

LAND TENURE AND LIVELIHOOD STRATEGIES: A CASE STUDY IN BAN SUB TAO, THAILAND

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Abstract

The establishment of Tap Lan National Park's new boundary through Ban Sub Tao, Thailand in 1981 drastically impacted inhabitants' land tenure. Alongside this change, the Por Bor Tor occupancy right was universally issued by the Thai government, which authorized its holders only to live and practice agriculture on the land. With Ban Sub Tao's location within the National Park and its associated Por Bor Tor 5 title came various restrictions in terms of decision making, credit access and agricultural practices; the latter was further influenced by poor soil quality and limited access to water and knowledge in the village. As part of this report, the role of the local land tenure context on the restrictions has been assessed and further conceptualized into land security, pledgeability, tradability and certainty. The results suggest that limited security, limited pledgeability and prohibited tradability of the land are inherent characteristics of Por Bor Tor 5. Although a clearly defined social contract between the state and the villagers engenders land certainty, the implied restrictions have shown to generate institutional, financial and economic dependency of the villagers, for which few short-term coping strategies are implemented. Ultimately, this causes stagnation in the main activity of the village: agriculture.

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1. Introduction

1.1. General Context: Land Titling in Thailand

Since the early 19th century, Thailand has led countless land titling reforms, effectively replacing existing boundaries and owners with each reform. In 1872, King Chulalongkorn launched an initiative to privatize land that historically belonged to the country as a whole. Later, the Land Code introduced in 1954 solidified these land registrations and distinguished between public and private land. A subsequent series of land titling reforms have been launched since then, resulting in a registration rate of private land that accounted for 40% of the country by 2004 (*Giné, 2005; Nabangchang-Srisawalak, 2006*).

An efficient land administration system was necessitated by the burgeoning Thai agricultural sector (sustained by the growing population and market globalization), particularly as these cultivated lands began to encroach upon designated natural forests. This administration system took the form of various state agencies that enabled legal claim on occupied public land and allocated occupancy rights per the Agricultural Land Reform Act of 1975. Such governmental agencies were represented by various ministries, including the Ministry of Agriculture and Cooperatives, the Ministry of Interior, and the Ministry of Natural Resources and Environment (which included the Department of National Parks and Wildlife and the Royal Forestry Department). Each ministry varied in its land use and total conservation objectives; this intrinsic segmentation and division of responsibilities fostered a lack of coherence, which resulted in overlapping claims on areas and boundary discrepancies (*Nabangchang-Srisawalak, 2006*).

1.2. Local Context: Land Tenure in Ban Sub Tao

The project area provides an excellent paradigm from which the consequences of overlapping land claims and their effects on land tenure can be examined. Ban Sub Tao (บ้านซับเต่า), located in the Udom Sap (อุดมทรัพย์) sub-district in the Wang Nam Khiao (วังน้ำเขียว) district of Nakhon Ratchasima (นครราชสีมา) province, has extensive experience dealing with boundaries imposed by the Department of National Parks and Wildlife and the Royal Forestry Department.

Prior to 1981, Ban Sub Tao's boundaries overlapped with Tap Lan National Park, causing land disputes between villagers and park officials. Following protests and petitions led by their chief, park boundaries were redrawn in 1981, and the current *Por Bor Tor 5* (PBT5) occupancy right (which, for practical reasons will be referred to as a title in this report) was uniformly assigned to the remaining 15,000 rai that made up Ban Sub Tao. This new title offered fewer rights than their previous title, *Sor Bor Gor*. PBT5 authorized villagers only to live and practice agriculture on their land; selling, renting, or transferring land associated with a PBT5 title was prohibited. While the villagers were not given any other compensation, this resolved the boundary disputes. Nonetheless, Ban Sub Tao's new relation with the National Park and its compromised land title generated new restrictions and challenges for the village.

1.3. Objectives and Research Questions

Ban Sub Tao's location in the National Park and its associated PBT5 title fundamentally impacted villagers' livelihoods. As their main activity was agriculture, the effects of restrictions set by PBT5 on agricultural development and credit access were studied, as well as the modified decision making processes under

regulations set by the National Park. Furthermore, the coping strategies in response to these restrictions and its effects on village stability were studied.

The ensuing research questions and sub-questions are detailed as follows:

How does land tenure (dictated by the PBT5 title) affect livelihood strategies of the inhabitants of Ban Sub Tao?

1. How does PBT5 influence decisional autonomy in Ban Sub Tao?
2. How does PBT5 affect the credit access of its title holders?
3. How does PBT5 affect farming practices in Ban Sub Tao?
4. What strategies are implemented to cope with restrictions related to land tenure in Ban Sub Tao?

1.4. Concepts and Framework

According to Herman de Soto (2000), property rights give the power to prosper as they are the cornerstones of capital production.

The related neoclassical theory of property and its assumptions on rational and efficiency-seeking economic actors form the basis of theories that link land rights and agricultural development. Such hypotheses are manifested in Changrajang's three principal channels through which land rights can affect agricultural investments and production:

1. Land rights security: mitigation of uncertainty about future possession of land that has been invested in;
2. Land rights tradability: creation of a market for land and therefore the efficient allocation of resources;
3. Land rights pledgeability: ability to pledge land as collateral, granting access to a formal credit market that provides loans for investment. (*Changrajang, 2015*)

Security, tradability, and pledgeability particularly resonate with the restrictions imposed by PBT5, and are therefore three essential dimensions from which livelihood strategies, agricultural practices, and economic development will be analyzed. The impact of each aspect's restrictions on villagers in Ban Sub Tao will be assessed, as well as their ability to cope within and beyond the range of these restrictions. Previous studies have demonstrated mixed evidence on the relative significance of security, tradability, and pledgeability on agricultural development, and it is an objective of this study to elaborate on this variation in the literature (*Feder, g. and Onchan, t., 1987; Giné, X., 2005; Chankrajang, T., 2015; Menkhoff, L. and Rungruxsirivorn, O., 2009; Feder, G. and Feeny, D., 1991*)

While the neoclassical theory aligns with the aforementioned research to some extent, additional elements detailed by Lund (2001) will be integrated into the analysis. According to Lund, land titling programs increase both security (through privatization) and uncertainty (through exclusion of third parties). His definition of certainty is dependent on prevailing social contracts; by simplifying land tenure to a unified title in Ban Sub Tao, the social contract between the state and the PBT5 holder is theoretically clearly defined. Because this title does not offer privatization and therefore the associated security detailed by Lund, analysis will be focused primarily on the concept of certainty in order to better understand the effects of PBT5.

2. Methodology

In order to study the impact of PBT5 on livelihood strategies, a strategic plan was produced prior to the field research. This plan was intentionally made flexible due to limited knowledge of the actual conditions in Ban Sub Tao, and the necessity of collecting diverse information on the field. For that reason, the research questions and data matrix (Annex 5 - Synopsis) were flexible and could be readily amended.

The initial phase of the field work was devoted to assessing the historical, social, economic, and agricultural contexts to acquire a better understanding of Ban Sub Tao. This phase was also used to appraise information that appeared to be conflicting or relevant to the research objectives, so that further investigations could be made.

Direct questions were used to gather information on market access, credit access, and agricultural practices, while social dynamics were inferred through observation and triangulation. As expected, some portions of the synopsis were deemed irrelevant or of secondary importance, and new elements or factors that were overlooked prior to the field work became significant. This new information became central to the new research questions and sub-questions that were developed, and redirected the agenda for the following week.

During the second week, the research focused on furthering our knowledge and triangulating our understanding of the workings of Ban Sub Tao. Since it was expected that there would be discrepancies based on different perspectives, the same questions were asked to all levels of authorities in order to better understand the influence of power and to better triangulate the findings.

Following completion of the field research, all data was categorized and analyzed in the context of the four novel sub-questions; the concepts detailed by the neoclassical theory of property and Lund's theory provided the framework within which findings were analyzed and discussed.

2.1. Methods

In the course of the field work, a range of methods were used in a particular sequence to first establish rapport with the villagers and later acquire more detailed information. On the first day, a semi-structured interview (SSI) was conducted with the chief to get a historical and political overview of the village. Throughout the week, randomly selected villagers throughout the village were interviewed to triangulate and corroborate information given by the chief. On the second day, transect walks were performed with key informants who indicated points of interest throughout Ban Sub Tao.

A questionnaire designed to gather both quantitative and semi-quantitative data on household organization, agriculture, and credit access was pilot tested on these informants, and later used to randomly survey villagers. This was accomplished by dividing the village into four equal quadrants and sampling every third house within each village quadrant. Because different people surveyed different quadrants, a consequence of this non-uniform sampling was that the data was not harmonized. Although a comprehensible quantitative analysis of the data was difficult to achieve, major trends were nonetheless evident.

In order to gather more precise and harmonized quantitative data on agricultural expenses and income, a second questionnaire was distributed on the final day. However, this data was collected during a village ceremony, rendering the data collection disorganized and presumably biased.

As a first step for gathering data on research-specific topics, a Participatory Rural Appraisal (PRA) was organized, which simultaneously gave an overview on local trends and social dynamics. However, despite extensive preparation, the PRA was made less efficient by the lack of organization in the way partici-

pants were gathered. Seven to ten participants participated in three workshops on agriculture, credit access and investments, and social structure in the village. Various PRA methods were utilized, including a crop calendar, a cropping chain, a social map, and games designed to assess investment patterns, factors in decision making, and knowledge access. Each activity was complemented with active conversation, such that several focus groups were effectively created.

Respondents of interest, selected according to their answers in questionnaires and the PRA, received follow-up SSI's that focused primarily on agricultural practices and coping strategies. The second week was also used to conduct SSI's with authorities and officials, including representatives from the village fund, the BAAC, Udom Sap sub district, the Royal Forestry Department, the Department of National Parks and Wildlife, and the Research and Training in Re-Afforestation Station. Interviewing of all stakeholders permitted an understanding of the influence of different perspectives and their respective discrepancies, and allowed effective triangulation of data.

In order to better understand the environmental conditions in Ban Sub Tao, a systematic transect walk was performed using GPS mapping to organize village cropping systems and resources. Moreover, soil samples were taken from various cropping systems throughout the village and their respective pH, carbon and nitrogen content were analyzed in order to assess the soil quality.

Following completion of data collection, a community meeting was organized in order to present the findings to the chief and fifteen attending villagers. This meeting allowed confirmation, rejection, and feedback for conclusions that were made, and launched a discussion about transitions in agricultural practices. At this meeting, a local pioneer of non-chemical farming and a representative from the forestry research center provided information on and shared their experiences with farming alternatives. This permitted the provision of knowledge with regards to resource accessibility, and hopefully offered a source of inspiration for villagers, who seemed to be interested in the prospect of organic farming practices. Ultimately, the meeting was a means for confirmation of the data and proposal of potential avenues for improvement according to interpretations of this data.

While the methods proved effective in gathering suitable data, improvements could have been made to amend collection issues – namely scheduling issues, difficulty gathering respondents, and difficulty collecting uniform quantitative data.

3. Results and discussion

3.1. Restrictions of land titles and decisional autonomy

As recently as the 1970's, the structure and appearance of Ban Sub Tao was profoundly different: homes were scattered and in closer proximity to agricultural fields, boundaries between agricultural land and nearby degraded forests were unclear, and minimal infrastructure existed (including the absence of electricity and water). Households were grouped, first in 1981 and again in the late 1990's when the second cluster of houses in Ban Sub Tao was established south of the main town, leaving their fields empty of houses and huts. At the same time, the government provided Ban Sub Tao with tap water (1980's) and electricity (1996).

In 1981, the National Park boundaries were redrawn, incorporating some of Ban Sub Tao's fields into the total protection area, and the remaining fields into the conservation forest. Initially, the government planned to relocate the villagers and appoint them little to no land so that all of Ban Sub Tao could be de-

voted to the National Park. Villagers successfully resisted this eviction according to the chief of Ban Sub Tao, vocalizing protests as far as Bangkok. Though they successfully evaded this relocation, the consequences were nevertheless substantial; the assimilated farmlands were given stringent regulations as per the policies of the protection areas.

Notably, incorporation of Ban Sub Tao into protected areas involved a title change. As per regulations set by the 1975 Agricultural Land Reform Act, villagers received the PBT5 certificate for their land. The primary change that occurred with the introduction of PBT5 was the revocation of land ownership, which was transferred to the state. Those with PBT5 were authorized to live on and cultivate the land, and obligated to pay taxes on the land. According to interviews with the chief and villagers, no compensations were provided for this loss of ownership.

In 2010, the government exempted villagers from paying land taxes in an attempt to minimize park encroachment. This policy rested on the assumption that villagers who paid taxes began to equate these payments with some extent of land ownership, allowing them to claim protected areas as agricultural land. Thus, the government believed that elimination of these taxes would ostensibly disconnect feelings of ownership over public land.

Because the PBT5 certificate did not grant land ownership, land could only be inherited, but not transferred: no official record of land transfer exists for over thirty years in Ban Sub Tao. As part of the re-assignment of land boundaries, Ban Sub Tao and the neighbor Ban Sub Phu were allocated a fixed territory of approximately 15,000 rai (2,400 ha) with no opportunity for further expansion (Figure 1).



Figure 1 - Ban Sub Tao boundaries, as indicated by the chief. The red line is the approximate boundary between the National Park (south) and the Conservation Forest, as indicated by the villagers.

PBT5 restricted land activities only to living and agriculture, and any other activities (i.e. participating in the tourism industry) were prohibited. No trace of such activities was seen in Ban Sub Tao, and no villagers alluded to such a possibility. Nonetheless, it should be noted that other villages with the same land title relied heavily on the tourism industry as a source of income (i.e. Ban Sub Somboon).

Villagers' autonomy was additionally restricted by the imposed rules of the National Park and Conservation Forest within which they resided, and further complicated by the considerable ambiguity of these boundaries. While the chief, villagers, and the United States Geological Survey (USGS) cited the division between the National Park and the Conservation Forest in the middle of Ban Sub Tao, designated by a pole near the school, the Forestry Department indicated otherwise. Their departmental map illustrated the boundary of the Conservation Forest on the actual forest border, which would grant them total control over the village land. Such distinctions are consequential, since the different departments have control over different areas of the village, and each request to develop new practices or build new infrastructure in the village required authorization from the Forest Department, National Park, or Sub-District office. The National Park and Conservation Forest have similar, strict guidelines, with comparable agricultural impacts. Both departments ostensibly ban villagers from all uses of forest resources, and prohibit the development of new infrastructure (i.e. digging water reservoirs, building new roads), effectively limiting agricultural advancement. Although formally illegal, they did authorize villagers to forage in the forest (i.e. mushrooms), on the condition that no tree was chopped or damaged. On the other hand, government representatives permit existing and planned infrastructure developments, and recognize villagers' rights to behaviors deemed illegal by the National Park and Conservation Forest.

The strategies implemented by villagers to cope with the aforementioned land tenure restrictions will be presented in section 3.4.

It should be noted, however, that there exists potential to remove restrictive policies: the chief has discussed being in the process of separating the communal forest from the National Park, which would grant villagers more freedom in the forest. Further, villagers have the potential to change their land title to Nor Sor Sam, which would allow them to buy, sell, and transfer their land. According to the Udom Sap sub district office, villagers who have lived on their land for at least 10 years can acquire the Nor Sor Sam land title – this title, however, cannot be currently awarded as boundaries between Ban Sub Tao and the National Park are still unclear. Per estimations of the Sub District, such boundaries should be clarified in four to five years, allowing villagers of Ban Sub Tao to acquire Nor Sor Sam as early as 2031.

Discussion:

Government and departmental organization is complex, and far removed from villagers – their chief served as the main form of communication, through which each interaction proceeded. His authority was extensive, from organizational to judicial. Although not a visible concern among the villagers, the possibility for the rules to be changed could not be dismissed as negligible. Despite the successful resistance of eviction, future eviction attempts are possible – and it should be noted that the chief stated he was unwilling to perform the same protests, under any circumstance, in the future.

This power structure supported the accrual of command toward singular authorities, reinforcing a system which further perpetuated their own power. Each development required authorization, forging direct connections between villagers and their medium to higher authorities (i.e. the chief, sub district). Such a system ultimately strengthened the chief's relevance and made him indispensable. Further, each request

by the chief had to be approved individually, conferring power to a higher level of authority. In the instance that a request was rejected, fault was not placed on the middle man because decisions were ultimately made outside the range of his power. Rather, any resentment was targeted toward those officials who refused requests, creating a division between the two disagreeing sides and effectively strengthening relationships between villagers and their concurrent middle men. This model applies to each level of this power structure. With strong central authority (currently a military junta), it was unlikely that villagers could acquire more autonomy.

Since any authorizations granted could theoretically be revoked at any time, security levels were diminished. However, revocation of these authorizations were unlikely as it would damage politicians' credibility, ultimately fixing the social contract between the state and the villagers and generating certainty. The result was a stable framework that benefitted even villagers in the short term by stabilizing a power balance.

3.2. Credit Access and Investments

From data collected by questionnaires, it was determined that the main channels of credit access in Ban Sub Tao were through the village fund and the Bank for Agriculture and Agricultural Cooperatives (BAAC): 80% of respondents had a loan with one or both sources. The general organization, as well as credit policies and risk management strategies, are analyzed below.

The village fund:

Village funds, introduced in 2001 by the government in 77,000 villages across Thailand, are micro-finance institutions with the goal of increasing access to formal credit for low-income households (Menkhoff and Rungruxsirivorn, 2009). Since its establishment, the government has provided a total of 2,200,000 baht for Ban Sub Tao's village fund.

Ban Sub Tao's village fund was comprised of 137 members, of which 92 had a loan. The village fund elected their committee members for 2 years each, with elections held annually. According to the Questionnaire results, the committee was responsible for deciding the loan amount and the interest rate, which varied from 0.5% to 20%, for each villager. These decisions were based on available information about the borrower and their financial status. According to the committee board, this information was easily accessible at the village level.

In order to be eligible to receive a loan through the village fund, one must: (1) be a member of the fund for at least six months; (2) be a resident of Ban Sub Tao; (3) be the sole borrower from the village fund in his/her household. Villagers could take an annual maximum loan of 30,000 baht, which could be extended to 70,000 baht under the unanimous approval of all members of the village fund. According to the questionnaire results, the average loan amount accounted for 23,000 baht. To borrow from this fund, villagers needed two to five guarantors to support their loan. Moreover, while it was mandatory for the borrower to present his/her plans for investment (most often for agricultural purposes) before the loan was issued, there was no follow up or control by the committee. A communal savings existed within the village fund as a preventative measure against defaults, and was sustained by an annual 300 baht contribution by each member of the fund; the defaulter, however, still owed the interest rate of his/her loan.

Each year, the interest money accrued by the loans were dispersed among various reserves that strengthened the village. These included supporting the village fund (20%) and the committee (20%), fund-

ing benefits for the members (20%), investing in infrastructure and village maintenance (20%), investing in education (10%), and funding transport of members to and from court (10%).

Strengths of the village fund included its low administrative burden, low interest rate, and easy access; however, the loans that the fund were able to dispense were relatively low according to the farmers.

The Bank for Agriculture and Agricultural Cooperatives (BAAC):

The BAAC is a state banking enterprise, owned by the Thai Ministry of Finance. Its objectives included providing financial assistance to farmers and cooperatives in their on-and- off-farming activities, providing knowledge and technology to the farmers, and collaborating with the public and private sectors to enhance farmers' standards of living. The BAAC began to provide loans to Ban Sub Tao in 1990. Prior to 2017, farmers declared that they did not have any debt problems; since that year, however, farmers have increased their loans (and consequently, their collective debt) to invest in agricultural inputs. On average, villagers had higher loans with the BAAC – the average loan at the BAAC was over 100,000 baht.

The duration of a loan through the BAAC was for 10 to 18 months, and this loan was closely monitored by the BAAC. According to one villager, this vigilance was considered beneficial because it limited the risk of “vanishing money”. To be eligible for a loan, farmers were required to have up to five guarantors (who were contacted by the bank in cases of default, before legal action was taken against the borrower), and, so that the bank could minimize risk, farmers could not borrow over 60% of their expected income.

Interest rates depended on the solvency rate of the borrower, such that poor payers paid higher interest rates. Unlike the village fund, interest rates were relatively constant; borrowers were ranked on their solvency, and given a rate between 7.0% and 9.25%. If a borrower was unable to pay despite these controls, his/her interest rate rose to 10% the following year. The benchmark rate for the Central Bank of Thailand was 1.5% since the first quarter of 2016. Thus, the minimum interest rate of 7% left a margin of 5.5% for the bank, one that the BAAC representative claimed was one of the lowest in the Thai market.

The BAAC was used as the primary source of credit in Ban Sub Tao, and was accessible to villagers because it offered credit to holders of a PBT5 title (so long as they had the support of two to five guarantors). Commercial banks typically did not lend money to holders of a PBT5 title, and it appeared that the BAAC was the only financial institution that granted credit to holders of PBT5. According to the BAAC representative, close monitoring, access conditions, and interest rate policies were applied uniformly to PBT5 and other land titles owners.

Investments

In all surveyed cases, loans were used to finance agricultural activity, including agricultural inputs and transport. These results were corroborated by the PRA session, in which it was learned that loans issued by the village fund were used by maize and cassava farmers for seeds, pesticides, fertilizers, and labor; these loans ranged from 10,000 to 30,000 baht per household. Moreover, loans from the BAAC, in addition to input investments, have been used to cover land rentals outside of the village, as well as machinery and equipment.

A comparison of the annual income and expenses (i.e. seeds, fertilizers, pesticides, and labor) of the farmers suggests a quantitative level of debt among the villagers of Ban Sub Tao. Through a second round of questionnaires designed to acquire more precise and harmonized information about expenses and loans, it was found that the average difference between annual income and loans was approximately

90,000 baht. As the major source of income for farmers in Ban Sub Tao, this agricultural revenue had to cover most the households' living expenses following repayment of the loan. However, in 80% of the cases, the loan amount was less than the annual costs of production, and the average expense surplus was approximately 72,000 baht. This surplus suggested that farmers self-financed a portion of their production costs. Deducting these expenses to determine the net profit (after repayment of loans) resulted in an annual average profit of 18,000 baht. Additional loans therefore had to be taken in order to continue funding farming activities, illustrating the debt cycle cited by villagers.

It must be noted, however, that only agricultural-related revenues and expenses have been taken into account for these calculations. Other sources of income, such as remittances and off-farm labor, were part of villagers' debt mitigation strategies.

Discussion

The results of several SSI's have demonstrated that the debt cycle generated by annual loans for current expenses was considered a major problem for farmers, with "no way out". Increasing input prices (see cap 3.3) effectively illustrate this debt cycle putting pressure on the funds that farmers borrowed. At the same time, decreasing market prices and production losses due to pests and disease have further increased debt and made it increasingly difficult for farmers to repay their loans. These findings were confirmed by the PRA, during which profit and loan deficit was mentioned several times.

In addition to loans, the BAAC also provided advice on the most profitable crops according to up-to-date market price reports. However, the BAAC provided these suggestions based only on economic factors and not on contextual analysis – growing the currently recommended milk jujube fruit would require long-term investments primarily in the form of irrigation systems. Given that the average duration of loans was twelve months long, such a transition would inevitably put farmers in considerable debt. Despite this mismatch between theory and practice, villagers agreed that the BAAC was the third most influential factor affecting their decision making (after the farmers themselves and their respective neighbors).

From this analysis, it can be argued that PBT5 effectively imposes limitations on credit and investment, particularly due to the short duration of issued loans, limited loan value, and limited access to issuing credit institutions. In this way, the reduced pledgeability of the land adversely influences the agricultural development opportunities of Ban Sub Tao.

3.3. Agricultural practices

Agricultural activity was the main source of income in Ban Sub Tao, and farmers have been growing the same crops, namely maize, cassava, and sugarcane, with the same practices for decades. However, the location of the village put farmers at risk not only for erosion damage, but also for water shortage due to limited rainfall and limited ability to build infrastructure. Moreover, while credit access enabled farmers to intensify their agricultural production, it has at the same time generated and sustained new challenges for farmers. Here, the farming activities of Ban Sub Tao are detailed with respect to the current political, environmental, and economic contexts of Ban Sub Tao.

1990's: Agricultural Transition in Ban Sub Tao

Prior to the 1990's, farmers in Ban Sub Tao abstained from chemical use in their agricultural practices. Such practices were modified in 1990, when the BAAC enabled farmers to invest in agricultural inputs and increase production by introducing short term credit options. Use of inputs progressively increased as companies began to advertise their inputs through village presentations, and production has since intensified through the use of chemical fertilizers and pesticides. This effect was evident in the expansion and intensification of agricultural fields from 1984 to 2017 (Figure 2). Field extension was especially apparent between 1984 and 2003, and subsequent soil fertility depletion due to farming intensification can be seen in the increasingly lighter color of the field over time.

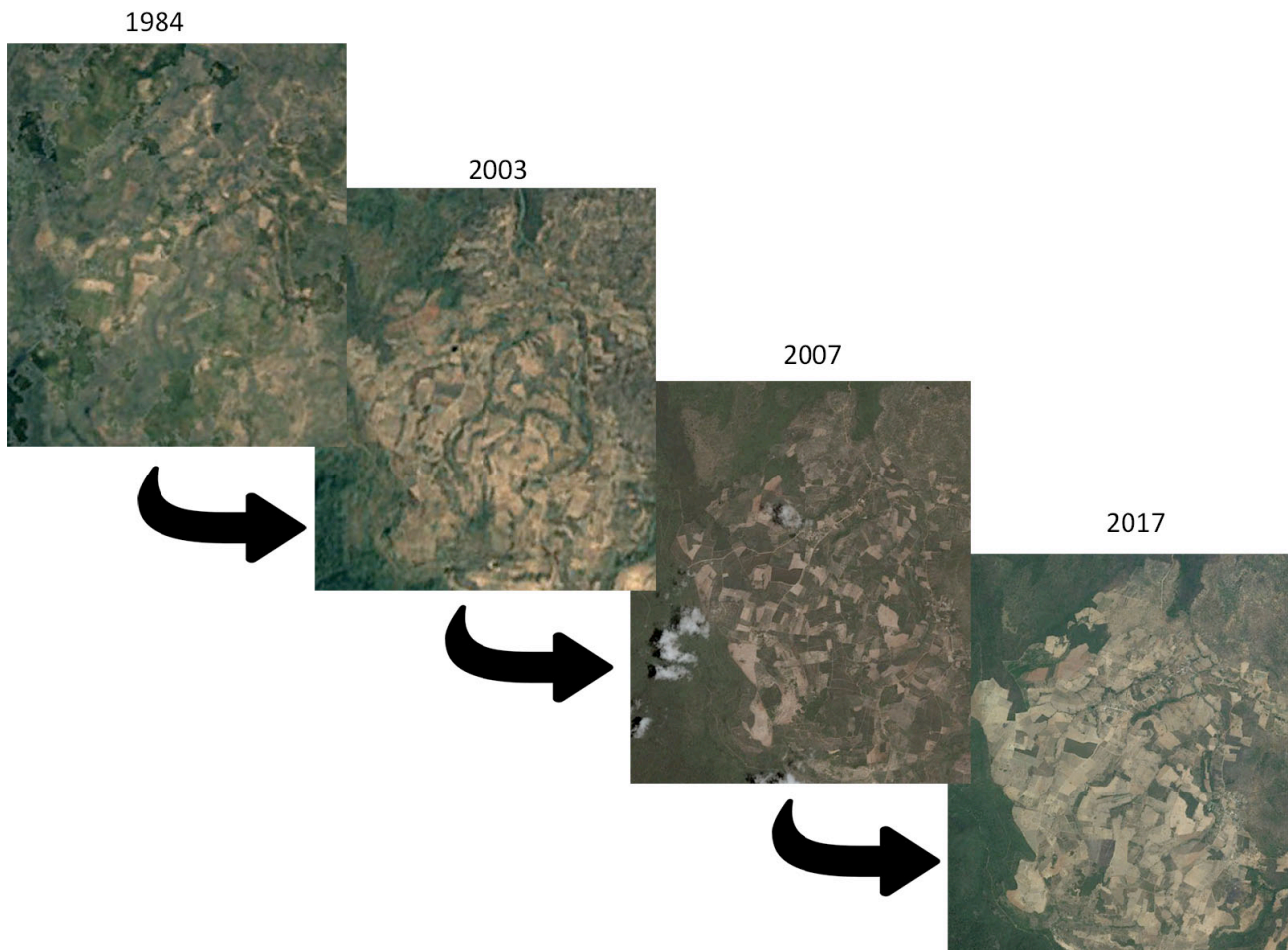


Figure 2 - Satellite view illustrating agricultural extension and intensification in Ban Sub Tao from 1984 to 2017 (source: Google Earth, 2017).

The Agricultural System

Because cassava and sugarcane required relatively less water than maize, they were cultivated year-long. Maize, however, required frequent rainfall and was thus only able to be cultivated during the short rainy season in Thailand. Figure 3 details annual cultivation patterns according to questionnaires and interviews with farmers; this information was further confirmed at the community meeting.

Trend of Price Evolution

Farmers' reports of trends with respect to the price of inputs (Figure 5), yield, market prices, and profit over time were gauged and recorded during the PRA in order to better understand the progression of agricultural tendencies in Ban Sub Tao.

Most answers were unanimous, confirming a decrease in market price, profit, and yield over time and an increase in input prices (Figure 4).

As crops were grown for commercial purposes, a cost-benefit analysis of each crop was conducted. Figure 6 and Figure 7 illustrates the profita

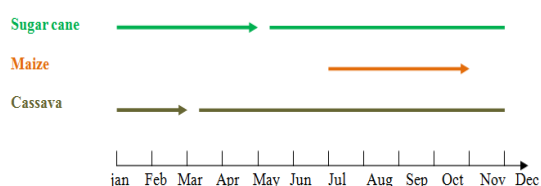


Figure 3 - Crop calendar for Ban Sub Tao

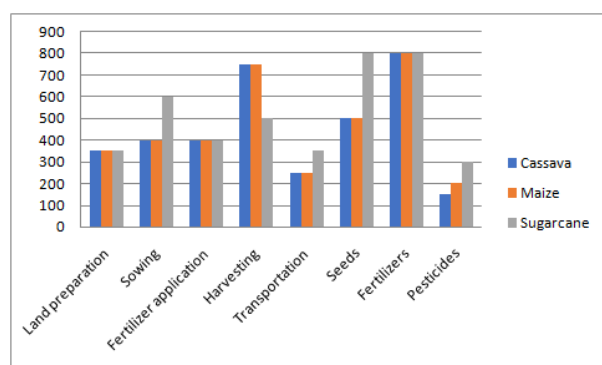


Figure 4 - Costs of inputs for cassava, maize and sugarcane in Ban Sub Tao

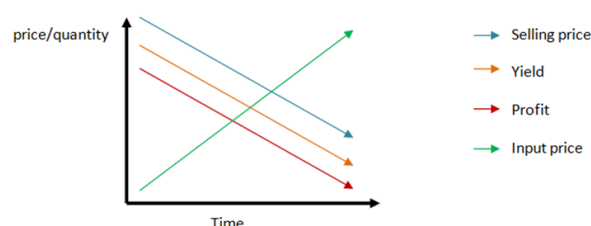


Figure 5 - Agricultural Trends in Ban Sub Tao.

bility of the three cash crops, and encompasses data acquired from farmers about their input expenses, yield, selling prices, and income. This data was further confirmed at the community meeting. Income was calculated using reported yield and selling prices, and these values were compared to reported incomes. The total input prices were then subtracted from both income values to determine farmers' calculated and reported profit margin.

The discernible difference between calculated and reported profit values was noteworthy, and may be due to reporting errors. Because calculated income values were consistent with regional revenues, the discrepancy may be the in reported expenses (i.e. seeds, fertilizers, pesticides, labor, transportation), which would misrepresent profit calculations.

Alternatively, this discrepancy may be indicative of farmers' practices and perceptions of income. The inconsistency is particularly substantial for cassava, which was profitable based on reported values and caused deficit based on quantitative data calculations; nonetheless, cassava was grown on the majority of fields. Such a dichotomy implies a lack of knowledge in profit margins, and suggests that farmers may fail to perform calculations necessary to enforce proper decision making (i.e. omitting cassava cultivation due to its inevitable deficit). It may also be suggestive of income perceptions, in which farmers operate under the assumption that their profits are higher than they actually are. Therefore, better knowledge access may improve farmers' situation and optimize their agricultural practices.

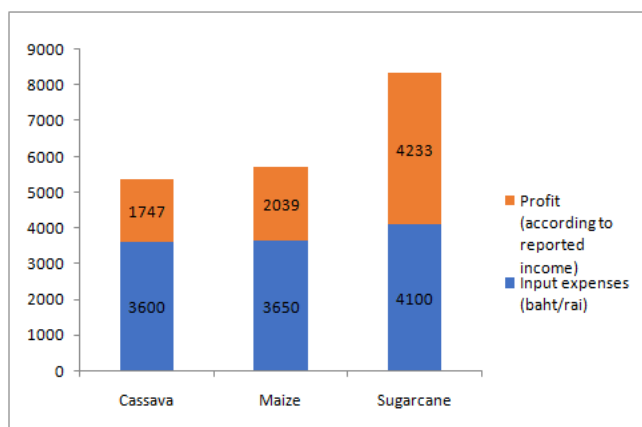


Figure 6 - Reported income and calculated profit, as told us during SSI and community meeting

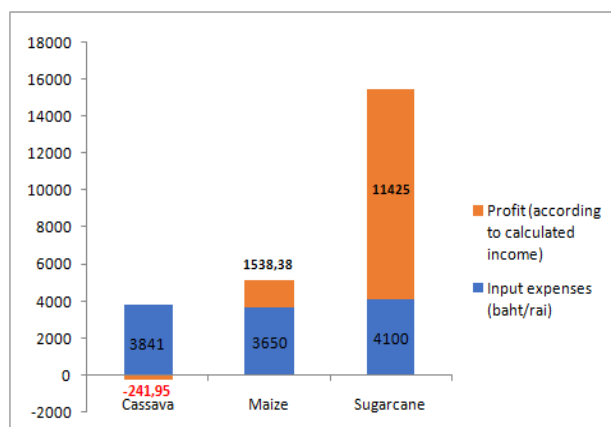


Figure 7 - Calculated income and calculated profit, from the expenses' figures collected with the second questionnaire, and the income as in the SSI and community meeting

Restrictions

During the PRA, the farmers reported that the most influential factors on their agricultural practices were (in order of importance) family, themselves, the bank, and their neighbors. These factors comprised only individuals and institutions, and it was later revealed that other prominent external factors affecting agriculture included credit access (as discussed in Cap. 3.2), soil quality, water access and knowledge access. Moreover, labor supply and villagers as limiting factors are often mentioned market accesses.

Soil quality

The soil map of Thailand (Annex 3 - Soil map of Thailand) suggests that the soil in Ban Sub Tao was generally shallow, with some stony, sandy soil derived from quartzic and siliceous sandstone parent rocks (type 42 in the map); such content is indicative of relatively low soil fertility. It was thus expected that the soil would have a low pH, low carbon and nitrogen content (and low CEC), and a constant need for agricultural inputs to support productivity.

The soil of different fields in Ban Sub Tao was assessed to support these hypotheses, and the respective properties of these samples are summarized in Figure 8 - Soil sample plot locations with accompanying analysis results.. All cultivated plots, with the exception of sugarcane, were along the same road and were in close proximity.

The results confirmed the expectations, with relatively low pH values ranging from 4.97 to 5.91 and a very low carbon and nitrogen content (about 0.1% nitrogen, below the detectability threshold, and between 0.7 and 1.6% carbon). The ratio of C/N was consistently found to be about 10/1, and appeared to be unrelated to pH values.

A one-way ANOVA and Tukey test were conducted to analyze differences in nutrient composition and pH values between the soil samples. The data indicated that the soil was acidic and generally lacked nutrients, but these effects appeared to be governed more so by local conditions than by crops. However, comparison of adjacent plots suggested minute effects of agricultural practices: intercropped cassava fields, for example, had higher carbon (and nitrogen) contents than their monocropped counterparts ($p < 0.05$). Similar effects were observed for maize fields, as cultivation of maize alone was a less demanding practice relative to maize and cassava monocrop rotation. Finally, tree plantations and forests had the effect of in-

creasing carbon content ($p < 0.05$), and further substantiate the initial observation that nutrient availability and pH were unrelated ($p > 0.05$).

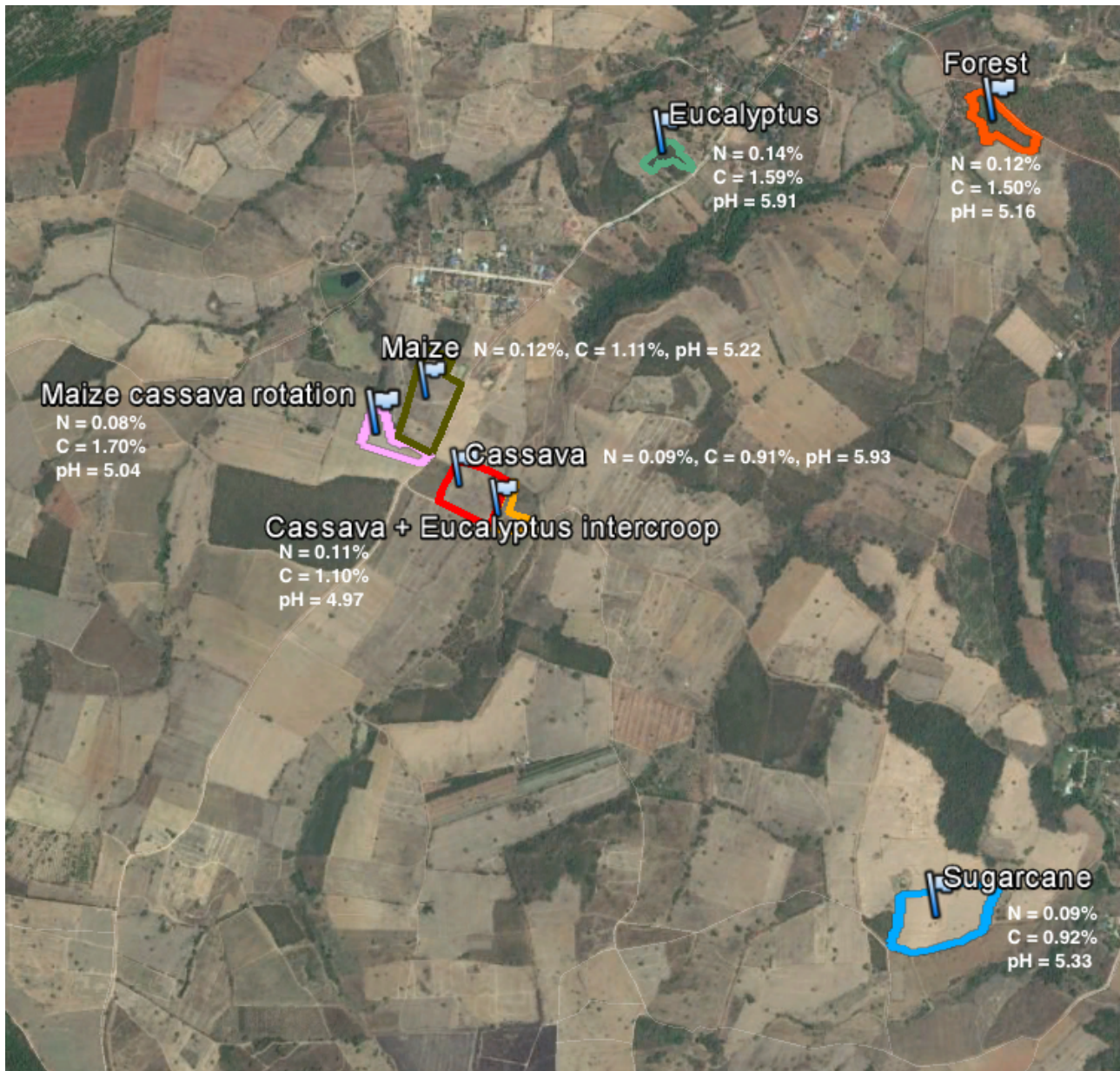


Figure 8 - Soil sample plot locations with accompanying analysis results.

Water access

Empirical observations corroborated villagers' claims that Ban Sub Tao suffered from an overall lack of water – most rivers and vegetation in forest areas were dry. As per these observations, it was seen that the soil structure was poor, and there was evidence of erosion due to high rain intensity (Figure 10). Moreover, there was an apparent absence of irrigation systems and ponds in the village, undoubtedly as a result of restrictive regulations put in place by the National Park. This lack of water ultimately restricted farmers' ability to make decisions concerning their crops.

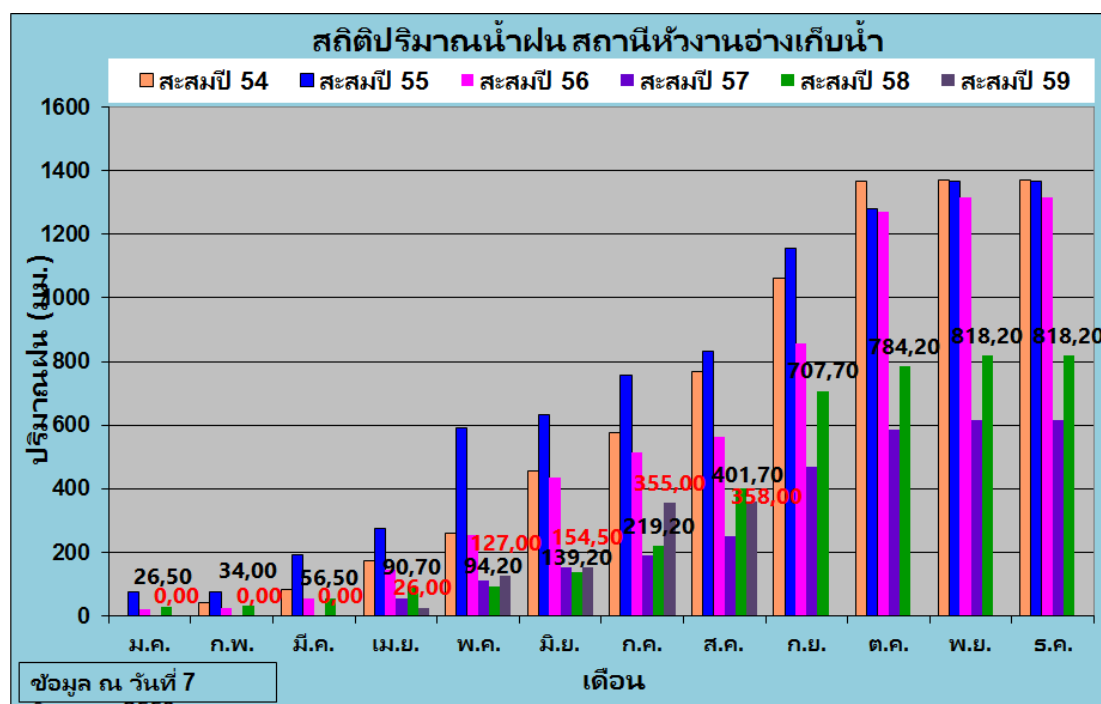


Figure 9 - Monthly total precipitation (mm) from 2011 to 2016 recorded at the Lam Chiang Sa reservoir, Wang Nam Khiao District. Source: document from Udom Sap sub-district

According to interviews with the villagers, 2015-2017 were the driest years they could recall (Figure 9). Villagers also agreed that these conditions limited their flexibility of decision: their crop choice was made not freely, but because they were the only crops that were suitable for Ban Sub Tao's agro-climatic conditions.



Figure 10 - Heavy erosion between dirt road and cassava field, in the southern part of Ban Sub Tao.

Access to Knowledge

It was found that a frequent knowledge source for farmers was provided by agricultural input companies that presented and sold their products in Ban Sub Tao. These companies offered knowledge to farmers and subsequently encouraged them to purchase their products. While villagers appreciated the knowledge provision, they expressed distaste for the marketing aspect – many suggested that these companies had ulterior motives and wanted only to sell their products, not to help farmers improve their practices.

During the PRA, farmers expressed interest in learning about organic farming, as well as the agricultural inputs they used. They were particularly concerned with the varying benefits between available fertilizers.

Discussion

The obtained results confirm our statement concerning the restriction on the agricultural activity linked to the land title PBT5. Indeed, according to our research, PBT5 impacts the development of agricultural livelihood through its limitations in terms of security, tradability and pledgeability.

First, because farmers were unable to legally expand their land, they were inclined to intensify their production through the use of chemical inputs. These products enabled reasonable production in poor quality soil, but caused long term soil deterioration. Use of chemical inputs only increased following the arrival of the BAAC in the 1990's, which permitted only short-term loans for farmers. This perpetuated a debt cycle in which farmers were forced to continue intensification in order to pay back loans taken to afford these inputs. This increasing use of inputs, in addition to the lack water, ultimately threatened the future of their farming activities.

Second, as discussed in section 3.2, because issued loans were all short term and effectively generated a debt cycle, long-term investments were nearly impossible for farmers of Ban Sub Tao. Furthermore, it takes several years to earn a return on investment from newly launched projects, a latency period farmers could not afford. Many farmers, for example, expressed interest in growing eucalyptus trees – while initiation of these projects required low initial investments, the major challenge was enduring the three years during which no income would be earned from the eucalyptus plantation. Thus, annual loans issued by the BAAC and the village fund could not be honored, rendering long-term investments unrealistic.

Within this restrictive context, the decision making process of the farmers regarding their farming activity is impacted.

The assessment of decision making revealed that the majority of farming decisions were made due to within-village influences. This internal dependence has effectively reinforced stagnation in farming practices, in the use of annual cash crops and short-term chemical investments. Moreover, since no farmers in the village have attempted to pioneer new agricultural practices, there is no internal model from which villagers can follow.

It can be argued that PBT5 assumed a significant role in normalizing and perpetuating fixed agricultural practices in Ban Sub Tao. Specifically, its limitations on infrastructure building have uniformly cemented cropping systems and agricultural practices across the village. Villagers appear to be locked into planting either maize, cassava, or sugar cane due to a lack of water and a limited ability to address this problem. In this way, optimized practices have become a self-perpetuating norm on the basis of restrictions set by PBT5; ultimately, this homogeneity systematically reinforces and maintains the status quo.

3.4. Implemented strategies to cope with the restrictions

As analyzed along the report, due to Ban Sub Tao's location in the National Park and its accompanying land title, villagers grappled with externally imposed regulations that constrained livelihood improvement opportunities. These constraints were the source of four major issues, according to the villagers: land restrictions, financial restrictions, restrictions to infrastructure development, and knowledge restrictions. The success of coping strategies by which villagers managed these constraints illustrate the extent to which PBT5 effectively impinged on their livelihoods.

Rigid Land Boundaries

The rigid land boundaries levied by PBT5 effectively prevented villagers from expanding their land, as each plot was defined and could not be transferred by any means. These restrictions fostered extensive illicit activity in the village – land was bought and sold illegally, and it was not unusual for farmers to secretly rent out their land without contract. In some instances, farmers who sold their land would continue to farm in the communal forest in secret. Though this illicit activity carried risks because such land transfers were not formally recognized, they nonetheless served as a viable means by which villagers could bypass restrictions imposed by PBT5. Other farmers expanded their practice by legally renting land outside of Ban Sub Tao for farming.

Although often stated factually by several informants (sub-district, villagers, and the chief) that park encroachment was a means to expand agricultural land, analysis of satellite images of adjacent forests does not verify this statement. Between 2000 and 2014, there was a marginal, if at all, depletion of forest area (Figure 11). A loss of trees can be observed in the northern part of Ban Sub Tao (labeled red in the figure), but this loss is more likely due to a change in plantations (i.e. from rubber trees to the current eucalyptus). Other minor changes are observable in the agricultural area, evident of intensification. However, these same images on a larger scale illustrate a clear increase in the forest cover of the National Park (labeled blue in the figure).

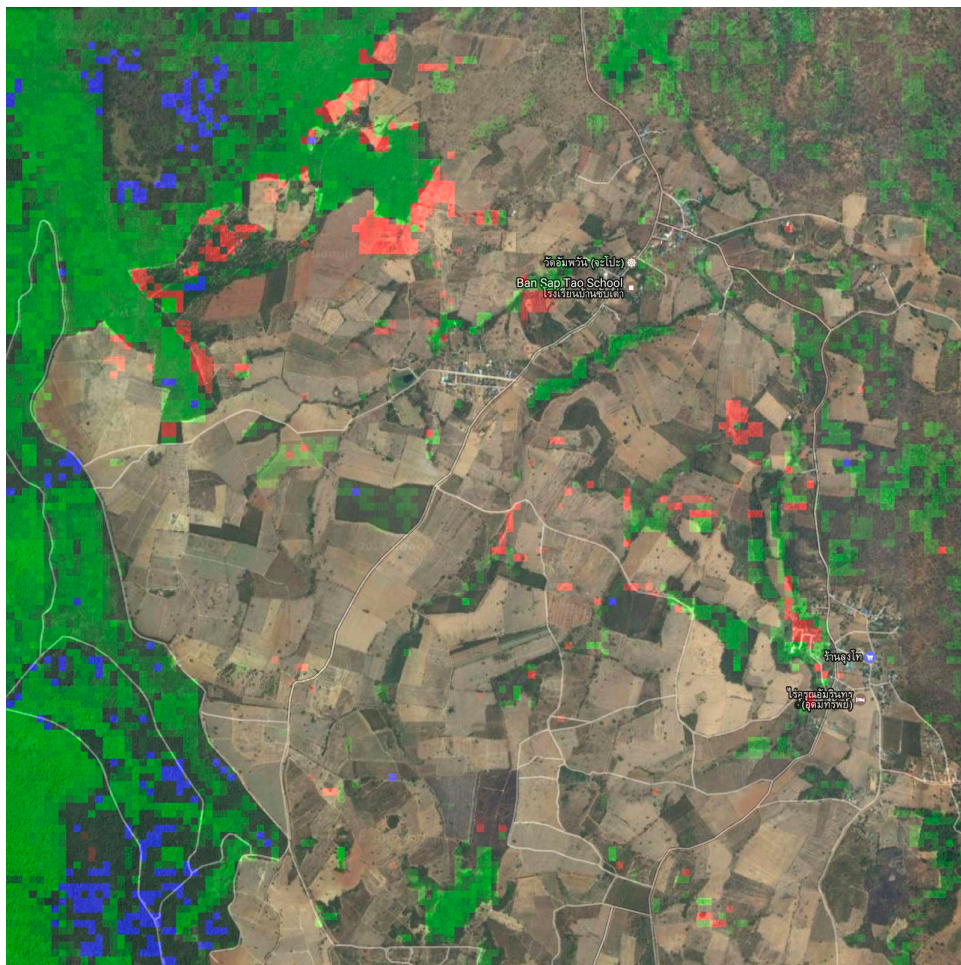


Figure 11 - Tree cover loss (in red) and gain (in blue) in Ban Sub Tao and its neighboring area. Composite image comparing 2000 and 2014 satellite data (Source:modified from Hansen et al., 2012 and University of Maryland)

Financial restrictions

Due to lack of control over market price fluctuations, input prices, and crop decisions, villagers faced a reduced ability to profit, particularly when market prices were not in their favor. When asked about their strategies to cope with resulting financial stress, villagers were adamant in stating that there was no such strategy, and that they just had to make do with the reduced income. However, it should be noted that they possessed some flexibility in rotating between their three main crops (maize, cassava, and sugarcane) according to market prices. Nonetheless, because the restrictions of PBT5 discouraged villagers from experimenting with new crops or agricultural practices, their ability to cope with these market price fluctuations was severely limited.

To supplement this income, villagers worked as laborers on their neighbors' fields (average wage of approximately 270 baht/day) or as construction workers in cities; a portion of villagers also received remittances from their family members -- an average of approximately 64,500 baht annually. These secondary sources of income gave villagers a greater ability to financially cope with challenges introduced by their land titles.

Also, because PBT5 was not a generally acceptable form of collateral, villagers faced restricted credit access due to the nature of their land title. The existence of a village fund in Ban Sub Tao offered an alternative by issuing relatively small loans to villagers. This alternative channel for credit granted limited flexibility in coping with the restraints of PBT5. Nonetheless, the village fund served as a useful secondary loan for villagers, of which 70% had borrowed from the village fund.

Infrastructure development

Both the situation of Ban Sub Tao in the National Park and the coupled PBT5 land title restricted the ability of villagers to build and develop infrastructure in their village. As per the guidelines of the National Park, infrastructure could not be built within the National Park and the Conservation Forest, but representatives of the National Park were willing to "consider" such requests. However, a discrepancy existed between levels of authority regarding the legality of land developments (specifically in the case of building ponds, canals, and dams) -- while the government considered these improvements legal, it was illegal from the perspective of the National Park and Conservation Forest.

To acquire desired infrastructure improvements, villagers met annually with Sub District officials to discuss their needs as a village, and these officials made efforts to meet villagers' needs. The sub district representative described several planned infrastructure improvements to be implemented by 2021. Such improvements were requested by the villagers, and include the building of concrete roads to Ban Sub Tao, irrigation systems, and a public pond. A collective budget of 4.6 million baht was available to fund these public works; however, a recurrent issue that cannot be overlooked was the change in priorities made with new government turnovers. Thus, it is uncertain whether this fund will be used in the same way following the next government turnover. In this way, the extent to which villagers could cope with the limitations on infrastructure building was limited, as their means to attain prospective improvements were abandoned with subsequent government turnovers.

Also, Ban Sub Tao's location in the National Park limited permissible building options in the area -- the construction of a community center, for example, was deemed illegal in Ban Sub Tao. To bypass these regulations, villagers instead built an agricultural learning center that served a dual purpose as a community center. This strategy to circumvent such regulations proved wholly effective, as Ban Sub Tao managed to legally procure buildings deemed necessary by simply rebranding their projects.

Access to knowledge

Ban Sub Tao's situation in the National Park and its associated PBT5 land title further restricted knowledge access for villagers. Though the newly built learning center could be seen as a knowledge access opportunity, its use has merely been as a community center and as an advertising medium for agricultural companies. While this facility theoretically enabled knowledge access, interviews with villagers exemplified a clear lack of access to desirable agricultural knowledge despite knowledge supply from companies and banks. Thus, an evident disconnect between villagers' desire for knowledge and the actual knowledge supply existed, such that the extent to which villagers could procure applicable agricultural knowledge in the face of their restrictive land titles was severely limited.

Past successes

Though coping strategies for these enacted restrictions thus appeared to be marginal, the role of the chief of Ban Sub Tao in acquiring substantial improvements for the village was notable. As a former member of the Udom Sap Sub District office, the chief had the voice necessary to draw attention to Ban Sub Tao.

In the past, the chief successfully lobbied for water and electricity, and successfully protested and petitioned for the clarification of overlapping land boundaries between Ban Sub Tao and the National Park. Moreover, he utilized allocated government funds to procure water towers that improved water accessibility in the village, and currently is working to acquire a new canal for Ban Sub Tao and to define the boundaries between the Communal Forest and the National Park in Ban Sub Tao. Thus, it appears that the chief served a prominent role not only in acquiring relevant infrastructures, but also in effectively communicating with officials and ensuring government accountability.

4. Discrepancies in Results

It was consistently found that perceptions of resource accessibility differed across levels of authority, reflecting the power dynamics inherent in imposed regulations. Specifically, government departments that established and enforced guidelines reported the feasibility with which villagers could procure knowledge, credit, and infrastructure. These opinions conflicted with those to whom the guidelines applied. Generally, villagers saw such regulations as crippling, rendering acquisition of these resources nearly impossible. Access to knowledge and infrastructure building were two domains characterized by this issue.

Access to knowledge

A stark contrast in perceptions of knowledge access existed between government officials and villagers. While government officials appreciated a simplistic understanding of knowledge access and defined generalized agricultural instruction as pertinent to villagers of Ban Sub Tao, villagers saw this same instruction as insufficient. Specifically, the BAAC provided broad knowledge on villagers' crops, existing market trends (i.e. which crops could currently be sold for the highest price on the market), and further advised villagers to develop infrastructure in the absence of rain. Though the BAAC saw this knowledge provision as an effective means to mitigate default risk, villagers saw this information as inadequate or not targeted toward the material they wished to learn. Similarly, the Sub District representative assessed knowledge ac-

cess as widespread and sufficient; these differing perceptions indicate a potential disconnect between government perceptions of villagers needs and their actual needs.

Infrastructure building

Interestingly, the perceived ease with which these infrastructure improvements could be made differed between authorities. A sub district official for Udom Sap, for example, stated that small projects (i.e. ponds) in Ban Sub Tao were “easy” to carry out, requiring only a “simple” tax form to be completed and permission from Udom Sap and the National Park. Park officials also believed the process to be relatively simple, requiring only permission from officials. The major discrepancy existed between these officials and the villagers, who perceived such infrastructure improvements as nearly impossible due to the rigid restrictions imposed by PBT5. Empirical observations supported villagers’ assertions, as there appeared to be limited availability of public and privatized infrastructure geared towards alleviating the commonly emphasized water shortages.

5. Group work and learning experience

The eclectic backgrounds of the different group members of our group enabled us to investigate the project study from various perspectives, ranging from social science to natural science. This cross-disciplinary measure allowed original research and a comprehensive perspective of the research questions. Furthermore, collaboration with the Thai students permitted a deeper understanding of the local habits, as they possessed crucial scientific and cultural knowledge.

These different points of view turned out to be a group strength, since we quickly agreed on the essential points of the project, and each member enriched the action plan with their individual interests. The same harmony persisted during field work and during writing of the report.

A similar relation was found with the Thai counterparts on the field -- project outlines were similar and only minor adjustments were made for a constructive collaboration. Occasionally, some cultural differences emerged on the field -- we found that Thai counterparts were much more direct in interacting with the locals. This was part of the learning process and did not impact the group experience negatively.

Oftentimes, the group split in two or more groups to take advantage of the four Thai-speaking group members and expanding our reach to informants. These groups changed each time, and a considerable amount of time was spent debriefing each other. This organization had numerous advantages (i.e. greater number of contacts, diminished impact of having multiple people interview a single informant, etc.). On the other hand, debriefing group members carried the risks of infusing interpretations into data and information variability. All things considered, we find these strategies effective, with more advantages than drawbacks.

It is a general agreement that the greatest challenge during the course of the fieldwork was the language barrier, such that it was impossible to speak directly with the Thai informants. Much time had to be spent debriefing interpreters about the content of the interview to avoid possible misinterpretation of the questions, and to improve the quality of the interview. This proved effective, as both the Thai students were extremely successful at minimizing loss of information during the translation process. Their dedication to direct translations was essential to contextualizing parts of interviews that were still unclear during the

debriefing phase, and they willingly worked overtime to ensure that the Thai students were effectively debriefed in the evenings.

Despite all efforts made, it is likely that some details were lost, especially in conversation between the Thai students and the villagers, when little time was left for properly translating the questions. Perhaps there is no solution to this limitation, and we cannot think of a better setup to minimize the loss in translation.

6. Broader discussion and conclusion

From our results and analyses, it can be observed that the extensive restrictions faced by villagers of Ban Sub Tao have ultimately led to stagnation of their main livelihood activity: agriculture. As suggested by the neo-classical theory of property, also supported by de Soto, such restrictions are grounded in the land tenure system, locally represented by the uniformly assigned PBT5 land title received by villagers in 1981. In fact, from investigations and discussions along the report, we can conclude that PBT5 implies limited security, limited pledgeability, and no tradability of land rights. As a consequence, it generates political, financial, and economic dependencies and ultimately, engenders stagnation of the economic system.

In fact, the governmental power structure characteristically fosters dependency in the decision making process—any kind of initiative involving land use must first be approved by institutions in power.

Also, due to the nature of their land title, villagers' credit options are limited, as many institutions do not issue loans to holders of PBT5. Thus, villagers are dependent on the few organizations that issue loans to holders of their title. Further, the credit system in place promotes a constant debt cycle, so that villagers lack the opportunity to invest in long-term projects.

In addition, because the field sizes are fixed by PBT5, and these fields have limited water access and poor quality soil, villagers are virtually inflexible in their choice of cropping systems. Their practices involve primarily intensive cassava, maize, and sugarcane production. These practices are predominantly market-driven, resulting in villagers' dependence on market access and prices. Because their cash crops are produced for feed and biofuel markets, they are directly influenced by external factors such as a fluctuating global oil price. Furthermore, we can argue that the production of feed and biofuel crops hampers the food sovereignty of an agriculturalist community.

Through the PBT5 title, all villagers theoretically face the same limited security, limited pledgeability and prohibited tradability. In this sense, a horizontal hierarchy in terms of restrictions and their consequences on development opportunities characterizes the village. Nonetheless, the triangulated data revealed certain external elements impacting the three studied features of land tenure.

First, a villagers' land size influences their operate within PBT5's restrictions. In 1981, the assigned land title permanently fixed land size characteristics. Though it is unclear exactly how the land size for each villager was determined and assigned, it is speculated that it roughly paralleled the boundaries set in place by their previous title, Sor Gor Tor. Because land size directly affects agricultural production and therefore income, it logically follows that those with more land per their PBT5 land title have greater credit access with the BAAC, which issues loans of up to 60% of income. Thus, it can be suggested that the discernable wealth disparities in Ban Sub Tao are rooted in the unequal distribution of land in 1981, which causes disproportionate pledgability as a function of land size.

Second, despite prohibited tradability of land under PBT5, many villagers have mentioned illegal land trade and rentals in Ban Sub Tao. Details were difficult to gather, but it appeared that those who held social capital undertook the illicit procurement of land. Specifically, “rich men from Bangkok” and “police officers” were named as buyers of land in Ban Sub Tao. Thus, willingness to engage in illicit activity permitted flexibility within the constraints of PBT5. It was hypothesized based on these anecdotes that those who disregarded the law benefited from powerful social networks, that garnered an extent of security against the enforcement of these imposed regulations. In this way, it is conceivable that social capital in the form of power or strong social networks enabled illicit activity such as the acquisition of land, and provided some flexibility in the restraints specified by PBT5.

Though there exists some potential for villagers to accommodate the restrictions of PBT5, it can be argued that the ultimate effect of the title is stagnation generated by a high level of certainty. Through the standardization of decision processes, available credit institutions and land size, the social contracts between authorities and the villagers are fixed and generate certainty, as it is defined in the Lund framework.

Stagnation is particularly prominent in the agricultural production system; the current production system with cassava, maize, and sugarcane has been embedded in village agricultural practices for over thirty years. Over time, villagers have experienced the evolution of input use, market prices, and the practical limits of the production system. Further, they have regularly cited poor soil quality, lack of water, minimal crop diversity, and fluctuating market prices as barriers to their ideal agricultural practices. Though villagers are aware of these limits, their coping strategies are all short-term, indicating that villagers operate within the system, rather than pursuing strategies that would eradicate themselves from the system entirely.

Given the political, financial, and economic dependency of villagers on higher powers, and extensive external control over land tenure, land use, and investments, it is implied that the current system is at least partially governed by external stakeholders. Cassava and sugarcane production are central to long-term projects funded by the Thai government to sustain the bio-energy-economy. (*Bangkok Post*, 2017) Therefore, it can be argued that influential external stakeholders are incentivized to preserve stagnation, and in so doing upholding the current system.

While villagers seem to operate under the certainty that the production system will endure for future generations, there is a ubiquitous underlying desire for change. Villagers have expressed an ideal situation in which they can diversify crop production with more vegetable and eucalyptus plantations, incorporate livestock, lower input use, and adopt resource-friendly agricultural practices. According to the villagers, these idyllic plans are, however, constrained by the financial, political, and market economy dependence – implying that the aforementioned eradication from the system is considered idealistic. It is believed that any changes in this dependence are contingent on the capacity building ability of the villagers – in this context, the access to knowledge about alternative farming systems and their practical implementation.

SUGGESTIONS FOR MEDIUM/LONG TERM TRANSITION TO ALTERNATIVE FARMING SYSTEMS

Consistent with the stability seeking goals of this project, potential long term alternative livelihood strategies that can conceivably be implemented to benefit villagers of Ban Sub Tao are proposed. Blatant weaknesses are apparent in the current agricultural practices, which uniformly utilize intensive and chemical-dependent monocultures of cassava, maize, and sugarcane. This prodigious use of chemical inputs has, in turn, caused the depletion of soil resources. A transition to an alternative, diversified system with reduced chemical use would, we believe, promote stability.

The lack of water, poor soil quality, and limited credit access are perceived as a given by the villagers, to which they must adapt in their agricultural practices. In consideration of this assumption, the following practices are suggested:

1. *Efficient use of local natural resources:* Currently, leaves and straw are abandoned on the fields following harvests. These abundant residues can alternatively be used for mulching and composting to increase the soil moisture and structure and to prevent soil erosion. This initial measure would help to reduce chemical input use.
2. *Livestock use:* Though some breeding of livestock was observed, particularly for cattle and poultry, it appeared that the farmers were not strategically utilizing organic material from their livestock. Soil nutrients could be improved by collection of livestock manure and addition to fields, which could be supplemented by purchased manure if livestock production does not meet the needs of the land. Though it is much more difficult in practice to collect manure from the non-enclosed poultry, these poultry can be fed within the field so that deposition of manure occurs directly on the field. While this would result in an uneven distribution of manure that varies as a function of the livestock population, such a modification would cost nothing to implement.
3. *Improved fallow system or agroforestry with Nitrogen-fixing trees:* Nitrogen fixing trees such as *Leucaena leucocephala* (Buresh and Cooper, 1999) have the effect of improving soil quality and protecting against erosion. Though cultivation of these trees would in practice reduce the total cultivated area, the soil would benefit from the trees' release of nutrients and deposition of organic matter (i.e. dead leaves and roots). These trees would also protect crops from heavy rain damage and further retain moisture in the soil. Consequently, this would allow farmers to improve their soil fertility, production yield, and crop quality while simultaneously reducing their input use.

The first two interventions require only practical knowledge; however, the subsequent recommendation additionally requires financial support for the infrastructure and labor essential for its implementation. Given that credit access for villagers is limited and that such a transition necessitates a period of no income, we suggest a collaboration with the government – specifically, departments of the Conservation Forest and National Park. Presumably, this would be mutually beneficial, as it is within the objectives of these departments to protect and conserve the environment – thus, healthy farming systems with positive effects on the soil and surrounding areas are well aligned with government interests.

In addition to financial support, improved knowledge communication is essential to promote an efficient transition to more stable agricultural practices. It seems that opportunities are available in the region, through the success stories of non-chemical farming pioneers in surrounding villages and independent training sessions led by experts and universities. Specifically, the Park Research Center is active in distributing knowledge on agroforestry and reforestation techniques.

Finally, an effective transition requires ensured market access for new agricultural products. This should not be a barrier to transition, as farmers who currently practice non-chemical farming in Ban Suk Somboon benefit from widespread market accessibility, and sell their products to local markets and trading companies.

Box 1 - Suggestion for medium/long term transition to alternative farming system

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Annex 1 – First questionnaire (final)

The questionnaire for study

Ban Sub Tao, Udom Sub, Wang Nam Khiao, Nakornratchasima

Part 1: General Information

1. First name _____ Surname _____
2. Age _____
3. Address _____
4. Highest level of completed education: No formal school - Primary - Secondary – University
5. Resident/ Settlement
5.1 How long has the majority of people in your household lived in Ban Sub Tao?
O More than 5 years
O Less than 5 years

- 5.2 Do you live here since you were born? () Yes
() No (if no, answer the question 5.2.1 and 5.2.2

5.2.1 Where is the district that you migrate From.....Province.....

5.2.2 The reason of migration.....

5.3 At the first time you moved in, how many rai do you have..... rai

How about now?rai

6. How many people do you have in your household

6.1 Agriculture, in your land.....

6.2 Didn't work as a farmer.....

7. Are you a member of group activities in the village? () No

() Yes, please identify the group..... position.....

8. Apart from the learning center, are there any local organizations active in the village? () Yes ()

No If yes, please indicate the local organization.....

Part 2: Livelihood and Income

9. Please indicate source of household income (average)

source of household income	Income (per season/per year)	In the village/ Outside the village	Main	Secondary
1. Agriculture, in your land				
1.1 Crop..... The amount of production..... The selling price.....				
1.2 Crop..... The amount of production..... The selling price.....				
2. Agriculture , the rental land				
2.1 Crop..... The amount of production..... The selling price.....				
2.1 Crop..... The amount of production..... The selling price.....				
3. Process Agriculture products				
4. Labour in agriculture				
The agricultural income				
1. Transportation				
2. Officer				
3. Agro tourism				
4. Shop				
5. Remittances				
6. Equipment for rent				
7. Industry				
8. Handicraft				
9. Others....				
Other income(not agriculture)				
Total				

10. Does your household eat what you cultivate on your field?

- ☐ Yes, we only eat what we grow
☐ Yes, we eat some of what we grow
☐ No, we sell all of what we grow to the market

11. Do you consider your household:

- ☐ Wealthier than village average
☐ Average wealth
☐ Less wealthy than village average

12. Are there any member in your household has a health problem?

☐ Cancer ☐ Asthma ☐ Parkinson ☐ others, please indicate..... ..

13. Are there any member in your household has a health problem?

() Cancer () Asthma () Parkinson () others, please indicate.....

Part 3 the information of Land Use for agriculture

14. Please indicate the detail of your production in the recent season/year.

Location	The Total of Land (rai)	Acquisition of Land	Titles	Land Use (Please indicate)					
				Crop	Land size (rai)	Livestock	Land size (rai)	Other activities(ponds/resident /cooperative)	Land size (rai)

15. * Acquisition of Land 1. Inheritance 2. Purchased Land 3. Rented Land 4. Beginning to work on the land without the title 5. Given by the government 6. Other
16. * The type of titles 1. P.B.T 5 2. Others (please indicate) 3. Rented Land 4. Don't know about the titles
17. 14. Costs and Profits of Agricultural Product

Please indicate crops that you plant

Average costs per season estimated..... Baht per Rai as follow

	Amount of using per Rai	Costs per Unit
Seed costs		
Fertilizer costs		
1)		
2)		
Pesticide costs		

15. **Labor costs** () Hired labors () Hired some labors and did it by myself () Did it all by myself

Average costs of labors that you hired per season/ year estimated..... Baht per Rai as follow as Wages 1)Baht

Wages 2).....Baht

16. Agricultural inputs (pesticides, fertilisers, improved seeds...)

16.1 Please rank top 3 that you think they are the most important.

Top 3 Do you think you use it correctly?

- Pesticides _____ (Yes/ No)
- Fertilizers (urea) _____ (Yes/ No)
- Fertilizers (NPK) _____ (Yes/ No)
- Fertilizers (compost) _____ (Yes/ No)
- Fertilizers (manure) _____ (Yes/ No)
- Fertilizers (green manure) _____ (Yes/ No)
- Special seeds _____ (Yes/ No)

- Irrigation system _____ (Yes/ No)
- Tractor, harvester, other machines _____ (Yes/ No)
- Hired labor _____

17. Credit and credit access

17.1 Do you have a loan to finance your agricultural activity? () Yes () No () Yes, but not only for agricultural activities

Credit	An amount of a loan (Baht/ Year)	Interest rates	Purpose of having a loan	Types of collateral
BAAC				
Other commercial bank				
Srisawad				
Inputs seller				
Product buyer				

17.2 Did you experience any trouble accessing the loan?

- ☐ No, I provided the documents and they gave me the loan
- ☐ No, I didn't have all the required documents but I could complete the loan
- ☐ Yes, one or more financial institutions denied me the loan, but I got the loan from another financial institution
- ☐ Yes, one or more financial institutions denied me the loan, but I got one through an informal lender
- ☐ Yes, no formal or informal lender granted me a loan
- ☐ I don't know, I went to an informal lender and I had my loan
- ☐ No, I never asked for a loan

18. General Information about Land Tenure

Information	Yes	No	I don't know
() Por Bor Tor 5 (P.B.T.5)			
Por Bor Tor 5 is a document certifies that the occupier has a free decision on their land.			
Por Bor Tor 5 can be transferred to descendant.			
Departments controlling that area program for activities that farmers can do in their lands; for example, argiculture.			
Generally, the occupier has to pay taxes on the land unless there is a committee agreement not to pay those taxes.			

19 . Migration

19.1 During the last 30 years, has anyone from your household left Ban Sub Tao? (Y/N)

If yes, how many? _____

19.2 Are they employed in:

- ☐ Tourism sector _____ (number)
- ☐ Agriculture _____ (number)
- ☐ Manufacture _____ (number)
- ☐ Transport _____ (number)

O Other/I don't know _____ (number)

19.3 Did they move with their spouse / children?

O They had no spouse / children _____ (number)

O No, they moved because of marriage _____ (number)

O No, spouse stayed in Ban Sub Tao _____ (number)

O No, children stayed in Ban Sub Tao _____ (number)

O No, they left children and spouse in Ban Sub Tao _____ (number)

19.4 Where did they move? (P: Permanent T: Temporary DN: I Don't know)

O Bangkok _____ (number)

P/T/DN

O Phuket/other touristic area in Thailand _____ (number)

P/T/DN

O Elsewhere in Thailand _____ (number)

P/T/DN

O Other country _____ (number)

P/T/DN

O I don't know _____ (number)

P/T/DN

19.5 Do they send remittances to the household? (Y/N)

19.6 Do they return to Ban Sub Tao for a period every year? (Y)_____ (number)

19.7 Do people usually return to Ban Sub Tao after living elsewhere? (Y)_____ (number)

Annex 2 - Methods

Table 1 - Overview of applied methods

Assessment - first week	
Method	Number
Semi-structured interview with chief	1
Transect walk/Participatory observation	2
Semi-structured interviews with farmers	10
Participatory Rural Appraisal (mainly mapping, visual and non visual tools)	Circa 25 participants
Questionnaires	28
In deep study, triangulation - second week	
Semi-structured interviews with chief	2
Semi-structured interviews with key informants (bank, government, village fund and other institutions representatives)	7
Transect walk	1
Soil sampling	7
Final discussion, dissemination, confirmations	
Questionnaires	11
Community meeting	Circa 15 participants

Methods

SSI: We choose to use semi-structured interviews for the possibility to change the direction of our question and let the interviewed person the ability to develop or explain their opinion and situation. We have started the SSI by the chief of the village to have a broad vision of the context in Ban Sub Tao. We then asked the villagers, randomly selected in different areas of the village, to get deepen understanding of the first information given by the chief and also see if they all feel the same or agree with him in an implicit way. After this still in the village we interviewed the village fund as we discovered most of the villagers have a loan from it.

After this we have started to interview five key informants which are the national park representatives, the conservation area representative, the BAAC bank, the subdistrict, the village fund committee and the Research Centre. We then finish our interview by the chief to confirm our findings and go deeper in some unclear points from our side. The choice of this order was pertinent as we could get a good idea of the situation from the lowest decision maker (the villager) to the highest (politics and banks). Through this approach we were able to argue with the key informant what we saw and learn from the Ban Sub Tao inhabitant and avoid the escape from them from the real issues.

PRA - mapping and other tools (visual and non-visual):

The participatory rural appraisal was one of the most interesting moment of our field research. We spend an entire evening to prepare the different methods and support and also ask the translator teacher about some hint to have a good participation from the participant. We started the first workshop by an ice-breaking game to make people feeling more comfortable and open to speak about their information. We also proposed them some snack during the time we gather enough people for each workshop. We had a great synergy within the group with the Thai student and translator to be on the same line concerning the progress of each workshop and activity. We were so really prepared to do a really efficient PRA. However we didn't spend enough time in terms of organization and have to face some difficulties to gather villagers to each workshop. However we all did our best and end up with interesting results, as well as a good lesson concerning the importance of the organizational part when organizing such event.

Agriculture: The first workshop was dedicated to farming. We first started by a group mapping to get an overview of the production of the three main cash crops: Sugar cane, cassava and maize. We asked the farmers to explain where do they by their inputs, from which companies, which companies is buying their production and where and finally the number of hired people for each crops. In the second activity we ask them to imagine receiving 1 million baths to invest in their farming production. We ask them then on what they would like to invest in and then to vote for the most important investment they proposed in order to rank them. Through this approach we didn't imply the answer and let them the freedom to choose their answer. Thus we could assess if their proposition was in line with the ones we thought or not. We continued with a game asking them for their main factors influencing their decision making concerning their farming practices. We gave them five pieces of straw and assigned one plastic cup for each factors: bank, family, neighbours, chief, own decision, companies, other. We then asked them to distribute their straws pieces according to the importance of their main factors. To avoid them to put all pieces in the same cup we request to spread them in at least two different cups. This technique was efficient as it was possible for us then to make a percentage of the influence of each factors according to the number of straws pieces. The last activity by asking them where can they get agricultural knowledge and if they feel like it is enough or otherwise what would they like to learn. We finally end up the agricultural workshop by thank them and ask them for their details, production and surface. The agricultural workshop was quite successful, the methods used were relevant and gave us interesting information even if only 10 villagers have participate.

The second workshop was about *village life, history and infrastructures*. It was entirely based on mapping and visual tools. It was arguably the less successful of the three parts, because some of the participants were the same of the agricultural part, therefore already tired, and the group cohesion wasn't ideal. After the mapping, we turn the workshop into a focus group with a smaller number of villagers, gathering the expected information anyway.

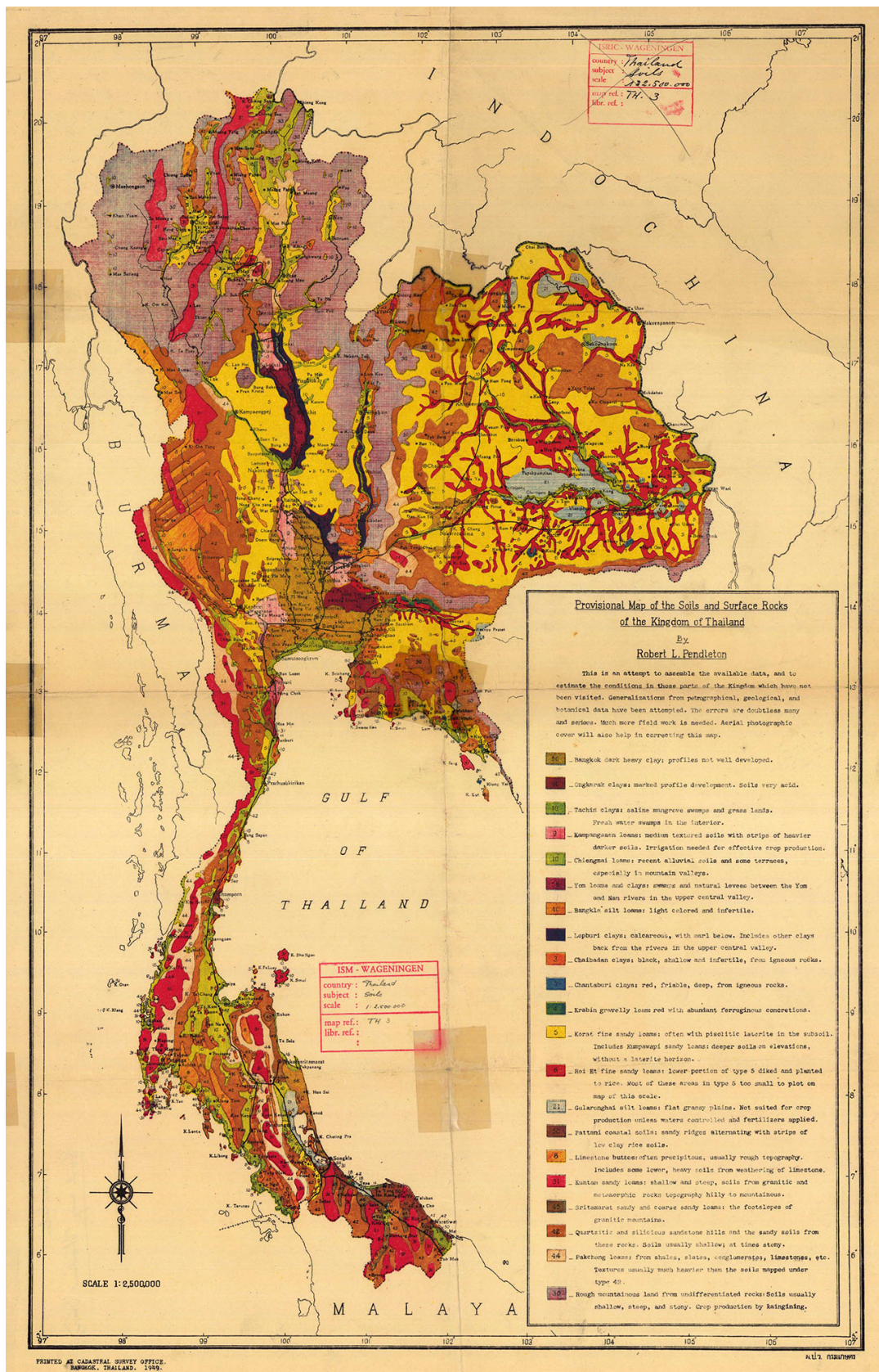
The first round **questionnaires**: The participatory rural appraisal arise lot of new information for our research but everything was quite broad to be analyze in a proper way. That's why we choose to create a questionnaire, which allowed us to get specific information. We focused on agriculture and credits as quantitative data would be relevant in our research concerning these topics. The questionnaire in the synopsis is been translated in thai, departing from the original setup toward a selection of more detailed tables, resulting a little confusing while on the field, resulting in different kind of answers that made the analysis almost impossible. Nonetheless we could get a trend of the cost and benefit and also good information concerning the credits access and farmers' household situation.

We spread into 4 different binome of Thai speaker and Danish student to handle a maximum of questionnaire in only one day. A pilot test has been made the previous day to set the duration of the questionnaire and the method to answer the questions. We had big discussion between all Moo 10 members to be in totally in line with the Thai students on what we aims to get as answer. The objective was to be able to let them handle the questionnaire by their own to be the most efficient.

Community meeting: The second to last day before the end of our research we chose to organize a community meeting to share our findings with the villagers. This method was quite relevant for our research as we could get feedback from farmers as well as give them ideas about alternative to develop their activities and start thinking about transition to more sustainable practices. Also it was important for us to propose them some alternatives according to the development strategies we identify during the ten days of fieldwork. Once again, we had some issues to gather people but finally success to gather fifteen people to this meeting including the chief of the village. We led the meeting with presentation and discussion concerning: crop production details, contextualize the agricultural activities shaped through a SWOT analysis, and assess their decision making. To finish we organize short speech from local people to bring their experience and propose some alternatives to the villagers. Our objective was to carry our input in the improvement of the situation in the village according to our research and provide source of inspiration to the villagers. For that we request the help from the forestry research centre and the owner of a organic research centre which is one of the pioneer in organic agriculture in the area.

2nd questionnaire: When we went through our questionnaire to assess the agricultural quantitative data concerning financial part we realized our data was not possible to analyze because each groups got different kind of information. We so decided to create a last questionnaire to obtain the missing informations. We handle it during the last day in the village during a religious event at the temple. It was difficult to ask people to spend time responding our question during this time so we tried to be the most accurate as possible concerning the question and didn't spend more than 10 minutes for each respondent. We so could get information about farming incomes and expenses in terms of inputs, their production and surface.

Annex 3 - Soil map of Thailand



Annex 4 - Soil analysis

The plots sampled for soil analysis were chosen to represent the different main crops in Ban Sub Tao, namely cassava, sugarcane and maize, and two common practices in the area (alternating cassava and maize, and cassava intercropped with eucalyptus). The aim of those samples is to establish how impacting the agricultural practices are on soil characteristics. A forested area in the village and an eucalyptus plantation represent the relatively unperturbed soil, with expected higher nitrogen and carbon contents.

To assess the soil features, we measured nitrogen and carbon content, as well as pH.

We selected seven samples in different plots. Three samples are been taken for every plot, representing the average soil in the area (W-shaped sampling).

Figure 8, in CAP 14, shows where the soil is been sampled, and the details of analysis are shown in Table 2

Table 2 - Analysis results for the three soil samples taken in each field

Name	N %	C %	pH
maize 1	0.11	1.12	5.22
maize 2	0.12	1.15	
maize 3	0.12	1.06	
maize cassava rotation 1	0.09	0.70	5.04
maize cassava rotation 2	0.08	0.70	
maize cassava rotation 3	0.07	0.69	
cassava 1	0.08	0.86	5.93
cassava 2	0.09	0.99	
cassava 3	0.09	0.87	
cassava+eucalyptus intercrop 1	0.11	1.06	4.97
cassava+eucalyptus intercrop 2	0.11	1.07	
cassava+eucalyptus intercrop 3	0.11	1.16	
eucalyptus 1	0.14	1.63	5.91
eucalyptus 2	0.13	1.56	
eucalyptus 3	0.14	1.57	
forest 1	0.11	1.38	5.16
forest 2	0.14	1.60	
forest 3	0.10	1.52	
sugarcane 1	0.09	0.90	5.33
sugarcane 2	0.10	0.93	
sugarcane 3	0.09	0.92	

We performed an analysis of variance (ANOVA), and the significance is been evaluated with a Tukey's test with 0.05 threshold (in Figure 12 the details for carbon content). The difference in carbon content is significant for the adjacent plots with different crops, corroborating the hypothesis of an impact on soil due to agricultural practices (rotation and intercrop).

We also found a similar carbon content in forest and eucalyptus plantation (insignificant differences), while both tree-covered plots differ from every other cultivation, endorsing our suggestion for agro-forestry practices to support the soil fertility.

Carbon
Tukey HSD

(I) Plot	(J) Plot	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
maize	rotation	.41333*	.04827	.000	.2485	.5782
	cassava	.20333*	.04827	.012	.0385	.3682
	intercrop	.01333	.04827	1.000	-.1515	.1782
	eucalyptus	-.47667*	.04827	.000	-.6415	-.3118
	forest	-.39000*	.04827	.000	-.5548	-.2252
rotation	sugarcane	.19333*	.04827	.017	.0285	.3582
	maize	-.41333*	.04827	.000	-.5782	-.2485
	cassava	-.21000*	.04827	.009	-.3748	-.0452
	intercrop	-.40000*	.04827	.000	-.5648	-.2352
	eucalyptus	-.89000*	.04827	.000	-1.0548	-.7252
cassava	forest	-.80333*	.04827	.000	-.9682	-.6385
	sugarcane	-.22000*	.04827	.006	-.3848	-.0552
	maize	-.20333*	.04827	.012	-.3682	-.0385
	rotation	.21000*	.04827	.009	.0452	.3748
	intercrop	-.19000*	.04827	.020	-.3548	-.0252
intercrop	eucalyptus	-.68000*	.04827	.000	-.8448	-.5152
	forest	-.59333*	.04827	.000	-.7582	-.4285
	sugarcane	-.01000	.04827	1.000	-.1748	.1548
	maize	-.01333	.04827	1.000	-.1782	.1515
	rotation	.40000*	.04827	.000	.2352	.5648
eucalyptus	cassava	.19000*	.04827	.020	.0252	.3548
	eucalyptus	-.49000*	.04827	.000	-.6548	-.3252
	forest	-.40333*	.04827	.000	-.5682	-.2385
	sugarcane	.18000*	.04827	.028	.0152	.3448
	maize	.47667*	.04827	.000	.3118	.6415
forest	rotation	.89000*	.04827	.000	.7252	1.0548
	cassava	.68000*	.04827	.000	.5152	.8448
	intercrop	.49000*	.04827	.000	.3252	.6548
	forest	-.08667	.04827	.571	-.0782	.2515
	sugarcane	.67000*	.04827	.000	.5052	.8348
sugarcane	maize	.39000*	.04827	.000	.2252	.5548
	rotation	.80333*	.04827	.000	.6385	.9682
	cassava	.59333*	.04827	.000	.4285	.7582
	intercrop	.40333*	.04827	.000	.2385	.5682
	eucalyptus	-.08667	.04827	.571	-.2515	.0782
	sugarcane	.58333*	.04827	.000	.4185	.7482
	maize	-.19000*	.04827	.017	-.3582	-.0285
	rotation	.22000*	.04827	.006	.0552	.3848
	cassava	.01000	.04827	1.000	-.1548	.1748
	intercrop	-.18000*	.04827	.028	-.3448	-.0152
	eucalyptus	-.67000*	.04827	.000	-.8348	-.5052
	forest	-.58333*	.04827	.000	-.7482	-.4185

*. The mean difference is significant at the 0.05 level.

Figure 12 - Detailed statistical analysis for carbon content in sampled soil. The results mentioned in the text are highlighted.

Land Security and Livelihood Strategies: a case study in Ban Sub Tao, Thailand

Final Synopsis

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1. Introduction

1.1 General context

Ban Sub Tao, located in the Udom Sap sub-district in the Wang Nam Khiao district lies in the heart of a country-wide conflict, in which there exists overlapping land claims by different stakeholders with different objectives. The government-led expansion of the Khao Yai and the Thap Lan National Parks for conservation purpose put pressure on the agricultural activity of the village, which in turn affected land and resource management. Previously, villagers of Ban Sub Tao had been asked by the government to relocate, but refused to do so.

Protected areas date back to 1964, when a government development plan aiming to reform the agricultural sector and land management created these areas. The plan promoted agricultural intensification, regardless of its effects on soil fertility (*Chamruspanth, 1993*). The creation of several semi or total protected areas counterbalanced this intensification. However, protected areas have often suffered political instability in Thailand and neighboring countries; enforcement of strict protection regulations has not always been effective, and National Parks have seen illegal logging, encroachment, and land clearance for agriculture (*Cohen, 2014*).

As Thailand modernized, education levels, life expectancy, and similar indexes have improved significantly, and urbanization has increased. Like in many other developing countries, internal migration to the cities has left only the elder in the rural areas, dramatically increasing the average age there (*CIA's World Factbook, 2017*). Specifically, the Ban Sub Tao village in the Udom Sap sub-district has seen the migration of their youth into cities, leaving older populations in Ban Sub Tao to maintain their farmland (*SLUSE Basic Information, 2017*).

1.2. Land Tenure and Land Rights

In 1986, the Thai government launched a vast reform program in collaboration with the World Bank, which aimed to give titles to all land owners. The plan created four types of titles according to land use. While the titling system does not allow changes in land use, in practice people do so regardless of their titles.

Another important aspect of this titling allowed external actors to buy land; however, this reduced the economic security of poor farmers since their existing titling was not enough to provide land security. This titling system further lacks support policies and zoning policies that would prevent conversion of land use to non-agricultural purposes and fragmentation of land. Furthermore, landowners often were in possession of existing land titles (which had been changed three times since 1954, sometimes introducing the concept of “partial ownership”), which were in many instances not updated to the newer versions. Thus, the latest reform resulted in conflicting understandings of land boundaries and ownership (*Rattanabirabongse et al., 1998; Chankrajang, 2015*).

Within this framework, there are three levels of land tenure security: the highest security offered by the N.S.3 K (*Nor Sor 3 Kor*), which grants the tenant full rights of transfer (sale, rent or inherit the land). More temporary land rights are granted by the S.T.K.1 title (*Sor Tor Kor 1*) issued by the Royal Forest Department to former illegal squatters, and the S.P.K.4-01 (*Sor Por Kor 4-01*), or partial land rights which cannot be transferred. Other titles issued by the Cooperative Promotion Department offer similar rights, providing only usufruct rights and partial tenure security. K.S.N.3

and K.S.N.5 titles (*Kor Sor Nor* 3 and 5) fall into this classification. The lowest tenure security is granted by the mere possession of tax payments receipts (*Wannasai and Shrestha, 2008*).

2. Neo-classical theory of property

According to Herman de Soto, property rights give the power to prosper (de Soto, 2000). In the context of conflicting land use between the government and the local farmers (with hypothetical consequences on land and resource management) and ambiguous land rights, we base our research on the neo-classical property theory's assumptions of rational and efficiency seeking economic actors. In line with this theory, Ghebru and Holden (2015) highlight three avenues through which land titling could be important to agricultural development:

1. Tenure security (*ceteris paribus*) encourages long term investment and the adoption of new technologies to enhance agricultural productivity;
2. Tenure security encourages efficient use of resources;
3. Tenure security enables farmers to pledge the land as collateral for credit access for investment purposes. (*Ghebru and Holden, 2015*)

This theory relates problems of land tenure to credit access, agricultural practices, land and resource management, and socio-economic issues.

3. Problem statements

3.1. Land security implications in agriculture

According to the chief executive of Ban Sub Tao, the main activity of the village is agriculture. Maize, cassava and sugarcane are presumably grown for self-consumption and commercial use. Chemical inputs such as pesticides and fertilizers are commonly used in large quantities on the fields. In addition to the health issues induced by pesticides, the excessive chemical use is indicative of soil degradation (*SLUSE Basic Information, 2017*). Both the intensification of agriculture and expansion of the National Park can be observed from Google Earth (Figure 1).

– Problem statement:

According to the neoclassical theory of property, livelihood strategies are presumably adapted to optimize land use in the short term, considering ambiguous land rights and features such as plot size and labor availability. With productivity being at the corner stone of the decision making process, farmers in Ban Sub Tao potentially opted to grow valuable annual cash crops and utilize inputs characterized by a quick response on the field despite potential soil degradation. Furthermore, tenure insecurity is generally associated with deforestation and forest encroachment (*Wannasai et al., 2008*) which in the studied area counters the conservation goals of the National Park.



Study area in 1984



Study area in 2017

Figure 1 - Source: Google Earth

3.2. Land security implications in credit and investments

When self-financing options are limited, credit access is required to purchase inputs and investments in the field. There exist different rural credit markets in Thailand. Informal and formal lenders offer different credit services, each with their own collateral requirements and interest rates. The various lending options coexist due to limited ability of banks to enforce contracts, which eventually constrains the households. Moreover, lower accessing costs and increased information availability has resulted in the extended use of informal lenders. Thus, policies that subsidize credit, expand banks at the village-level, and create land titles have been implemented. Reforms in the enforcement of private contracts and property registration have been most effective in improving access to formal credit (*Giné, 2011*).

– Problem statement:

Land titles and land rights are presumably limited and ambiguous in Ban Sub Tao because, in order to control the area surrounding National Parks, the government is incentivized to issue restricted land rights. These restricted land titles are not accepted as collateral by banks, which effectively constrains credit access.

Investments in land improvements to retain soil fertility, increase productivity, and accrue capital is dependent on, among other factors, land security, because borrowers who can pledge land collateral receive “significantly higher” credit (*Feder and Onchan, 1987*). The investment includes three types of assets: capital, land improvements and structures and non-agricultural activities and assets. While capital investment is not completely lost in the case of eviction, land improvements and structure investments are (*Feder and Onchan, 1987*). Based on the neoclassical theory of prop-

erty, and in consideration of tenure insecurity in Ban Sub Tao, farmers will presumably invest more in capital and non-agricultural activities to limit the risk of a low return on investment.

3.3. Land security implication on socio-economic issues

Ban Sub Tao's demographic is strongly influenced by migration flows, by which young people move to cities and leave older people to farm. It is believed that this migration flow is driven by education institutions and job opportunities in the cities. Furthermore, villages in close proximity to Ban Sub Tao are transitioning to alternative livelihood strategies as a result of relocation and economic opportunities. Specifically, development of the tourist industry and local organic markets have pushed this transition, while Ban Sub Tao's main activity continues to be conventional agriculture.

– *Problem statement:*

The neoclassical theory of property assumes that tenure security results in efficient use of resources (land and labor in the case of Ban Sub Tao). In the framework of this theory, since land rights are ambiguous in the village, the land market is not efficient, which results in non-optimal land use. Thus, land security should theoretically shift livelihood toward more productive activities (which could be tourism and organic farming). Furthermore, consistent with the stated theory, the opportunity cost of staying in the village drives the labor force to migrate to the cities. In fact, labor productivity is hypothetically, and theoretically, higher in the city due to non-optimal use of land in Ban Sub Tao.

4. Objectives and Research Questions

In line with the context described and the problem statements grounded in different theories, the objective of our research is to assess the efficiency of agricultural activity and the village's socio-economic patterns in relation to the perception of land security by farmers. As a first step, the study aims to highlight potential relations or differences between legally issued land titles (and the recognition of these titles) and the perception of land security by the villagers. Next, our aim is to assess the several hypotheses that have been raised regarding the level of land security and the decision making process of farmers in terms of investments, agricultural management practices, and (more broadly) livelihood strategies. Furthermore, as the boundaries between fields and National Parks are unclear, the final aim of our project is to raise a discussion about the possibility of compromising the different land use objectives of stakeholders (i.e. the government and national park and the local villagers) by promoting sustainable and conservation-friendly agricultural practices.

From these objectives, the following research question and sub-questions were raised:

HOW DOES LAND SECURITY AFFECT THE LIVELIHOOD STRATEGIES OF THE INHABITANTS OF BAN SUB TAO?

- To what extent are legally issued land titles consistent with the perceptions of land security by villagers of Ban Sub Tao?
- How does land security affect the agricultural activity (farming practices, land management, land investment and market access) in Ban Sub Tao?
- How does land security influence credit access for villagers in Ban Sub Tao?
- To what extent does land security influence youth migration flows? Could these migration patterns be impacted through the implementation of alternative or enhanced livelihood strategies?

5. Methodology and methods

In order to answer these research questions, we will start by comparing the legal security given by land titles and perceived security. This will help us to develop an idea of the relevance and efficiency of the land titling system, as well as the meaning of land security for the villagers of Ban Sub Tao. Their perception of security will be assessed through in different contexts. Afterwards, agricultural and socio-economic consequences of the level of perceived security will be assessed.

The project will be conducted in line with the Sustainable Livelihood Framework elaborated by Ellis in 2000. The data we collect will integrate contextual frameworks (i.e. population, migration), and contexts including social relations, local institutions, and organizations to assess livelihood outcomes and the strategies used to optimize these outcomes. An assessment of the vulnerability context (i.e. land security, soil quality, migration, climate change) will be conducted in line with the livelihood assets and organizational structures to analyze the livelihood strategies of villagers in Ban Sub Tao. In the context of overlapping claims and conflicting goals for land use by the local population and the National Park, Ellis's livelihood framework highlights the modified access to livelihood resources.

A variety of social and natural science methods were chosen in order to triangulate the results and verify data. A total of ten steps were selected for the methodology, implemented in a specific order to efficiently gather contextual data and to acquaint ourselves with the village inhabitants. Specifically, a door-to-door method accompanied by questionnaires will be applied to get an overview of the village's households and activities. During the first days, the village will also be mapped through observation to create an overview of the resource display, facilities, markets, and infrastructures in the village. A transect walk and GPS tracking will be used to plot perceptions of both land and natural park boundaries and assess potential disparities in these boundaries among different parties. These preliminary results will clarify points of our research to focus on and allow us to identify populations for further interviews. Once the main focuses of the village are identified, the use of Participatory Rural Appraisal tools will be applied. The PRA will allow us to obtain information about land title issues, understand perceptions of assets, and visions of migration flows. Then, a group activity will be done to get opinions of all the participants in a proactive way. Finally, the youth, elders, and farmers will be separated to ask specific questions.

To overcome the language barrier, each member of the group will spend time working with a specific person; we also hope to create a rapport with locals by demonstrating interest in and assisting with their day to day activities. At the same time, this would cultivate trust among inhabit-

ants of the village and allow us to best observe the way locals practice activities and utilize their resources, which may open up a new channel for research.

After gathering contextual and observational data, semi-structured interviews will be conducted to investigate perceptions of land rights and tenure, factors related to land security, past, present, and future goals of livelihood strategies, agricultural practices, health, NGOs and their potential use to the villagers, youth migration patterns, and visions of their ideal environment. These interviews will be conducted first with approximately 10-12 villagers selected at random to get an overview.

We will then conduct semi-structured interviews with a local authority member, a bank representative and a National Park officer, to gain other perspectives and triangulate these opinions and perceptions. This will allow us to approach the interviews with a deeper understanding of different perspectives, and to be more proactive during the interview. Once we are done with the interviews, we will organize a focus group with the villagers to address our findings in a constructive discussion.

In addition, soil sampling and quality assessment will be executed in three types of farms characterized by different land titles and perceived security levels. The purpose of this method is to identify a potential relation between land security, land improvement, and investments and the quality of the soil.

Finally, we will be conducting a group discussion with five people, in which we will discuss and validate our findings, and potentially gain new insights or contexts for these results.

The eclectic backgrounds and interests of the different members of our group enable the possibility to investigate the project study under different approaches, from social science to natural science. The cross-disciplinarity triangulation will ideally lead to original research and an overall outlook of the studied questions. Furthermore, the collaboration with the Thai students will allow a deeper understanding of the local habits as they have crucial scientific, cultural and language knowledge. Methods will be discussed together and altered if needed.

Timetable

Week 1	Mon 27/02	Tue 28/02	Wed 01/03	Thu 02/03	Fri 03/03	Sat 04/03	Sun 05/03
Morning			Travel day	Door-to-door, Questionnaire	Transect walk (half group) / Working day (half group)	PRA organisation-contact for semi-structure interview	Presentation
Afternoon			Travel day	Door-to-door, Questionnaire (half group) / SSI chief (half group)	Transect walk (half group) / Working day (half group)	PRA	Door-to-door, Questionnaire / Observation
Evening			Presentation and feedback	Group discussion about first feelings and first assessment of research approach	Finish mapping		Share of our findings / Adjustment of SSI questions

Week 2	Mon 06/03	Tue 07/02	Wed 08/03	Thu 09/03	Fri 10/03	Sat 11/03	Sun 12/03
Morning	SSI villagers	SSI authority (half group) / soil sampling (half group)	SSI bank representative	Focus group organisation	Buffer day to organise a new data collection in case we need it	Organisation group discussion	Community meeting
Afternoon	SSI villagers	SSI authority	SSI park representative	Focus group		Group discussion	Closing ceremony
Evening	Transcript data in a nice way	Transcript data in a nice way	Transcript data in a nice way	Discussion of findings so far and if we miss some information			

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Annexe 1 - Data Matrix

Research Question	Sub Questions	Lens of security perception	Data required	Methods	Limitations	Plan B	Additional comments and questions	Follow Up / Analysis
How does land security affect the livelihood strategies of the inhabitants of Ban Sub Tao?			Issued titles in the village	SSI with chief (existence of list?) and Questionnaire	chief reluctant to answer questions	triangulate with other perspectives	For the security assessment, look also for information about what people DO to increase their security feeling	After initial data is collected, Categorize according to wealth groups, land titles, property regime in any other categories we see fit. Decide if soil sampling is useful. Follow up on any interesting correlations / info
		Political		PRA - social mapping of titles & boundaries Institutional rights: ask key informants in SSI Perceived rights: ask villagers in SSI	People don't show, only some show, not representative of population	Focus group with ones who show	How is it regulated? (the land use mentioned in the title) Risk of expropriation? do others have access? who has rights to what in this land? How is the decision making process established regarding the expansion of the National Parks?	Which institutions (forestry, land ministry) exercise power?
		The rights granted by the titles		3 transect walks with villagers AND chief AND part official & compare boundaries	Time consuming, people don't want to outline it	Give map and have them outline it		
		Cultural (religion, ethnicity)	Existence of minorities with limited rights	Ask translators/Thai students	If it's a relevant issue, we must go in deep	PRA/SSI		
		Social	Relations with neighbours	SSI			Ownership security when other people RECOGNIZE it (social relation) Strong power networks and social relations	
		Institutional	Relations with local authorities Member of local organization / what organization ? Presence of fences	Questionnaire Observation	Possible sensitive topic			
	How are land titles and perceptions of land security related?	Biophysical	Location of field (closer to forest, etc.)	Observation Transect walk				
		Field activity	Agricultural practices	SSI		Observation	Plant perennial, cash crop, building house, built terraces... To more you invest, the more secure	Higher compensation when someone else wants land
			Freedom of decision	SSI	Don't understand question, lost in translation Informant doesn't answer some questions, or the answer is biased	Rephrase in a simpler way, offer examples / options for them to pick from		Creation of security
			Access to credit	SSI with banks		SSI in another bank		
		Financial		SSI with villagers				
			Financial plans (future investments)	SSI	Don't understand question, lost in translation	Rephrase in a simpler way, offer examples / options for them to pick from		
			Relative wealth	PRA				
			Existence of savings	SSI				
			How long they have been there	Questionnaire	Imprecise answers	SSI with village chief		
		Historical	Expectations for future of their land (will they still have it)	SSI	Possibly a sensitive question		How do the villagers perceive the expansion of the National Parks?	PRA
			How land was acquired	Questionnaire	Imprecise answers	SSI with village chief		
How does land security affect the livelihood strategies of the inhabitants of Ban Sub Tao?			Cropping system	Observation during transect walk				
			Agricultural inputs (pesticides, fertilizers, improved seeds)	SSI if more info is needed SSI				
		Agricultural practices	Labour supply Land access (water sources, distribution of transport, storage, transformation) - set on field what is relevant	Questionnaire (for quantities) SSI Observation during transect walk				
			Land investments (land improvements)	SSI	Don't understand question, lost in translation	Rephrase in a simpler way, offer examples / options for them to pick from	What are the problems encountered in agriculture? Is there forest encroachment applied?	
	How does land security affect agricultural activities in Ban Sub Tao?	Land management/ use	Reason for crop selection	SSI	Don't understand question, lost in translation	Rephrase in a simpler way, offer examples / options for them to pick from		
			Soil quality	soil sampling	Time consuming	Reduce samples/focus on less plots		

Research Question	Sub Questions	Lens of security perception	Data required	Methods	Limitations	Plan B	Additional comments and questions	Follow Up / Analysis
		Market access	Subsistence / commercial & scale of market (local, regional, international)	SSI / participatory observation				
		PRA - Historical timeline of land use, major events - ask key informant about major events so they can be used as reference						
			Source of income	questionnaire				
			Expectations for the future	SSI				
				Focus group				
				Observation				
		Alternative livelihoods	Impact of tourism in the region (how park impacts flow of tourists, tourist industry)	Focus group	Can't keep up with translations, members go off on tangent	Have focus group recorded, have translator translate after (if this happens but ideally order is kept), redo if needed with smaller group		
			How many have left	Questionnaire				
			How many plan to leave and why	PRA	Possible sensitive question	ask 1-on-1		
		Migration	Where they are going/ what are the plans If they send money home/ plan to send money home	Questionnaire & PRA (follow up questions to first) Questionnaire & PRA (follow up questions to first)				Potentially a follow up focus group depending on results of PRA
			If there is a need for collateral	SSI with bank				
				SSI with villagers	Don't understand question, lost in translation	Rephrase in a simpler way, offer examples / options for them to pick from		
		Credit access	Major services offered by bank	SSI with bank	Doesn't want to answer specific questions / skips over questions	ask for clarification, triangulate with others, find other representatives who may be willing to answer		
			What is being invested in (capital, land improvements, non-agricultural)	SSI	Don't understand question, lost in translation	Rephrase in a simpler way, offer examples / options for them to pick from		
			How are investments financed	SSI	Don't understand question, lost in translation	Rephrase in a simpler way, offer examples / options for them to pick from		

Annexe 2 - Participatory Rural Appraisal (PRA) framework

Objective: Gather data to get an overview of possible research findings in order to improve the semi-structured interviews. According to the results of our first questionnaire, we would like to gather at least 30 people representative of the different backgrounds.

Our approach: Because we want as many participants as possible, we chose not to do a group discussion, which would be hard to control. A group discussion also risks non-participation of some people, as well as monopolization of the conversation by other people. Thus, we will use a participatory rural appraisal approach to create a game in which everyone participates. This will ensure active participation and help us to immediately create a rapport with villagers that will facilitate our research for the remainder of the field period.

The location: For this method a special location is not needed. The PRA will be performed in a room with an informal environment so participants can feel as comfortable as possible in the setting.

Duration: The PRA will last for 2 hours maximum. We assume that people have more important things to do than attend to this meeting so we want to do it as fast as possible. We will first focus on the questions for the youth, as we believe it will start off the session with energy, but we also assume their interest would be shorter than that of older people.

Implementation: (*Draft*)

Icebreaking introduction game: The first game aim to create a good atmosphere for the PRA. For that we will ask people to stand up one by one and saying their name and their favorite part of the village. One translator or Thai student should help us to write down the answer. Furthermore to facilitate the communication it will also help us to see if our research topic is relevant or if we should adapt it to people's concerns and in which way. We will start with a presentation of each of us in Thai to say our names and backgrounds.

Following the introduction, we will split the groups into younger (25 y/o and younger) and older groups and ask them questions separately. We are operating under the assumption that asking sensitive questions about migration, land security, etc. across age groups may make participants less willing to truthfully answer.

Stones in hats game: We want to ask specific questions with potential answers for each of our questions. The questions aim to provide us a broad overview for each of our topics: land tenure, livelihood strategy, access to credits and society structure/migration.

Hands up survey: To get rapid answer to some questions we will then proceed to a hands up survey. These should be yes/no questions. It would be easy for us to gather quantitative data through this method as we just have to count how many people raise their hands to get quantitative data. The questions will be:

- Who has a legal title of land ownership?
- Who has heard about land eviction?
- Who feels concern about land eviction?
- Who would like to move out of the village?
- Who would like to stay in the village?

After this, we split the group in 2 (not according to age but according to interest) and proceed to the creation of a time line and a social map of the village.

Village and agriculture timeline: Major events in the village, expansion, new infrastructure.

Land use timeline: With emphasis on evolution before/after major events, such as government policies, the National Park Act, the threat of relocation,...

Social mapping: To see how boundaries are perceived by the villagers. Add resources fluxes, infrastructure, wealth ranking households, households with different land titles

To end the PRA session, everybody together, summing up what has been discussed during the different activities:

Brainstorming: about land tenure security/ insecurity feelings, the perception of the National Park, problems related to agriculture,... and to finish, the expectation for the future of the village

Group organisation:

Alice+1 translator+1 Thai student: ask the questions and lead the games. Alice as an experience as scout chief so she is the most appropriate to fill this role. Also she's a woman so it should be easier for her to make people feel comfortable.

Kelly+Andrea+1 translator+1 Thai student: take notes and help Alice if needed.

Vincent: Observe peoples' reaction according to the different topics and see on which people feel comfortable and note the sensitive ones.

Annexe 3 - Questionnaire framework (Draft)

Date: _____
GPS Waypoint: _____
Questionnaire n.: _____

Introduction

Hello, we are a group of students from Copenhagen University in Denmark and Kasetsart University in Bangkok..... Your answers will be completely anonymous.

....

Thanks for your time!

Respondent's profile

Mr. Mrs. Miss.

First name: _____ Surname: _____

Age: _____

Highest level of completed education: No formal school - Primary - Secondary - University

Birth place: Ban Sub Tao - Other village in district - Other district - Outside of Thailand

Main occupation: _____

Secondary occupation (if any): _____

Tertiary occupation (if any): _____

General about Household

Name	Age	Sex	Main Activity	Secondary Activity

- Source of household income (please cross main and secondary)

	Main	Secondary
Agriculture, in your land	_____	_____
Agriculture, not your land	_____	_____
Transportation	_____	_____
Tourism, park related	_____	_____
Shop/commerce	_____	_____
Remittances	_____	_____
Manufacturing	_____	_____
Other	_____	_____

- Does your household eat what you cultivate on your field?

- ☐ Yes, we only eat what we grow
- ☐ Yes, we eat some of what we grow
- ☐ No, we sell all of what we grow to the market

- Do you consider your household:

- ☐ Wealthier than village average
- ☐ Average wealth
- ☐ Less wealthy than village average

- Your household is generally:

- ☐ Less healthy than average
- ☐ Average health
- ☐ Healthier than average

How long have you lived in Ban Sub Tao?

- How long has the majority of people in your household lived in Ban Sub Tao?

- ☐ I can't remember / forever
- ☐ More than 5 years
- ☐ Less than 5 years

Titles

- What size is your land? _____ rai

- Do you have a legal document (title) for your land? (Y/N)

- If yes, what is the name of this document?

Nr.	Title	Portion	Title duration	Main Crop
	N.S.3 K			
	S.T.K.1			
	S.P.K.4-01			
	K.S.N.3/5			
	Other			

Acquisition of Land

- How did you acquire your land?
- ☐ It's been inherited from my/my wife's family
 - ☐ I purchased my land
 - ☐ I rented/borrowed my land
 - ☐ I began to work on my land without title
 - ☐ It was given by the government
 - ☐ Other: _____

Credit and credit access

- Do you have a loan to finance your agricultural activity?
 - ☐ Yes
 - ☐ No
 - ☐ Yes, but not only for agricultural activities
- Who gave you credit (for the main loan)?
 - ☐ Bank (Which bank? _____)
 - ☐ Other financial institution (Specify: _____)
 - ☐ Informal loan
- Did you experience any trouble accessing the loan?
 - ☐ No, I provided the documents and they gave me the loan
 - ☐ No, I didn't have all the required documents but I could complete the loan
 - ☐ Yes, one or more financial institutions denied me the loan, but I got the loan from another financial institution
 - ☐ Yes, one or more financial institutions denied me the loan, but I got one through an informal lender
 - ☐ Yes, no formal or informal lender granted me a loan
 - ☐ I don't know, I went to an informal lender and I had my loan
 - ☐ No, I never asked for a loan

Local Organizations

- Are there any local organizations in Ban Sub Tao that can assist you in land management?
(Y/N)
- Please indicate the number of these local organizations:
 - ___ Political
 - ___ Social (education)
 - ___ Social (assistance/health)
 - ___ Working aids (for farmers/mutual help)
 - ___ Working aids (for other workers)
 - ___ Union (for farmers)
 - ___ Union (for other workers)
 - ___ Cooperative between farmers
 - ___ Cooperative between other workers
 - ___ Cooperative (farmers and other workers)
 - ___ NGO
 - ___ Other: _____

Agricultural inputs (pesticides, fertilisers, improved seeds...)

- How important do you think those inputs are (5 = most important)?
 - Pesticides (1 - 5) ___
 - Fertilizers (urea) (1 - 5) ___
 - Fertilizers (NPK) (1 - 5) ___
 - Fertilizers (compost) (1 - 5) ___
 - Fertilizers (manure) (1 - 5) ___
 - Fertilizers (green manure) (1 - 5) ___
 - Special seeds (1 - 5) ___
 - Irrigation system (1 - 5) ___
 - Tractor, harvester, other machines (1 - 5) ___
 - Hired labour (1 - 5) ___
- Do you use the inputs below? Do you think you're using that correctly?

- Pesticides	(Y/N)	(Y/N)
- Fertilizers (urea)	(Y/N)	(Y/N)
- Fertilizers (NPK)	(Y/N)	(Y/N)
- Fertilizers (compost)	(Y/N)	(Y/N)
- Fertilizers (manure)	(Y/N)	(Y/N)
- Fertilizers (green manure)	(Y/N)	(Y/N)
- Special seeds	(Y/N)	(Y/N)
- Irrigation system	(Y/N)	(Y/N)
- Tractor, harvester, other machines	(Y/N)	(Y/N)
- Hired labour	(Y/N)	

Migration, how many have left, where and to do what

- During the last 30 years, has anyone from your household left Ban Sub Tao? (Y/N)
- If yes, how many? ____
- Are they employed in:
 - Tourism sector ____ (number)
 - Agriculture ____ (number)
 - Manufacture ____ (number)
 - Transport ____ (number)
 - Other/I don't know ____ (number)
- Did they move with their spouse / children?
 - They had no spouse / children ____ (number)
 - No, they moved because of marriage ____ (number)
 - No, spouse stayed in Ban Sub Tao ____ (number)
 - No, children stayed in Ban Sub Tao ____ (number)
 - No, they left children and spouse in Ban Sub Tao ____ (number)
- Where did they move? (P: Permanent T: Temporary DN: I Don't know)
 - Bangkok ____ (number) P/T/DN
 - Phuket/other touristic area in Thailand ____ (number) P/T/DN
 - Elsewhere in Thailand ____ (number) P/T/DN
 - Other country ____ (number) P/T/DN
 - I don't know ____ (number) P/T/DN
- Do they send remittances to the household? (Y/N)
- Do they return to Ban Sub Tao for a period every year? (Y)____ (number)
- Do people usually return to Ban Sub Tao after living elsewhere? (Y)____ (number)

THANK YOU!

Annexe 4 - SSI with villagers, questions guideline

Theme: Land title and land security

1. What kind of land title do you hold for this land?
2. What rights does this title officially grant you?
 - 2.1. Can you sell or rent out the land?
 - 2.2. Can other people use this land?
 - 2.2.1. How so?
 - 2.3. Are there any limits on the activities you can do on this land?
1. Do you feel that other villages respect your ownership of this land?
 - 1.1. Do other people enter your land when they are not supposed to?

- 1.2. Do other people utilize your land when they are not supposed to?
- 1.3. Do you know these people?
 - 1.3.1. Who are they?
- 1.4. Has anyone ever claimed land that you own?
 - 1.4.1. Who?
 - 1.4.2. Local authorities?
2. Do you have relatives in government positions?
 - 2.1. What positions?
 - 2.2. How are you related to them?
3. Do you find it beneficial to know people in government positions?
 - 3.1. How so?

Theme: Agricultural practices and livelihood

1. Can you tell me about your farming system?
 - 1.1. On how many plots are you cultivating? (size?)
 - 1.1.1. What crops are you growing on these plots?
 - 1.1.2. Is there a reason you chose to grow these crops?
 - 1.2. To whom do you sell your crops (local-national-international?)
 - 1.3. Do you keep some for you own family consumption?
 - 1.4. What are the major problems you face in the farming system?
 - 1.5. Do you use agro-chemicals? Fertilizers? Pesticides? Improved seeds?
 - 1.5.1. In which quantities?
 - 1.6. What are the available land infrastructure (e.g. water, distribution, transport, storage, transformation)?
 - 1.6.1. Have you been part of the decision making process for this infrastructure?
 - 1.6.2. Have you financially supported this project?
 - 1.7. What agricultural investments have you made in the past for your land?
 - 1.7.1. Why?
 - 1.7.2. Do you plan on making any investments on your land in the future?
 - 1.7.2.1. How will these investments be financed? (loans / savings?)
 - 1.7.2.2. Would you be able to use savings for these investments?
 - 1.8. Do you have any concerns about soil degradation?
 - 1.8.1. How do you deal with it?
 - 1.9. Do you ever wish to change to a non-agricultural occupation?
 - 1.10. Do you expect to still own this land in the same way 10-20 years from now? (Do you expect your children will own the land?))

Theme: credit access

1. Do you have a loan?
 - 1.1. Was it easy to take out your loan? If not, why?
 - 1.1.1. Can you describe the process of taking out a loan?
 - 1.1.1.1. Did you need collateral?
 - 1.1.1.2. What was the collateral? / What can be used as collateral?
 - 1.2. Into what are you investing this loan?

Annexe 5 - SSI with Government representatives, questions guideline

1. Cadastral map of the area
2. Titles historical (Do you keep trace of the land titles in the village?)
3. Which titles are common in the area? Are they updated?
4. Map of park boundaries, historical evolution of park
5. Does the park have buffer areas (semi-protected)? What rules are applied there?
6. Does anybody have legal right to live within the park boundaries?
7. Does anybody have the legal right to use the forest's resources (logging, grazing/transhumance rights, harvest fruits/berries/flowers/mushrooms...)
8. History of evictions and relocations

Annexe 6 - SSI with Bank representatives, questions guideline

1. What services are offered by the bank for villagers to have access to credit?
2. Is there a need for collateral?
 - 2.1. If so, what is used as collateral?
 - 2.2. Does the bank provide advice for people who are not able to provide this collateral?
3. If not, what do people normally do if they cannot provide this collateral?

Annexe 7 - SSI with Ban Sub Tao Chief, questions guideline

1. How the chief is chosen/elected?
2. How was the last election? (NOTE: Avoid the question is the mood is not relaxed)
 - 2.1. Other candidates?
 - 2.2. Was the election tense?
3. Do you feel your authority is respected?
4. Do you keep trace of the land titles of the villagers? (If the translator says they have those prerogatives)
5. Which title is the more common in the village?
6. Talk about ownership issues in the village
7. Are there non-villagers who own part of the land around the village?
 - 7.1. How are the relations with them?
8. Describe what you feel is the perceived security in the village
 - 8.1. If it's been an issue, did you intervene?
9. Talk about migration, and the reasons for people leaving the village
10. Do you think health is an issue in the village? Why?

During transect walks:

Try to ask the chef and villagers separately about the tenure insecurity and issues, if possible.

Annexe 8 - SSI with Park Representative, questions guideline

1. Map of boundaries, historical evolution of park
2. Does the park have buffer areas (semi-protected)? What rules are applied there?
3. Does anybody have legal right to live within the park boundaries?
4. Does anybody have the legal right to use the forest's resources (logging, grazing/transhumance rights, harvest fruits/berries/flowers/mushrooms...)
5. History of evictions and relocations
6. What kind of ownership does the land titles of people near the national park grant them? [maybe name the land titles after interviewing people?]

Annexe 9 - Observations framework

Wealth distribution:

- Cars
- Motorcycles
- Trucks
- Tractors
- Other means of transportation
- Other Agricultural mechanization
- House dimensions
- Lagers (private)
- Lagers (public)
- Satellite/telephone
- Running water, fountains
- Wells

Village spatial distribution

- Shops
- Markets
- Temples
- Tourist infrastructure
- Public services (post office, telephone...)
 - Public fountains
- Other services

Visible signs of insecurity

- Fences around houses (only the bigger/wealthier?)
- Fences around shops
- Controlled access to some areas
- Vigilantes
- People carry weapons

Fields/Agriculture

- Visible differences in management (same crop but visibly poorly managed in some fields)
- Difference of size (check satellite first)
- Fences
- Rural road maintenance
- Fixed irrigation systems

Annexe 10 – Soil sampling

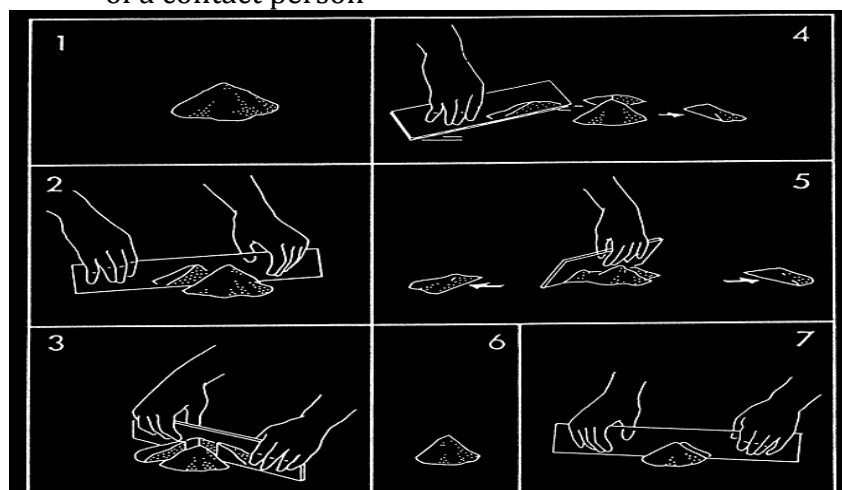
Total C and N, sampling and drying the soil while in Thailand and performing the analysis when back in Denmark, using the IR-MS spectrometer in Department of Pland and Environmental Science at UCPH.

Sampling procedure:

1. Remove surface plant litter material from a minimum of 5 randomly selected auger sites
2. At each site auger to a known depth (e.g. 30 cm) and put the auger contents in a clean plastic bucket so that all 5 augerings can be thoroughly mixed prior to subsampling. Take a sub-sample of about 200 g (one cupful). Discard the remaining soil.

Soil preparation for C and N analysis

1. Air-dry the soil by spreading it out in a shallow tray or on a piece of paper in a well ventilated place protected from rain and contamination. Alternatively soils can be dried in a forced air oven at a maximum temperature of 60°C. Break up any clay clods. When the soil is dusty it is dry enough.
2. Crush the soil lumps gently so that the gravel and roots etc. are separated from the mineral soil.
3. Sieve the soil through a 2 mm sieve leaving the gravel and roots etc. in the sieve.
4. Retain the gravel for weighing if required. This should be done if it appears to be about 5% or more by mass of the original sample.
5. Retain a representative sample for analysis.
6. Use the pyramid method to take a sub-sample of about 25 grams
7. Crush the sub-sample using a mortar – the soil must be crushed to a fine powder
8. Label the bag with: Number of sample, Country and group number
9. The samples must be accompanied by a list of the samples and the name and email address of a contact person



The pyramid method