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Transition from Upland Maize Farming to Sustainable Agriculture in Thailand

Sittidaj Pongkijvorasin
Faculty of Economics,
Chulalongkorn University

E-mail: sittidaj.p@chula.ac.th

Khemarat Talerngsri -Teerasuwannajak
Faculty of Economics,
Chulalongkorn University

E-mail: khemarat.t@chula.ac.th

UPLAND AGRICULTURE IN THAILAND

Uplands in Thailand, like in many other ASEAN countries, are considered highly important and vulnerable in both ecological and social aspects. Their functions as source of headwaters and controlling water cycle and water balance have profound and far-reaching effects. Forests in uplands are also key source of carbon sequestration and biodiversity conservation. In 2008, it was estimated that there are almost 4,000 villages with approximately 1 million people including ethnic groups locating on the upland areas of Thailand (Highland Research and Development Institute, 2018). The coexistence of people and upland forests is one of the distinctive features in most ASEAN countries, including Thailand.

Thailand and its neighboring countries have faced the problem of deforestation for many decades due to concession, commercial logging and expansion of mono-crop culture onto upland areas. Constant rise in chicken meat consumption over the past decade has been a favorable condition for Thai broiler meat exporters, and this has resulted in high domestic demand for maize as it is a main ingredient in broiler feed. This trend has aggravated the deforestation problem in recent years. In 2017, Thailand produced almost 4.4 million tons of maize within cultivating area of about 6.5 million rai (equivalent to about 1.04 million ha.)[3]. Maize demand

[3] "Rai" is a common measurement unit of land in Thailand. 1 ha. is equal to 6.25 rai.

was forecasted to exceed 7.7 million tons per year from 20[3]2, 75% higher than the current level (Thai Feed Mill Association, 2014). This implies that about 11.5 million rais of maize cultivating areas are required by 2032, given the same productivity per area. However, data in 2013 showed that about 59% of maize cultivation area was already on unsuitable land. As high as 47% of maize cultivation area was in forest territory, especially in the northern part of Thailand where 54% of the maize cultivation land located in forest (data from Land Development Department cited in Thai Feed Mill Association, 2014). This has resulted in higher occurrence of natural disasters such as landslides, flash floods, drought, and environment degradations due to heavy use of herbicide.

The misunderstanding that farmers decided to grow maize because of its relatively high returns has resulted in biased policy orientation. Current policies to combat the problem are heavily focused on subsidy for adoption of more environmentally-friendly alternative crops. However, there are studies showing that return from upland maize farming was far lower than other crops. In a good year, upland farmers might get a return of about 2,000 baht/rai (US$415/ha.)[4], but the return could be negative in a year where maize price was low, e.g., in 2008. During 2004-2010, it was estimated that the annual net profit for an upland maize farmer was only 1,200 baht/rai (US$250/ha.). With an average cultivating area of 36 rai (5.76 ha.), a representative upland maize farmer gain on average 43,400 baht/year (US$1,446) during that period (Talerngsri-Teerasuwannajak and Pongkijvorasin, 2015).

Given its low return, farmers' decision to grow maize ought to come from reasons beyond financial prospect. For examples, lacking irrigation development on uplands causes farmers to rely purely on rain as water source for their crops, and maize can accommodate this limitation. Also, while farmers were always certain that all maize produced can be sold owing to constantly high domestic demand and extensive maize buyers' network, they could not feel such assurance from other alternative crops. Moreover, government policies to support maize cultivation had played an important role in farmers' decision.

In this article, we classify factors which induce farmers to choose an upland maize farming into 3 categories, these are:

(1) physical limitations;
(2) market structure of maize; and
(3) related agricultural and resource policies.

Physical limitations

Upland agriculture is naturally restricted due to physical constraints. First, only a small variety of crops can be grown on high elevation Second, almost all cultivating areas in upland lack irrigation system. A formal irrigation development in conserved upland forest is prohibited under Thai law. Hence, most upland agriculture in Thailand is rain-fed. These constraints limit choices of crops that farmers can grow and limit farmers' capacity to add value to their products. Finally, and probably most significantly, upland area are mostly hard to reach by market. Locating in remote area results in a higher logistics and transportation costs and little buyers' competition, hence few selling options for farmers. Farmers pay higher price to have inputs transported to them, and face with lower selling price for their outputs.

These physical restrictions prompted farmers to choose maize as their main crop. In comparison with other high-demanded crop in the market, maize survives well on high altitude

[4] In this article, we use an estimated exchange rate of 30 baht/US$

with limited rainfall and does not need much care. Maize output can be left to dry in field or kept in storage for long while farmers do not have to worry much about its quality, unlike fresh vegetable or fruits. Farmers can easily sell their products through extensive buying network which has firmly established even in remote areas of northern Thailand. The factors of production (e.g. seeds, chemical fertilizer, herbicide) are home delivered by middlemen or salesperson. Mobile milling service near field including transportation services are locally provided by middlemen in the village who have good and trusting connection with silos.

Market characteristics

Unique market characteristics of maize is one other salient factor affecting farmers' decision. For Thai farmers' living standard, maize is considered a high cost crop, i.e. with expensive hybrid seeds and fertilizers. Hence, a farmer who lacks fund usually opts to take out input loans from silos and repay with high interest rate after harvesting. This input loan provided directly by silos is a mechanism that hinders farmers' bargaining power and their choices. Prices of inputs (usually higher than market price) and output (usually lower than market price) are set by silos. Farmers are owed to sell whatever produced to silos that lend them inputs while bearing all price and market risks. From time to time, when maize price is low, the farmer suffers from high interest rate and gets deep into the debt cycle (Talerngsri-Teerasuwannajak and Pongkijvorasin, 2015). Farmers who are in debt with silos are compelled to continue growing maize in the subsequent year and seek input loans from the silos as they cannot find other sources of fund to start the new crop year and they want to repay debt. We refer to this trap as "input-loan loop", hereafter. This loop features trading relationships among farmers, local middlemen and silos, as illustrated in Fig. 1.

Farmers with sufficient funds may not be trapped in this "input-loan loop". They can freely choose to buy inputs from cheaper shops or during sales promotion where inputs are cheaper. They can also choose when or where to sell maize, or even whether to grow it again the following year. Although this group of farmers seems to have bargaining power and choices in the market, they are still trapped in the bigger "market loop" of maize supply chain. Considering overall supply chain shown in Fig. 1, the main buyer of maize, the feed industry, is engaged in interlocking business relationship with seed, herbicide and fertilizer industries (Relationship A in Fig. 1). Some big agribusiness firms have formed vertical linkages from upstream to downstream business and had influential presence at both ends of maize supply chain. This allows the feed industry to exert control with high bargaining power in the market. Consequently, farmers in the maize supply chain are continuously left with small margin (called "market loop" hereafter). For example, during 2004-2010, albeit many policies to support maize farming had been implemented, a representative upland farmer had managed to accumulate only around 300,000 baht (US$10,000) of net income from maize (Talerngsri-Teerasuwannajak and Pongkijvorasin, 2015). Although smallholders appear to be left off from the formal vertical coordination of the agribusiness firm, they were practically part of the vertical coordination through input loans. To a certain extent, the input-loan loop has managed to tie farmers into informal contract farming, hence, made them part of a vertical coordination.

Notice also that under this structure of "market loop" and "input-loan loop", the relationship between farmers and resources cannot be fostered. Downstream market or users of maize are under no obligation to protect upland natural resources. Overall market characteristics has fueled the urge to increase maize produce and farmers viewed that there was no other way except from

forest clearing to acquire more cultivating land. In this relationship (relationship B in Fig. 1), farmers view forest only as a source of input (i.e. land) and that the only way to increase their income is to increase their cultivating area which brings about higher degree of deforestation.

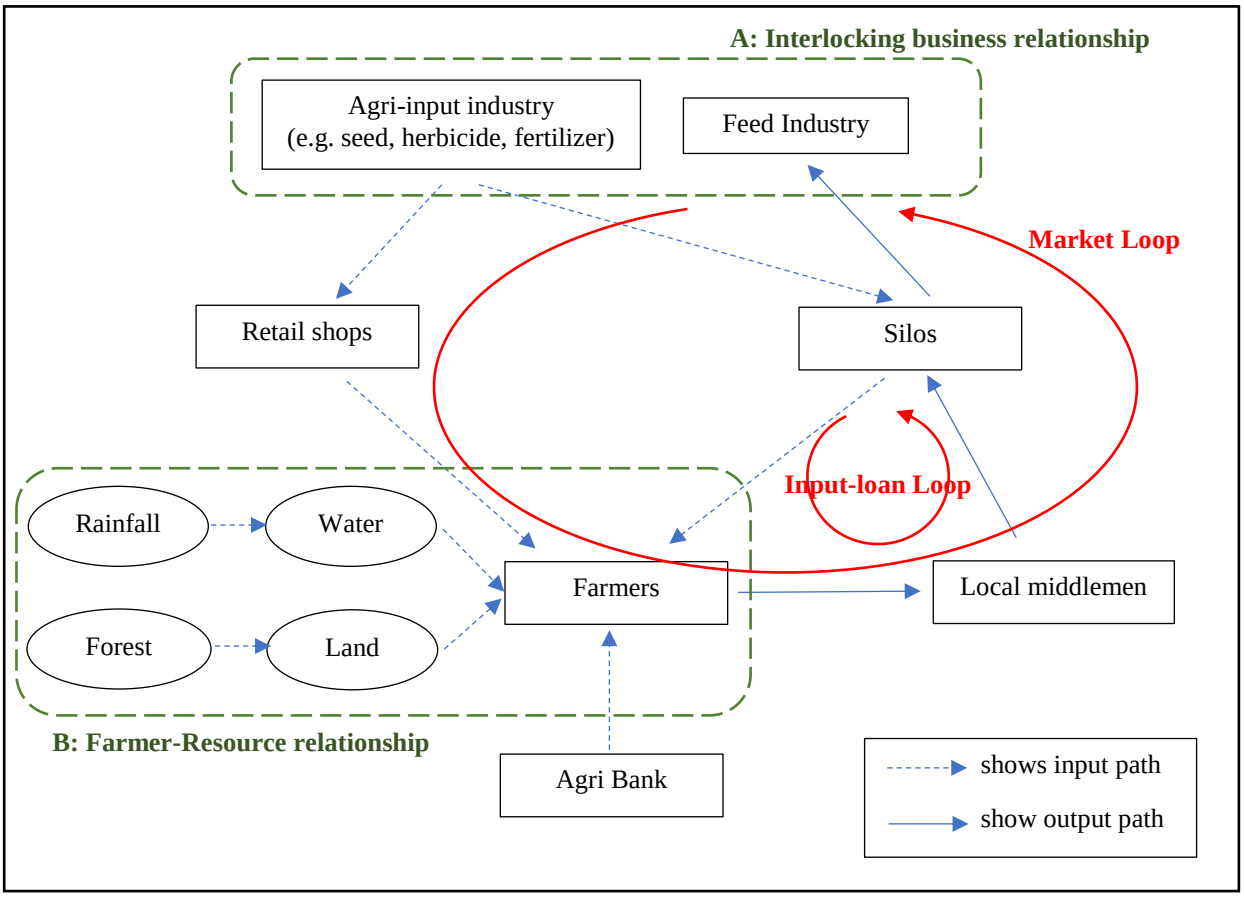

Fig. 1. Relationship among resources, maize farmers and stakeholders in maize supply chain

Government policies

Agricultural policies, for example, maize price guarantee, financial support, disaster compensation are all attributable to upland farmers' decision to grow maize. The subsidy-oriented policies incentivized farmers to expand their maize farming area (Pongkijvorasin and Talerngsri, 2014). Although these policies aimed to raise farmers' income, the "market loop" as shown in Fig. 1, enables big firms with control over upstream and downstream of the maize supply chain to extract surplus that was supposed to belong to farmers through various channels, e.g. input and output prices. The subsidy-related policies had induced farmers to focus on quantity, hence expansion of cultivating areas, which in turn exacerbated deforestation problem. Even though only those cultivating on legal land were theoretically eligible for the subsidy or support, this criterion was not at all pragmatic during implementation stage. It is not possible to physically differentiate maize grown in upland areas from those grown in lowlands. Ineffective command-and-control type regulation in protecting forest owing to low monitoring and

enforcement ability of the government, coupled with the lack of policy to support fair share of benefits to locals who take part in forest conservation are all attributable to rapid forest conversion to maize field.

Notwithstanding the fact that maize is a high cost and low returns crop, the upland physical constraints, the characteristics of maize supply chain and subsidy- oriented policies have resulted in expansion of upland maize farming. This in turn, creates what so called "vicious cycle of highland maize farming" which describes relationship between farmer's well-being deterioration and resource degradation (Talerngsri-Teerasuwannajak and Pongkijvorasin, 2015).

LESSONS FROM THE FIELD

As mainstream approach concerns mainly on direct return or income from cultivation, the corresponding policies were then in the forms of direct subsidy scheme, both on output and input prices. The contesting paradigm views rural development from a broader perspective. It concerns about way of living; how people can harmoniously coexist with natural resources, and focuses on management of interaction between agriculture and resource to achieve a balanced coexistence. In the same token, the "Sufficiency economy philosophy" founded by the late King Bhumibol of Thailand also looked at rural development from a holistic approach to solve upland poverty problem while keeping natural resources intact.

In Thailand, there are upland areas where farmers had decided to move out of maize or mono-crop cultivation and changed to other more environmentally-friendly crops, e.g. perennial trees, coffee, integrated farming and green-house vegetables. In this section, we examine different practices which transform (mainstream) unsustainable upland agriculture into a more promising one. We explain how different practices contribute in tackling three underlying limitations classified in the previous section.

One major problem resulted from upland physical limitation is shortage of water for cultivation during dry season. Instead of investing in large-scale irrigation systems which may adversely affect ecosystem and are prohibited under forest law, smaller scale of water and land management techniques for smallholders can be used. For examples, "Lum Kanomkrok" whereby small water reservoir could be built on each smallholder's land, and "terraced paddy fields" were introduced in some areas to ease the problem. In addition, Bau Poung San Khao, by which series of small reservoirs are built along mountain ridges between main reservoir and cultivating area to help distribute water, is found to be beneficial in some upland areas. Moreover, with proper techniques and supports from government or private sector on seedlings of alternative crops, farmers have better choice of crop to grow in the uplands. Regarding high transportation cost, there are cases where farmers formed groups or cooperatives to attract traders. This strategy also plays crucial role in reducing logistics cost in many areas. It allows farmers with more options of crops to grow as they can connect to the market easier.

One important factor underpinning the success of adoption of alternative crop is "supporting market". Majority of farmers who opt to grow alternative crops run into "trap of traditional market" whereby products are sold to middlemen who come to buy products at farm only if the quantity supplied is large enough. Farmers compete to sell their products to middlemen even at low price to ensure that their products could be sold. Most have no storage technique and capability to process and add value to the products. This partly explains why the success rate of new adoption of alternative crop is relatively low. However, there are cases where farmers managed to add value, increased quality or processed their products, so they opened up new

market segment for the products. The strategies to increase value added per unit of product here are along the line of "deepening" strategy in "new rural development paradigm" (Ploeg and Renting, 2004). Rural development can be defined as a shift of development boundary through 3 strategies which are deepening, broadening, and re-grounding. In many rural areas of Thailand, we observed the use of "broadening" strategy, which refers to adoption of new non-agricultural activities as means to make a living such as agri-tourism and providing necessary agricultural services. "Re-grounding" strategy - new ways of resource mobilization – e.g., output reuse or on-farm cost-reduction, is also observed, but with much less frequency. We noticed that deepening strategy seemed to gain more popularity in policy and practices in Thailand, however, other possible strategies are also worth exploring. In principle of designing alternatives for farmers, the more dependent upland residents are on fertile natural resources, the more likely that they would be willing to preserve forests and refuse to return to maize farming. The market ecosystem of the alternative crop should help strengthen farmers' bargaining power. Farmers have relatively more choices of when, where and how to obtain inputs, and where to sell their outputs compared to when they were engaged in maize farming. Fig. 2 shows possible alternative ecosystem of crops in uplands where farmers have higher bargaining power and are neither trapped in "input-loan loop" nor "market loop" as in the case of maize shown in Fig. 1.

In Fig. 2, on the input side, reuse of farm input and other local sources of farm inputs are practices that can ease problem of high inputs cost, and enable farmers to be less dependent on financial capital and source of fund. They are less likely to fall into input-loan loop. More importantly, the relationship between farmers and resources are rearranged. Farmers are aware that forests are vital source of water, and effectiveness of their small-scale irrigation including the ability to use limited land in a more efficient manner depends on how well forests are preserved. Buyers of upland products are bounded by principles, market requirement, consumer demand and even regulations to care for upland environment. Stakeholders in the supply chain have changed their perspectives towards natural resources. Forest is no longer a passive source for people to extract profit from (i.e. win-lose relation) as people and forest have now formed interdependent relationship; the former will benefit only when the latter are well looked after. With the new attitude, they can coexist, deriving a win-win outcome.

On the output side, farmers now have better chance to capture profit margin as they have more choices of outlets for their products and are no longer trapped in "market loop". Nonetheless, there is no more buying- guarantee, what they produce will not automatically be sold. Hence, enhancing individual farmer's and farmer group's capacity is a vital step to link products to markets. Forming farmers' group not only helps reducing input and transportation cost, but also increases farmers' bargaining power and makes it easier to find market. Although, in practice, establishing farmers' group, product- processing group or quality-enhancing group can be difficult, it is an essential mechanism to secure sustainable transformation in the uplands. In addition, good relationship between farmers and resources can be sustained in a longer term only when involving buyers are aware that their conducts affect farmers' behaviors. It is of high importance to support buyers with right attitudes towards resources and communities residing near forests. So far the government approaches have regularly been in the form of organizing market events, yet, a more concrete and systemic one to increase capacity of social enterprises, buyers with environmental concerns and local markets are highly needed. Under this new market ecosystem, upland agriculture may find ways toward sustainability.

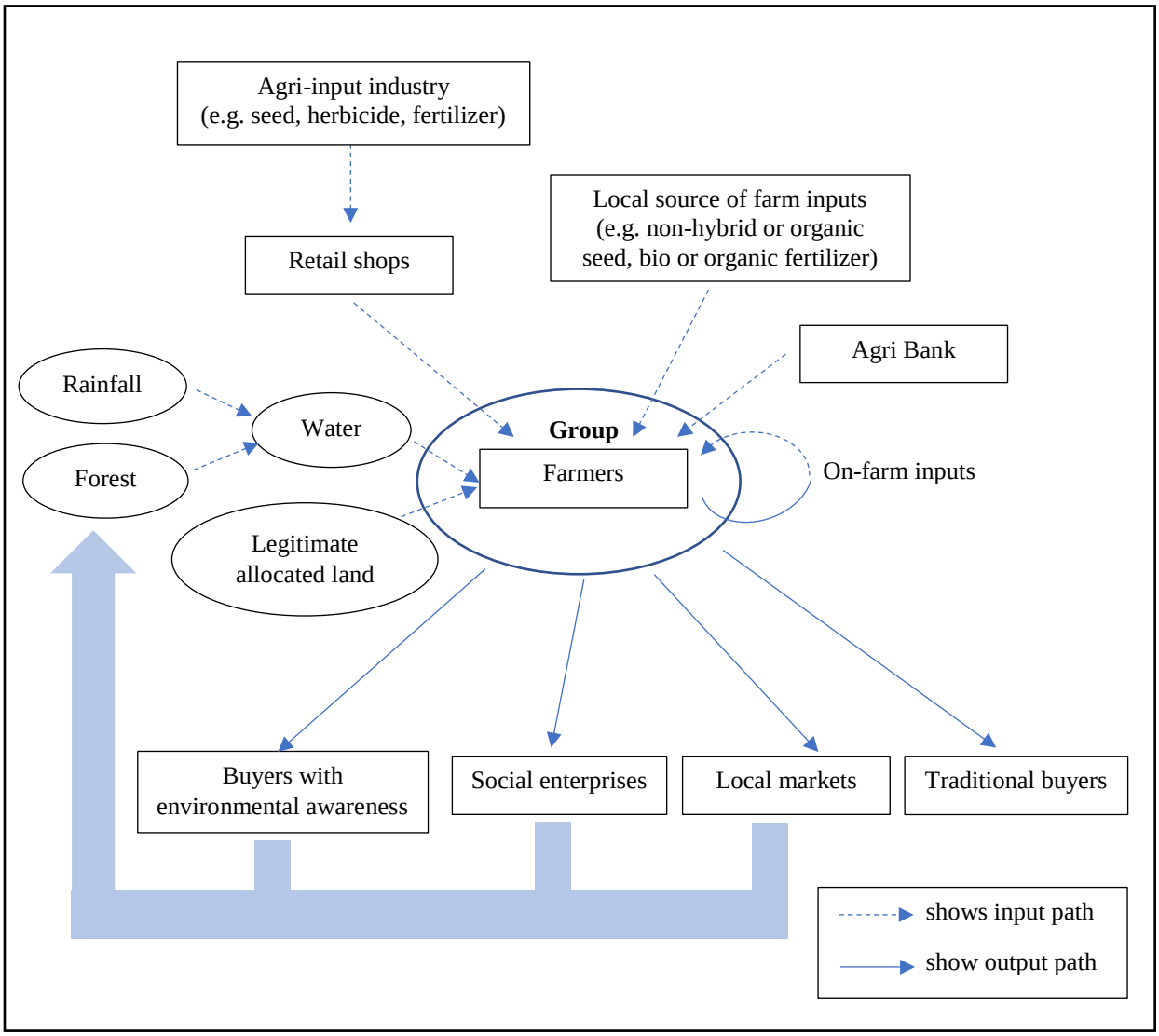

Fig. 2. Example of supply chain and market condition for alternative crop

Even if farmers who adopt alternative crops are still governed by a market condition that limits their buying or selling choices, assistances from the government are necessary to ensure that at least farmers are well protected under contract farming and local social enterprises receives sufficient supports. On this matter, Talerngsri and Pongkijvorasin (2017) suggests the 4 essential principles needed for agriculture business aiming for sustainability in upland. The business should 1) give high returns per unit area, 2) reduce risk, 3) strengthen farmers and community, and 4) set conditions explicitly to improve environment. These 4 principles are keys to achieve livelihood and environmental sustainability in uplands. Strategies used in upland agriculture should, at least, do not obstruct these principles.

Last but not the least, in spite of the fact that upland sustainability could not be effectively established under national mainstream agricultural and forest policies, there is still room to play at policy level. Community forest bill which seems to struggle recently gives right to community to manage their own resources, hence, enhances locals' feeling of ownership and willingness to

give best care to their forests. Furthermore, coordination among agencies and people at local level help ease problems resulting from some mainstream national policies. Local rules and regulations including local but official agreement of land use are examples of useful operations at local level.

CONCLUSIONS

Seeking solutions to establish sustainability on uplands of Thailand needs true understanding of the problem and their underlined causes. The current mainstream agricultural and forest policies arose from a perception that farmers who engaged in mono-crop agriculture are in search of high return, hence subsidies both in cash and in kind were deliberately used as main tools to incentivize farmers to leave maize farming. Such approach although, may work initially, it is difficult to sustain in a longer term. Physical constraints of the uplands, characteristics of maize supply chain, and related government policies were factors that induce upland farmers to engage in mono-crop especially maize. Consequently, to induce a transition toward sustainability on upland, we need to find proper means that address limitations resulting from these factors.

To address water problem, innovative means such as small- scale water management (for examples, Lum Kanomkrok, Bau Pueng San Khao), is one of the solutions to increase crop options for farmers. While forming farmers' group to increase product quantity and achieve economies of scales in transportation and marketing has been used as well in many areas to address distance problem.

Market to support alternative crop is important to ensure that farmers will not return to maize farming. Farmers' bargaining power should be enhanced by supportive market structure. Farmers ought to be independent when purchasing inputs and have more options of whom to sell products to. In addition, helps to support local product processing or adding value to products are important to ease market limitations, and increase farmers' bargaining power.

Innovative policy format is needed to replace some ineffective current policies. Product price guarantee, pledging schemes, including mono-crop loan with low interest rate cannot bring about sustainability on upland. Designing upland policy needs to go beyond the old paradigm and top down policy. New approaches must enhance farmers' capacity, strength of farmer groups and bargaining power. Furthermore, coordinated agricultural and forest policies are necessary to propel a transition to sustainable land use. They ought to strike a balance that makes farmers realize importance of forests or local resources. By allowing farmers a fair share of benefit in preserving forests, their conservation awareness would be strengthened, along with sense of ownership and willingness to care for natural resources.

REFERENCES

Highland Research and Development Institute, 2018. About Highland (2018, October 24) (retrieved from https://www.hrdi.or.th/about/Highland)

Ploeg, J.D., and Renting, H., 2014. "Behind the 'Redux'" A Rejoinder to David Goodman" *Sociologia Ruralis* 44(2): 233-242.

Pongkijvorasin, S., and Teerasuwannajak, K.T., 2014. "Win-Win Solutions for Reforestation and Maize Farming: A Case Study of Nan, Thailand." in *Sustainable Economic Development: Resource, Environment, and Institutions.* by Balisacan, Chakravorty, Ravago (eds.), Academic Press.

Talerngsri, K. and Pongkijvorasin, S., 2017. *Highland Agricultural Business and Sustainability: lesson learned and recommendation.* published by Knowledge Network Institution of Thailand and Thailand Research Fund. (in Thai)

Talerngsri-Teerasuwannajak, K., and Pongkijvorasin, S., 2015. "A Study of Maize Farmers' Incomes and Vicious Cycle of Highland Maize Farming" *Applied Economics Journal* 22(1) (June 2015): 51-78 (in Thai)

Thai Feed Mill Association, 2014. *Feed Mill Industry Strategy 2032*. (in Thai)

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