared to improve the rice characteristics. Ultimately the existence of genetic-diversity of the local rice aims for the food security and improvement of the people's quality of life.

The network members proposed local rice genetic-diversity conservation and development at the field and community levels.

1. Exchange and spread of local rice strains among communities and networks as much as possible to achieve higher rice genetic diversity
2. Field experiment to conserve and improve local rice genetic-diversity and serve as tangible demonstration that will extend to other areas.
3. Raise awareness of local plant species, take action in the field and proclaim farmers' ownership of the initiative.
4. Record local rice and plant genetic-diversity information for continued conservation and development.
5. Meet annually for exchange of various and expansive traditional, local rice strains at all levels, such as field, regional, national and international levels
6. Establish local rice genetic conservation and developments networks extending to other local plant genetic as well.
7. Promote indigenous culture and tradition related to local rice and plant strains conservation and development
8. Unite to fight the overwhelming presence of rice and plant genetic by multinational companies, GMO plants, and other poli-

cies that transgress every community's right to local plants conservation and development.

Policy proposal for local rice genetic-diversity conservation and development

1. The government should support the farmers in implementing local rice conservation and development at field levels. Significantly, the program should invoke farmers' participation, cognizant of the local culture, beliefs, knowledge and farmers' wisdom and appropriate to the local ecosystem.
2. The policy on rice and plant genetic resource management should recognize the rights of the farmers and the communities. It should neither result to monopoly of rice plant genetic nor restrict the farmers' and communities' rights.

The I-sarn Network of Local Rice Genetic Conservation and Development

The Initial Stage

The Alternative Agricultural Network and other non-government organization networks that support and work on rice-related realized that the genetic issue was at the heart of the changing Thailand and world agricultural system since the green revolution to globalization era. The green revolution used technology to transform the genetic make up local species to breeding strains or hybrid. Consequently, this led to enormously decreasing local genetic and extinction of most local species.

Presently, the multinational companies are using biotechnology and bioengineering to alter genetic that is called GMO. They legally registered these for patent. This process would destroy all primitive genetics that the farmers possess. The multinational companies have monopolized the genetics giving them infinite benefits.

The Alternative Agriculture Network has been using local genetic conservation and development to significantly improve sustainable agriculture. Since 2000, the network has collaborated with Rural Reconstruction Alumni and Friends Association (RRAFA), Biothai and Khao Khaun Foundation to work on the genetic issue at the field level. They work for the people's awareness of the situa-

tion, problems, policies and actions to resolve the problem.

Rice was the first plant for the farmers to analyze this issue because rice has different dimensions. These involve economic, social and cultural dimensions in the production and consumption processes as well as I-sarn culture and beliefs. The networks aimed to conserve and improve the local rice genetic to provide for the farmers' needs. Importantly, the farmers should have ownership of rice genetic.

Farmer centered, people participation, and field level practice were the core principles of genetic conservation and development. This approach is more sustainable and effective than just storing rice species in the seed bank because rice would be able to address the real world environmental problems.

Working Process

The Alternative Agricultural Network began its work on the genetic issue of I-sarn in a meeting on regional strategies. The activity started in interested geo-ecological areas that also acted in unison. Then, field activities extended to the other areas. After that, the working group, which consisted of the representative from geo-ecological areas, regional and national levels, was established. It is now composed of 15 members that designed, planned and implemented activities together to the strategies' end.

Since 2000, the local rice varieties, has been sought surveyed, and studied in six provinces, including Surin, Roi-et, Yasothon, Kalasintu, Mahasarakham, and Khonkhan. The study was focused on plain field rice varieties. More than 50 varieties of local rice were collected from the different areas, studied their constraints and strengths and other related local knowledge.

When the study was completed, the network conducted a seminar on the concept and importance of local rice strains. Khao Khaun Foundation provided training on seeds selection and breeding techniques. RRAFA gave learning processes and Biothai provided input on monitoring related policies.

The participants were 40 farmers from seven geo-ecological areas, Suring, Roi-et, Thung-kula-ronghai, Kalasintutu, Yasothon, upper Khonkhan- lower Khoraj and Mahasarakham. The participants

were inspired by the instructors who provided information about the importance of local rice varieties and conservation of the indigenous strains. The farmers exchanged rice strains with different geo-biological areas during the seminar. The local rice grains were selected as well.



The farmers agreed to promote and grow local rice in their field. Unfortunately, they did not have seeds yet so they were given local rice seeds to experiment in their field. The regional staff continue to follow up the implementation in each geo-ecological area.

The monitoring result indicated that after planting local rice in the field, the participants were not certain whether that rice was local rice or not because they did not know the specific characteristics of each specie. A workshop on local rice seed selection techniques was conducted for farmers in each geo-ecological area. They were taught with techniques on determining rice characteristics. The farmers practiced the seed selection from rice ears, field, and unpolished rice. They also practiced the unpolished rice culturing.

The training input included the related genetic situation and policies in national and international levels that affect the farmers. These include the government's breeding rice extension policy, TRIPS agreement, bio-piracy, and GMOs.

Finally, each farmer prepared the personal plan, working together in the communities and geo-ecological area and plans for the network. The participants' needs in different levels, their strengths and weaknesses were also identified.

Look forward to the Future

There are now seven farmers in six geo-ecological areas who continue to save, select and breed local rice. They were able to collect more than 30 rice varieties. They did not only practice their learning in their field but were also able to teach other farmers. More than 100 farmers in seven geo-ecological areas are interested to grow local rice in their field.



The network is still in the initial process of encouraging farmers to improve their techniques, and sharing of related political situations, problems and impact. Some farmers could analyze and understand the relevance of the issues on their work while most of the farmers could not easily follow the learning process and require more time to fully comprehend.

Consequently, the directions in the future of the network are focused on providing learning about related political issues and impacts, and expanding to other local vegetable and medicinal plant varieties and local animal strains. Hopefully, this would help increase bio-diversity in the field and encourage more farmers to use sustainable agriculture system.

Case Study:
Mr. Beaw Thaila, Ban Nong Jaeng,
Don Jedi District, Supanburi, Central, Thailand

Montawadee Krutmechai

The Foundation of Reclaiming Rural Agriculture
and Food Sovereignty Action (RRAFA)

Mr. Beaw is a rice farmer but also grows vegetable for household consumption. He lives at 110 Ban Nong Jaeng, Moo 4, Tambon (Sub-District) Rairot, Don Jedi District, Supanburi Province. He is now 64 years old and finished grade 4 in elementary education. Beaw has a wife and her brother's family is living with them.

He has a total farmland area of 24 rais (9.6 acres), divided into two plots of 12 rais each. Most villagers are engaged in rice farming but the yield is not good due to lack of irrigation and they have to depend totally on rainfall. They grow rice only once a year and the yield will be really low when drought hits their farmlands. Therefore, the farmers in this community cultivate rice primarily for household consumption and keep some grains as seeds. They will sell their rice only when they have surplus.

Beaw has been engaged in rice cultivation since 1957 and has shifted from native to improved rice variety such as Hom Mali 105 (jasmine 105). It requires fertiliser and other chemicals in the cultivation. The yield is about 25-30 thangs (basket) per rai.

In 2002, Khao Kwan Foundation, a non-government organisation in Supanburi Province came in to promote low cost rice cultivation without using fertiliser and other chemicals. Beaw was interested to

do rice farming that would reduce his production cost and not use any chemicals.

Beaw and 50 other farmers in the village got together to form a group in March 2002. They held meetings and other activities to share and learn from one another. They also took part in study trips to integrated agriculture implementation in Roi-et and Khonkaen.

At present, they are engaged in low cost rice cultivation and grow everything they need for their household including vegetables. They buy only that is necessary, like pork. Beaw grows native rice varieties, such as Hom Mali, Jek Choey, Dum Noi, Nang Mon, and Khao Kaew. They have a dream of using buffalo to till their land because gasoline is expensive.

Analysis of Situation of Rice Production and Concept on Solution

Beaw said the farmers will not succeed because of high cost and indebtedness if they continue to use chemical fertilisers, weed killer and insecticides. This will make their lives more difficult. They need to work harder because the cost would not be worth their investment if they are working on small farms. Their health will also deteriorate and possibly suffer from rheumatism.

The cost of production is high because the current wage rate is already 150-200 Baht per day. The weed killer costs 300-500 Baht while the yield remains at only 25-30 thangs per rai regardless of the amount of chemicals and fertilisers used.

Beaw turned to biological method, such as preparation of biofertiliser using cow dung, pigs and chicken droppings, molasses, and pest management using Boraped (*Tinospora cordifolia*) and Sadao (Neem). He learned these methods of sustainable agriculture from farmers' school activity organised by Khao Kwan Foundation.

Beaw realised that sustainable agriculture was different from modern rice farming because it helped reduce their expenses and produced non-toxic yield. More importantly, they do not work round-the-clock to produce the yield they needed.

Knowledge, Wisdom and Experience in Sustainable Agriculture

For Beaw, success in sustainable agriculture requires the following:

- **Soil Management:** The soil condition of each area has different levels of acidity and alkalinity. The farmers must know the basic soil condition of their own farm to be able to address the problems and prepare it well for cultivation. For example, if the soil is too hard due to long-years of chemical application, the farmers should loosen the soil and spread biocompost to add nutrients to the soil.
- **Rice seed management:** The farmers should select seeds to get good rice varieties. Brown rice can be selected by husking paddy. Separate the grains with poor properties such as, turbid grain, large embryo, twisted grain, and the like from the grains with good properties such as, clear non-twisted grains. Keep and store the seeds so they need not buy new seeds every planting that cost 120-130 Baht per thang and yet the quality is not good. Dry the rice paddy under the sun for three days after harvest. The storage can be done with the following methods. Keep the grain in wooden box or sack and this can be stored for one year. Ensure appropriate water management in the rice plant because too much water result slow growth and have fewer shoots.
- **Disease and pest management:** The insects in the rice farm should not be a serious problem since the farmers are into annual crop cultivation. Insects that are usually found are plant hopper, stem borer and Malaeng Singha (rice stalk borer). Beaw applies herbs such as, Neem, Sarb Sua, Boraped, aromatic lemon grass and Hang Lai to control the insects.
- **Development of ecosystem:** Beaw gives importance on developing the ecosystem by growing vegetables on the side of his rice field. It provides for the plants' good natural environment. Now, common frog, green frog and fish are using his rice field as their ecological habitat.
- **Water management:** Scarce water source is a major problem. The yield is heavily dependent on the rainfall and the rain

usually comes in July-August. Beaw dug a pond to store the water from rain that he can use later when the rain is scarce.

Below are Beaw's experiences in using the methods and techniques in Sustainable Agriculture:

Soil Management and Soil Preparation

Tilling

In preparing the soil, the farmers will use or hire power tiller to plough the land at a fee of 200 Baht per rai. Normally, soil preparation is done twice to loosen the soil. To reduce the cost, Beaw till his land only once and apply bio compost or bio fertiliser to improve the soil.

Micro organisms help loosen the soil and enrich it with nutrients. Vegetable plots and cultivation of different kinds of trees are good for the rice field.

Forest that is naturally a rich land is the habitat of small and large animals and numerous kinds of plants. Plants depend on animals while animals also depend on plants. Similarly, micro organisms decompose large trees although it takes a long time to transform it into dust.

Using this principle, Beaw explored the forest to learn the ecosystem and collected sample of micro organisms for experimentation and breeding. There are several items that can be used as food for micro organisms. Molasses is important for micro organisms to breed. Rice bran, leaves, rice straws that can be found may also be used to feed micro organisms.

Breeding of micro organisms can be done in several ways. Beaw used the method:

Materials:

10 kilograms	Bamboo with micro organisms about
5 kilograms	Fine bran
5 kilograms	Raw husk
5 kilograms	Molasses
20 litres	Plain water

Preparation steps:

First fermentation:

Pour 20 litres of plain water into a can followed by 20 kilograms of molasses. Stir thoroughly and set aside. Pour all ingredients (in point 1-3) onto the ground and arrange into square pile. Cover the entire ground with plastic or sack. Put a heavy wood or stone on top for 10 days to prevent the plastic or sack from being blown away.

After 10 days, open the cover and you will find white micro organisms spread all over. This is called "expanding micro organisms". Feed the micro organisms with feed materials.

After 15 days, you will find even more micro organisms spread all over. Farmers can divide these into two parts. They can keep one part for further propagation while the other part can be used for other purposes, such as making fermented juice and hormones, and so on.

Second Fermentation:

Prepare 5 kilograms of molasses and mix it with 20 litres of plain water, then stir well. Put the micro organisms earlier prepared and ferment it for another 15-20 days. Worms will be born from the fermentation. Leave until the worms die and keep them for the third fermentation.

Third Fermentation:

Put 10 more kilograms of molasses and 200 litres of plain water in the molasses and water mixture earlier prepared in the second fermentation. The mixture will produce foam that will make it a good agent. Pour this onto the hard soil in the rice field to help loosen the soil.

Bio compost preparation:

Micro organisms help in decomposition and come from good soil in forests where they dwell. Fine bran and molasses serve as feed for micro organisms at an early stage in order to increase the stock and help decompose organic matters faster.

Organic matters include leaves, rice straw, husk, burned husk, sugar cane plant, and water hyacinth. Different animal droppings, such as chicken droppings, cow and buffalo dung have

rich nutrients for plants also because of nitrogen content.

These ingredients are good in helping the soil restructure itself and provide nutrients for plants.

Organic fertiliser generally used in rice field is a concentrated formula.

One metric ton of organic fertiliser has the following ingredients:

1 part	Available organic fertilizer (Good agent)
8 parts	Animal droppings (chicken and pig droppings, cow dung)
120 metric tons	Waste from sugar mill
2 parts	Fine bran
60 metric tons	Raw husk

Mix all ingredients together and leave it for one month. Put biological hormone and turn the compost pile once to mix the ingredients thoroughly. Leave it for one month.

Apply in rice field before tilling. It helps loosen the soil.

Biological hormone:

Fish, fish head and waste
Food waste (vegetable)
Buffalo or pig placenta
10-15 kilograms Molasses

Mix all ingredients with molasses. Put the ingredients in a plastic tank with 200 litres of water for 200 kilograms of ingredients and ferment for 15 days.

The same ingredients are decomposed for 2-3 months and can be used as spray mixture for the plants later.

Worms will develop but will later die in water. The juice has aromatic and sour smell that will serve as hormone agent ready for use. Mix the hormones with water, at the ratio of 20 litres of water for 1 litre of hormone.

Spray the mixture mixed with water (20 litres of water for 200 cc or 3 spoons of hormone) in rice field when rice starts to shoot ears at the age of 30-60 days. Spray the hormone again when rice is near flowering, at the age of 90 days, for regular flowering with full grain.

Spray at both the leaf and stalk. The output is increasing yield of 30 to 50 thangs per rai.

Marketing Management

Beaw shared the following guidelines on marketing management:

Good rice yield commands better price that would bring back the investment. The problems of the farmers in this area are the low yield, poor quality of rice and therefore, low selling price that is exploited by the traders. The farmers can sell Hom Mali 105 at 6,500-8,000 Baht per metric ton. The traders buy it at the lowest price of 6,500 Baht because the grain is not full with lots of grass and grass flower.

After opting for sustainable rice farming system, Beaw got better quality of rice. He was able to sell it at 8,500 Baht per metric ton because his paddy is full, regular and non-toxic. He grows Hom Mali Daeng (red jasmine) and Mali (jasmine) 105. He also sells Hom Mali Daeng as medicinal rice that can cure beriberi and diabetes.

Husking paddy using the traditional rice husking tool helps the farmers save on the milling fee that is normally paid to the rice mill at 8 Baht per thang, whether by for household consumption or for sale.

Is Sustainable Rice Farming Truly an Alternative for Farmers?

Beaw found sustainable rice farming a viable alternative for farmers. His production cost considerably reduced while the yield quality is good and can produce to as high as 50 thangs per rai. He could sell his rice at as high as 8,500 Baht per metric ton. More importantly, it is good for his health because he is not exposed to chemicals during cultivation, uses non-toxic rice for consumption and was able to use this to command better price for his yield.

Beaw said with appropriate methods, techniques and management, sustainable rice farming could certainly help farmers to be self-sufficient. From his experience in 2 years, he compared the reduction of cost of cultivation of modern rice farming and sustainable rice farming.

Modern Rice Farming Method (with fertilizer and other chemicals) (Remark: 1US\$ = 37 Thai Baht)

Expense Item	Calculation	Total/Baht
Cost of chemical fertilizer (Urea)	12,000 Baht/metric ton (100 0 kg.) Needs 200 kg per rai (24 rais of land)	48,000
Weed killer, insecticide	3 sets of weed killer at 320 Baht per set	960
Chemical insecticides		About 1,000
Hormone	740 Baht per bottle	740
Cost of rice seeds bought from trader	110 Baht/rai	2,640
Gasoline (for water pump, etc.)		About 5,000
Wage of workers for chemical spraying	680 Baht per rai x 3 sprays	2,040
Rent of combine	500 Baht/rai	12,000
Wage for grain collecting	3 Baht x bundles	
Total cost		73,180

Output : 30 thangs per rai low quality rice; selling price at 6,500-7,500 Baht per metric ton

Sustainable Rice Farming (using organic fertilizers and techniques)

Expense Item	Calculation	Total/Baht
Cost of biofertilizer (compost)	400 Baht/metric for use on 5 rais of rice field (needs to use for 24 rais).	1,900
Cost of molasses (materials for herbal solution preparation are generally plants that are locally acquired.)	30 Baht/rai	
Wage for workers to spray herbal solution.	40 Baht per rai x 24 rais	960
Rent of combine at 500 Baht per rai.	500 Baht/rai	12,000
Wage for grain collecting	3 Baht per bundle	
Total cost		43,200

Output: 50 thangs per rai, high quality rice; selling price at 8,500 Baht per metric ton

Quality yield results to better price

Beaw produced 50 thangs per rai when he engaged in sustainable rice farming in the last two years. He used to get only 30 thangs per rai despite intensive use of fertilisers.

In chemical rice farming, he spent 3,000 Baht per rai on the average while he spent only about 1,800 Baht per rai in sustainable rice farming. He was also able to sell his produce to the rice mill at

8,500 Baht per metric ton when chemical rice farmers get only 6,500-7,500 Baht per metric ton.

Beaw and his family have better livelihood with sufficient food for household consumption and is able buy more food items such as, pork and other meat. His wife has the capacity to process and other agricultural produce helping Beaw with additional income. She makes shampoo from Kaffir and other herbs, dish washing soap and fabric softener. She is now interested in processing food from agricultural produce.

Because he need not spend round-the-clock in his field, Beaw has an additional job of making cement post to earn additional income. He is also interested to develop agricultural produce for added value in the future, such as processing of dessert from non-chemical rice he grows

He has a good relationship with his family members and neighbours. His brother-in-law and nephew help Beaw in the field. They take turn managing their rice field and their house. They learned sustainable rice farming from Beaw and are still learning new knowledge to develop their agricultural capacity further.

They grow rice from July to August, take care of their rice field from September to November, and they harvest their rice in December.

Earlier, Beaw was called *Kaset Lom Thung Yuen* (failing farmer) or *Kaset Rumkarn* (annoying farmer) by his neighbours. When his family became successful in rice farming, his neighbours recognized him and showed interest to follow his model.

Their community's ecosystem in the rice field is renewed. The use of various bio-techniques and methods helps improve and enrich the ecosystem in rice field when common and green frogs now dwell in their rice field.

Factors Supporting Sustainable Rice Farming

Beaw spends his own money in sustainable rice farming. He uses only locally available resources. In 2002-2003, Khao Kwan Foundation provided support for him in the form of "knowledge" on preparing biocompost. Later in 2003, Mr. Amnuay Limpun, a member of Or Bor Tor, Tambon Administration Organisation gave 30,000

Baht for the preparation of compost and another 30,000 Baht from the Provincial Office of Agricultural Extension of Supanburi. These enabled him to prepare 70-80 metric tons of biocompost.

The farmers' group where he belongs also received 190,000 Baht from Khao Kwan Foundation for their rice seed fund. Recently, the District Extension Office offered them other loans but their group is still studying their needs and conditions of the loans.

They continue to grow neem, tobacco, boraped, sarb sua, sugar apple for the leaves, marigold, and the like that use to prepare various herbal solution to replenish their supply. In addition, they continue to use locally available resources that are appropriate for their use.

Beaw had an opportunity to take part in learning activities. For example, he joined a study trip to visit different provinces in 2002 at Roi-et, Khonkaen and Phichit. He took part in no less than 10 training programs and attended meetings with fellow farmers in farmers' school activities every month. He also attends meetings of Khao Kwan Foundation and a group promoting savings for the farmers on the 17th day of every month. He was able to get useful news and information on rice farming and agriculture from his attendance in these meetings.

Major Lessons

From his experience in sustainable rice farming, Beaw discovered that he has known rice plant better. For example, he now knows the growth process of the rice plant and needs in every period and the different parts. He gained new understanding that he never got before. He learned that some insects and pests in the rice field can be useful. These can be used to control harmful insects and pests. If this is not successful, he can use herbal solution also to control the pests.

Beaw said his family can be the available labour for his rice field and they can take turn in managing the house and the rice field. Work without overdoing is the principle of Beaw to get better yield and reduce the cost.

Looking at the strength of this work, Beaw gives importance to his farmers group. Its members who come to share, learn and help

one another should be developed further to fulfill their goals and address different problems. At this point, they see water management as their most serious problem and their knowledge on this is still inadequate.

Beaw would like to improve their learning on the collection, selection and development of the different rice varieties. They need these rice breeds to respond to the needs of the farmers in the village in the future.

Transplanting of Rice

Background

The proliferation of paddy field weeds is the problem of Thai farmers throughout the country. At present, farmers tend to prefer the wet seeded rice planting method for transplanting because it requires less and easy to do. Moreover, paddy-sown fields take shorter time to finish the process and therefore, convenient if the farmers do not have enough farm workers or can not afford the wages of farm workers which is too high or the farmers themselves are in a hurry to also engage in other higher-paying jobs.

But the yield from wet seeded rice planting is not good and more rice seeds are used in paddy-sown fields. It varies from the lowest of 70 thang (Thai capacity unit equivalent to 20 liters) to 80 and the highest of 100 thang per rai of paddy field.

In addition, the rice mills will not buy rice that has other grains or debris. They will buy it at a lower price of only 2,000 baht per kwian (Thai capacity unit equivalent to 2,000 liters). As the minimum price of rice ranges from 5,000 to 6,000 baht, the farmers have to use chemical herbicides to control the weeds. Therefore, the LG Goldstar rice transplanter or the “walking transplanter” that is a Korean technology has been introduced to solve the weeds problem.

Mr Thanaruch Klai-klang, Khao Kwan Foundation’s coordinator of the Project for the Development of the Rice Seeds Fund learned from his friend who knew about this machine that the Korean farmers use it and its technology was patented by the Koreans. His friend saw how it worked at the Kasetsart University’s Kamphaengsaen Campus in Nakhon Pathom. The machine was imported by a com-

pany but neither the state nor the business community promoted its use. It seemed that they put up numerous barriers for the farmers to be able to use it.

Benefits

Thanaruch explained that apart from solving the weeds problem and waste of rice seeds, the machine requires fewer expenses on fertilizers, other chemicals, and water pumping. The rice stalks grow taller while the rice plants sprout well and are easy to maintain. But the machine can be used in leveled paddy fields with adequate water retention only. Paddy fields in highlands must be able to retain water.

Nakhon Sawan farmers had to sow 30 kilograms of rice seeds in a one-rai paddy field. When they shifted to the "walking transplanter", their use of rice seeds went down to 6-7 kilograms per rai while the yields shot up to 100 thang per rai without the use of chemical fertilizers and herbicides at all. This is opposite to wet seeded rice planting they previously practiced that required a lot of chemical pesticide use, which in turn affected the economy and environment. The shift to transplanting method addressed their weeds problem and reduced the use of chemicals to the extent that the farmers' health and resource use are sustained.

Application:

An LG Goldstar rice transplanter or the "walking transplanter" costs 125,000 baht and consumes about one liter of petrol per rai. The machine can cover six rai of paddy field in a day if the paddy field is well leveled and the machine is not broken or short of petrol. The farmers can learn to use the machine very easily, as the operation and working parts of this machine is quite similar to those of a walking tractor.

Application Process:

1. Plant seeds in nursery beds. For a highland plot or paddy field, lay plastic sheets and put the materials for planting such as, paddy husk and compost before sowing the seeds. Allow 15-20 days

- for the seedlings to grow and reach the 15-centimeter height.
2. Reserve a 10-20 square-meter plot/rai as a nursery bed
 3. Cut the seedlings into patches (like those of grass patches to be laid on the lawn) and transplant using the machine;
 4. The machine will work as required, mostly 2-3 seedlings at a time. Note: It has to be done manually with the help of a rope which is stretched out as a guide if transplanting a single seedling. It is up to the owners of the paddy fields to choose how many seedlings they want to have transplanted. The machine has a variety of slots.
 5. Transplanting by machine produces four-column rows of rice seedlings each time depending on the slope of the paddy fields' dykes. The rows of the seedlings may be winding but do not pay attention to it. Such winding feature of the rows of seedling transplant is inevitable in certain marshy areas.
 6. Make sure that the fields are flooded to prevent the growth of weeds. The level of flooded water should be about 5-10 centimeters.

The quality of the soil will improve if the farmers prevent weeds from growing. The seedlings will be strong, healthy and safe if chemicals are not applied. This will result in lower production costs while the seedlings will get the required nutrients that will make them strong enough to resist the pests. Thus, the farmers can remove the bad seedlings from the fields and keep only the needed rice strains which will result in higher yields and a better selling price.

Success Stories from the Best Practices

The following are the lessons and enrichment of knowledge based on the successful stories and best practices of the farmers in this study:

1. **Farmers' Concept and Paradigm shift** (in Analysis of Problems and Alternative Solutions)

The paradigm shift among farmers who had been influenced by modern agricultural practices for a long time was difficult especially when the current economic and social conditions are not favorable for such change. Development workers and Khao Kwan

Foundation realized need for an effective approach to address this. They adopted a learning process based on a curriculum that is relevant to local rice farming to overhaul the rice farmers' thinking and consolidate the farmers' organization.

Mr. Daycha Siripathra, Khao Kwan Foundation director said providing the farmers with techniques and methods was not the appropriate intervention. The farmer's way of thinking was the main issue that development workers have yet to dig into. Most farmers still cling to their old values and thinking pattern. Focusing on techniques, marketing, product standardization, policies and projects will not succeed because the cause of the problem was never tackled. The intervention would not be sustainable.

Mr. Beaw Thai-la and Mrs. Samruay, for example were clearly certain to take this farming alternative. They were very happy with the changes and found that sustainable agriculture was viable. They believe that other farmers should learn about sustainable agriculture that would bring about self-sufficiency, reduce production costs, and increase and improve the quality of their yields. The farmers' household consumption would be self-sufficient while their production need not be labor and time-intensive. With appropriate techniques and management, sustainable rice farming could considerably improve to the farmers' livelihood.

2. Securing Sustainability and Self-sufficiency

Douglas, GK, (1984) pointed out that sustainability in agriculture must be a condition favorable to fulfill the future's need for food without incurring social costs. Sustainable agriculture will not bring about any economic and environmental damages. It will neither reduce chances nor restrict income distribution. Essentially, agricultural sustainability takes into account three issues: 1) economy, 2) ecology, and 3) society or community.

Gips, T (1984) further added a qualitative factor or human factor that was in into the meaning of agricultural sustainability. Meanwhile Masanobu Fukuoka (1985) stated that the ultimate

1. Warakorn Luangmanee et al, 2003, a research study on "Development of Appropriate Agricultural Support to Small-scale Farmers in the Lower Khon Kaen-Upper Korat Geological Location", Bangkok: Foundation for Sustainable Agriculture

aim of agriculture was not at growing crops, but at the cultivation and perfection of human beings. Therefore, sustainable could serve as a means to develop people. It is not only a practical method but also a concept that can link up the people's way of life throughout the world¹.

The case studies included in this paper reflected the conclusion of the four farmers who had decided to shift to sustainable agriculture. First, they were convinced that sustainable rice farming provided them with a wide diversity of plant growing and cattle raising methods. At the same time, it helped improve the soil, water and ecosystem.

Through sustainable agriculture, they hoped to achieve self-sufficient livelihoods, secure adequate income to cover their necessities, and most importantly, realize self-reliance in production so they could stop using chemicals. Our next step is to facilitate the realization of their remaining aspirations.

2.1 Economic aspect

The farmers who got involved in the projects were satisfied with the change and results. They found it worthy to invest in sustainable rice farming although the yield may not yet equal that of chemical rice farming. Their families now have sufficient food for household consumption and are able to buy a few things they need that they cannot produce themselves. Moreover, the farmers are proud that their rice farm was able to provide work for their family members and serve as model to their neighbors.

2.2 Social Cultural Aspect

The farmers of sustainable rice farming have strong relationship with their family members because they could spend more time for each other. Many of their children or the new generation may be interested in pursuing other occupations instead of working on their rice farms. However, they understand this situation and the farmers continue to develop their farms hoping that their children may return back to be the farm later.

Their products are healthy and can nurture the family well. They realized the value of healthy food and healthy life.

The participation of family members in the farm are divided and based on the value of mutual help. Their ideas reflect their common interest, understanding and valuing the work in the farms.

The cooperation of the farmers as a group is important. The meetings and learning forums serve as opportunity for them to learn, share and mutually help each other. Working with the goal of self reliance and problem solving, the farmers continue to participate in the organization to enrich their knowledge, learn the different innovations on rice farming and get skills on analyzing problems.

They were able to get support from the government, business sector, and non government organizations (NGO). The NGOs support them through learning activities, provide financial support and teach them to manage their projects by themselves without creating conflict among the members.

2.3 Environmental and ecological system

The farmers developed the ecological system by planting vegetable and other plants along with the rice plants. They give the importance on improving the soil quality, and water source management. As they became aware of the methods to reduce and eventually, stop using chemical inputs, they learned making composts and bio-fertilizers.

The farmers developed their farms' water supply during the dry season by digging a pond to save the water brought by the rains. They planted different kinds of vegetables around the pond for the family's household consumption and increase the green area of the farm. Various kinds of living things such as frog, fish, crab, earthworms were also grown around the farm to bring back its ecological sound condition.

3. Farming model through appropriate technology development

Mr. Daycha Siripatra, Director of Kao Kwan Foundation believes that appropriate technology could be developed with the farmers. Nature can manage in its own way and learning from nature results to more innovations and increase potential alternatives for the farmers. There is a need to continuously learn, observe, and experiment.

They did not believe before that traditional rice variety can produce 100 bin per rai. It can now reach even up to 150 bin through the selection of traditional rice varieties. Simple techniques are more appropriate for the farmers and there are many other ways to solve the problems using the principle of simple and cheap yet high quality production.

4. Management

Sustainable rice farming has two management levels, farmer and farmers' group management.

The farmer level management includes fund, labor and knowledge application of sustainable rice farming. The farmer manages his/her own funds by relying on his own investment and reduce the costs and should be lower than chemical farming. They could learn how to do simple recording of their expenses and income based on their implementation.

Labor management means self-sufficiency on the labor requirements. Hiring of labor is only a small part, such as harvesting or spraying the herbicide. Most of the farm workers are 50-60 years old. The younger generations in the central region do not know how to plant rice anymore. They are more inclined to work in the factory, company or other offices, getting regular salary though they do not still have the work security.

The farmers gained their knowledge related to appropriate technology from their interaction with community and participating in the learning activities of NGOs, such as training, study trips, seminars and meetings.

The farmers' group management includes working out on the agenda of the group in cooperation with the NGO workers. The NGO workers help the farmer leaders ensure people's participation in the learning process and strengthen the group's development. The farmer leader and group members manage the funds from financial support of NGOs, government agencies, and the business sector. The funds are usually devoted to developing rice varieties, compost making, bio-fertilizers, and the like.

5. Work Approach: Strengthening of a Learning Process

The structure and process of the Farmers' School served several important roles.

The farmers' paradigm shift will take effect if simultaneously supported by concrete cases. The school's curriculum featured the following steps: 1) Facilitating a forum for the farmers to learn and analyze their situation; 2) Discussing the farmers' expectations by encouraging them to set their objectives; and 3) Organizing the information previously gained. Over the past four months of the school's operation, development workers spent their time discussing, updating, and exchanging ideas and summarizing lessons with the farmers on a weekly basis.

The process of learning must be continuous so that it was powerful enough to have an impact on the farmers' consciousness where a paradigm shift could start. Such process took at least four months, with weekly follow-up meetings.

Field trips and occasional training sessions would be a waste of time if they were done without processing the learning and providing continuing activities. For the School's concept and structure to create a paradigm shift whereby sustainable agriculture would be widely adopted, the development workers must come up with a clearly developed curriculum. This would include a body of knowledge, concept and technologies that proved to be effectively appropriate and could serve as an answer to the farmer's concerns and problems.

It should be noted that a concept on opening the farmers' schools was previously promoted by the UN's Food and Agriculture Organization (FAO). Its idea was applied to the work of agricultural development in many provinces of Thailand. Khwan Khao Foundation studied this concept and applied it to the organization's work.

The FAO-oriented farmers' schools that the foundation visited lacked an adequately comprehensive and organized body of knowledge that would solve the farmers' problems. It did not deal with "seeds management" Neither did it encourage the farmers to stop using chemical fertilizers. The foundation's school aimed, on the contrary, at promoting "seeds management",

which was a key to the farmers' self-sufficiency. It also strongly supported the use of organic fertilizers and other biological techniques without compromising with any use of chemicals. While the government's farmers' school adopted the IPM approach, the foundation's school adhered to the IPM system, a combination of local culture and an alternative body of knowledge.

The learning process was run alongside organizing the farmers' group to help quicken the learning process in an effective, sustainable and practicable manner. The farmers lived in a closed community. To do things differently as an individual could be branded as "crazy". But doing them differently as a group would make the farmers more convinced and their determination strengthened, as Mr Beaw Thai-la explained. He thought organizing the farmers helped strengthen his participation in the movement and served as a forum for them to exchange their opinions and learn from each other. This should continue to contribute to the farmers' achievement in problem-solving.

According to the case studies, the learning process of the northeastern farmers counted on a collective analysis of the problems and exposure trips to look for their solutions. They practiced what they learned and summarized the lessons on a continual basis. Exposure trips were interesting to new farmer students because these were relevant to the farmers' experience. The trips provided them with a chance to hear with their own ears, see with their own eyes and learn while working. As a group, the farmers could support and coordinate with each other more.

There are various concept and methodologies of learning process. The approach adopted by Khao Kwan Foundation is the process experimented for more than 30 years. This learning process, focusing on active participation, worked quite successfully in bringing farmers to spend suitable time together learning from one another.

6. Future Trend:

Small-scale farmers will likely disappear gradually while only the rich farmers will remain. Such thing could happen if the farmers themselves did not do anything. Those farmers who

got bankrupt doing modern agriculture would sell their land and turn into waged laborers. Their land would go to the rich who has the capacity to invest because they had more land and the wage of labor was cheap.

Small farmlands owned by small-scale farmers who had been heavily indebted would be bought by rich capitalists and big business companies who were eager to get in. The more the government encourages the farmers to engage in commercial and modern production, the less self-sufficient and more dependent on external factors they will become.

Such a scenario would not materialize if the farmers will become self-reliance. Modern method of agriculture will bring only bankruptcy to the farmers. It depends almost entirely on the farmers themselves to let such condition to happen or not.

The future is optimistic because Thai farmers are too richly endowed with multi-dimensioned community coherence and 2,000-years of indigenous wisdom in rice farming to be easily converted. In such countries under colonization as Sri Lanka, their land would be taken by foreign colonizers, who were powerful enough to order their colonist farmers to stop growing rice and plant cotton, sugar and tea instead. Once the farming method had been changed, the original indigenous wisdom and values that held the country's social fabric together would disappear. Generation after generation, a variety of the original local knowledge would be gone.

Apparently, other occupations were not good enough to provide sustainable income and happiness to the Thai farmers. An obvious example was the economic crisis in 1997. A lot of people ended up returning to their rural communities and taking the rice fields as a remedy against unemployment. This has proven that rice farming is viable; otherwise, all farmers will leave it for other employments.

7. Challenges and Recommendation

7.1 Challenges

Paradigm shift is the most difficult thing to do since the farmers have been familiar with the chemical inputs in agriculture modernization for more than 40 years. The government policy

of export-oriented agriculture also had a great impact in promoting rice as a commodity for sale focusing on economic achievement. Through the government extension workers, the plantation modernization system, high yield varieties, high technologies, mono cropping system, chemical fertilizers and pesticide were introduced to the farmers with motivation of higher income.

The critical issue at present is the Rice Bill that is proposed and being developed by the government. This has become debatable among the sustainable rice farming producers and government agencies.

Globalization is rapidly changing the agriculture sector and the farmers' lives with the transnational corporation's (TNC's) increasing control over agriculture production. The government is entering into the negotiation process in several bilateral and multilateral agriculture and trade agreements through the Free Trade Agreement (FTA), and WTO. These have affected the government policies on market access, Genetic Modified Organism (GMO), and the like.

As the country's mainstream agriculture production is currently geared toward neo-liberal capitalism, the agricultural sector and the farmers are facing more issues and challenges. However, farmer organizations, NGOs and people's movements remain active in facilitating change. The forums of the farmer to share and learn from each other are vital because it could lead to their action for change. Once the farmers realize their power and rights, things can move forward. Given all that, these are the challenges that have to be considered:

1. The number of farmer who has been practicing in sustainable agriculture is still very minimal compared with the twenty million farmers in Thailand that is about thirty percent of the whole population. Mr. Siripathra said that the accomplishments are still very low and they are still strengthening the farmer models. They need to reach a larger number of farmers.
2. The farmers still find it hard to do away with chemical and fertilizer inputs. They think that the use of chemicals is the

modern way of production and the effective way to increase the yields. They fear of losing money if they will not use chemicals in the farm.

3. The technology used in sustainable rice farming is very simple but requires time and persistent care. The farmers implementing sustainable rice farming are committed to it, diligent, have good observation skill, patient and hard working. There are new comers who are interested in the sustainable rice farming model but many of them perceive these methods will not be able to respond to their needs or solve their immediate problem like regular payment of their debts. There are farmers also who would like to buy selected traditional rice seeds but they prefer those with immediate output and less time involvement in the farms. They need to develop appropriate technology that will address their concern, convenient and not complicated to plant but has the quality of yield that they need.
4. The learning process has to develop new, creative and interesting techniques that will encourage the farmers to participate in the whole process. There are different categories of participants. Some are fast learners, some farmers need to learn by doing it themselves and some need creative and interesting way to acquire the learning that they need. The development workers need to be creative in facilitating the learning process and line up activities that are appropriate to each type of participants.
5. The neo-liberal capitalism affected the farmers' lifestyle. Their style as rural people is not much different from the people who live in the urban areas. Sustainable agriculture's values of self-reliance and self-sufficiency are the opposite of their present lifestyle. The farmers driving motorcycle to their farm rather than walking, using mobile phones, hiring harvesting machine rather than their manual methods and the like. These cause them to spend more aside from the farms inputs. Their cultural practice of helping one another in the farm is slowly vanishing from their everyday life.

6. The new generation's lack of interest to work in the farm is critically important. Most of the farmers implementing the best rice farming practices are getting old and now aged at around 50-60 years old. Some are in the middle age such as 30-40 years old and many of the younger generation who are younger than 30 are shifting to other occupation. The question is who will continue rice farming in the future.

7.2 Recommendations

1. The rice farmers comprise twenty percent of Thai population. A rice crisis will translate to an equal magnitude on the entire Thai society. As long as rice is the food staple of the people and plays a crucial role in cultural practices in the communities and society, the rice farmers will remain a major section of the entire Thai nation.

Being one of the biggest numbers in the society, the farmers can play a crucial in the political aspect. They can influence the national political agenda, vote and negotiate to address their problems and can be a political force to contend with in the society.



Achieving food security and food sovereignty for the farmers and the entire Thai people does not necessarily mean having to go back to the traditional way of life. The farmers need to be self-sufficient in their own consumption and self-reliant in their agricultural production and way of living.

The farmers have the measures to develop food security they just need to decide on whether they can or will do it or not.

2. To buy the rice seeds every cropping period can be costly for the farmers. At the same time, the rice breeds from the market place could not ensure the quality. So the farmers should give importance on collecting the rice seeds for use in the next cropping. Moreover, the farmers should pay attention to recollect the traditional rice varieties in order to be more self-reliant.
3. Store sufficient rice, at least for family consumption. A person will approximately consume 200 Kilograms of paddy rice) per year. The farmers in the Central region of Thailand can produce 30-100 Thang per rai of rice. They will still have plenty of rice to sell even if they keep rice for their consumption.
4. Set up community rice mill in order to use and process rice on their own. The farmers can mutually help each other and depend less on the merchants or middlemen.
5. The income of farmers will improve if they will plant different kinds of agricultural products for their own consumption and for sale. Apply processing techniques to add value to their agricultural products, such as desert, food vine, noodles, and the like.
6. Development workers can relate the issues on rice to social, political, environment, spiritual, way of life, cultures, values, dignity of farmers, and other dimensions. The application of appropriate technologies on non-chemical inputs can create more opportunities for the farmers. It leads to low investment cost and chemical free rice products that can have potential medicinal value on the consumers. This

can be a good sales pitch that will result to increase in the farmers' income as well.

7. Development workers should continue developing participative and innovative learning methodologies. The learning sessions serve as a vehicle for the farmers to realize that only they can provide solution to their problems and avert a possible rice crisis.
8. Thailand is rich in rice-related tradition and values. The challenge is getting the people discover and practice their worship of the three mothers (Mae) of the natural resources - Mae Bho-sop (Mother of rice), Mae Kong-kha (Mother river) and Mae Thor-ranee (Mother of earth). Rice can rescue the nation from the crisis and working on rice continuously is the hope and alternative for the Thai farmers, Thai society and the entire world.
9. Rice, wheat, corn, and potato the food staple of the world. However, only rice can adjust itself in all condition whether it's low land, flooding, high land, and any other ecological zone. Rice can respond to the crisis and the needs of the people in the future. Rice will become the main food of the people of the world, not only Asian people.
10. Sustainable rice farming is the way to against neo-liberal capitalism and globalization. The strategy is to develop the farmers' power over production. It is the way to improve current state of the farmers, especially small-scale farmers. The farmers are the majority of the people in the country. If they can be self-reliant, the society will be secured and stable as well.
11. Sustainable rice farming is the farmers' way to get out of their debts. The farmers' indebtedness can be traced to high investment cost of agricultural production and their consumerist way of life.

This alternative mode of production results to lower cost of production, increase and higher quality yield. The techniques are simple, easy-to-use, secured and sustainable. The farmers use the self-sufficiency economy as a principle. They will produce enough for their family's consumption,

sell whatever is left, and share with the others or keep the seeds for the next planting season.

Globalization has led to the farmers' consumerist way of life that has aggravated their situation. The only way out is to live on sufficiency economics. The mode of production will have to complement their consumption needs. One of the solutions is to provide support for the farmers. But the most important thing is for the farmers to change its way of thinking.

12. The crisis can be turned into an opportunity to create change. If the problems on chemical inputs didn't surface, the farmers may not think about organic farming or sustainable agriculture. For the farmers, they will never change without a crisis. However, the crisis should not destroy the social values include land, cultures, and language.