

Paper:

The Impact of the Thai Flood of 2011 on the Rural Poor Population Living on the Flood Plain

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Poor and non-poor groups from two flood-prone villages in central Thailand were compared following the flood of 2011. The results showed that the damage/income ratio was higher among persons in the poor group living in old, high-pillared houses near the river. Although this group was not as well prepared and experienced less damage than the non-poor group, they had fewer resources for recovery. The study examined household history, networks, and socio-economic status, as well as the local history. The poor group's socio-economic characteristics may limit their capacity to resettle, as they have lived in the flood-prone area for generations. Proposals to address this included improving dykes and early warning systems as well as offering compensation for lost earnings.

Keywords: Thailand, rural population, household survey, river flood, poverty reduction

1. Introduction

1.1. Context of the Research

Most of the casualties of natural disasters that occurred from 1975 to 2000 were among the poorest residents in developing countries [1]. A key document by the United Nations [1] stated that the improvement of community resilience to disasters was a crucial element in breaking the negative cycle of poverty. However, with regards to the relationship between poverty and the vulnerability to disaster, it is difficult to apply research results from one area to another region or country because of diverse natural conditions, stages of economic development, and socio-cultural situations [1]. Research demonstrating the connection between vulnerability to disaster and poverty [2–4] in developing countries has long been a main study area of disaster sociology and economics. However, there has been little prior work done in Southeast Asia regarding flood disasters and poverty with respect to rural areas, and wide-ranging flood risks have rarely been re-

searched. This river flooding on the plains in Southeast Asia causes few casualties, and there is little recognition of these floods as disasters. Instead, farmers welcome floods as “gifts from the gods.” Politically, the productivity of the agricultural sector is relatively low in comparison to that of industrial parks or commercial facilities, so damage to agricultural land has been overlooked for a long time.

However, rice is the staple food as well as a major export product of Southeast Asian nations, making the stable production of rice important from both economic and public order perspectives. Also, in the rural areas of developing countries, a greater proportion of the population is poor, and access to services and information is more limited than it is in urban areas. This limited access increases the vulnerability of the people to disaster in these poor areas. Accordingly, investigation into the relationship between flooding and poverty in rural areas of Southeast Asia is very significant and indispensable to understanding the complete picture of flooding and poverty.

The plains of mainland Southeast Asia tend to flood extensively because of their extremely gentle gradient. For a long time, the government officials of the region have protected only the politically and economically important cities with embankments and drainage channels, and they have adopted policies that alleviate flooding by diverting water to surrounding rural areas [5]. In regions of Thailand and Myanmar that experience frequent flooding, lifestyles adapted to flooding, such as living in traditional raised-floor houses and owning boats, have become established. However, the fact that agricultural communities have folk knowledge does not negate the need for disaster prevention and reduction. Disaster measures are ongoing activities that constantly evolve with the development of scientific techniques, the development of the national economy, and changes in natural conditions due to climate change and development, etc. As such, they should evolve according to sociocultural conditions and the degree of economic development of the region [6]. The 2011 Thailand floods that form the subject of this paper differed from “traditional” floods and were of an unprecedented scale in terms of both area impacted and the damage caused. Recently, lifestyles have changed in rural

1. This paper is a full translation of the paper titled “The Impact of the Thai Flood of 2011 on The Rural Poor Population Living in the Flood Plain” by Yukiko Tahira and Akiyuki Kawasaki published in Journal of the Institute of Social Safety Science, No.27, pp. 167–177, Nov. 2015 (in Japanese).



areas as well, as a consequence of the economic development of Thailand; household belongings have increased, and the extent of damage caused by floods has also tended to rise. There is a large degree of inequality in Thai society, and inequality is also expected to increase in rural areas. In light of the fact that the impact of environmental degradation due to climate change and economic development will intensify in the future, the need for disaster prevention will probably increase steadily. It is necessary to hypothesize disasters of a scale that overwhelms conventional response methods, to perform an inventory of the current situation, and to identify areas that should be improved going forward.

1.2. Objective of this Paper and its Position with Respect to Prior Works

The objective of this paper is to analyze the following by means of a questionnaire survey of the inhabitants of areas prone to flooding in the Kingdom of Thailand: the relationship between flooding and the poor, who are particularly vulnerable even in agricultural communities; the characteristics of flood response; and the social background and living conditions of residents in flood zones. This paper goes on to present options for solutions that should be taken in the future to reduce poverty and prevent disasters in rural communities.

As a result of the 2011 Thailand floods, research has been carried out from various angles concerning disaster prevention organizations in Thailand [7, 8]: flood control measures through the enhancement of dams and embankments, etc. [9, 10], the economic aspect of damage on the industrial sector [11], and political strategies concerning flooding [12], etc. However, with respect to research on non-industrial land, research on the relationship between the conversion of agricultural land into residential districts and flooding does exist [13], but there is little research concerning agricultural land itself [14]. This is largely because existing research on flooding has focused on the infrastructure of flood prevention projects, and there has been little interest in agricultural and residential land, which have low productivity.

There has also been research that has demonstrated that the poor in developing countries are being visited by deeper and longer-lasting flooding [15, 16], but this research has primarily dealt with urban areas. Thai research analyzing the effects of income, education, and age on flood vulnerability and information gathering [17] has identified the tendency for people in highly-vulnerable demographic categories to live in flood zones. Other research has found that even though residents have become more aware of flood evacuation, only a small number of them have decided to reconstruct flood-protection houses since the 2011 Thailand flood for economic reasons [18].

However, these prior studies focused on the damage to the poor, the impact of this damage, and countermeasures. They did not go so far as to focus on the poor themselves, the victims of the flooding. Empirical data are scarce on their social backgrounds and views on flooding, the de-

tails of how they came to live in high-flood risk areas, and the reasons why they have stayed. Light has therefore not yet been shed on such matters. Furthermore, although analysis concerning the poor and flooding has identified the tendency for the poor to live in disaster-prone regions, there is almost no research analyzing whether the impact of the disaster is related to geographical characteristics (residential areas) or whether there is a closer relationship with the characteristics of the poor themselves. Meanwhile, flood research that has placed the focus on infrastructural flood control measures has continued to look at land use in regions of high disaster risk in recent years and the relationship between land and people, including the issue of relocation. However, a genuine start cannot be made on resolving the problem of flooding without an understanding rooted in the historical and cultural background of the people who live there.

This paper first obtains data through a questionnaire survey conducted on residents in 100 households in the Ban Chang Subdistrict of Suphanburi Province, the Kingdom of Thailand. The data is then used to identify the “relative poor,” who are the most vulnerable of all households, and analyze the characteristics of this group and their vulnerability to disaster as compared to the non-poor from four perspectives: type of residence, flood duration and depth, damage, and disaster preparation and aid for victims. Next, with regards to the relationship between the poor and residential areas, an inquiry is made into the reason why the poor live in flood zones based on the households’ experience of relocation, networks, opinions on relocation, education, and occupational backgrounds with reference to historical context. Finally, proposals are made to mitigate the damage suffered by the poor in rural areas with consideration for potential future climate change and transitions in social environment.

1.3. Administrative Structure and Poverty in Agricultural Communities in the Kingdom of Thailand

The regional administrative structure of the Kingdom of Thailand consists of provinces under the central government. These are divided into districts (amphoe), sub-districts (tambon), and then villages (muban). There is a popular election system for the heads of the two smallest administrative denominations (subdistricts and villages), and the higher ranking officials are dispatched by the central government. Two counselors under the head of the subdistrict are appointed to each village in the subdistrict. They lead a Tambon Administrative Organization (TAO), or “OrBorTor,” which is established in the subdistrict and provides aid to victims in a disaster. The TAO manages the data and statistics for the households in the district and has an accurate grasp of conditions there as a result.

The 2013 per capita GDP of the Kingdom of Thailand was USD 5,779 [19], which already made it a middle-income nation. The percentage of the population under the international standard poverty line of USD 1.25/day per capita purchasing power parity (PPP) was 0.3% in

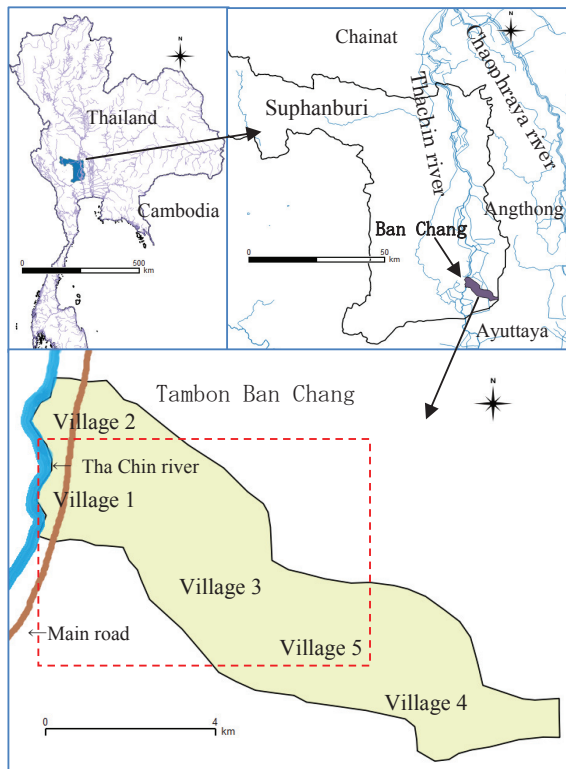


Fig. 1. Location and geographical map of Ban Chang Tambon subdistrict.

2010 [20], but 10.94% of the people are defined as poor [21], according to the 2013 poverty line independently established by the Thai government (per capita monthly income of 2,572 baht USD 78). Poor households in Thailand have the following characteristics: situated in agricultural communities in the north or northeast, a large number of members, a head of the household with a low level of schooling in comparison to the heads of non-poor households, no land holdings (or only small-scale holdings), and comprised of just the elderly and children [22]. In descending order, occupational income in the agricultural sector ranks owner farmer, tenant farmer, and then farm laborer [22], and there is a close relationship between land ownership and income in agricultural communities.

1.4. Overview of the Study Area

The study area for this paper is the Ban Chang Subdistrict, Song Phi Nong District, Suphanburi Province, which forms part of the Chao Phraya River delta (**Fig. 1**). The Ban Chang Subdistrict is located at a distance of approximately 120 km or 2 hours by car to the northwest of Bangkok. This region – including the neighboring Ayutthaya Province and Ang Thong Province – has been called the “flood path” since long ago [23]. Nowadays, this region has been irrigated and engages in double cropping of rice. Annual flooding still occurs, and wide areas are submerged from around September to November. For this reason, the government usually does not provide compen-

sation for houses or crops damaged by floods in a normal year.

The area of interest, the Ban Chang Subdistrict, was cultivated by farmers who moved from Ang Thong Province around 120 years ago. The population of the subdistrict is 3,125, with 90% of the workforce being employed in agriculture [24]. It is a village typical of the central rice cultivation region with 100% of households connected to water and electricity services and a high rate of cell phone and TV ownership.

The subdistrict is comprised of five villages, of which the 1st and the 5th are the survey sites for this paper. The western boundary of the subdistrict is the Tha Chin River, which flows southward, and the 1st village is located on the east bank of the river. The 5th village is approximately 5 km to the east of the 1st. The Tha Chin River breaking its banks is the primary cause of flooding in the area. The Tha Chin River is 325 km in length and has a catchment area of 1,300 km². It forks south from the Chao Phraya River in Chai Nat Province north of Suphanburi Province and flows into the Gulf of Thailand in the southern Samut Sakhon Province. The Tha Chin River is approximately 25 m wide at the 1st village, but the embankment is low, allowing water to quickly flow out into the surrounding area when the level rises.

The houses in the 1st village are clustered along the Tha Chin River. Since the main road that runs north-south through the 1st village parallel to the river also works as an embankment, flooding in the district between the Tha Chin River and the road tends to be particularly serious. Conversely, the 5th village is separated by a distance of approximately 6 km in a straight line to the east from the Tha Chin River, and it suffers the least annual flooding damage of the 5 villages in Ban Chang Subdistrict.

2. Study Method

2.1. Method and Propriety of the Sampling Study

The questionnaire for the study was first prepared in English by the authors, after which it was translated into Thai by a native speaker of Thai who was also proficient in English. Then, a different Thai researcher visited each household, conducted interviews, and filled out the questionnaire on site. 100 households were selected at random from the 1st village alongside the Tha Chin River, where flooding is severe, and from the 5th village, located far from the river where not much flooding is experienced in a normal year. With the population distribution taken into account, 44 households from the 1st village and 56 households from the 5th village were surveyed. The date of the survey was March 28, 2015.

The validity of the sample was calculated based on 2011 statistics. Adopting the maximum value for the test population rate of 0.5 with a confidence of 95% and a range of error of 5% from a total population of 1,032 people from the two villages, the value for validity was 280. The number of samples obtained in the actual survey was

343, by which the survey was deemed to be sufficiently valid.

The questionnaire included the following items: a. basic information on the household (sex, age, education, and occupations of the members), b. background of the household (previous relocations, seasonal work, community participation activities, means of communication possessed), c. residence (type, material, age, landownership), d. damage sustained in the 2011 Thailand floods (inundation depth, inundation duration, cost of damage), e. aid during the 2011 Thailand floods (kind(s) of aid received, additional restoration measures), g. income (past and present agricultural land ownership, cultivation land, cash income), and h. opinions concerning flooding (extent of impact, intention to relocate).

There were two reasons why the 2011 Thailand floods were used for the survey, in spite of the fact that over three years had passed. The first was because the 2011 floods remained in the memories of the residents as flooding of unprecedented scale, and the second was because, in contrast to the annual floods that do not impact some areas, the entire region was flooded in 2011, removing the necessity to differentiate between victims and the unaffected. A further reason was to verify the way in which the residents themselves and the authorities had responded during the exceptional circumstances that overwhelmed the residents' traditional capacity to adapt, as well as to investigate measures taking into account the potential for an even greater disaster in the future due to climate change and environmental degradation.

2.2. Classification by District and Classification by Economic Circumstances

In this paper, a comparative analysis is conducted around four groups classified by geographic conditions and also classified by the economic conditions of the household, independent of geographic conditions. Geographic conditions pertain to a group close to the river (households in the 1st village) and a group away from the river (households in the 5th village).

The two classifications were established to distinguish between whether the impact of the flooding on the poor was because of the tendency for them to inhabit flood zones or due to the characteristics of the poor themselves. This paper attempted to eliminate, to the extent possible, variations due to physical separation from the river and differences in administrative service by village. It also attempted to emphasize differences related to household economic status. The potential for issues of geographical economic disparity is suggested based on interviews with Tambon Administrative Organization officials in chapter 4.

In the classification by economic conditions, a highly economically vulnerable group was extracted from the 100 households as being the relative poor. The rest were classified as being the relative "non-poor." Accordingly, in this document, "poor" does not necessarily signify being below the poverty line.

Table 1. Number of households by crossing location and economic status ($N = 100$).

	Village 1 and poor	Village 1 and non-poor	Village 5 and poor	Village 5 and non-poor	Total
Number of household	17	27	6	50	100
	44		56		

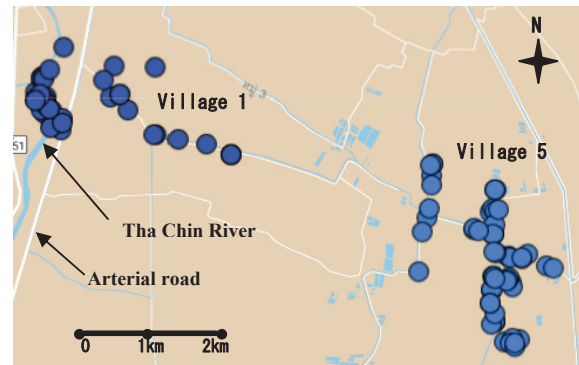


Fig. 2. Distribution of households surveyed (within the dotted field of Fig. 1).

The conditions for identification of the poor are, in order of priority, agricultural land ownership, education, occupation, and cash income. Usually, the most general index by which to measure the economic conditions of a household is cash income, but since the income sources of farmers are diverse and irregular, it is difficult to determine whether a household is poor by cash income alone. Meanwhile, the poor in rural Thailand tend to possess little or no agricultural land. In the results of this survey, there was also a strong relationship between income and the area of agricultural land possessed (correlation coefficient: 0.72). However, households engaging in tenant farming on a large scale, even though they possessed no agricultural land, were excluded. Next, households with a member who had received higher education were excluded. This was because the poor generally attend school for a short period [21], and only 15% enter higher education in total [25], 1/3 the rate of ordinary households. With regards to occupational conditions, households with two or more factory workers or households with one or more civil servants or company employees were excluded.

After identifying 24 households based on the above conditions, one household with an income per capita in excess of the 2013 average household income for the central region (approximately 310,000 baht) was excluded. In this way, a final total of 23 households formed the relative poor group surveyed for this paper (Table 1). These 23 households included 17 from the 1st village and 6 from the 5th village, meaning 75% were from the 1st village. Fig. 2 shows the spatial distribution of the households surveyed.

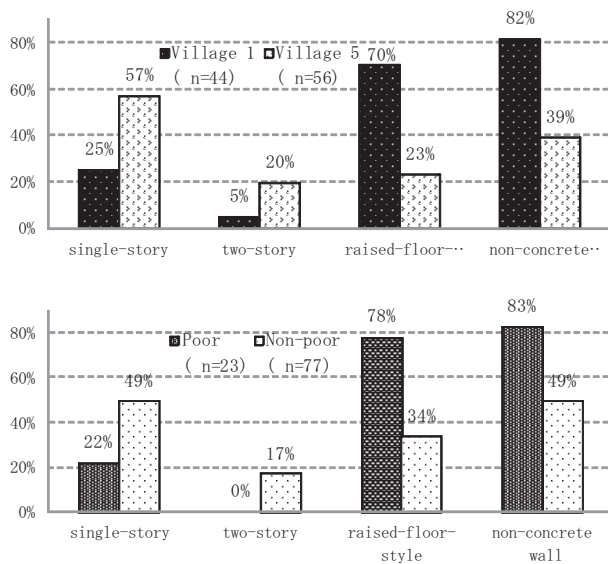


Fig. 3. Type of house ($N = 100$, multiple answers). Upper: the 1st village and the 5th village, lower: the poor and the non-poor.

3. Survey Results

3.1. Demographic Composition of the Households Surveyed and Characteristics of the Inhabitants

The survey covered 166 people from 44 households in the 1st village and 177 people from 56 households in the 5th village. The gender ratio was 54:46 overall, with females slightly outnumbering males.

Most of the private residences in the villages were non-engineered houses, designed by their inhabitants but built by professionals. In contrast to the fact that 70% of the houses in the 1st village had raised floors, only 23% of the houses had raised floors in the 5th village (Fig. 3). This is because the annual inundation depth is high in the 1st village but low in the 5th village. However, the rate of raised-floor housing occupied by the poor was higher in the 5th village group than in the 1st village group. Also, the proportion of houses in which only wood, corrugated iron, and bamboo were used for the walls was the highest for the poor at 83%. The age of houses occupied by the poor was 47 years on average – 1.6 times the 29 years for the non-poor. This is because single-story concrete buildings have become popular in recent years due to changes in lifestyle and the susceptibility of wood to termite damage.

3.2. Flooding Depth and Duration of the 2011 Thailand Floods

In this section, we investigate the kind of relationship that exists between the depth and duration of flooding around each household and the geographic characteristics and economic conditions of each household.

Figures 4 and 5 show that the duration and depth of flooding were more serious in the 1st village than in the 5th

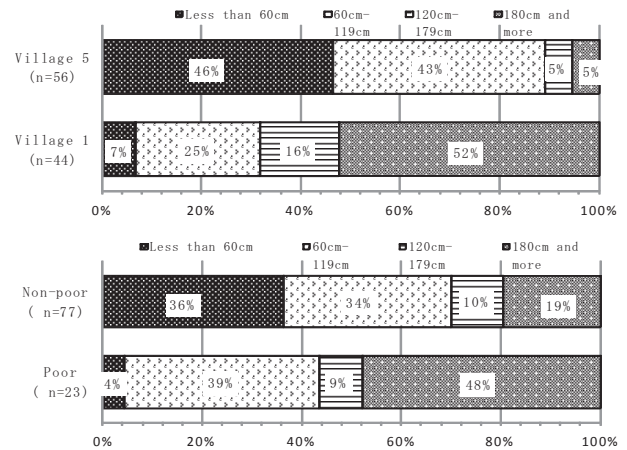


Fig. 4. Maximum flood depth around houses during the flood ($N = 100$). Upper: the 1st village and the 5th village, lower: the poor and the non-poor.

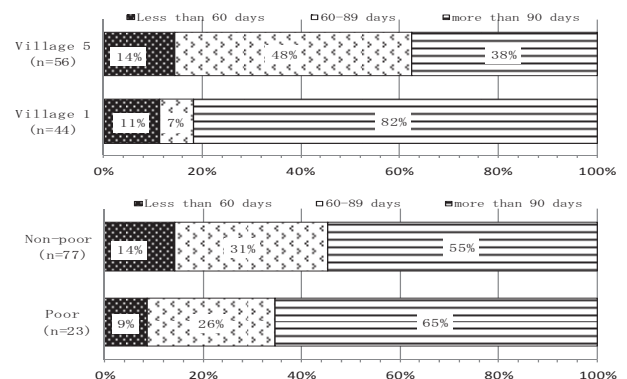


Fig. 5. Period of flooding around houses during the flood ($N = 100$). Upper: the 1st village and the 5th village, lower: the poor and the non-poor.

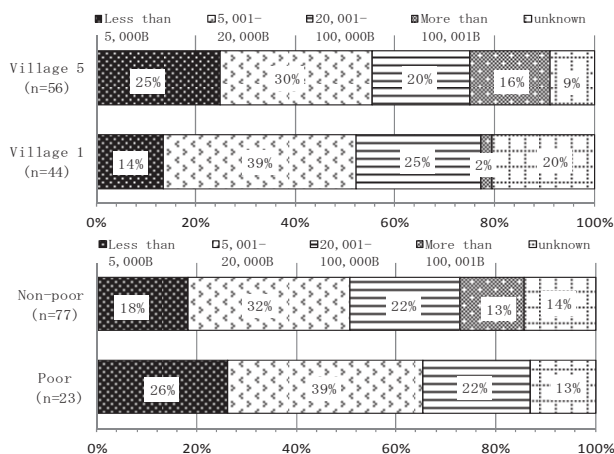
village. 80% of the 1st village was flooded for 3 months or longer, and the maximum flooding depth exceeded the height of a person at 180 cm and over in not less than half of cases. The scale of the 2011 Thailand floods is indicated by the fact that the flooding reaches a depth of 1 m at most and lasts 2 months in a normal year.

The poor live between the 1st and 5th village. If the investigation is limited to the comparatively shallow flooding depth of under 120 cm, 43% of the poor were flooded, which is higher than the 32% for the 1st village. The difference in flooding duration between the poor and the non-poor was smaller than the difference between the districts. The depth of flooding itself was found to be more closely related to the location of the house than to the economic status of the owner.

Table 2 shows that the depth of flooding on average was 41 cm higher for the poor households from the 1st village than for the non-poor households from the same village. In other words, both location and economic status affected the depth of inundation. However, the difference in the average inundation periods is not as obvious as the difference in the average inundation depths among the four groups.

Table 2. Crossing two factors (village1, poor), (village1, non-poor), (village5, poor), and (village5, non-poor) ($N = 100$).

	Average inundation depth(cm)	Average inundation period(days)	Ratio of inundation above house floor (%)
Village 1 and poor (17)	202	81	71
Village 1 and non-poor(27)	161	85	70
Village 5 and poor (6)	85	92	17
Village 5 and non-poor (50)	67	76	34

**Fig. 6.** Total cost of damage incurred in the flood ($N = 100$). Upper: the 1st village and the 5th village, lower: the poor and the non-poor.

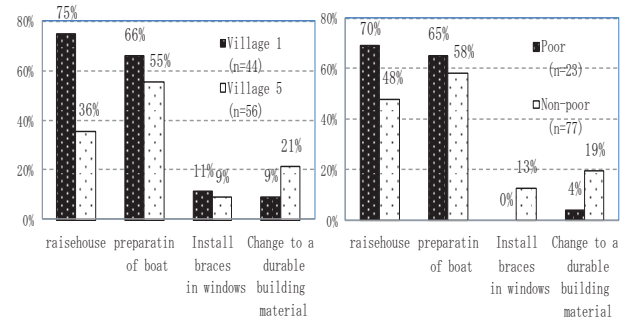
3.3. Damage Due to Flooding and its Impact

Next, we looked at the distribution of cost of damage incurred in the flood (Fig. 6). The poor experienced many cases of light damage of 5,000 baht (150USD) or under, and no poor households reported damage of or in excess of 100,000 baht (USD 3,000), such as to a house or a vehicle. This is related to the fact that of the residents had few assets and lived in houses that had raised floors. In interviews, the damage suffered by the poor was primarily due to household belongings being submerged in water. The reason why serious damage was concentrated in the 5th village, although the rate of inundation above floor level was much lower in the 5th village than in the 1st village (Table 2), was probably due to it rarely flooding and the inhabitants being unaccustomed to floods, the large number of one-story houses susceptible to flood damage, and the many well-to-do households with significant possessions (Table 3). Furthermore, another reason was that there were several households among the non-poor in the 5th village that took advantage of the flood to rebuild their houses, pushing up the total sum of damage by regarding the cost of rebuilding as “flood damage.” Conversely, even when the floors and walls of poor households were damaged by the flood, non-poor households reported large-scale repairs or rebuilding works. Meanwhile, the poor experienced a high ratio of damage cost to income at 36%, compared to 27% for the non-poor (Ta-

Table 3. Ratio of damage to income.

	Average amount of damage (Baht)	Average income per year (Baht)	Ratio of damage to income
Poor (n=21)	19, 833	54, 578	36%
Non-poor (n=66)	70, 000	255, 319	27%

(N=87)

**Fig. 7.** Rate of implementation of long-term measures against flooding. Left: the 1st village and the 5th village, right: the poor and the non-poor ($N = 100$, multiple answers).

ble 3). Furthermore, despite the large number of poor households in the 1st village, this greatly exceeds the damage rate of 13% for the 1st village. If one takes into account that the annual income of the poor is approximately 20% that of the non-poor, the poor are probably impacted more heavily by flood damage, even if the absolute value of the damage is lower.

3.4. Preparations Against Flooding and Aid for Victims

Figure 7 shows the long-term preparations against flooding undertaken by the residents at the time of the 2015 survey. “Raising the house” includes living in a raised-floor house, raising the foundation of the house, and increasing the height of the raised-floor pillars, among other things. Many households have been living in raised-floor houses since before the 2011 floods, but some increased the height of the stilts or rebuilt their houses in a raised-floor style after the flooding. Here too, the 1st village had the highest rate; the 5th village had the lowest. There was a stronger relationship with distance from the river than with economic position. Around 60% of households in all groups indicated that they had a boat preparation of a boat. A difference according to economic position was observed in “Install braces in windows” and “Change to a resistant (to flooding) building material.” Since such flood control measures incur certain costs and are not as popular as traditional raised-floor houses, the measures were probably only implemented by households that could afford them.

Figure 8 shows the short-term preparations reported to have been carried out directly before the flooding. With

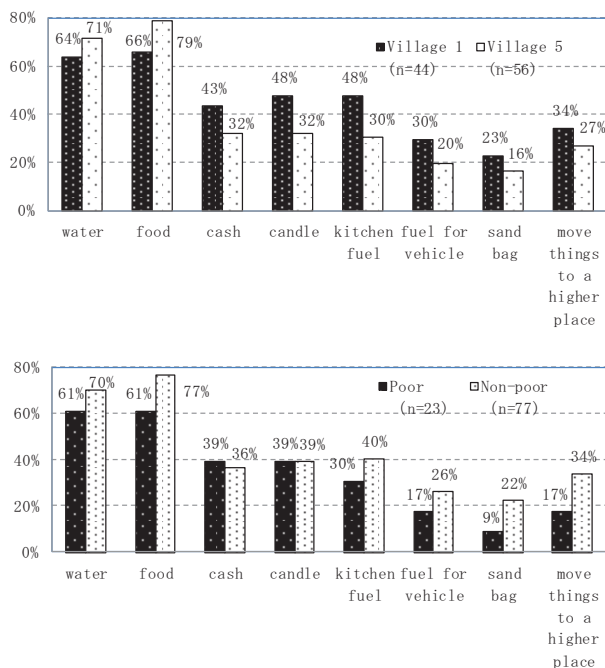


Fig. 8. Rate of implementation of short-term measures against flooding. Upper: the 1st village and the 5th village, lower: the poor and the non-poor ($N = 100$, multiple answers).

the exception of food and water, the preparation rate tended to be higher in the 1st village than in the 5th village. This may be related to the households being more accustomed to flooding, greater flood danger, or early warnings by the Tambon Administrative Organization officials in the 1st village. However, the situation was reversed in a comparison by economic position, whereby the poor – which included many of the households in the 1st village – tended to have a lower preparation rate than the non-poor, with “kitchen fuel,” “fuel for vehicle,” “sandbags,” and “moving things to higher locations” ranking particularly low.

Concerning aid for victims of the flooding, each house struck by the disaster was allocated a “disaster relief payment” of 5,000 baht (USD 150) as a result of the Thailand central government’s policy on the 2011 floods. Across this entire district, the rate of people who replied that they had received this relief payment reached 96%. The next highest rates of aid received were “drinking water/food distributions” (94%), “free medical examinations and treatment” (88%), and “kitchen utensil distributions” (83%). A national project gave free house repairs to particularly poor households struck by the disaster.

Respondents to the survey selected multiple answers from the following 15 types of aid received after the disaster: “government relief payment, etc.,” “public toilets,” “transportation,” “food and water,” “clothes,” “kitchen utensils,” “medical examination and treatment,” “house repairs,” “seed distributions,” “low interest loans for victims,” “academic support,” “road or other infrastructure improvements,” “peripheral cleaning,” “compensation for damaged crops,” and “other.” As a result, the average

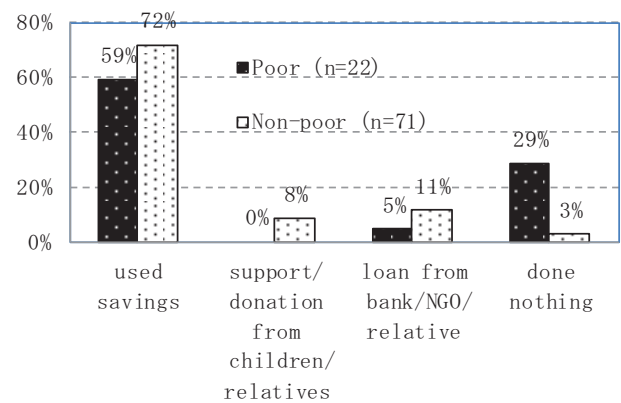


Fig. 9. Method of supplementation in the case public aid was insufficient ($N = 93$, multiple answers).

across all groups was 5–5.5 types of aid received. The poor who are the subject of this paper do not have agricultural land and are not subject to seed distributions or compensation for damaged crops, so the number of kinds of aid received by the poor was anticipated to be lower than that for the non-poor, but in fact the numbers were almost the same for the poor and non-poor at 5.2 and 5.3, respectively.

However, looking at the previous short-term disaster preparations this time by number of items, in contrast to the households in the 1st village taking an average of 3.5 measures, the poor made the fewest preparations of all groups at 2.7. From this it can be said that although the poor received almost the same amount of aid as the non-poor received, the poor tended to make fewer preparations against disaster.

Despite receiving more than five kinds of aid on average, the rate of negative answers to the question “Was there sufficient public aid with respect to flood damage?” was 86% among the non-poor and 91% among the poor. The highest rate of response to the question “How did you supplement the shortage?” posed to those who responded negatively was for “I used savings” (Fig. 9). It was found that, even among the poor, 60% had saved what they could in preparation for flood damage. However, the rate of the response of “I am doing nothing” was 29% for the poor, approximately 10 times the rate of the non-poor. Also, the rate of receiving donations or borrowing money from the bank or relatives for the purpose of recovery from the damage was lower for the poor than for the non-poor. Accordingly, the poor were found to have limited means of recovery.

4. Relationship Between the Relative Poor and Place of Residence

4.1. Background to the Poor Gathering Along the River

Several prior studies [15, 17] have demonstrated that the poor tend to live in places prone to disaster, and this

fact has come to be understood empirically. For this paper as well, when the poor households were extracted, 17 of 23 belonged to the 1st village.

So far, we have demonstrated that the characteristic housing and insufficient short-term preparation against the floods as well as limited economic resources for damage restoration coupled with the large degree of damage to their income may contribute to the negative cycle of poverty.

But why is it that the households which tend to be poor are more likely to be located in regions more susceptible to flood damage? This requires a detailed investigation that also covers historical context and goes beyond the scope of this survey. However, the results obtained suggest several reasons. The first is the fact that the 1st village has public land located along the river; the 1st village therefore has districts in which poor households that do not possess residential land are concentrated. In the results of the survey, 90% of the non-poor owned the land on which their house stood, but only 35% of the poor did the same.

The Tha Chin River was a traffic route before roads were built, so people gathered in places along the banks, such as markets and temples, and communities of the people who worked in these places were established. Furthermore, there remains land without a clear owner along the river because the area has suffered deep flooding since long ago, making it unsuitable as agricultural land. This land thereby probably went on to be registered as public property, at which time it came to play the role of place where the poor converged. Land registration began in Ban Chang in 1919, approximately 20 years after the reclamation of the region began.

4.2. Immobility of the Relative Poor

The movement of residents from flood-prone areas is one measure that could reduce damage. At first glance, the poor, who do not own agricultural land, might seem to be able to relocate freely, without being tied to a given region. In this section, we examine this possibility based on their opinions on birthplace and relocation.

According to public statistics, 88% of the inhabitants of Suphanburi Province are natives of the province [26]. The answers to questions on household relocation in the survey showed that the poor have a particularly strong tendency to be settled. In 100% of poor households, either the head of the household, his wife, or both parties were born in the village in which they currently lived. In contrast, neither the head of the household nor his wife was from the village in which they currently lived in 17% of non-poor households (Fig. 10). The most common reason why they had moved into a village was, "Agricultural land was scarce where I come from, so I moved here to purchase a larger plot" (62%), indicating that they had moved in search of a more affluent life. The rate of households originating within the village was 80% for the 1st village and 82% for the 5th village, demonstrating the tendency for poor households to be settled. The accounts of Tambon Administrative Organization officials also support the

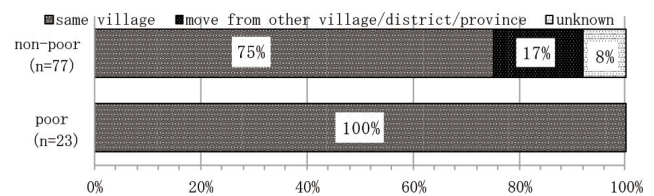


Fig. 10. Place of origin of the household (N = 100).

Answer to the question: "Would you like to move to an area that does not flood if finances permitted it?"

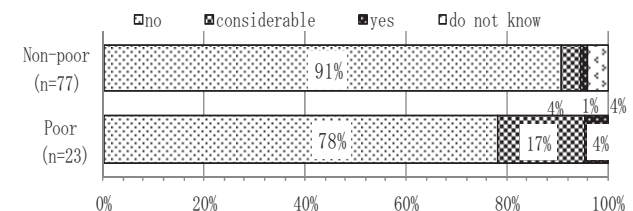


Fig. 11. Intent to relocate (N = 100).

picture of the poor in agricultural communities being people who have lived in the same village for several generations.

From the perspective of social participation as well, 55% of non-poor households participate in volunteer, association, or other local activities, but only half this number of poor households, 26%, do this. As seen in the previous section, none of the poor received support from relatives to recover from the flood damage, and the rate of ownership of cell phones for communication between individuals is also significantly low, indicating that the poor have weak networks.

The residents the authors came into contact with in this district were united in their opinions that flooding is something that has always happened and is not a problem, that they do not want to move anywhere, and that the place where they were born is the best. However, the ratio of the poor who responded affirmatively to the question "Would you like to move to an area that does not flood if finances permitted it?" was high (Fig. 11). This suggests that the immobility of the poor may also be caused by economic factors.

In the survey, the percentages of the population in the 1st village aged 60 or more or under 15 were 24% and 10%, respectively, whereas these figures were 17% and 15% for the 5th village. There are therefore more elderly residents and fewer children in the 1st village. This suggests the possibility that the members of the working generation in the 1st village, where 46% of households have no agricultural land, leave to find work in the capital. Only the elderly remain.

Also, for those aged 15 and older, the survey found that the percentage of poor agricultural and other day laborers (45%) and the unemployed poor (33%) differed greatly from the non-poor agricultural and other day laborers (12%) and the non-poor unemployed (7%), as can be seen in Fig. 12. In contrast to the ratios of elderly for

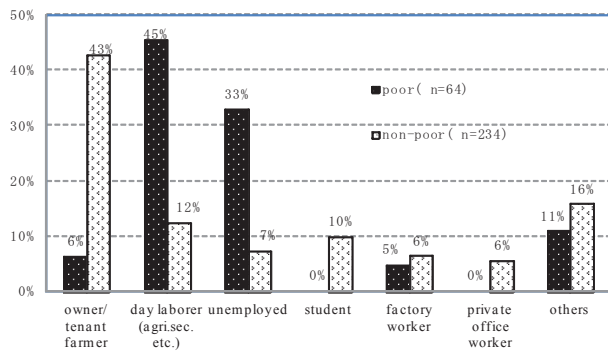


Fig. 12. Occupation of those aged 15 and older (N = 298).

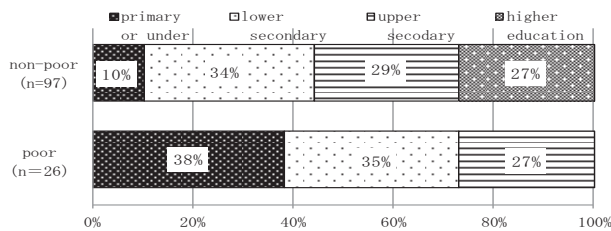


Fig. 13. Difference in academic background between those aged between 15 and 39 (N = 123).

the poor and the non-poor, 24% and 20%, respectively, the poor aged 15 and older had a rate of unemployment that was 5 times that of the non-poor (33%). This result indicates that young people unable to find work due to physical disability or other reasons remain in the village.

The disparity in education between the poor and the non-poor is an index that indicates that inequality is on the increase in the village. The number of middle schools increased even in agricultural communities in Thailand in the 1990s, and the rate of people receiving secondary education or higher rapidly increased [27]. For this reason, there is a large difference in the academic backgrounds of people currently in their 40s and older and those in their 30s and younger. Of the people aged 40 or more, 95% of the poor and 87% of the non-poor did not progress beyond elementary education. In contrast, the disparity between the poor and the non-poor increases for the under-40 group (Fig. 13). In particular, 38% of the under-40 group poor did not progress beyond elementary education. This difference may produce a difference in the means of obtaining various forms of information and the quality of the information obtained.

In this manner, various factors may combine to restrict the poor from relocating away from flood-prone districts. It can be seen from the results of the survey, interviews, and public statistics that the capacity to relocate depends on factors such as youth, education, occupation, and assets. People with networks of relatives or friends on whom they can rely depart from the village, leaving behind those who cannot.

5. Conclusion

5.1. Summary

5.1.1. Flood Damage and Response of the Poor

The poor in flood-prone regions experience deeper and longer-lasting flooding than the non-poor do on average due to the characteristics of their places of residence. However, this is not proportional to the cost of damage incurred by the poor. Instead, the tendency for the cost of damage to be low was observed due to their high rate of living in traditional raised-floor houses, familiarity with flooding, and limited possessions. At the same time, the ratio of damage to income was higher for the poor than the non-poor, indicating that the impact was relatively more serious for the poor.

The houses in which the poor live are old, and measures to strengthen them are not taken. Also, the poor make little in the way of short-term preparations against disasters, with few people taking simple measures, such as stockpiling kitchen fuel or moving things to higher locations in particular.

The rate of using one's own savings as an additional way of recovering from the damage was the lowest for the poor. Also, almost none of the poor received loans, such as bank loans or free-of-charge support from relatives, and 29% of people did nothing to recover from the damage. Coupled with the above high degree of damage with respect to income, it was demonstrated that the poor had difficulty recovering from the damage through their own efforts, despite the fact that the amount of damage was small. This sensitivity to disasters and limited coping capacity of poor people are well known [4].

5.1.2. Aid for the Poor and its Role

Little research had been done on the conditions of rural districts at the time of the 2011 Thailand floods, and the details of aid given were not clearly known, but this paper has contributed to clarifying these matters to a certain extent. Tambon Administrative Organization officials provided much aid in the unusually large 2011 Thailand floods. Each household received an average of 5 kinds of aid. One of these was a uniform relief payment of 5,000 baht, provided to almost all households. This was generous aid for the poor, who had incurred relatively light damage. During the flooding, the distribution of food, water, and clothing; the provision of medical care; the stable supply of electricity; and the markets opening and enabling residents to procure food prevented a more serious impact on the poor. Put another way, the local administrations of Thailand can be said to have functioned in providing a certain form of safety net, which at least prevented the poor from life-threatening consequences, even in such unforeseen flooding as the 2011 Thailand floods.

5.1.3. Immobility of the Poor

This paper used the results of a questionnaire and public statistics to demonstrate, to a certain extent, the mechanisms by which the poor gravitate to flood prone areas,

the reason why they remain there, and the socio-economic context to this.

Most relatively poor households in the survey are located close to the river and are susceptible to the effects of flooding. This is related to the issue of riverside land use. Most of the poor households continue to live in the same village in which they were born, and several generations of their families are likely to have been poor. Beside their social ties to community, one of the reasons why they live in a location where they are likely to incur flood damage is due to economic factors, and also possibly because their relocation is limited by low academic background, low income and sporadic employment, scarce assets, and weak networks.

At the same time, poor villages tend to have more elderly people and fewer children. This may be because those who could relocate have already left the village and only these relatively immobile people remain in flood-prone areas.

5.2. Recommendations for Improving Flood Control Measures and Reducing Poverty

Both long-term and short-term measures are necessary to alleviate poverty in flood-prone regions. In this paper, we would like to propose the following three measures: infrastructure improvements, compensation for loss of earnings for victims, and the improvement of early warnings.

The first is a measure to reduce flooding through infrastructure improvements in the area between the main road in the 1st village and the Tha Chin River. The lifestyles of the people and the cultivation of crops are limited by flooding that exceeds 1 m even in normal years in this district, and the Tambon Administrative Organization officials recognize this to be one of the causes of poverty. The direct measure of establishing and embankment in this district would probably be effective.

The second is the establishment of a government aid program with respect to damages suffered by landless farmers. The majority of the poor aged 15 and older work as day laborers. Aid for agricultural communities equivalent to compensation for the loss of earnings the government paid to residents in urban areas in 2011 can be expected to have an effect.

The third is the improvement of flood advisories and the enhancement of early warnings and communications. Televisions give information for the wider region but do not give detailed information for individual localities, such as when the floodwaters will arrive. At the time of the 2011 floods, Tambon Administrative Organization officials went in person to upstream sluice gates to collect information. The construction of a mechanism with which to accurately predict floods and quickly pass the information to the Tambon Administrative Organization officials in regions downstream would probably lead to a reduction in damage.

5.3. Future Tasks

Lastly, we would like to suggest future tasks to further flood research in agricultural communities. In rural districts, the poor tend to be particularly settled and inhabit flood-prone areas for many generations, suggesting that flooding is related to their negative cycle of poverty to some extent. In order to demonstrate this, a detailed family income and expenditure survey and an investigation spanning some months or years is necessary.

Another task would be to promote studies and research with a focus on future changes and needs. It would be valuable to investigate the impact of declining water quality and other environmental changes on society and to study the application of early warnings via cell phones, which are now common among the people.

The 2011 Thailand floods may have been a special case, but it is likely that the flooding of agricultural communities will intensify in the future due to climate change and environmental degradation. At the same time, families are increasing their possessions, and means of communication are changing rapidly due to economic expansion, so methods of agricultural community disaster prevention and aid requirements can be expected to change. Taking into account socio-economic, technological, and cultural development, practical research on disaster prevention/reduction in agricultural communities is necessary.

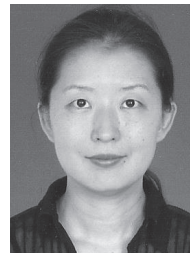
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