

The Food and Water Shortage after Typhoon Haiyan in the Philippines: A case study of the local “last mile” logistics from the viewpoint of food security

Masanori Takeshita* and Natsumi Aratame**

* Associate Professor, Faculty of International Studies, Takushoku University

**Professor, Faculty of International Studies, Takushoku University

ABSTRACT

Food security has become increasingly discussed as a matter of concern in some developed countries, including Japan. Immediately after the Great East Japan Earthquake, many people had to spend several days without any food and water due to the slow delivery. This delay can be interpreted as a failure of the food security policy in Japan. In order to meet the needs of the times, the food security policy should be changing like in Britain and other Western countries. Japan realized this fact after the failure of the Great East Japan Earthquake at last, and recognized the importance of humanitarian logistics. However, the most difficult part of humanitarian logistics is the local “last mile.” It is still unknown whether food assistance could reach remote rural areas smoothly. We studied Typhoon Haiyan as a case study of this “last mile” problem. The results confirmed that there was severe food and water shortage immediately after the typhoon struck, but at the same time, the results indicated the resilience of rural areas. These findings can serve as useful basic information for further food security in Japan and other countries.

Keywords: food security, food chain, resilience, Typhoon Haiyan, food and water, disaster, humanitarian logistics

1. Introduction

Food is a fundamental requisite for human existence, and in recent years, food security has become increasingly discussed as a matter of concern in some developed countries, including Japan. Two main triggers appear to be at work: One is the low food self-sufficiency ratio in Japan, and the other is the clumsiness of the government’s response to the Great East Japan Earthquake. That is to say, immediately after the earthquake, many people had to spend several days without any food, because delivering food to the disaster-stricken area was relatively slow. This delay can be interpreted as a failure of the food security policy in Japan.

Discussions around food security, however, can be confusing because not only is food security a slippery concept but also for a developed economy like Japan multi-faceted and complex. According to the Food and Agriculture Organization of the United Nations (FAO), food security

exists “when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (FAO 1996). It is, however, too broad a definition to be practical. Other than this UN definition, various definitions of national food security exist and they have been changing with the times. In order to understand the idea of food security from a historical perspective, Britain’s experience seems to be appropriate because Britain is the first country that experienced the Industrial Revolution and, since then, Britain has been a large net food importer like Japan, so food security has been critical all the time.

Similar to Japanese food security policy, Britain used to focus on the food self-sufficiency ratio as a way of insulating the nation from uncertainties such as war, economic calamity, drought, and natural disaster. This view was set out in the 1975 British White Paper *Food from our own resources*. The identification of domestic self-sufficiency with food security is rooted in Britain’s

experience of wartime disruption. In World War Two, Britain's food imports were seriously impeded by German U-boats, overseas enemy occupation, and the Pacific War. By 1943, food and feed imports were only half their 1930s' level (British Ministry of Food 1946). After World War Two, severe food shortages arose. War-induced dislocation in international trading relationships and shipping shortages precluded the resumption of food imports to pre-war levels. Thus, the post-war drive for greater self-sufficiency across Europe was a response to shortage.

The new agricultural policy, however, was a success. It overcame wartime shortages, and by the 1970s, agricultural output had trebled (Ingersent & Rayner 1999). This trend was observed not only in Britain but almost all over the world. Japan introduced the rice acreage-reduction program in 1970 in order to respond to an oversupply of rice. So it is no exaggeration to say that the age of plenty began after the 1970s. These changes and trends in international circumstances altered Britain's understanding of food security and the role of the self-sufficiency ratio. In other words, self-sufficiency makes little sense in today's world of inter-related markets. Thus, Britain concluded that food security relates fundamentally not to self-sufficiency but to affordability of, robust access to, and confidence in food supplies (DEFRA 2006).

Why Britain no longer put emphasis on the self-sufficiency ratio is summarized as follows. The first reason is the fact that since the Industrial Revolution, Britain has never been self-sufficient in food (DEFRA 2006). Secondly, according to the DEFRA, self-sufficiency fails to insulate a country against disruptions to its domestic supply chain, which might occur as a result of natural disasters (e.g., extreme weather events), food health scares at the processing stage, fuel disruptions, or other sources. Thirdly, the UK is the fourth most densely populated country in Europe, and is denser than populous countries like China and Pakistan. Basic trade theory teaches that in densely populated countries like the UK where land is relatively scarce, agriculture is unlikely to be a major source of international competitive advantage. Rather, it makes economic sense for the UK to source part of its raw food requirements from countries with more appropriate resource endowments (DEFRA 2006). Fourthly and above all, self-sufficiency is clearly less valid in today's dependent world. Domestic agriculture itself depends upon a variety of imported inputs such as fertilizer, fuel, and machinery. Circumstances in which food imports are cut off would also be likely to hamper domestic production potential. Put simply, food security goes beyond agriculture. It involves promoting resilience in the food chain, the security of industrial and trading infrastructure, and, fundamentally, the security of energy supplies. The key point of enhancing security is "diversifying supply options."

As mentioned above, Britain's food security has been changing in order to meet the needs of the times, but Japan's food security is still clinging to self-sufficiency. The fatal flaw of Japan's food security surfaced in the Great East Japan Earthquake. Immediately after the earthquake,

there was plenty of food and water in Tokyo, but this food could not be delivered to the disaster-hit area swiftly. We previously interviewed more than forty victims for another research project, and found that most of them had to spend several days without any food and water supply. For most Japanese people, however, this slow response might not be seen as a failure of food security, but other countries expect such emergencies beforehand and prepare for the disruption of food channels. For example, in the UK, both the government and business sectors work together to build resilience of critical infrastructure such as food chains. In order to minimize the impact of natural disasters, they made the "Resilience Cycle," which consists of four steps (identifying risk, assessing risk, building resilience, and evaluating resilience) (UK Cabinet Office 2011). In the first step, both the government and business sectors identify risks based on a reasonable worst-case scenario for each type of hazard, which include hydrological hazards (e.g., droughts, floods), geological hazards (e.g., earthquakes, landslides, volcanoes), and climatic and atmospheric hazards (e.g., extremes of heat and cold, windstorms). Then, the steps of building resilience and evaluating resilience follow. Furthermore, the government developed guidance and a checklist for business sectors and all those with a stake in the delivery of essential services (including regulators, suppliers, and emergency planners).

As another example, the Australian government introduced the Trusted Information Sharing Network (TISN) in order to cope with threats affecting the food supply chain (Australian Government 2012). TISN is a forum in which the Australian government and business community work together. The forum covers a wide range of sectors that include industry groups, supermarket retailers and distributors, major food and beverage processors, major foodservice providers, representatives of primary producers and their suppliers, and so forth.

On the other hand, the Japanese government did not make any such preparedness before the Great East Japan Earthquake. We also interviewed a store manager of a major supermarket (York Benimaru) in disaster-hit areas in 2013 and he assured us that there was no linkage and preparedness between government and supermarkets. So the York Benimaru had to struggle to restore their food distribution systems by their own hand.

The Great East Japan Earthquake, however, made the government reconsider food security in Japan and by the next year, the Ministry of Agriculture, Forestry and Fisheries published a new guideline assuming natural disasters, in which the word "supply chain" was used for the first time (MAFF 2012).

At the time of disaster, a supply chain or a food chain is called "humanitarian logistics." Of course, humanitarian logistics has been widely studied in disaster research because it is one of the most important factors. If humanitarian logistics become poor in quality such as long delivery time or dirty water, it can mean the loss of lives (Kovács and Spens 2007; Beamon and Balic 2008). Added to this, recent reports have indicated that logistics accounts for some 80%

of the cost of disaster relief operations (Tatham and Pettit 2010; Whiting 2010). Therefore, a European ambassador who observed the immediate aftermath said, “We don’t need a donors’ conference; we need a logistics conference” (Shane and Bonner 2005).

In the history of humanitarian logistics, it was the Indian Ocean tsunami in 2004 that represented a turning point. On December 26th 2004, huge waves severely struck the coastal fringe of most of the countries fronting the Indian Ocean including those in East Africa, the west Indonesian Archipelago, and the Malaysian Peninsula. It claimed approximately 230,000 lives and displaced 1.7 million people. Over 40 countries and 700 NGOs provided humanitarian assistance (Thomas and Fritz 2006). Immediately following the tsunami, aid providers had to collaborate on an unprecedented scale among a number of governments, NGOs, United Nations (UN) bodies, the International Committee of the Red Cross (ICRC), and the military. The scale of the disaster was so large that in the early stages of the crisis it was only possible to get aid to a few of the worst affected areas with the use of military resources. The 2004 tsunami finally provided evidence that the effectiveness of the emergency aid response hinges on logistics speed and efficiency (Pettit et al. 2011), thereby increasing awareness of the crucial role of logistics in humanitarian relief operations (Christopher and Tatham 2011).

In the wake of the 2004 tsunami, all emergency response systems had to be reviewed and overhauled. At first, the UN established the Humanitarian Response Review (HRR) in 2005, representing one of the most significant attempts in coordinating humanitarian response and disaster management (Altay and Labonte 2011). Then, the HRR led to a major innovation—the Cluster Approach (CA). The CA identifies different sectors, and it assigns a specific role to each of them (cluster lead) within the UN system. For example, the leading role of water and sanitation was assigned to UNICEF, emergency shelters to UNHCR, emergency telecommunication to OCHA, and logistics to WFP.

The WFP (World Food Programme)—the leader of the logistics cluster—has established five Humanitarian Response Depots in key locations around the world: Brindisi, Italy; Panama City, Panama; Accra, Ghana; Dubai, UAE; and Subang, Malaysia. In addition to storage services, the WFP improved logistic preparedness and inter-agency coordination, training programs, tracking systems, online toolkits, and manuals (WFP 2015).

Other than UN bodies, a number of companies in different sectors have developed emergency-response capabilities (Budhiraj and de la Torre 2010): in manufacturing (Coca Cola, GlaxoSmithKline), in retail (Home Depot, Lowe’s, Target, Wal-Mart), and in transportation (Federal Express). DHL employees, for example, recognized that conventional transport containers, such as boxes, are often insufficiently robust. Instead, they used durable, waterproof DHL courier bags to deliver goods as part of the relief efforts to remote and inaccessible

areas. When packed with donated relief goods, these “DHL speedballs” can hold up to 25 kg; they are better able to withstand airdrops and stay afloat longer than other containers (DHL 2015).

It can be said that humanitarian logistics has become far more sophisticated and robust in the last decade. However, as has often been pointed out, the most difficult part in humanitarian logistics is the local “last mile” (Fenton 2013). That is to say, it is relatively easy to deliver food and water to a big city, but it still remains an open question whether the people in remote rural communities could actually get the necessary food and water smoothly. As far as we know, there is no report that has studied the actual situation of rural areas in terms of food and water. It has to be confirmed because the actual situation of rural areas is critically important for both food security and disaster studies.

Then, Typhoon Haiyan hit the Philippines in 2013. Over a 16-hour period, the “super typhoon,” with a force equivalent to a Category 5 hurricane, directly swept through six provinces and affected over 10% of the nation’s population of 105 million people. Haiyan’s estimated wind speeds were between 195 mph and 155 mph, with wind gusts of up to 235 mph. (By contrast, Hurricane Katrina had wind speeds of 140 mph at landfall.) The typhoon knocked out power, telecommunications, and water supplies. Between 65% and 90% of structures were heavily damaged or destroyed. Three weeks after the typhoon, more than 5,000 deaths and 1,600 people missing were reported (OCHA 2013).

Haiyan caused a massive demand for humanitarian assistance requiring effective humanitarian logistics. In terms of humanitarian logistics, Typhoon Haiyan served as a real test. The success would be measured by the effectiveness of logistics, whether food and water were actually delivered or not, particularly in the first few days after the typhoon struck (i.e., the immediate response phase). According to media reports, three days after the typhoon hit, food assistance by WFP reached the city of Tacloban (UNiFEED 2013). The WFP distributed rice and high-energy biscuits (HEBs) to more than 170,000 people. It is, however, still unknown whether the food assistance could reach the remote rural areas and how those people endured difficult conditions until the food came. For these reasons, the purpose of this study is to confirm (1) when the people in remote rural areas could get food, water, and other relief goods, and (2) what the actual needs of the people were at that time. In other words, we intended to record the real situation of the local “last mile” for the future research of food security and logistics.

2. Research Methods

2.1. The study site

Typhoon Haiyan quickly created a humanitarian crisis. The hardest-hit areas were the coastal communities in Leyte Province and the southern tip of Eastern Samar.

In particular, the city of Tacloban (population 220,000), capital of Leyte Province, was one of the hardest-hit places and a scene of concentrated destruction and death. Thousands of Tacloban residents likely drowned in a “two-story-high” storm surge, including people seeking safety in a sports stadium that served as a shelter (Bradshear 2013). In fact, however, many observers and aid workers feared even greater desperation in more remote areas beyond the cities, where there was little or no communication.

It is appropriate for our study to choose a remote and rural area as the study site in order to obtain a better understanding of the effectiveness of logistics. Therefore, we chose Tolosa in Leyte Province as our study site, which is located 24 kilometers south of Tacloban City.

Tolosa was one of the poorest parts of the Philippines. Since the people in the area had no access to big markets, humanitarian relief seemed to be vital. To make things worse, most of the population depends on agriculture. This means if their agricultural resources are destroyed by a typhoon, harmful effects will last for long time.

2.2. Structured and in-depth interviews

Structured interviews were conducted at Capangihan Barangay (Village) in Tolosa Municipality in Leyte Province to collect basic information such as the lack of food, water, and other essential goods. The reason that structured interviews were used instead of questionnaires was because most of the residents in the barangay were illiterate. The interview questions were arranged into several variable groups, including demographic data, damage data, relief information, agricultural problems, and chronological events before and after the typhoon struck (see the appendix). With the cooperation of the University of the Philippines, the survey was conducted with 50 households on May 27th through 29th in 2014. And this was followed by in-depth interviews so as to understand the post-disaster problems in detail.

3. Results

3.1. The agriculture of Capangihan Barangay

Capangihan is one of the small barangays (villages) in Tolosa, whose population is allegedly around 600. Most residents engage in agriculture. In fact, among 50 households, we interviewed 35 people (70%) who were engaged in agriculture, of which 14 were land owners and 28 were wage laborers on the farmland (Fig. 1). The main commercial crops were coconut and rice. Other than that, they also cultivated tomato, squash, gourd, sweet potato, okra, corn, mango, etc. The wages of the laborers in the farmland were very low, around 200 pesos (4.5 US dollars) per day. Most residents had been living there for more than 20 years.

3.2. The typhoon damage

According to the answers of the interviews, most residents in Capangihan Barangay evacuated to relatively safe places before the arrival of Typhoon Haiyan. This is because the captain of the barangay announced that the typhoon would be so huge that everyone had to evacuate. The power of the typhoon, however, was bigger than expected, so some of them had to evacuate to another safer place again because their primary shelter was blown away. A woman said that she had to crawl on hands and knees for 300 meters in the middle of the heavy storm. She saw pigs were flying in the high air, and iron roofs of houses were flying, too.

Fortunately, nobody died in Capangihan Barangay due to the advance evacuation, but almost all houses collapsed completely (Fig. 2). The damage to agriculture was so huge that fallen trees were scattered everywhere. One farmer used to cultivate 400 coconut trees, but only 50 remained after the typhoon. Coconut trees usually show substantial resistance to heavy wind, thus thousands of coconut trees

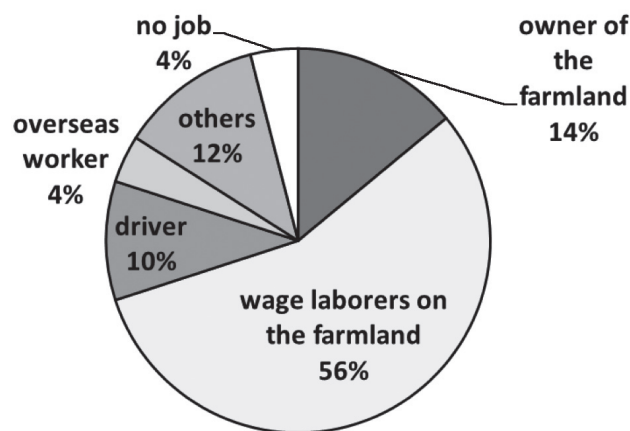


Figure 1: The occupations of the residents in Capangihan Barangay (N=50)

used to be planted in such a typhoon-prone area. However, Typhoon Haiyan was unexpectedly enormous. Another elderly farmer who also lost most of his coconut trees said

that he had never seen such devastation in 68 years. It is beyond doubt that Capangihan Barangay was one of the most severely damaged areas by the typhoon.

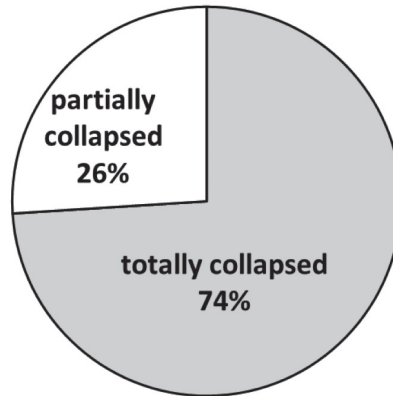


Figure 2: The damage to the houses caused by Typhoon Haiyan (N=50).

3.3. The food and water shortage immediately after the typhoon struck

The interviews revealed that more than 70% of the residents suffered from a lack of food for the first few days immediately after Typhoon Haiyan struck, and this suffering lasted for a week (Fig. 3). Then, the lack of food declined sharply during 7 to 14 days after the typhoon struck. On the other hand, about 30% of the residents answered they had enough food immediately after the typhoon. This did not mean the relief foods were delivered soon after the disaster, but it meant they had a stock of food in their own broken houses. In fact, the relief goods were delivered to almost everybody during 7 to 14 days after the disaster.

A similar tendency was observed for water. At first, many suffered from a lack of water, and then the lack of water declined as time went by. However, in contrast with the food shortage, only 40% of the residents claimed they had too little water to drink soon after the typhoon (Fig.4). This did not mean the bottles of relief water were delivered immediately, but that there was a water-pump in the village and it was still available even after the disaster. The relief water was delivered during 7 to 14 days after the disaster like food.

In summary, it was almost one or two weeks after the typhoon struck when the relief goods reached this village. Until then, lots of people suffered from hunger unless they had a stock of food in their houses.

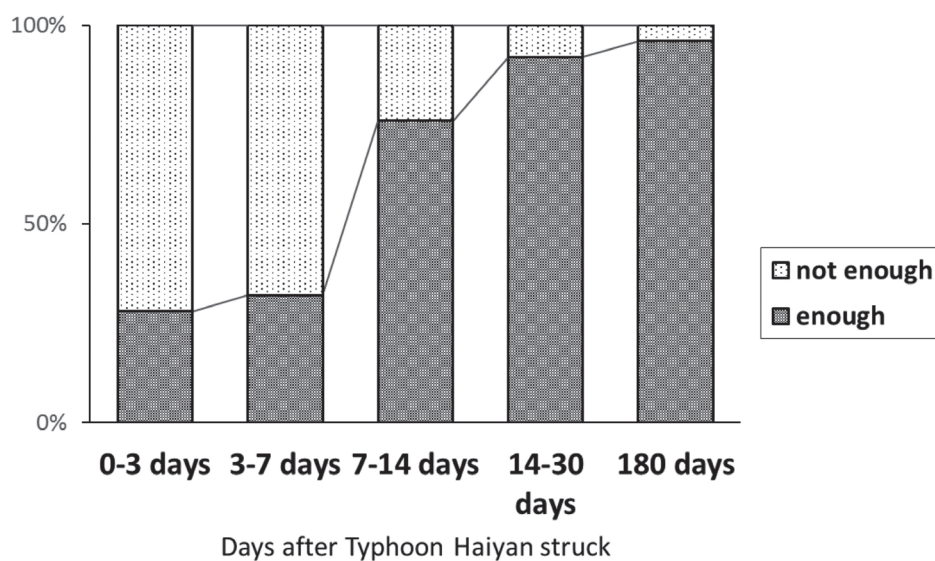


Figure 3: The food shortage caused by Typhoon Haiyan (N=50).

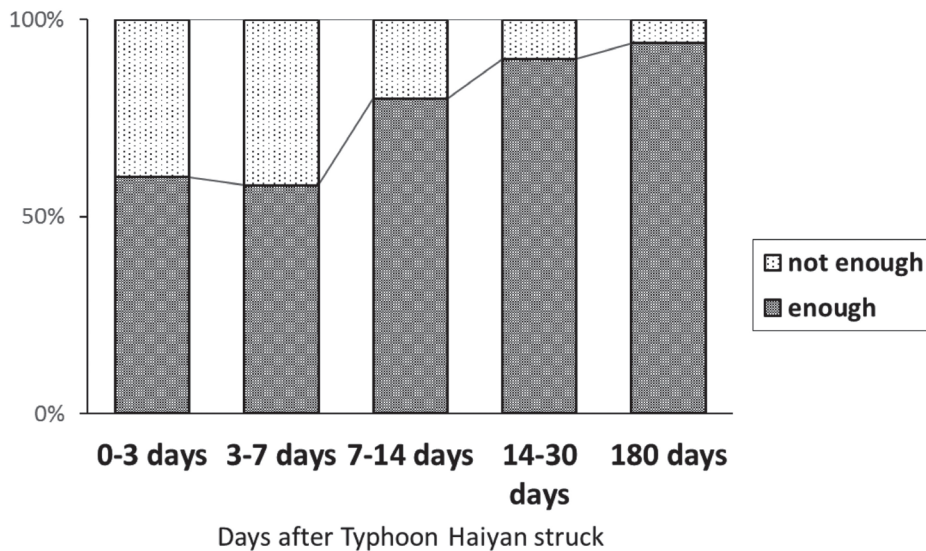


Figure 4: The water shortage caused by Typhoon Haiyan (N=50).

3.4. What was needed most at that time?

The interview results revealed a clear tendency regarding what was needed at that time (Fig. 5). In the first one week, most people wanted food and water, but after that, the need for food and water decreased dramatically due to the arrival of relief goods. Instead, the need for building materials for their shelters increased. This appeared to be the Philippines’ distinctive trend compared with other Western countries or Japan. In Japan,

for example, immediately after the giant earthquake and tsunami in 2011, the demand for temporary housing rose dramatically. In the Philippines, on the other hand, people tended to demand not temporary housing but building materials such as nails, hammers, saws, and iron sheets for roofs. For them, building their own houses by themselves seemed to be a quite natural practice. About two weeks after the typhoon, the demand for building materials began to decrease gradually, and the demand for financial assistance increased instead.

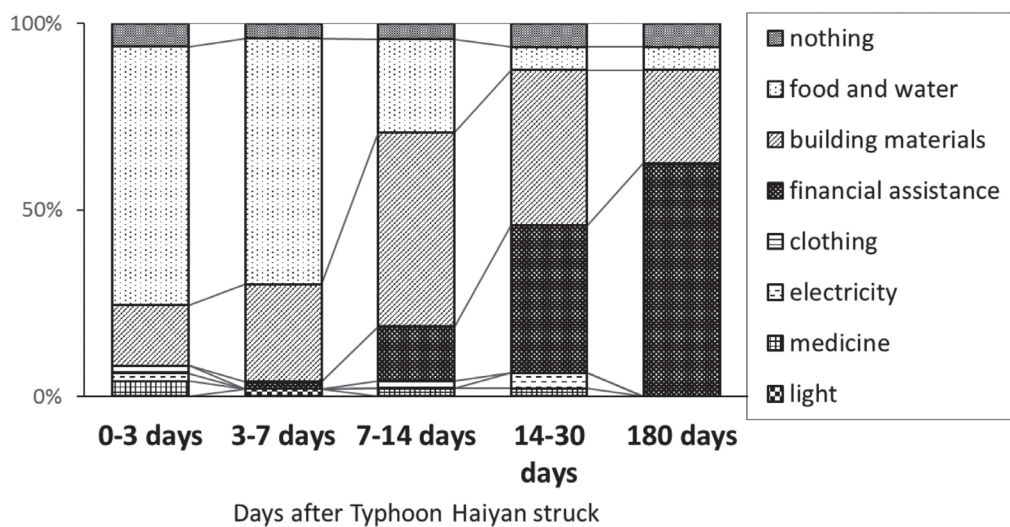


Figure 5: The people’s answers to the question “What did you need most?” (N=50).

The answers to the question “What kind of goods did you receive after the typhoon?” are shown in Figure 6 (about food) and Figure 7 (about materials). These results also revealed an interesting contrast between the Philippines and developed countries like Japan. In Japan, immediately after the giant tsunami, many cooked foods such as rice balls or boxed meals were delivered, while in the Philippines, most of the delivered foods were raw rice, vegetables, salt, and sugar. When it comes to the delivered goods, blankets, medicines, and sanitary napkins were common in both the Philippines and Japan, but waterproof

sheet, hammers and saws, iron sheet, and nails were distinctive as already mentioned.

Table 1 lists the donors and volunteers who actually helped Capangihan Barangay. There must be many more organizations that helped them, but these 22 organizations were names that people could remember. There were some abbreviations whose correct names we cannot figure out, but most of the names on the list were international organizations. So this list clearly proved that a variety of international logistics channels were actually used immediately after Typhoon Haiyan struck.

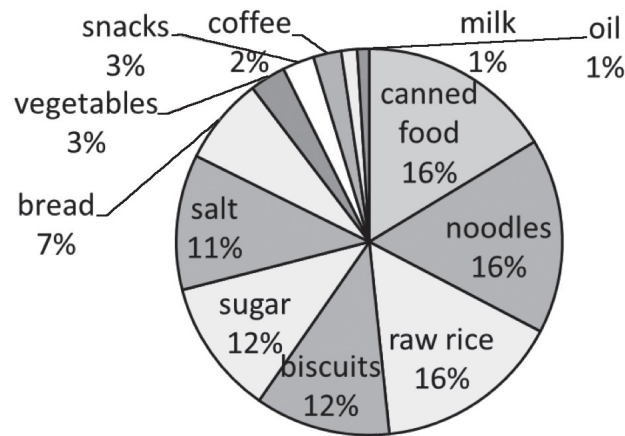


Figure 6: What kind of food was delivered? (N=300).

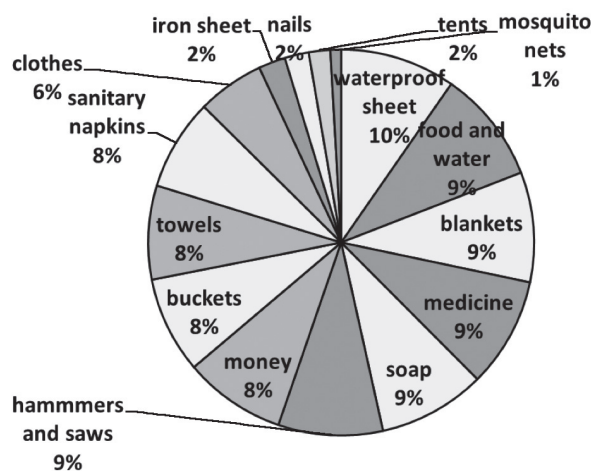


Figure 7: What kind of materials were delivered? (N=445).

Names and abbreviations of organizations
ABC-CBN
Accord Care
ChildFund,
Christian Aid
Christian Hyde
CRS (Catholic Relief Services)
DSWD (Department of Social Welfare and Development)
GMA
ICAN
NAMI
NASA
Northern Access Mining Inc.
PLAN
Red Cross
Samaritan's Purse
Save the Children
Senior Citizens
TVS
UK AID
WFP (World Food Programme)
World Vision

Table 1: The list of donors and volunteers

4. Discussion

4.1. The unique problems in the area

Although nobody died in Capangihan Barangay, almost all of the houses were torn down. Moreover, their living conditions have been deteriorating due to Typhoon Haiyan. The in-depth interviews revealed unique problems in this area.

Since most people in this area depended on coconut farming for a living, the death of coconut trees was more critical than losing houses. According to residents' words, it will take ten years to grow coconut trees again sufficient to bear fruit. Therefore, they will have to subsist on other sources of income for the next ten years.

In addition to that, the typhoon exposed a conflict between land owners and wage laborers on the farm land.

For example, a wage laborer's family had been living in their house for more than 60 years, but after Typhoon Haiyan struck, the land owner forbade them to rebuild their house because the land owner wanted to sell the land on which they had lived. That is to say, the land owner took advantage of the typhoon to expel the wage laborers from his land. The wage laborer's family, however, did not have any place to go, so the only choice left was to go downtown and become squatters. Therefore, the wage laborer's family decided to refuse eviction and to stay in their original house. The land owner then began to harass them with some violence. This led to the fleeing of a pregnant woman who felt her life was in danger.

As described above, the damage of the typhoon was not only in visible cases, but also in invisible cases like the relationship between land owners and wage laborers.

4.2. The resilience of a rural community

As mentioned earlier, rice and high-energy biscuits were distributed to Tacloban City within three days after the typhoon hit, but this study confirmed that the food assistance reached Capangihan Barangay in one or two weeks after that. Experts would be split on whether this two-week period was too late or not. At least, however, because it missed the critical “72-hour response time,” there is room for improvement.

At the same time, it was also a fact that in Capangihan Barangay, more than 60% of the people had enough water during those two weeks, and almost 40% had enough food. This fact might indicate the resilience of rural areas. In the case of Capangihan Barangay, the primary reason that people did not suffer much without any food and water assistance was because they had a water pump in the village that worked well after the typhoon hit, and they could also find vegetables in the farm fields. In addition to these advantages, the strong social bond in the barangay seemed to be a great factor. The barangay leader not only gave everybody appropriate disaster warning before the arrival of the typhoon, but also evacuated some villagers who lived in weak shanty houses to strong concrete houses. These efforts led to the good result of no fatalities even in the miserable situation where three-quarters of the houses collapsed completely.

In sharp contrast to this rural area’s resilience, many studies have suggested the vulnerability of urban cities (Havlick 1986; Matsuda 1990; etc.). The most common reasons are:

- Most of the cities are usually located on soft lowland plains that are prone to damage by earthquakes and floods.
- Roads in the residential areas are narrow, and open spaces are scarce.
- There are many urban facilities that have not yet experienced a strong earthquake, such as skyscrapers, underground complexes, highways, and so on.
- The city slum residents often have little alternative other than to occupy unsafe land, construct unsafe habitations, or work in unsafe environments.

One example of such a case was the loss of life in flash flooding and mudslides in Caracas, Venezuela in 1999 (IFRC 2001). Thirty thousand people died and 100,000 were displaced by this disaster in the densely populated coastal hills. Another tragic case, in 2001, was the mass movement of compacted garbage at an open-air solid waste plant that was triggered by heavy rainfall. This dump on the northeastern edge of Manila is called Payatas, where 2,000 people lived in shacks, working as informal material recyclers—700 were killed (Westfall 2001). The Latur earthquake of 1993 in India is another example. In this case, the primary victims were the wealthy city dwellers because they lived in non-reinforced heavy masonry dwellings that collapsed due to the earthquake while the

majority of the rural poor lived in safer lightweight houses (IFRC 1994).

The results of this study seemed to support the idea of the resilience of rural areas and the vulnerability of urban cities. However, rural areas must have vulnerabilities as well. For example, in a similar case to this study of a coastal storm, Hurricane Mitch in 1998 killed 27,000 people in rural areas in Honduras and Nicaragua (Lavell 2002). A major reason for these deaths was that the poor peasants had no choice but to live on steep slopes and on flood plains that were extremely unstable due to deforestation.

Yet from a different point of view, it is also a fact that in many rural areas, hazards, especially floods, are welcomed by the inhabitants as a means of natural irrigation because once the waters recede, people can practice flood-retreat agriculture, sowing their seeds in the wet soil. In Bangladesh, the regular annual floods that affect much of the country help to restore the soil’s fertility with a new layer of productive silt. This process is essential to life and livelihoods, and supports the dense population of farmers and fishermen (Schmuck-Widmann 1996).

4.2. Food security in the case of natural disaster

This study revealed the actual situation of the disaster-hit area from the point of view of food and water. Predicting typhoons is easier than predicting earthquakes or volcanic eruptions, so many international organizations must have prepared for Typhoon Haiyan, but the results confirmed that the local “last mile” was difficult. Delivering food to rural areas took an extra one or two weeks from the key city. Of course, shortening this time-lag would be ideal, but it seems to be difficult.

At the same time, this study revealed the resilience of rural areas due to their food stocks, water pumps, and strong social capital. This finding reminds us of the importance of a food stock. This means people in a remote rural area have to survive 7 to 14 days without any outside help until the food delivery comes. Thus, food and water stocks are critical.

As a precursor of a food stock, the Food and Grocery Sector Group in Australia developed and maintains a web-based pantry list (“Emergency Pantry List—ensuring the supply of critical foods and essential items for Australian conditions,” at www.pantrylist.com.au) to encourage households that are willing and able to stockpile food for emergencies, such as a pandemic, infrastructure failure, or natural disaster. The pantry list focuses on raising community awareness and self-reliance, in order to reduce demand on food channels during prolonged emergencies and therefore strengthen food supply chain resilience. Because of its effectiveness, the concept has also been adopted in Canada, New Zealand, and California.

In conclusion, food security in every country including Japan has to prepare for the disruption of food chains by natural disasters and in the event of a disaster, different approaches should be taken for rural areas from city areas.

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APPENDIX

The questions in the structured interviews

Information about the household head (HHH)

Name, Sex, Age, Occupation, Marital status, Highest grade completed, Birth place, Length of residence in this barangay.

Information about household members:

Number of household members living together, number of family members temporarily away from this household, Name, Age, Sex, Relationship to HHH, Highest education completed.

Chronological events before and after Typhoon Yolanda hit

The moment Yolanda hit

Q1. Where were you? What happened? The biggest problem was...

The first few days after Yolanda (0-3 days)

Q2. Where were you? What happened? The biggest problem was...

Q3. Did you have enough food and water? Who helped you? Who gave you food and water? What did you need most?

3-7 days

Q4. Where were you? What happened? The biggest problem was...

Q5. Did you have enough food and water? Who helped you? Who gave you food and water? What did you need most?

7-14 days

Q6. Where were you? What happened? The biggest problem was...

Q7. Did you have enough food and water? Who helped you? Who gave you food and water? What did you need most?

14 days to 1 month after Yolanda

Q8. Where were you? What happened? The biggest problem was...

Q9. Did you have enough food and water? Who helped you? Who gave you food and water? What did you need most?

At present

Q10. What is the situation now? Do you have enough food and water? Is there anybody helping you?

Q11. Who is helping you? Who gives you food and water? What do you need most?

About food security

Q12. What kind of food assistance did you receive after the typhoon?

1. raw rice 2. cooked rice 3. canned food 4. noodles 5. biscuits 6. bread 7. snacks
8. sugar 9. salt 10. others (_____)

Q13. Did you receive any of the following after the typhoon?

1. food and water 2. blankets 3. clothes 4. tents 5. temporary shelters 6. permanent shelters
7. medicine 8. money 9. gas (petrol) 10. soap 11. towels 12. buckets 13. waterproof sheet
14. sanitary napkins 15. hammers and saws 16. others (_____)

Q14. When was it that your everyday food situation returned to the pre-typhoon level?

1. several days after the typhoon 2. one week after the typhoon 3. two weeks after the typhoon
4. one month after the typhoon 5. two months after the typhoon 6. still far from enough at present

About food security

Q15. Is there anybody in your household who died or is still missing due to the typhoon?

1. Yes (How many? _____). 2. No

Q16. Is there anybody in your household who was severely injured by the typhoon?

1. Yes (How many? _____). 2. No

Q17. What was the extent of damage to your house?

1. Totally destroyed 2. Partially destroyed 3. No damage

Q18. How long do you think it will take (or did it take if completed) to repair or reconstruct your house?

1. one month 2. three months 3. six months 4. more than one year 5. no intention to repair

Q19. Did any volunteers come to help you?

1. Yes → Who/what organization? _____
2. No

Q20. Did you get any assistance from abroad?

1. Yes → Which country? _____
What kind of assistance? _____
2. No

About agriculture

Q21. Are you a farmer?

1. Yes, I do farming for living. 2. I grow crops but not for living. 3. No, I don't do farming.

Q22. Do you have your own farmland?

1. Yes, I have my own farmland (and do not work on other people's land).
2. Yes, I have my own farmland (and also work on other people's land).
3. No, I don't own farmland; I am a tenant.
4. No, I don't own farmland but I work on other people's land as a wage laborer.

Q23. What kind of crops do you cultivate? Circle the most important crops.

1. rice area _____ ha
2. coconut number of trees/ _____ ha
3. pineapple
4. others _____

Q24. What kind of livestock (domestic animals) do you have?

1. chickens
2. cows
3. carabaos
4. pigs
5. others _____

Q25. How much do you earn annually from farming? _____ pesos

Q26. Total annual household income including both farming and non-farming income

_____ peso per a year

Q27. How much were your crops or animals damaged?

1. No damage
2. less than half (50%)
3. 50-80%
4. more than 80%

Q28. (To Rs who were engaged in farming) Are you growing the same crops now?

1. Yes
2. No → What crops are you growing? _____

Q29. How long will it take (or did it take) to repair or reconstruct your farmland?

1. one month
2. six months
3. one year
4. more than a year
5. impossible
6. no intention to repair

Q30. (To Rs who were engaged in farming) What kind of problems do you have in growing crops now?

About disaster information

Q31. Did you know that the typhoon was going to be so huge before it arrived?

1. Yes → Where did you get that information?

1. radio
2. TV
3. newspaper
4. internet
5. neighbors/friends

6. others _____

2. No

Q32. Did you receive an order or instruction to evacuate before the typhoon hit your village?

1. Yes 2. No

Q33. Was there a designated evacuation place in advance?

1. Yes 2. No

Q34. Have you ever been taught what to do in a time of disaster such as typhoon, earthquake, and tsunami in school?

1. Yes 2. No

Q35. Have you ever had evacuation drills for a big disaster like this before?

1. Yes (more than once a year) 2. sometimes (less than once a year) 3. never

About social capital

Q36. How often did/do you have dinner with your friends or relatives

1. before the typhoon? (seldom) 1 _____ 2 _____ 3 _____ 4 _____ 5 (very often)
2. after the typhoon? (seldom) 1 _____ 2 _____ 3 _____ 4 _____ 5 (very often)

Q37. How likely is it that you would ask your neighbors to take care of your children for a few hours if you were sick?

- (not likely) 1 _____ 2 _____ 3 _____ 4 _____ 5 (very likely)

Q38. How likely is it that you would ask your neighbors for help if you were sick?

- (not likely) 1 _____ 2 _____ 3 _____ 4 _____ 5 (very likely)

Q39. How well did/do people in this barangay get along

1. before the typhoon? (not well) 1 _____ 2 _____ 3 _____ 4 _____ 5 (very well)
2. after the typhoon? (not well) 1 _____ 2 _____ 3 _____ 4 _____ 5 (very well)

Q40. How would you rate the togetherness or feeling of belonging in this barangay

1. before the typhoon? (not close) 1 _____ 2 _____ 3 _____ 4 _____ 5 (very close)
2. after the typhoon? (not close) 1 _____ 2 _____ 3 _____ 4 _____ 5 (very close)

Q41. Do you belong to any of the following groups/organizations or participate in the following activities in this barangay?

	Name (if any)	**Frequency of participation
1. Peace/safety/disaster relief		
2. Religious		
3. Political		
4. Economic (e.g., co-operative)		
5. Social/cultural/recreational		
6. Other organizations or activities		

**Frequency 1. Every week 2. Every other week 3. Once a month 4. Rarely

Q42. How much do you feel you can trust the people in each of the following groups?

(not at all) 1 _____ 2 _____ 3 _____ 4 _____ 5 (to a very large extent)

- 1. People in this barangay _____
- 2. People in neighboring barangays _____
- 3. Family _____
- 4. Local government units _____
- 5. Government service providers (education, health, electricity, water) _____
- 6. Politicians _____
- 7. Judges, police, court _____

Q43. Generally speaking, would you say that you can't be too careful in dealing with people, or that most people can be trusted?

(can't be too careful) 1 _____ 2 _____ 3 _____ 4 _____ 5 (most people can be trusted)

About the aftereffects

Q44. Can you sleep well now?

1. can sleep well 2. sometimes difficult to sleep 3. always difficult to sleep 4. can't sleep at all

Q45. Do you experience flashbacks of the fear of the typhoon?

1. Yes. → How often?

1. everyday 2. several times a week 3. several times a month 4. rarely 5. never

2. No.

Q46. Did you have debt before the typhoon?

1. Yes. → Did your debt increase after the typhoon?

1. increased a lot 2. increased a little 3. No change 4. decreased

2. No.

Q47. What factors do you think helped you to survive over the past six months?

Q48. Your opinion (What do you want to teach the next generation as a lesson learned from this disaster?)

Thank you for your cooperation!!