MONASH University

Understanding Disaster Vulnerability in the Vietnamese Mekong Delta

Kien Nguyen-Trung

BA (USSH, Vietnam National University)
GradDip, MA (Flinders University)

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To my Mum and Dad, my Wife and two beautiful Daughters

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Abstract

This thesis explores the contribution of agency and social structures to the evolution of the social vulnerability in the Vietnamese Mekong Delta (VMD), following a historic drought and saline intrusion in late 2015 – early 2016. Based on qualitative case study research, I conducted 28 farm household interviews, 21 key informant interviews with stakeholders, documentary and archival records analysis, and direct observation. I employ secondary quantitative data analysis, quantitative analysis of household data, and thematic analysis of qualitative data to provide a comprehensive assessment of the topic.

Drawing on Bourdieu's theory of practice, I consider farmers as the agents, who have capacities to make decisions and take actions under the enabling and constraining conditions of the field of agriculture. In the present timeframe, I examine how they form their perception of risks and natural hazards in everyday life. Positioning crop production at the centre of their lives, farmers ranked natural hazard risks as the most fearsome threat, ahead of rice pests, pathogens, and market instability. Farmers described the 2015-2016 disaster as a crop failure, identifying physical happenings, financial effects, crop damages and psychological burdens. They were able to identify the contributing factors leading to the event.

While some criticised government officials for the occurrence of the disaster, farmers actively accepted their responsibility for contributing to the event. This reflects their collective habitus that is formed upon the use of cultural capital (belief in rice and land values, normalising risks), economic capital (land, money, assets), and social capital (bonding, bridging and linking relationships). The habitus shown in the use of these capitals for risk management strategies have been connected to deeply buried social structures, which can be dated back to the transformation of the agricultural field in the post-reunification of Vietnam context. The Vietnamese state, the dominant agent of the political field, pursued a food politics that turned the VMD into a 'rice bowl', took on agricultural modernisation with an emphasis on agricultural intensification and large-scale irrigation work construction. As a result, farmers were motivated to transform their habitus and cropping practice, which has seen them transitioning from a single cropping to a triple cropping system, putting themselves in a position of planting a risky crop 3 that was vulnerable to the present conditions of natural hazards (i.e., saline intrusion). In short, I argue that the current disaster vulnerability is a product of historical interplay between social structures and farmers' agency.

Declaration

This thesis is an original work of my research and contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

Signature: 

Print Name: KIEN NGUYEN-TRUNG

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Abbreviation and Terminology

CPV	The Communist Party of Vietnam.
Commune Government	The lowest legal administrative entity in Vietnam's political system. The highest level is the central government, based in the capital, Hanoi, followed by provincial government, district government, and commune government.
CHES	The Coupled Human-Environment System developed by Turner and colleagues (2003).
CPC	The Commune-level People's Committee is defined by Vietnam's Institution (2013) as the local administration level, elected by the People's Council of the same level, performs the role of the executive body of the respective People's Council and is the local state administrative body.
Crop 1	The Summer-Autumn rice crop or the first rice crop.
Crop 2	The Autumn-Winter rice crop or the second rice crop.
Crop 3	The late Winter-Spring rice crop or the Spring-Summer rice crop or the third crop.
DROP	The Disaster Resilience of Place model developed by Cutter and colleagues (2008).
DPC	District-level People's Committee is the administrative body at the district level.
PPC	Province-level People's Committee is the administrative body at the provincial level.
PAR	The Pressure and Release Model.
Ha	Hectare.
HH	Household.
HHI	Household interviews. (Each HHI is assigned an ID, ranging from HH1 to HH28.)
GoV	The Government of the Socialist Republic of Vietnam.
KII	Key informant interviews. (Each KII is assigned an ID, ranging from KII1 to KII21.)
Km	Kilometres.
Large cong	The area unit of local farmers in Village A. Each large cong equals 0.13 ha or 1,296 m2.
Land use	In Vietnam, land is not owned by individuals/households but by the State as the people's representative. The State hands individuals/households a certificate of land use right for a certain land parcel.
LMB	The Lower Mekong Basin including Laos, Cambodia, Thailand and Vietnam.
MRC	The Mekong River Commission, an intergovernmental organisation, formed in 1995 to promote regional dialogue and cooperation in the Lower Mekong River Basin, based on the Mekong Agreement between Cambodia, Lao PDR, Thailand and Vietnam.
MARD	Vietnam's Ministry of Agriculture and Rural Development.
MOLISA	Vietnam's Ministry of Labour, Invalids and Social Affairs.
MONRE	Vietnam's Ministry of Natural Resources and Environment.

MO	Mass organisations are a type of socio-political organisation formed to help Vietnam's Communist Party (VCP) and the State implement their policies and support people in social welfare at the grassroots level.
MPI	Vietnam's Ministry of Planning and Investment.
MIT	Vietnam's Ministry of Transport.
M	Metres.
NAV	The National Assembly of Vietnam.
NCHMF	The National Centre for Hydro-Meteorological Forecasting is a governmental body under the Vietnam Meteorological Hydrological Administration (VMHA).
NTP-NRD	The National Target Programme on New Rural Development was launched in 2009 to promote industrialisation and modernisation in rural settings.
United Nations	An international organisation founded in 1945 which currently includes 195 member states.
UNDP	The United Nations Development Programme is the United Nation's global development network formed in 1965 to support countries in achieving human development and sustainable development goals.
IPCC	The Intergovernmental Panel on Climate Change.
Poor and near-poor household	Household poverty statuses that are determined by the official poverty line issued by Vietnam's Ministry of Labour, Invalids and Social Affairs (MOLISA). Poor and near-poor households have an income of VND 1,000,000/month/capita (US$42.9).
Standard cong	The area unit of local farmers in Village B. Each standard cong equals 0.1 ha or 1,000 m2.
GSO	The General Statistics Office of Vietnam works under the Ministry of Planning and Investment (MPI) and is in charge of collecting and providing statistical data.
VMHA	Vietnam Meteorological Hydrological Administration.
VFA	Vietnam Food Association.
Village	Village is a self-governed settlement unit under the administration of a commune government.
VMD	The Vietnamese Mekong River Delta is located in the southern part of Vietnam.
VND	Vietnamese Dong. Each USD equals $23,270 VND (the rate recorded on 27 July 2020 by JSC Bank for Foreign Trade of Vietnam [Vietcombank]).

CHAPTER 1. INTRODUCTION

Problematising Vulnerability Studies

Disasters have been the focus of many interdisciplinary studies in recent decades. To the best of my knowledge, most studies have typically focused on sudden-onset natural hazards such as cyclones (Islam & Walkerden, 2014; Islam, Walkerden, & Amati, 2017), hurricanes (Aldrich, 2012b; Aldrich, Oum, & Sawada, 2015; Meyer, 2013), earthquake (Aldrich, 2011b; Yamamura, 2013), or flash floods (Andrew et al., 2016; Brouwer & Nhassengo, 2006; Wickes et al., 2015). Yet, there is less research undertaken on how slow-onset disasters such as drought, sea level rise, saline intrusion, or desertification are linked to the formation and evolution of vulnerability (Enarson, Fothergill, & Peek, 2007; Glantz, 1999; Staupe-Delgado & Kruke, 2017; Zebiak et al., 2015, T.B. Nguyen, 2015). Unlike sudden-onset hazards, slow-onset natural hazards are not known for immediately and detectably devastating effects such as house destruction, infrastructure damage, death, or the displacement of people. Instead, they are embedded in human intervention and the accumulation of environmental changes over time before becoming full-blown disaster(s) (Glantz, 1999). Studying these creeping hazards helps unravel the accumulating structural changes within the affected society and contribute to conceptual and empirical understanding of vulnerability.

It was a general belief that the concepts of natural hazards and disasters are synonyms. Disasters thus were often described in terms of the occurrence and the impacts of natural hazards. However, since the 1970s to the 1980s, there has been a new belief among disaster researchers and social scientists including sociologists and anthropologists that natural hazards and disasters are two different concepts: hazards are natural agents, while disasters are social phenomena (Oliver-Smith, 2015; Perry, 2007; Perry & Quarantelli, 2005; Quarantelli, 1989; Quarantelli, 2000; Wisner, 2016). As a result, the social conditions and capacities of the affected society rather than just the natural agents should be the focus in unveiling the root causes of disasters. To uncover these causes is to grasp why and how social vulnerability – the internal conditions that lead to possible sufferings when encountering natural hazards has formed and evolved (Adger, 1999; Cutter, Boruff, & Shirley, 2003; Hewitt, 1983; Quarantelli, 1998c; Wisner et al., 2004). Poverty, social inequality, lack of access to decision-making and relevant resources, and lack of coping and adaptive capacities are among the most visible

manifestations of social vulnerability (Adger & Kelly, 2012). Despite a large body of literature on vulnerability to natural hazards, scholars often focus on the physical determinants of vulnerability (e.g., the fragility of infrastructure, the lack of embankments) while tending to neglect the social aspects which are rooted deeply inside social systems (Blaikie et al., 1994; Enarson, Fothergill, & Peek, 2007; Wisner et al., 2004). Studies of slow-onset hazards in the Vietnamese Mekong Delta tend to focus on the present time frame (Birkmann et al., 2012; T.B. Nguyen, 2015), missing chances to unveil the transformation of vulnerability in association with human choices across time and space. In a study of a Peruvian earthquake in 1970, Oliver-Smith (1999a) demonstrates this historical analysis by tracing the root causes of this disaster to five hundred years ago and claims that the human choices shown in settlement location, settlement plan, along with building techniques and materials have contributed to the present occurrence of such a catastrophe. These factors combined with a skewed economic system, a weak industrial sector, a high illiteracy rate, chronic poverty, and an unstable political system already placed Peru in a vulnerable position before confronting the earthquake (Oliver-Smith, 1999a). The current study aims to replicate Oliver-Smith's (1999a) work in the context of a slow-onset disaster with the purpose of understanding vulnerability from the perspective of agency and social structure.

Sociologists have long questioned whether human agency or social structure is more important in shaping social outcomes. Human agency refers to the capacity of agents (individuals) to take meaningful actions in their social world. Social structures refer to the external conditions (rules, resources/capital) that enable and constrain human agents (Giddens, 1984; Bourdieu, 1977). In his theory of practice, Bourdieu claims that social structures produce habitus and habitus produces social practices, which in return reproduce social structures by its repetition (Bourdieu, 1977). In vulnerability research, the question can be modified to ask how agency and structure contribute to the shaping of social vulnerability to disaster. Disaster vulnerability has been approached and analysed from different perspectives such as the sustainable livelihood framework (Chamber & Conway, 1992; Chambers, 1989); the Pressure and Release model (PAR) and Access model (Blaikie et al., 1994; Wisner et al., 2004); the coupled human-environment systems (CHES) (B.L. Turner, 2010; B.L. Turner, Kasperson et al., 2003; B.L. Turner, Matson et al., 2003); the hazards-of-place of vulnerability model (Cutter, 1996, 2003); the disaster resilience of place (DROP) model (Cutter et al., 2008), or the MOVE framework (Birkmann et al., 2013); however, there is a minimal effort in explaining how social structures and agency interact with each other in the (re)production of vulnerability. Even in some

sociological collections (e.g., Rodriguez, Quarantelli, & Dynes, 2007), the role of human agency is also not properly addressed to see if agents passively follow social structures or actively reproduce or change their environments. This situation demonstrates a lack of theoretical depth (Enarson, Fothergill, & Peek, 2007) and the need to adopt sociological theories to guide empirical disaster research (Uekusa, 2017). This study aims to address this void by applying Bourdieu's theory of practice (1977, 1990) to analysing the formation and evolution of disaster vulnerability.

Additionally, while disaster research on such a topic often focuses on developed nations in North America and Europe, there is still limited evidence from developing countries (Andrew & Carr, 2013; Bankoff, 2003; Enarson, Fothergill, & Peek, 2007; Quarantelli, Lagadec, & Boin, 2007). Research on vulnerability in the social, economic, institutional, environmental contexts of these countries should contribute local/regional insights in disaster management and coping mechanisms that could counterclaim Western dominant approaches (Agrawal, 1995; Bankoff, 2003; Forsyth, 1996; Quarantelli, Lagadec, & Boin, 2007). My research aims to reduce this gap by looking at the disaster vulnerability in the context of Vietnam.

Questions from the Disaster Event

As of June 2016, 52 out of the 63 provinces and cities of Vietnam suffered severely from the combination of drought and saline intrusion, with 18 provinces declaring a state of emergency (UNDP, 2016). This was Vietnam's worst drought in recent decades. It lasted for about 20 months, from late 2014 to mid-2016 and resulted in the wet season starting late and ending early and the dry season being extended. The VMD suffered the greatest with a decrease in rainfall of 20-50 per cent below the annual average between November 2015 and March 2016, with no rain between January and March 2016 (UNDP, 2016, p. 6). The low rainfall and water flow levels of the river led to an intensification of the annual saline intrusion which was worse than the three highest salinity years: 1998, 2005 and 2010 (Mai et al., 2018, p. 374). The peak salinity concentration measured on February 8, 2016 at Cau Quan station (16.5 g/litre) was 5.7 g/litre higher than that recorded on April 8, 1998 (Mai et al., 2018). The saline attack occurred about one and a half months earlier than usual, with an intrusion length of 20-30 km further inland than expected and up to 60 km at the Hau River area (FAO, 2016; Mai et al., 2018; Southern Institute of Water Resources Research, 2016). The increase in saltwater intrusion

made the river water too salty for drinking or agricultural production. The total affected area reached 52.7 per cent of the Mekong Delta, which covered 10 out of 13 provinces and city (Mai et al., 2018). This caused the VMD a total economic loss of US$360 million (accounting for 53.4 per cent of Vietnam's total loss), and 244 thousand ha of rice crop losses (89.6 per cent of the country's rice crop losses) (Mai et al., 2018; United Nations, 2016a). Many local households experienced severe food insecurity as a result of the loss of food sources from agriculture. The lack of water for daily consumption also led to many skin and eye diseases. As a result, many local people migrated to big cities such as Ho Chi Minh City in search of employment (FAO, 2016; V. G. Nguyen & Ngo, 2016, 2017).

This situation shows the devastating effects of the 2015-2016 drought and saline intrusion that occurred in VMD and particularly the effects that occurred in the Tan Hung commune. The combination of these hazards caused a dramatic drop in agricultural production, especially in rice crop 3, which affected the local households' livelihoods. Following the historic crisis in the VMD, some commentators sought to identify the underlying causes of the disaster event. For instance, N.A. Nguyen (2017) blames three main factors: the lack of effective long-term hydro-meteorological forecast; the lack of effective prevention and responses activities from central to local governments; and ignorance of the overall water discharge from hydro-power reservoirs from China and Laos. The author later proposes three sets of solutions: immediate solutions focusing on the activities of local government and people in repairing and completing the local saline intrusion preventive embarkments and storing freshwater; medium solutions focusing on salinity intrusion works such as sea dike and sluice systems; and long-term solutions focusing on large-scale structures in the Mekong River estuaries such as sluice gates in Vam Co, Ham Luong, Co Chien, Cung Hau, and Cai Lon-Cai Be. While the author mostly concentrates on the role of 'hard' measures (infrastructure) and the preventive and responding capacities, he virtually ignores the structural roots within the affected social system which constituted the integral vulnerability to the 2015-2016 disaster. Unfolding these roots is the goal of this study.

Theoretical Considerations

In examining the root causes of the 2015-2016 disaster, the study first considers individual farming households as human agents who have capacity to perceive, judge and make their own

decisions in the field of agriculture. I question how and why local farming households as human agents took the risk of cultivating the third rice crop (from December to April) that eventually suffered from the 2015-2016 disaster. These questions were answered by exploring how farming households perceived the risks from natural hazards to their crop cultivation and what motivated them to take risks in planting the risky crop. Answering these questions is of particular importance to the case of 'creeping' natural hazards, which are often invisible and not detectable in the eyes of authorities and local inhabitants especially before they grow into a full crisis; therefore, disaster-prone groups are often not prepared with appropriate responses (Glantz, 1999; Staupe-Delgado & Kruke, 2017). In other words, less awareness of the crisis could impinge on disaster responses and could extend to recovery in the post-disaster context. Therefore, my objective was to address the risk perception and risk-taking endeavours in crop cultivation of local farmers.

Moreover, the study aims to uncover the structural conditions which led to the risk-taking practices of local farmers. Social structures, as features of social system, can be any rules and resources that could enable and constrain farmers' crop practices and their livelihood choices. Thus, they could be present in laws and policies concerning agricultural production, resources management (land, water), disaster risk management, and so on. Social structures in Bourdieu's sense are concretely demonstrated in fields, which are defined as the space of struggles between agents and institutions (Bourdieu, 1977; 1990). As such, rice crop cultivation can be regarded as part of the field of agriculture. This field is closely associated with the field of power (the political field) and other relevant fields such as industry and construction, services, disaster risk management. The government thus can be regarded as a key representative of the political field which occupies a strong and dominant position compared to farmers and other institutions within the agricultural field such as agricultural input suppliers, companies, brokers, merchants. From Beck's (1992) perspective, this position allows the government to have a strong influence on farmers' definition of risk when it comes to their decisions concerning crop cultivation. I also attempt to link the field of agriculture and farmers' risk-centred habitus with the reflexive modernity thesis proposed by Beck (1992) so as to see if farmers' habitus and practice reflect the overall trend of modernisation.

It is noticed that in accounting for risk taking behaviours of farmers, psychological and economic literatures often place emphasis on individual agents (van Winsen et al., 2016; Spicka, 2020; Asravor, 2019; Meraner & Finger, 2019; Flaten et al., 2005; Bashiru et al., 2014; Sulewski & Kłoczko-Gajewska, 2014). Farmers' socio-demographic characteristics including

age, gender, ethnicity, household income, farm size, and their risk perception are important in predicting if they are going to take or avoid risks. For instance, a collection of factors including risk perception, age, subjective numeracy, farm succession, farm size, and rented land was associated with different choices of risk management strategies for livestock farmers in Germany (Meraner & Finger, 2019). In another study in Czech Republic, the fact that living with partner/husband/wife could give rise to the sense of responsibility in farmers' choices of taking risk (Spicka, 2020). The perception of risks of natural hazards and climate extremes crucial to farmers' preparation and adaptation strategies (Le Dang, Li, Bruwer, & Nuberg, 2014; 2014; Ling et al., 2015; Schad et al., 2012). Experiencing disasters could be the critical factor in determining whether an actor would take a risky action in future events (Cameron & Shah, 2015). These authors' study in rural Indonesia concluded that people who endured a disaster (flood or earthquake) in the past three years would demonstrate higher levels of risk-cautious behaviours than those who did not. While these studies identified the agents' individual determinants of risk-related behaviours, they were unable to offer how larger social structures such as culture, community structures, family tradition, political system could impact farmers' decision making and risk management strategies. They failed to see that risk perception is a form of knowledge that can be linked to the disaster-affected group's accumulation of cultural capital, which should distinguish them from those groups not affected by disaster. They were also unable to explain how a single factor would be crucial in explaining the difference between two groups. To explain, for instance, why female-headed households were seen to more likely take risks than male-headed households in Northern Ghana (Asravor, 2018), while risk-taking behaviours were not gender sensitive in Czech Republic (Spicka, 2020), there were unfortunately no insights that could be drawn from those studies. The difference between two studies' findings can only be explained by the link between farmers' capital and habitus and the field of agriculture and the broader fields of such two studied societies.

This is where sociological theories like Bourdieu's become powerful. From Bourdieu's perspective (1977, 1986), it is possible to group those individual characteristics in the concept of 'capital'. There are three types of capitals including economic capital, cultural capital, and social capital. In this study, economic capital is considered in the forms of cash, savings and assets (land, water, pumping machine) that can help agents make profit. Cultural capital is defined as the mental and cognitive dispositions, cultural goods, educational level, knowledge and experience that can generate impacts (positively or negatively) on social practices. Social

capital is considered as a household's type of asset residing in their key members' social networks, providing the basis for their social actions. Although these capitals can be invested and mobilised by individuals, they are embedded in social structures of the field in which individuals live. As the conditions of the field, capitals not just enables but also constrains agents' decision making and risk taking. Therefore, capitals should have both positive and negative sides (Aldrich, 2011a ; Portes & Landolt, 1996; 2000) in relation to the choices and action of risk taking or avoidance. This study aims to contribute such insights into how capitals positively and/or negatively drive social vulnerability to disasters.

Research Questions

Based on a review of the literature and the context of the 2015-2016 disaster, this study aims to contribute to filling the above theoretical voids and practical needs by posing the central question: How can vulnerability to slow-onset disasters be understood from the perspective of agency and social structure?

In order to address this central question, the following three specific questions will be pursued:

1. How can past social structures shape present habitus and risk-taking strategies?
2. How do farmers perceive risks in everyday life?
3. How can the concepts of habitus and capital help explain farmers' risk-taking practices?

Answering these questions will contribute to the sociological understanding of disaster vulnerability and the structure-agency dichotomy. Also, the thesis expects to contribute evidence from a developing country to the Western theories such as the theory of practice (Bourdieu, 1977, 1990) and the theory of risk society and reflexive modernity (Beck, 1992; Giddens, 1984). Additionally, the thesis will provide implications for disaster risk management policies and developmental strategies for the Vietnamese Mekong Delta.

Thesis Outline

This thesis consists of eight chapters. Chapter 1 starts with situating the thesis' topic and ends with stating its research questions and its structure. Chapter 2 describes key concepts and

theories including disaster, risk and risk society, vulnerability, Bourdieu's theory of practice (field, habitus, capital and social practice). Chapter 3 details the case study methodology that was used to explore the research topic. This includes the methodological approach, research design, research process, sampling procedure, data collection, data analysis, ethical assurance, and limitations. Chapter 4 provides an overview of national, regional, provincial, district and commune backdrops, as well as delineating the processes of the 2015-2016 event, setting up the stage for empirical chapters.

Empirical findings are presented from Chapter 5 to Chapter 7 in order to answer to three specific research questions. Responding to specific question number 1, Chapter 5 traces back the structural context of the changes in the field of agriculture initiated by the Vietnamese state post-reunification (1975) and the socio-economic reform (1986). The reform entailed the State's food politics, soft and hard policies shaped the field of agriculture and farmers' habitus in the Vietnamese Mekong Delta (VMD). Responding to specific question number 2, Chapter 6 discusses farmers' description and explanation of the 2015-2016 disaster, as well as their perception of the nature of risks and natural hazards and the presence of risks facing their everyday life. Responding to specific question number 3, Chapter 7 uses capital and habitus concepts to account for the reasons behind the risk-taking endeavours during the adversity under study. Chapter 8 offers a summary of key findings from the thesis and a discussion of its theoretical contribution and policy implications for the VMD's sustainability development.

CHAPTER 2. CONCEPTUALISING VULNERABILITY

To frame an understanding of disaster vulnerability, in this chapter I delve into key social theories and concepts in the literatures of sociology, vulnerability and development studies. In the first part, I show that while the sociological understanding of disaster helps see the 2015-2016 event as a social crisis, the theory of risk society helps locate farmers' perception of risks in the age of reflexive modernity. Next, I discuss how the notion of vulnerability offers insights into uncovering the root causes of disasters. Finally, I use Bourdieu's theory of practice with the key notions such as field, habitus, capital, practice to explain my perspective in viewing disaster vulnerability as the interplay between agency and social structures.

Disaster and Risk

Disaster as a Social Crisis

The sociology of disasters can be traced to the works of Prince (1920) and Sorokin (1942). Yet, the idea of disasters was abandoned until the establishment of the National Opinion Research Center at the University of Chicago in the 1950s, which was a response to the demand for understanding people's responses to war threats; and the foundation of the Disaster Research Center at Ohio State University in 1963, which helped to institutionalise disaster research as an independent field (Quarantelli, 2000, p. 681). The concept of disaster in sociological thought initially was influenced by a hazard perspective, which centered on 'physical agents' or natural phenomena (Perry, 2007; Quarantelli, 2000). The problem with this perspective was to deem a disaster as '*epiphenomena'* - phenomena caused by something external to society, while disparaging the role of human intervention in leading to such a consequence (Quarantelli, 2005b, p. 342).

However, the emergence of new studies in the 1970s and 1980s has led to the detachment of sociologists (also disaster researchers generally and anthropologists) from the hazard perspective to focusing on disasters as social phenomena (Oliver-Smith, 2015; Perry, 2007; Perry & Quarantelli, 2005; Quarantelli, 1989, 2000; Wisner, 2016). As a result, disasters are distinguished from 'the naturalness' or natural hazards such as storms, floods, hurricanes, and tornados (O'Keefe, Westgate, & Wisner, 1976). The latter agents are neither disasters

themselves nor the only determinants of disasters (Quarantelli, 2005a), as if the occurrence of a hazard leads to no disturbance of or no negative impacts on the affected social systems (e.g., life losses, economic disruption, crop losses), there are no disasters (Quarantelli, 2005a). The role of the affected social system in forecasting and responding to a hazard is critical in turning such a hazard into a disaster (O'Keefe et al., 1976). Thus, as advised by many scholars (Oliver-Smith, 2015; Quarantelli, 1989; Quarantelli, 1998a), the conceptualisation of disaster should focus on social aspects and responses, rather than physical aspects – the agent-oriented approach. Some scholars even bring in cultural aspects to characterise disasters, seeing such events as 'the collapse of the cultural protections' or the inability of the social systems' cultural measures to effectively respond to hazard agents (Carr, 1932, p. 211). In sum, for sociologists, disasters caused by natural agents (e.g., storms, floods, earthquakes), by technological errors (e.g., Chernobyl explosion), by viruses and infections (e.g., SARS and COVID-19), and by man-made actions (i.e., disasters caused by human being's actions such as terrorism) are not distinctive since they share 'social origin, manifestation, or consequences' (Quarantelli, 2000, 2005a, 2005b, 2006). In other words, there are no natural/technological/biological disasters; there is only social disasters. This conception of disasters will be used in this study.

One of the first attempts to conceptualise disaster in a formal sociological sense was by Charles Fritz in his essay *Disaster* (1961). Drawing upon an unpublished paper by Robert Endleman (1952), titled 'An approach to the study of disasters', Fritz defines disaster as:

> an event, concentrated in time and space, in which a society or a relatively self-sufficient subdivision of a society, undergoes severe danger and incurs such losses to its members and physical appurtenances that social structure is disrupted and the fulfilment of all or some of the essential functions of the society is prevented. (p. 65)

The definition helps lay out two key features of a disaster. First, a disaster is an event framed in a certain period and in a certain location. Thus, in a study of any disaster, sociologists need to create those temporal and spatial boundaries so as to differentiate this event from other social events and incidents. For instance, the number of deaths annually caused by car crashes is not a disaster, although it involves many losses, because it accumulates gradually over a long period of time. Second, a disaster leads to immediate effects such as losses, or physical damage, which in turn precipitate negative impacts as expressed in disruption of essential functions of the social system. Although not clearly stated, Fritz implies that we should focus on the disaster's impact on society, rather than immediate effects that directly result from the hazard event. Fritz also indicates that the social system's normal functions, once effectively operated

under normal conditions, are unable to withstand the impact of disaster(s). In other words, society's normal norms cannot withstand new conditions created by disasters, so that it is required to form different norms to allow the society to regain stability (Perry, 2007, p. 6).

Barton (1963, 1969) was one of the first sociologists attempting to form a typology of disasters. Barton sees disaster as a collective stress situation where there is 'a large unfavorable change in the inputs of some social system', which can be a type of collectivities, spanning from 'enduring small groups' such as family to a national or world social system (Barton, 1963, p. 3). In his perspective, a social system suffers from a disaster only when its four areas of inputs including physical environments, external economic relationships, external power relationships, and sources of personnel fail to serve the system's demands (Barton, 1963, p. 3). When these inputs change towards negative consequences (e.g., an economic crisis leads to a food shortage), it means that 'large numbers of a society [are prevented] from living under conditions socially defined as normal or adequate in terms of human needs' (Barton, 2005, p. 127). Thus, the distinction between a disaster/collective stress from several members' accidents or strokes is that the former involves the failure of social systems in delivering the collective needs.

Barton also outlines three pivotal dimensions of disasters: (i) total scope of stress, or the scope of the system primarily affected; (ii) time dimensions including speed of impact and duration/frequency of impact; (iii) the degree of preparedness of the social system for stress (Barton, 1963). Barton takes into account both the impact generated by external threats (i.e., scope, time) and the social system (i.e., the scope of the system under the impact and its preparation). Barton notes that the temporal dimension of a change is of great import because it would decide the degree of the impact such change puts on the affected social system and the responding capacity the system uses to minimise the disruption.

Barton's typology of collective stress situations (2005) presented in Table 2.1 extensively complicates Fritz's (1961) suggestion that a feature of a disaster is its 'concentration in time and space'. In regard to the temporal dimension, he uses three scales of sudden, gradual, and chronic; for the spatial dimension, he focuses on 'societal scope', instead of just geographical levels, including national, regional, segmental, and local. This addition helps demonstrate disaster as a social phenomenon rather than just a natural one. The combination of these two dimensions creates many types of collective stress situations, regardless of the threats (man-made causes, natural hazards, or technological errors) (Barton, 2005, p. 129). Accordingly, natural hazards fall mostly into regional and local levels with earthquake, flood, hurricane, and

tornado belong to the *sudden* category, whereas drought, land sinking, coal seam fire belong to the *gradual* category.

Table 2.1. Barton's typology of collective stress situations

	National	Regional	Segmental	Local
Sudden	Nuclear war Invasion Economic crash Rebellion	Earthquake *Major flood* Nuclear plant meltdown Hurricane	Ethnic massacre Corporate layoff Expropriation of a class	Tornado Explosion Ghetto riot Plant closing by main employer
Gradual	Depression Epidemic Environment decay Government breakdown	Famine Drought Price collapse of main crop Land exhaustion	Aborigines dying off Obsolete occupation Rise of group discrimination Addictions to harmful substances	Decline of main industry Environmental pollution Land sinking Coal seam fire
Chronic	Poverty Endemic disease Wartime bombing Colonialism	Backward regions Endemic disease Internal colonialism	Enslavement Race or Class discrimination Persecution Political persecution Gender or sexual orientation discrimination	Slum Ghetto Rural slum Pockets of joblessness High crime areas

Source: Barton (2005); emphasis added.

Following Fritz, many scholars have adopted his definitions for their research on disasters. Kreps is one of those (Kreps, 1998; Kreps & Drabek, 1996). Seeing disasters as a 'systemic event and social catalyst', he modifies Fritz's definition as follow (Kreps, 1998, p. 28):

> Disasters are … nonroutine events in societies or their larger subsystems (e.g., regions, communities) that involve social disruption and physical harm. Among, the key defining properties of such events are (1) length of forewarning, (2) magnitude of impact, (3) scope of impact, and (4) duration of impact.

Most aspects of Fritz's definition, such as event, social disruption, physical harm, the scope of impact, duration of impact appear in Kreps' definition. However, Kreps adds the 'nonroutine' feature to distinguish this type of event from other everyday 'emergencies'. By this, he not only alludes to the notion that disasters are concentrated in time, but also happen in uncommon, unexpected ways to the affected social system. He explains this: 'The phrases *nonroutine events* distinguishes disasters as unusual and dramatic happenings from the reservoir of

everyday problems and concerns which confront humankind' (Kreps, 1998, p. 28). That nonroutine event is concretised in four dimensions of disasters as demonstrated in Table 2.2).

Table 2.2. Kreps' four key features of disasters

Key feature	Description
The length of forewarning	The amount of time between the identification of hazardous conditions and the actual onset of effects on particular locations. The warning time can be very short to quite long.
Magnitude of impact	The severity of social disruption and physical harm. Here lower to higher severity is socially defined disruption of normal routines, damages to natural or built environments, and direct effects on human beings (death, injuries, and illness).
Scope of impact	The social and geographic boundaries of social disruption and physical harm. These boundaries can be highly localized to quite diffuse.
Duration of impact	The time lag between the onset of social disruption and physical harm and when the disaster is no longer defined as producing these effects. That time frame can be short to quite open-ended.

Source: Kreps (1998, pp. 28-29)

This thesis aligns with definition of Quarantelli who puts disasters under the umbrella concept of 'collective crisis'. This concept is defined as:

> (i) a threat of some kind, involving something that the group values; (ii) when the occasion occurs it is relatively unexpected, being abrupt, at least in social time; (iii) the need to collectively react for otherwise the effects are seen as likely to be even more negative if nothing is done sooner or later. (Quarantelli, 1998a, p. 262)

There are some aspects worthy of note in Quarantelli's definition of disaster. First, a disaster means an affected social system faces a harmful consequence to its central values. Identifying what are the central values of a specific social system is of great import because it involves how such a social system ascribes significance to specific things/aspects. Some social systems would value environmental sustainability while others would value economic growth. In other words, each social system would have a different order of importance of values and this order would affect the way this system recognises and perceives threats and the impacts of a disaster. It may be more complicated as there is often conflict about the definitions of the threats and the impacts among different groups within a social system such as victims, policy makers, media, enterprises (Barton, 2005, p. 127). Here it is relevant to bring in the notion of definitions

of risks in Beck's (1992) terminology. The definition of disaster (its threats, threatened values, and impacts) is similar to the definition of risk, which is strongly affected by the power games over establishing an agreed definition within the society under study. This contestation is often dominated by the dominant institutions such as the government, scientists, mass media and professional organisations that have the power to convey their definition of disasters to serve their goals. Therefore, understanding the victims' definition of disaster in comparison to these dominant groups is of paramount importance.

Second, a disaster should be considered in the social time rather than the chronological time of the event. Social time is the timeline of the affected social system or community, not the timeline of the hazard itself. There have been scholars who have attempted to identify the temporal dimension of a disaster by documenting the timeline of its hazardous agent, where it begins and ends. For instance, Lindell (2013, p. 797) based on Fritz's conceptualisation, suggests: 'A disaster's concentration in time obviously defines three temporal periods – pre-impact, trans-impact, and post-impact'. This way of division is a threat-centered approach, which sees a disaster cycle according to the onset of a threat. For example, if we take into consideration floods, so the life cycle of flood disasters would be pre-flood, trans-flood and post-flood. Put another way, the beginning of this disaster is signaled at the point of time when the flood comes and is supposed to end when it goes. However, this perspective does not justify the activeness and unique effort in coping with disasters of the affected community/group under study. For instance, the impact of disaster cannot be contained among the affected community; one group may start to recover faster during the impact, while another may require more time post-impact to do so. Therefore, the duration of an impact is considered as '[t]he time lag between the onset of social disruption and physical harm and when the disaster is no longer defined as producing these effects. That time frame can be short to quite open-ended' (Krep, 1998, p. 28-29).

Therefore, the emphasis should not be put on the life cycle of the natural hazard, but rather on the responding actions of the endangered community. More than eighty years ago, Carr (1932, pp. 211-212) outlined three phases of a disaster. Rather than focusing on the natural threat, the phases focus on the affected community: (i) the preliminary or prodromal period refers to the time before the catastrophe's arrival which allows the potentially affected community to prepare for the upcoming disaster; (ii) the dislocation and disorganisation phase refers to the actual attack of the catastrophe, resulting in consequences such as deaths, injuries, and losses; (iii) the readjustment and reorganisation phase refers to the time when some parts of the

community starts to reshape their activities and recover following the adverse event. This division is reflected in a quite well-known delineation of disaster in the United States into four phases including mitigation, preparedness, response, and recovery (Quarantelli, 2000, p. 683). However, this division is also not absolute because it seems to reflect 'functions rather than phases' (Lindell, 2013, p. 798). The reason is that those actions can be concomitantly carried out during some stages. For instance, in the pre-disaster context, both preparation and mitigation can be simultaneously implemented (Lindell, 2013, p. 798). Another great idea is to characterise disaster's time by 'a cycle of stability-disruption-adjustment' (Perry, 2007, p.8). This separation relies on the qualities and statuses of the social system because it is concerned with responses the social system sends out to agents or threats. Stability refers to the pre-disaster context, when normal patterns/routines are activated and effective, essential functions are maintained. Disruption refers to the duration of disasters when collective routines are disrupted by certain factors. In this situation, collective routines that have helped run the social system effectively and efficiently turn out to be weakened and, as a result, cause incomplete achievement of the collective's needs and place them on alert. Adjustment refers to the post-disaster context when the collective attempts to mitigate the negative consequences and recover their essential functions. One noteworthy point is former routines cannot be used to resolve the problem. This requires the collective and its system to adapt its qualities and capacities to new conditions posed by the disaster.

The third feature in Quarantelli's definition of disasters is the collective action in responding to the disaster. The vital point in seeing disasters as collective crisis is that this kind of event does not just involve collective disruption, but also requires 'unplanned courses of action have to be undertaken to cope with the crisis' (Quarantelli, 2000, p. 681). The 'unplanned courses of action' refers to the fact that planned courses of action or normal norms cannot cope with the impact of disaster. The occurrence of disasters requires different approaches to solve the problem. This view originates from the 'emergent norm thinking' which holds that society is run by a set of norms, but they would be 'ineffective' in coping with disasters; therefore, different norms should be established in order to stabilise the society (Perry, 2007, p. 6). Put another way, to cope with disasters, social systems cannot use their current norms or usual activities. Instead, they must adapt and transform themselves into a state that is more suitable to the conditions posed by disasters. For instance, the occurrence of a prolonged drought to a community drains their water reservoirs and groundwater, making them unable to continue agricultural cultivation. Therefore, disaster-affected victims in this community, rather than

continuing their ordinary agricultural activities, must migrate to and find jobs in big cities to drastically adapt their water usage and agricultural practices.

In line with that thinking, Quarantelli (1989) takes a further step by putting disasters in the context of social changes. He argues that sociologists need to disentangle their approach from traditional viewpoints that characterises disasters as social problems or negative consequences. In his words: 'disasters are better seen as part of social change dynamics than as a nonroutine social problem' (Quarantelli, 1989, p. 249). Construing disasters as social problems ignores the fact that disasters could bring about positive consequences or changes. Quarantelli (1989, p. 250) explains this in precise words: 'In actual fact, there has been enough disaster research to indicate that there are always winners in an[y] functional results of disasters; they are not always bad in any sense of the term'. Hence, we should consider a disaster in the context of 'social change' because this way of looking allows researchers to see the positive side of the phenomenon, and know that the occurrence of a disaster is just part of the 'social dynamics' which constantly evolve in the context of social life (Quarantelli, 1989, p. 250).

The social change lens is based on the premise that a community, as a social system, is always in the context of developmental changes. That is to say, experiencing social changes is a necessary part of a community's growth. Dynes and Quarantelli (1970, p. 1) assert: 'The disaster not only destroys or weakens the normal system of community decision making, but it also makes urgent the establishment of a new basis for unity … Reaction to the disaster thus transforms the social structure of the community'. Take, for instance, community conflicts as phenomena of dysfunctional aspects of social structure. Based on observations of over 100 different disaster situations, Dynes and Quarantelli (1975) argue that the perception that a disaster brought about community conflict was not really true. Rather, there was a pattern that community conflict was absent during an emergency period and present in the post-emergency period (Dynes & Quarantelli, 1975). The arrival of disasters, instead of causing conflict, led to unity among the affected community.

> Disasters lead to a focusing of attention on the present. At least in the emergency period, the past and the future are temporarily laid aside. In this respect, a disaster provides a degree of liberation from many everyday concerns which does not always occur in other kinds of large-scale stress situations. (Dynes & Quarantelli, 1975, p. 5)

In another work, Dynes (2002) concludes that disasters create problems, but in return, problems give rise to new changes in community' structure, and then these changes accumulate

experience for the community to solve future problems. In sum, the occurrence of disasters brings about the demand of changes in affected-social systems because their normally established collective behaviours and mechanisms cannot help them to handle disasters. The changes happen in not just collective knowledge, attitudes but also methods and practices in order to reduce the negative consequences of disasters, remedy the impairment and build up adaptive capacities for future disasters. Indeed, this line of thought is relevant to the vulnerability research which centers on the terms such as 'adaptation' or 'adaptive capacity' defined as changes, transition, or transformation taken to meet new conditions posed by disasters (Adger, 2003b; Cutter et al., 2008; Pelling, 2010).

In this thesis, I define the notion of disaster as *a collective crisis caused by social vulnerabilities when they encounter the external threats, which leads to social disruption and damage to the crucial values of the social system under the impacts, and requires extraordinary collective effort to cope with, adapt to, and recover from adversity.* In this sense, the 2015-2016 drought and saline intrusion in the Vietnamese Mekong Delta (VMD) is considered as a disaster. In accounting for what constituted the disaster vulnerability, it is necessary to understand risk, vulnerability and structure/agency.

Risk in Reflexive Modernity

Since the 1980s, together with the increasing interest in disasters, risk has become central to many academic debates. The concept of disaster cannot be separated from the concept of risk, although they are two different notions. Risk is a prediction of future harms so as to make decision in present practices, whereas disasters or catastrophes are the harms already occurred (Beck, 2006). Disasters before coming into being are presented in the form of risk which is perceived and judged by the potential victims.

Risk has been approached, defined and explained from different perspectives such as the reflexive modernisation approach (Beck, 1992, 1996, 2000, 2006, 2009), the socio-cultural approach (Douglas, 1990, 1992, 2013; Douglas & Wildavsky, 1983), the governmentality approach (Dean, 1999), and the system theory (Luhmann, 1990, 1993). In this section, my goal is not to describe and explain all of these theories, but only to focus on some relevant theoretical elements drawn from Beck's theory to explain for disasters and vulnerability.

The risk society thesis, developed by Ulrich Beck and Anthony Giddens, belongs to a broader theory of reflexive modernisation, together with the theses of individualisation and multi-

dimensional globalisation (Beck & Beck-Gernsheim, 2010). Its general argument is that current modernity, since the 1980s, has distinguished itself from simple modernity based on industrialisation in the 18th-19th Century (see Table 2.3). While some theorists (Albright, 2007; Ritzer, 1997; Wolff, 2007) argue that our society has moved to post-modernity, Giddens (1990, 1991), Beck (1992), and Mythen (2004) claim that modernity is not over yet. Rather, modernity has entered an alternative form, late modernity, which differs from 'its classical industrial design' (Beck, 1992, p. 10).

Table 2.3. Differences between Classical Modernity and Late Modernity

Indicators	Classic modernity	Late modernity
Name of society	Industrial society	Risk society
Central logic	Production and distribution of wealth; priority is to obtain equality	Production and distribution of risk; priority is to obtain safety
Central relations	Production relations	Definition relations
Positions	Class and stratification positions are primary Being determines consciousness	Risk positions are primary Consciousness determine being
Reflexivity	External monitoring	Self-monitoring
System	Linear system, with single points of equilibria	Non-linear system, system dis-equilibrium and change produced internally through the feedback loop
Individual	Individual constrained by structures	Individuals freed from structures
Perception of risk	Calculable, perceivable, sensible	Incalculable, unperceivable, insensible
Sources of risk	Man-made risks Natural risks (hazards)	Manufactured risks from techno-scientific activities
Scale of risk	Local and national; physically and temporally bound risks	Global; physically and temporally unbound risks
Coping with risk	Manageable, Compensable	Unmanageable, cannot be compensable

Source: Compiled from Beck (1992), Ritzer (2011), Lash (1993), Lash (2002), Matthewman (2015)

In the simple modernity, when humans liberated themselves from traditional society by industrialisation, the main focus was to produce and distribute wealth (e.g., consumer goods, incomes, educational opportunities, property) that appeared in scarcity (Beck, 1992, p. 26). The goal was to equally distribute this wealth. In the second modernity, however, the priority of human beings is not social wealth but how to minimise risks. Risks in the second modernity are manufactured by human attempts of modernisation. In other words, risks are the consequences of modernity itself.

> Risk may be defined as a *systematic way of dealing with hazards and insecurities induced and introduced by modernisation itself.* Risks, as opposed to older dangers, are consequences which relate to the threatening force of modernisation and to its globalisation of doubt. They are *politically reflexive*. (Beck, 1992, p. 21; original emphasis).

This definition leads us to the key concept of reflexivity. Reflexivity can be approached through two parties, one is by a social system or its parts, another is individuals (Beck, 1992). At a macro level, this reflexive feature is understood as a process that modernisation becomes 'its own theme' (Beck, 1992, p. 19). In other words, modernity has to face its own consequences induced by over-production, consumerism, industrialisation, the adoption of technological advancements especially in building nuclear weapons. These processes, driven by 'a bottomless barrel of demands', have resulted in many unintended, undesirable, non-calculable, irreversible and invisible risks including environmental pollution, foodstuff toxics, nuclear weapons, and diseases (Beck, 1992, pp. 22-23). As the second modernity steps in, these risks have systematically gained political significance and affected all individuals and collectives. At an individual level, reflexivity is 'reflexive monitoring of action' which demands repetitively examining and readjusting one's social practices and, therefore, alternating oneself by constantly taking into account new information arising from their own social action (Giddens, 1990, pp. 36-38). However, it is noted that to be reflexive (in the second modernity) is different from to be reflective (in the first modernity). The former assumes the lack of consciousness, indeterminacy whereas the latter presumes the consciousness and determinacy (Lash, 2002, p. ix). The individuals in the second modernity often live in a precarious flow of life-changes which requires them to decide, choose and act in a fast manner. Therefore, they have limited chances (time, space) to reflect upon (i.e., be conscious about) the conditions and consequences of their own action. This should lead them to more dependence on their habitus (to be discussed in the next section) in making their decision. However, social scientists are the ones who have the time and space to reflect on the individuals' reflexes. To reflect on risk is to reflect on how the individuals contribute to the making of root causes of disaster (vulnerability) in their daily reflexes (Forbes-Mewett & Nguyen-Trung, 2019).

By nature, reflexivity in the second modernity focuses on self-monitoring; that is, individuals become more and more active in supervising their own courses of action. This is because individuals have been liberated from structural constraints and have gained more freedom in deciding their own fates and actions (Beck, 1992). Thus, the second modernity is characterised

by individualisation – a process putting individuals at the centre of their own 'biography' (Beck, 1992). By contrast, the traditional, or pre-industrial society is seen as occupied by the monitoring of external forces such as God, natural orders or social systems. In industrial modernity, self-monitoring is done through the social system, within which individuals as social agents abide by structural constraints.

It is not that the second modernity faces more risk than did the first modernity but the quality of risk has changed (Giddens, 1991). The current modernity's risk has exceeded the simple modernity's risk in four features: incalculableness, social risk positions, being unsatisfiable and political, and non-compensability (Beck, 1992, 2006). The first feature indicates the fact that risks in the contemporary world are no longer calculable, nor understood by lay people. In Beck's words:

> Many of the newer risks (nuclear or chemical contaminations, pollutants in foodstuffs, diseases of civilisation) completely escape human powers of direct perception. The focus is more and more on hazards which are neither visible nor perceptible to the victims. (Beck, 1992, p. 27)

Lay people cannot directly perceive risks by their own senses but have to rely on the scientific and technical knowledge and tools produced by science, the government, or businesses to understand the casual links behind risks (Beck, 1992, p. 23). For instance, a person who eats fast food may not know which factors/ingredients would cause them cancer. Only science with 'sensory organs' including theories, experiments, measuring instruments' can interpret and demonstrate hazards and risks in clear causal relationships (Beck, 1992, p. 27). Meanwhile, the government, media, and business have an advantage compared to lay people because they have the power to shape definitions of risk and affect the way lay people approach and perceive of risks. These institutions, which dominate society through the imposition of their definitions of risks, have transformed from 'instruments of risk management' to 'a source of risk' (Beck, 2006, p. 336). In other words, the way those institutions see risks affect the way the public see risk and, therefore, the way they prepare, react and recover from the risk. Although considering risk as an independent object of perception and calculation, Beck also views risk as being subject to social construction. He writes:

> [Risks] can thus be changed, magnified, dramatised or minimised within knowledge, and to that extent they are particularly *open to social definitions and construction.*

> Hence the mass media and the scientific and legal professions in charge of defining risks become key social and political positions. (Beck, 1992, p. 23)

Because of this perspective, some commentators have classified Beck's risk society thesis as a 'weak' constructionist/critical realist perspective (Lupton, 2013, p. 50). This epistemological stance claims risk as 'cultural mediations of 'real' dangers and hazards' (Lupton, 2013, p. 45). These dangers and hazards are real, objective, and independent of the individual – the perceiver; but only come into being through his or her judgement of risk (Lupton, 2013, p. 45). In Beck's perspective, this judgement presents itself in definitions of risk which are shaped and dominated by powerful 'players' such as scientists, governments, mass media or professional organisations. Therefore, instead of the production relations proposed by Marx, Beck (1992), proposes that the relations of definitions among those players and lay people dominate current modernity. Some are in a position to define risk and make their definition of risks dominant and serve their safety, while for others they must follow external definitions: 'The inequalities of definition enable powerful actors to maximize risks for 'others' and minimize risks for 'themselves'. Risk definition, essentially, is a power game' (Beck, 2006, p. 333). In this game of definition, as Beck claims, there are winners and losers. For some, risks can be potential dangers, harms, crises, but for others, they are 'big business' that needs to be endlessly satisfied (Beck, 1992, p. 23). Risks can be used politically to serve a group's sake.

The domination of the relations of risk definitions is related to *social risk positions*. If such relations are associated with the production of risk, social risk positions relate to the distribution of this phenomenon. According to Beck (1992, p. 23), each group occupies different risk positions which makes them exposed to and influenced by risks on different levels. Moreover, these risk positions are becoming more decisive than classic structures such as class and national society in explaining for new inequalities in world risk society (Beck, 2013, p. 65). These traditional structures cannot fully explain why risks violate the rules of classes or nation-states. No one, even those who are rich and powerful can escape from and stay invulnerable to risks. Likewise, no country can stay risk-free. As globalisation increases, the interdependence between nations rises.

Therefore, the causes and consequences of risks are not bound within any specific geographical location or space (Beck, 2006). Risk must be situated on a global scale, as risk exceeds the border of nations and regions becoming a global phenomenon. In this case, nations and regions are interdependent in the face of risks. Global warming and terrorism, for instance, are threats facing the whole world. Not only in a spatial dimension, but also in a temporal dimension, as

risk cannot be contained only within a specific time frame. The actions of today's generation may last for future generations to suffer. Similarly, de-localisation also happens in the social dimension where 'assignment of causes and consequences is no longer possible with any degree of reliability' (Beck, 2006, p. 334). In addition to this feature, risk also tends to increase the boundaries of time because risks may not appear in the current generation but rather manifest in the future. This generation's actions could create future risks.

As risk definitions dominate, risk has become central not just to scientific and political debates but also to daily life. Beck comments that 'Modern society has become a risk society in the sense that it is increasingly occupied with debating, preventing and managing risks that it itself has produced' (Beck, 2006, p. 332). Risk permeates into every aspect of social life, becoming a 'systematically institutionalised environment' or a 'risk culture' (Giddens, 1991, pp. 3-4, 118). Therefore, although modernity has brought about many measures to reduce risks, it also, as Giddens (1991, pp. 3-4) explains, 'introduces new risk parameters largely or completely unknown to previous eras.'

The third feature shows that contemporary risks cannot be compensable. The current scale and complexity of risks has exceeded the ability to compensate the losses or damages. No insurance can be used to counterweigh the losses in disasters or terrorist attacks. Therefore, 'the logic of compensation breaks down and is replaced by the principle of *precaution through prevention*' (Beck, 2006, p. 334; original emphasis).

The concept of risk is critical in comprehending the disaster vulnerability because it illuminates the systematic ways agents deal with hazards and uncertainties (Beck, 1992). This way in turn uncovers the social problems that transform into social vulnerabilities in the face of natural hazards.

Vulnerability

The study of disaster risk, as Beck and Giddens argue, should be taken in a reflexive fashion. Reflexivity means that we should look deeper into the nature of the disaster risks that are produced by modernity itself. In doing so, we need to find the roots of disaster risk within the affected social system under study. In order to do so, we need to understand the concept of vulnerability.

Vulnerability as Social Weaknesses

Originating from the Latin words, *vulnus* ('wound'), *vulnerare* ('to wound'), and the Late Latin adjective *vulnerabilis*, vulnerability was translated into English in the form of 'vulnerable' in the early 1960s (Merriam-Webster, 2019; Forbes-Mewett & Nguyen-Trung, 2019). Originally referring to the potential to have a physical harm, vulnerability now involves psychological, moral, and spiritual suffering (Merriam-Webster, 2019; B. S. Turner, 2008).

From the 1940s to the 1970s, the concept of vulnerability was dominated by the hazard perspective deriving from disaster research (Wisner, 2016, pp. 5-6; Oliver-Smith, 2015). Vulnerability as the outcome of human intervention was not considered (Wisner, 2016, p. 5). Only with the findings from empirical studies that were conducted in the 1970s and 1980s did this perception change. The vulnerability approach emerged to replace the hazard perspective, putting weight on the human role in creating disasters and urging scholars to move away from the Euro-American context to pay more attention to developing countries (Wisner, 2016, pp. 5-6; Oliver-Smith, 2015).

The vulnerability approach has gained currency in the 1990s with the emergence of many theoretical frameworks and models such as the sustainable livelihood analysis in rural contexts (Chamber & Conway, 1992; Chambers, 1989), the Pressure and Release model (PAR) and Access model (Blaikie et al., 1994; Wisner et al., 2004), the coupled human-environment systems (CHES) (B.L. Turner, 2010; B.L. Turner, Kasperson et al., 2003; B.L. Turner, Matson et al., 2003); the hazards-of-place of vulnerability model (Cutter, 1996, 2003); the disaster resilience of place (DROP) model (Cutter et al., 2008), and the MOVE framework (Birkmann et al., 2013). Although approaching vulnerability from different perspectives and epistemological stances, vulnerability is often seen as a characteristic of social systems, which is the 'internal side of risk' (Birkmann, 2006, p. 16). The following equation by Wisner et al. (2004, p. 45) illustrates this claim:

$$R=HxV$$

where, the risk of disasters (R), seen as the probability of losses expected by disasters, is a consequence of the combination of natural phenomena (H) and affected social system's inner vulnerability (V). Alexander (2000, p. 13) states:

> vulnerability refers to the potential for casualty, destruction, damage, disruption or other form of loss in a particular element: risk combines this with the probable level of

loss to be expected from a predictable magnitude of hazard (which can be considered as the manifestation of the agent that produces the loss).

Later he confirms that risk is equal to hazard plus vulnerability which is the potential harm socially constructed (Alexander, 2013, p. 980). A risk of disaster is a potential event that comes into being as a result of external threats (e.g., hazard) and internal forces (i.e., vulnerability).

Scholars from different perspectives have offered very different conceptualisations of vulnerability. Table 2.4 shows that each approach to vulnerability comes up with different components and names.

Table 2.4. Selected frameworks/models with elements of vulnerability

Theoretical approaches/model	Elements of Vulnerability
Sustainable livelihood analysis Chamber (1983, 1989); Chamber and Conway (1992)	Exposure to contingencies and stress Coping capacities
Pressure and Release Model Blaikie et al. (1994); Wisner et al. (2004)	Characteristics of groups Anticipating, coping, resisting, recovering capacity
Adger and Kelly (2012)	Lack of access to resources Lack of coping capacity
The hazards-of-place model of vulnerability Cutter (1996, 2003)	Potential exposure Social response
The coupled human-environment systems (CHES) B.L. Turner (2010); B.L. Turner, Kasperson et al., (2003); B.L. Turner, Matson et al. (2003)	Exposure Sensitivity Resilience (coping, responding, adapting/adjusting)
IPCC (2007)	Exposure Sensitivity Adaptive capacity
IPCC's 2014 paradigm (Field & Barros, 2014)	Sensitivity Adaptive capacity
The MOVE framework Birkmann et al. (2013)	Exposure Susceptibility Lack of resilience (anticipating, coping, recovering)

Source: Compiled from the cited sources.

From a sustainable livelihood perspective, vulnerability is considered a state of being which combines exposure and a lack of coping capacity (Chambers, 1989). The former component refers to the presence of external forces such as contingencies and stress, while the latter indicates the capacity of individuals or households. Vulnerability is a 'lack of buffers' against multiple stressors, not just disasters, but also unproductive expenditure, social conventions, physical incapacity, and exploitation (Chambers, 1983, pp. 103-104).

Cutter (1996, p. 530) in developing a hazards-of-place model, defines vulnerability simply as a 'potential for loss' which is a product of combining social vulnerability and biophysical/technological vulnerability. She considers vulnerability as a combination of potential exposure and lack of responding capacity. Adger (2006) highlights that exposure to stress results from both environmental factors as well as social changes. In a joint chapter with Kelly (2012, p. 22), he adds a lack of access to resources to the concept of vulnerability, alongside the component of 'coping capacity'. Wisner and colleagues (1994, 2004) regard vulnerability as the characteristics of the subject (individual or group) and their circumstances that affect their capacity to 'anticipate, cope with, resist and recover from the impact of natural hazards' and which eventually put them at risk (Wisner et al., 2004, p. 11).

The emphasis on 'physical exposure' was also present in works in climate change adaptation (IPCC, 2007; Smit & Wandel, 2006). For instance, The Intergovernmental Panel on Climate Change (IPCC) (2007, p. 883) defined vulnerability as a function of three components including exposure, sensitivity, and adaptive capacity. In this paradigm, IPCC (2007) sees vulnerability as a combination of both internal properties (sensitivity and adaptive capacity) and external threats (exposure), in which, the latter is viewed as the driver of the former (see also Sharma & Ravindranath, 2019). This paradigm was later challenged by IPCC's (2014, p.5) new paradigm that defines vulnerability as 'the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt'. Sensitivity is defined as 'degree to which a system or species is affected, either adversely or beneficially by climate variability or change' (Field & Barros, 2014, p.1772) while adaptive capacity as 'the ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences' (Field & Barros, 2014, p.1758). In comparison with the IPCC's 2007 paradigm, vulnerability is no longer a combination of both external factor (exposure) and internal factors (sensitivity and adaptive capacity). Exposure as a 'geographical location' shown in 'the presence of people, livelihoods,… [or] assets in places and settings that could be adversely affected' is excluded from the concept of vulnerability (Jurgilevich et al., 2017; Field & Barros, 2014, p.1765). This means that just living or working in a place that may be affected by hazards does not constitute a community's vulnerability. Rather, the community's vulnerability only occurs when they display the sensitivity - the degree to which their living patterns (e.g., their houses) or livelihoods may be affected by the hazard if it occurs and a lack of adaptive capacities that help them overcome those effects.

Vulnerability and Resilience

The concept of adaptive capacities reveals the close, albeit ambiguous, relationship between vulnerability and resilience (Miller et al., 2010). The latter notion is derived from the Latin word *resilio,* meaning 'to jump back' (Manyena, 2006, p. 432), the concept of resilience was first developed in the three fields of physics, ecology, and psychology and psychiatry. Physics and mathematics regard 'resilience' as 'the capacity of a material or system to return to equilibrium after a displacement' (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008, p. 127). From a psychological perspective, some authors argue that '[r]esilience … involves an initial loss of functioning and subsequent recovery followed by a quick return to basic functioning' (Shalev & Errera, 2008, p. 154). The affected person or community who is considered resilient, although suffering from the impact of the traumatic event, is able to bounce back to the State in which 'basic functioning' is revived. Following this approach, resilience is a characteristic ascribed to the affected subjects: resilient person, resilient group or resilient community. 'One who is resilient may be considered irrepressible; buoyant; enduring; flexible: the person who bounces back – unchanged – from exposure to trauma' (Vickers & Kouzmin, 2001, p. 96). Being applied in disaster research, resilience to disaster has been prominent in policy discourses such as in IPCC's reports (2007, 2014) as well as academic debates (Cutter, Burton, & Emrich, 2010; Folke, 2006; S. B. Manyena, 2006; Paton & Johnston, 2006). Using the concept of disaster resilience as a 'metaphor' comparable to how physics and mathematics view physical resilience (Norris et al., 2008, p. 127), almost all resilience researchers define resilience 'as ability or capacity' (Lucini, 2014, p. 36) of a social system to 'bounce back' from adversity. 'Disaster resilience', therefore, 'is seen as the 'shield', 'shock absorber', or buffer [of the subject] that moderates the outcome to ensure benign or small-scale negative consequences' (Manyena, 2006, p. 438).

There are two stances when viewing disaster resilience: as an outcome or a process (Cutter et al., 2010). The former viewpoint assumes that disaster resilience is a final end in the face of disaster. In other words, affected social systems must cope with disasters in order to achieve that goal. The weakness of seeing it this way is to make disaster resilience a static state, ignoring the dynamics of social units in accomplishing that state. In reviewing definitions from 1991 to 2005, Manyena (2006) states that scholars gradually turned from outcome-oriented to process-oriented perspective in defining resilience. The transformation drew on the shortcoming of the former approach which places disaster management in a 'reactive stance' (Manyena, 2006, p. 438). As an outcome, the concept of resilience presumes a static result of

a passive response to the effects of a natural hazard. As a process, this concept presumes an adaptive change through many stages that combine collective subjectivities, coordination and activities (preparation, responses, recovery, transformation) across time and space. Therefore, community resilience must include 'both reactive and proactive elements', coupling recovery from adversity (the former element) with the transformation of their environments to mitigate future events (the latter element) (Pfefferbaum, Reissman, Pfefferbaum, Klomp, & Gurwitch, 2007, pp. 349-350).

Research on resilience and vulnerability acknowledges the existence of both concepts; however, it portrays them in 'opposite poles of a continuum reflecting susceptibility to adverse consequences or benign consequences upon exposure to high risk circumstances' (Kaplan, 2002, p. 19). That is, resilience represents positive outcomes whereas vulnerability indicates negative results following adversity. Lucini (2014, p. 29), however, argues that those two concepts 'are not opposite; instead, they are correlated, showing the features of systems or victims potentially at risk'. Despite having been widely studied, the boundaries between vulnerability and resilience, along with other similar concepts such as adaptability and adaptive capacity, are often blurred (Adger, 2006; Birkmann et al., 2013; Cutter et al., 2008; Gallopín, 2006). Table 2.5 shows that there are at least six different explanations of the linkages between those three concepts, according to Cutter et al. (2008).

Table 2.5. Linkages between vulnerability, adaptive capacity, and resilience

Type of linkages	Scholars
Resilience is a subset of adaptive capacity.	Adger (2006), Birkmann (2006), Folke (2006)
Adaptive capacity is a subset of vulnerability.	Ford and Smit (2004), O'Brien et al. (2004)
Adaptive capacity is a subset of resilience, and resilience is a subset of vulnerability.	Birkmann (2006), B.L. B.L. Turner, Kasperson et al. (2003); B.L. Turner, Matson et al. (2003)
Resilience is a subset of vulnerability.	Manyena (2006)
Adaptive capacity is a subset of resilience.	Paton (2003), Paton and Johnson (2001, 2017)
Resilience and vulnerability are two separate, but often linked concepts.	Cutter et al. (2015, 2016; 2014; 2008)

Source: Modified from Cutter et al. (2008).

In the context of climate change, vulnerability is seen as a function of the exposure of a community to climate change and its adaptive capacity (i.e., the ways the community changes itself to adjust to conditions of climate change) to handle that exposure (Ford & Smit, 2004; Smit & Pilifosova, 2003). The authors also note that vulnerability has a positive correlation with the former element, and a negative correlation with the latter. In this definition, vulnerability entails two components: exposure to hazard and adaptive capacity. Viewing

resilience as more or less similar to the concept of adaptive capacity, it can be seen that Ford and Smit consider resilience and adaptive capacity to be subsets of vulnerability.

In terms of the vulnerability of a given socio-ecological system, B.L. Turner, Kasperson and colleagues (2003, p. 8074) regard vulnerability as 'the degree to which a system, subsystem, or system component is likely to experience harm due to exposure to a hazard, either a perturbation or stress stressor'. They situate resilience, along with exposure and sensitivity, within the structure of vulnerability. In this context, exposure refers to the linkage between social system and hazards (frequency, magnitude, and duration); sensitivity refers to the interaction between human conditions (social/human capital and endowments – for instance, population, entitlement, institution), and environmental conditions (natural capital and biophysical endowments – for instance, soil, water); and resilience entails coping responses (e.g., extant program), impact (e.g., loss of life), and adjustment and adaptation (e.g., new program) (Turner, Kasperson et al., 2003, pp. 8076-8077). With this conceptualisation, adaptive capacity is part of resilience, while resilience is part of vulnerability. This viewpoint is shared by other scholars whose approach takes a socio-ecological perspective such as Gallopín (2006). Gallopín (2006, p. 301) sees vulnerability as a big umbrella containing sensitivity, exposure and capacity of response, with resilience being a subset of the latter.

From the hazards-of-place model, Cutter (1996, p. 530) views vulnerability broadly as 'a potential for loss' associated with a specific location. This concept exists in three forms, including social vulnerability, biophysical/technological vulnerability and place vulnerability. If social vulnerability is the potential of social groups for losses as a result of disaster, biophysical vulnerability is the potential of biophysical environment for losses in interaction with disaster (Cutter, 1996, p. 530). The place vulnerability is the combination of both former vulnerabilities. This viewpoint helps understand vulnerability as the dynamic connection between social system and biophysical environment.

In this thesis, I draw on the viewpoint proposed in the disaster resilience of place (DROP) model (Cutter et al., 2008) so as to understand the position and relationship of vulnerability and resilience. This model assumes that resilience and vulnerability are two separate but interrelated concepts. While vulnerability is the pre-existing conditions interacting with hazard events to lead to immediate effects, resilience is:

> the ability of a social system to respond and recover from disasters and includes those inherent conditions that allow the system to absorb impacts and cope with an event, as

> well as post-event, adaptive processes that facilitate the ability of the social system to re-organize, change, and learn in response to a threat. (Cutter et al., 2008, p. 599)

Both resilience and vulnerability appear as antecedent conditions created by the interaction between three systems: social, built and natural. These conditions could be either inherent vulnerability or inherent resilience or both. If they create the potential for losses of society, they are termed immanent vulnerability. If they generate the ability for the community to cope with, adapt to and recover from the negative impacts of disasters, they are called intrinsic resilience. Cutter notes that there are some social characteristics that only amplify resilience or attenuate vulnerability, but also some affect both. For instance, education can lead to either a lack of suitable knowledge or skills for disaster responses or an enhancement of those knowledge and skills to help handle disaster risks. The occurrence of the hazard event with varying characteristics such as 'frequency, duration, intensity, magnitude, and the rate of onset' (Cutter et al., 2008, p. 602) combines with antecedent conditions to give rise to immediate effects of the hazard (e.g., flood covers all the road, making people unable to do their daily shopping). The degree of these effects must be considered in their interplay with coping responses that help mitigate the impact of disaster.

While vulnerability only takes part in pre-event, resilience follows through the process of disasters until recovery is achieved. In post-disaster contexts, resilience exists in a form of 'adaptive resilience' which aids in the case that the negative impacts of disasters exceed the absorptive capacity – 'the ability of the community to absorb event impacts using predetermined coping responses' (Cutter et al., 2008, p. 603). Adaptive resilience helps the community to regroup and respond to the situation in which their predetermined coping strategies and capacities – or routine functions in sociological terms – cannot be effective in mitigating the losses or damage caused by disasters. Adaptive resilience contains the improvisation and social learning which allow the community to diversify their adaptation and promote social cohesion for not just recovery but future planning (Cutter et al., 2008, p. 603).

While I agree with Cutter and colleagues' on the relationship between vulnerability and resilience, I argue that vulnerability cannot be limited to the pre-disaster context. The antecedent conditions that engender the vulnerability of the community to disasters, indeed, continue to exist in trans- and post-disaster context. For instance, the lack of suitable housing structure to cope with strong winds was a problem that led to a disaster but could continue to be a problem in the post-disaster context. They could be either worse due to the impacts of disaster or better due to effective recovery and adaptation strategies. However, the problem or

vulnerability could still be there to hamper the process of recovery or be a new source causing vulnerability to new disasters in future. Therefore, I argue that vulnerability is not just inherent in social systems as antecedent conditions but also exists in varying forms during and after disaster. Looking at it this way helps us see the relation between vulnerability and resilience running through the disaster circle.

Another discussion of resilience that is relevant to the concept of vulnerability is the debate over the nature of the former as 'bouncing back' from an adverse event in a timely manner (Lucini, 2014; B. Manyena, O'Brien, O'Keefe, & Rose, 2011). Such an assumption has been criticised because the 'bounce back' approach cannot capture the change caused by disasters (B. Manyena et al., 2011). As Paton and Johnston (2006) explain:

> This usage [of bounce back], however, captures neither the reality of disaster experience nor its full implications. Even if people wanted to return to previous state, changes to the physical, social and psychological reality of societal life emanating from a disaster can make this untenable. That is, the post-disaster reality, irrespective of whether it reflects the direct consequences of disaster or recovery and re-building activities undertaken, will present community members with a new reality that may differ in several fundamental ways from that prevailing pre-disaster. It is the changed reality (whether from the disaster itself or social response to it) that people must adapt to. (Paton & Johnston, 2006, pp. 7-8)

Hence, disaster resilience should include the ability of 'bounce forward' or 'move on' after disaster (B. Manyena, 2009; B. Manyena et al., 2011); namely, having the capacity to proactively rebuild and adapt itself in order to better cope with disasters occurring in future. As such, community resilience is not simply returning to homeostasis; it entails the potential to grow from the crisis. In other words, the process of building resilience in the aftermath of a disaster must involve the social change context where the affected society adapts to new conditions posed by the disaster event (Dynes, 2002; Dynes & Quarantelli, 1970, 1975; Quarantelli, 1989).

Structural Causes of Vulnerability

It is of paramount importance to recognise that the root causes of disaster is social vulnerabilities within the pre-disaster social structures (Hsu, Howitt, & Miller, 2015; Oliver-Smith, 2013). The task of understanding a disaster thus is to find the causes that 'rendered

people vulnerable in the first place' in the face of natural hazards (Bankoff & Hilhorst, 2009, p. 695).

From a sociological perspective, vulnerability has been identified as weaknesses of social systems that are coupled with external factors in creating disasters. Quarantelli (2005b, p. 345) highlights how

> … disasters stem from the very nature of social systems themselves. Disasters in this framework are overt manifestations of latent societal vulnerabilities, basically of weaknesses in social structures or social systems. The source or origins of disasters are in the very system in which they appear. They should not be seen as the result of an external force from outside impacting the social system. Likewise, the appearance of a disaster goes beyond the effects of a hazard on different lifestyles among victims. Rather a disaster is rooted in the weaknesses of a social system that manifest themselves depending on the dynamics of that system.

This quote shows us the sociological stance that a social system's 'latent' inner vulnerabilities or weaknesses are the main source of disasters. Hence, the occurrence of natural hazards, for instance, floods, in two different communities would lead to dissimilar effects and impacts: one community might suffer social disruption while the other might not. The inner strengths and weaknesses (or resilience and vulnerability) of each community would be the differentiating factors.

Furthermore, it is important to note that the features and weaknesses of a social system are not the same as those of its separate parts or elements. Rather, a social system is a complex interaction between those parts and elements. Quarantelli puts it:

> In considering disasters, one should start with the social systems involved instead of looking at the victims ... Our view [sociologists] is that disasters are similar [to system accidents] in that they latently exist in the larger social systems, and are the result of a convergence of a variety of social factors none of whom might be very important in themselves. (Quarantelli, 2005b, pp. 345-346)

Applying this viewpoint to the case of flood disasters, for instance, its causes cannot be found in the victims – the sub-units, but in the social structures or social system in which those victims are living and working (Blaikie et al., 1994; Oliver-Smith, 1999a, 1999b, 2013; Wisner et al., 2004; Quarantelli, 2005b). As an example, the cause of the flood disaster is not the susceptibility of separate victims, but the vulnerabilities of the system in which they are living

and working. Some of a social system's vulnerabilities are, for example, inappropriate housing distribution, weak community-based disaster forecasting and planning, lack of effective disaster responding management and recovery mechanism, unavailability of economic resources, poor and loose social networks, and the ineffectiveness of information and communication systems. All of these factors would turn the occurrence of the flood from a purely natural event into a social disaster.

In light of recent findings and theoretical frameworks, there is a new perception that sees hazards as more than the result of external forces but also caused by 'human activities, not just technologically, but also in terms of human alteration, or construction of the environment' (Oliver-Smith, 2015, p. 548). The theory of risk society proposed by Beck (1992, 2006) expresses strongly such a claim. Beck (1992, 2006) alludes that humans, in their own process of modernisation, have produced not just wealth but also the risks that lead to disaster. Reflecting on disaster, therefore, is to reflect on human vulnerability, or the actions or interventions that cause human society to be vulnerable to hazard agents.

Many lessons in identifying the root causes of vulnerability can be drawn from vulnerability research (Miller et al., 2010). Alexander (2013, p.982), for instance, uses external threats/causes to classify vulnerability into six types based on social origins.

1. Total vulnerability: caused by the lack of organisation or readiness in coping with threat of disaster.
2. Economic vulnerability: caused by the lack of adequate occupation.
3. Technological or technocratic vulnerability: caused by the riskiness of technology.
4. Residual vulnerability: caused by the lack of modernisation in terms of adaptation.
5. Delinquent vulnerability: caused by corruption, negligence, and other forms of anomie.
6. Newly generated vulnerability: caused by changes in circumstances.

For Adger and Kelly (2012, p. 22), vulnerability results from a lack of access to resources and lack of coping capacity, which include four indicators: 'poverty, marginalisation and access to resources; resource dependency and diversity; inequality and marginalisation; and the appropriateness of institutional structures for enhancing resilience'. The affected community's vulnerability is strongly associated with the wider context of its natural environment and social system that include the prevalence of political institutions and 'market structures' (Adger & Kelly, 2012, p. 22). These conditions can facilitate or hinder the ability to cope with and adapt

to the negative impacts of disasters. This viewpoint is analogous to sociological thoughts that see vulnerability as a product of social structures rather than an agent's actions. According to Adger & Kelly (2012, p.20),

> the state of vulnerability is socially differentiated. Vulnerability to environmental change is not the same for different populations living under different environmental conditions or faced with complex interactions of social norms, political institutions and resource endowments, technologies and inequalities.

The Pressure and Release Model (PAR) developed by Blaikie et al. (1994) and Wisner et al. (2004) is very relevant. The model explains the occurrence of disasters as a result of the interaction between the progression of vulnerability (through three stages including root causes, dynamic processes, and unsafe conditions) and the hazard (e.g., earthquake, flood). The progression of vulnerability looks deep inside social systems to identify the causes of vulnerability. Root causes are general processes inherent in social, economic, political and legal systems, including ideologies, cultural assumptions, beliefs, law and social relation that lead to the limited access to power, structure, and resources among population. These root causes do reside within current society but also result from past events such as wars, which can contribute to identifying current disasters. This is similar to what Bankoff et al. (2004, p. 3) argue that '[v]ulnerability is not just concerned with the present or the future but is equally, and intimately, a product of the past'.

Those root causes are responsible for dynamic processes that only exist in present time. These dynamic processes are 'more contemporary or immediate, conjectural manifestations of general underlying economic, social and political concerns' (Wisner et al., 2004, p. 48). Macro forces such as rapid population growth, rapid urbanisation, arms expenditure, and deforestation are some of these processes, which lead to the lack of local institution, training, appropriate skills, local investments, and local markets. The function of these processes is to transform underlying root causes into unsafe conditions. These conditions are 'the specific forms in which the vulnerability of a population is expressed in time and space in conjunction with a hazard' (Wisner et al. 2004, p. 49). Conditions ranging from living in dangerous locations and in unsafe buildings, to the lack of disaster preparedness, directly affect the degree to which the population can potentially suffer from hazards. In contrast to climate adaption research focusing on physical exposure (IPPC, 2007, Smit 2006), the PAR model considers exposure in a more social way. While not downplaying the state of exposure to physical threats, it is more critical to look at why some groups must engage in such conditions of exposure.

Based on the PAR model, Oliver-Smith and colleagues in their FORIN approach (2016, p. 23) argue: 'Vulnerability (and resilience) is a complex social condition often deriving from the workings and interaction of multiple dynamic processes and underlying "deep-rooted causes"'. They assert that vulnerability research should go beyond description of surface impacts of disaster to uncover such causes within the social structures of affected systems.

> The preceding identification of central themes and fundamental questions that allow a basic knowledge of damage and loss, impacts and effects and their immediate descriptive causal relations, must be accompanied by more structural, deep-rooted, underlying causal analysis that allows us to understand why such unsafe conditions exist as such. Essential to the analysis of root causes is the delineation of derived risk drivers, sometimes referred to as dynamic processes. (Oliver-Smith et al., 2016, p. 28)

They suggest to seek those causes by looking at dynamic processes such as population growth and distribution, urban and rural land use patterns and processes, environmental degradation and ecosystem service depletion, poverty and income distribution (Oliver-Smith et al., 2016, pp. 29-30).

In short, PAR and FORIN models offer analytical tools to grasp different layers of vulnerability within the social systems under study. However, the analysis of the root causes of vulnerability often neglects the relationship between structure and agency. This is due to the fact that vulnerability research often looks from an actor-oriented approach (Nelson et al., 2007).

Bourdieu's Theory of Practice

Field, Habitus, Practice

Structure versus agency/action, along with macro versus micro, society versus individual, objectivism versus subjectivism have been contested issues in the history of sociology (Jenkins, 1992; Ritzer & Stepnisky, 2018). Early scholars divided themselves into two separate and opposing theoretical approaches: structure-centred and agent-centred. The first includes structuralism, functionalism, and Marxism while the second consists of methodological individualism, social phenomenology, symbolic interactionalism, and ethnomethodology. What separates these two schools is that the structural perspective views social structures as the determinant of social action while the agent perspective considers social agents as active

subjects who can construct and reconstruct the structures in which they live. In the 1980s, there were endeavours aiming at integrating structure and agency. The standout approaches include structuration theory by Anthony Giddens (1984) and a theory of practice by Pierre Bourdieu (1984, 1986, 1989, 1990a, b). In this thesis, I will extensively base my theoretical understanding on Bourdieu's theory of practice with a reference to Giddens's theory where appropriate.

Every human being can be regarded as a social/human agent or an actor. Each agent has agency which is the capability of intervening, acting, and improvising in specific ways in the social world (Giddens, 1984, p. 11). People live and take action in social structures which enable and constrain them (Bourdieu, 1977, 1990a, b; Giddens, 1984).

Social structures are 'objective structures independent of the consciousness and will of agents, which are capable of guiding and constraining their practices or their representations' (Bourdieu, 1989, p. 14). By this definition, we can associate social structures with the existences of rules and resources embedded in a specific society, distinguishable from the natural environment (e.g., river, sea, landscape), or built environment (e.g., infrastructure). Drawing on the imagery of football fields, Bourdieu uses the metaphor of '*field*' to concretise the concept of social structures. He views the field as 'a network, or a configuration, of objective relations between positions. These positions are objectively defined, in their existence and in the determinations they impose upon their occupants, agents or institutions' (Bourdieu & Wacquant, 1992, p. 97).

For Bourdieu, the field is a space of struggle for capital or resources that are in scarcity or at stake (Bourdieu & Wacquant, 1992). Each society is made up of a number of different fields (Bourdieu & Wacquant, 1992), which can be the field of arts, religion, economy, education, literacy, and so on. Such fields share with each other a 'structural and functional homology' in the sense that 'each has its dominant and its dominated, its struggles for usurpation and exclusion, its mechanism of reproduction' (Bourdieu & Wacquant, 1992, p. 106). Each field has a specific logic of guiding the action of the present agents that is different from other fields. This logic exists in terms of rules or regularities that 'define the ordinary functioning' (Wacquant & Bourdieu, 1989, pp. 39-40) and also govern the availability and distribution of capital of the field. These rules and regularities orient the ways individual agents and institutions interact and compete for capital in order to benefit themselves. Within each field there can be subfields; however, '[e]very subfield has its own logic, rules and regularities, and each stage in the division of a field … entails a genuine qualitative leap' (Bourdieu &

Wacquant, 1992, p. 104). In other words, Bourdieu's theory of field is different from a theory of system because it does not consider a subfield as part or a component of the larger field. Each subfield runs on its own logic and has different qualitative characteristics.

In a field, agents and institutions constantly struggle, according to the rules constitutive of this space of game, with various degrees of strength and, therefore, diverse probabilities of success, to appropriate the specific products at stake in the game. (Wacquant & Bourdieu, 1989, p. 40). The effect of rules on the agents within a field define the limits or the boundary of such a field: 'The limits of the field are situated at the point where the effects of the field cease' (Bourdieu & Wacquant, 1992, p. 100). However, the boundaries between fields are very 'imprecise and shifting, determinable only by empirical research' (Jenkin, 1992, p. 53). This point can be observed in the practice of farmers who move from the field of rice cultivation to the field of agricultural labour or the field of industry or construction. Each of these fields of economy has a different logic that requires farmers to follow.

The analysis of a field must be conducted in the relationship with the 'field of power' or a political field, which is regarded by Bourdieu as the dominant field (Wacquant & Bourdieu, 1989, p. 37). The importance of the field of power is that it can impose 'political effects' on any other field, requiring them to 'fulfil political functions' (Bourdieu & Wacquant, 1992, p. 105). By doing so, the political field 'structure[s] all other fields' (Jenkin, 1992, p. 53). Any agent or institution that wants to make an action in their field must always put themselves in the relations with the political field that can check on them: 'Those who dominate in a given field are in a position to make it function to their advantage, but they must always contend with the resistance, "political" or not, of the dominated' (Wacquant & Bourdieu, 1989, p. 40). In short, dealing with the political field is one of the structural conditions for agents' choices, representations, and actions.

Fields are not static but always changing. The change of fields is strongly associated with the transformation of society in terms of social differentiation, economic growth, technological advances, globalisation, which are derived from the transitions between traditional society, the first modernity and the second modernity (Jenkin, 1992; Beck, 1992; Giddens, 1990). These transformations affect the interaction between forces present in a given field, inducing the change of the field quality. Bourdieu asserts: 'the principle of the dynamics of a field lies in the form of its structure and, in particular, in the distance, the gaps, the asymmetries between the various specific forces that confront one another' (Bourdieu & Wacquant, 1992, p. 101).

It is worth noting that the concept of social structure (or field) in Bourdieu's sense shares many similarities to the concept of social system in Giddens' theory. For Giddens, a social system, patterned across time and space is 'reproduced relations between actors or collectivities, organised as regular social practices' (Giddens 1984, pp. 25, 377). Giddens regards social structures as 'properties of social systems', that exist in terms of 'rules and resources' (Giddens 1984, p. 25). So, for both theorists, rules and resources are crucial properties of social systems (in Giddens' terminology) or field/social structures (in Bourdieu's sense).

What guides social practice or action is crucial to both Bourdieu's and Giddens' theories. For Giddens, social structures exist in social practices where human agents, in expressing themselves as actors, feel, perceive, understand, and adopt rules and resources by mobilising these properties rooted in their 'memory traces' and their 'knowledgeability' (Giddens, 1984, p. 377). Knowledgeability refers to the comprehension of the conditions and consequences of their action. This knowledgeability is embedded in practical consciousness which guides the agent in judging the context and conditions for their action (Giddens, 1984). The concept of practical consciousness in Giddens' sense is in parallel with Bourdieu's concept of *habitus* – which I find more useful in understanding an agent's action. Bourdieu considers habitus as dispositions in terms of 'the cognitive and motivating structures' (1990b, p. 56). These structures do not just exist in the form of mentality or perception but also in an agent's way of standing, walking, speaking, and so on (Bourdieu, 1990b). These dispositions help guide human agents to perceive, grasp, evaluate, and assess the social world so as to take appropriate actions.

Habitus is a set of dispositions that is 'structured' by the social world but also is 'structuring' that social world through the production of social practices (Bourdieu, 1990b, p. 52). In other words, habitus is both the product of social structures and the producer of social practices. In the latter sense, habitus considered as 'the organising principle of actions', '*modus operandi* informing all thought and action', 'mental structures' (Bourdieu, 1977, pp.18, 164). In claiming so, Bourdieu establishes the relationship between social structure (field) – habitus – social practice. Structure produces habitus, habitus produces social practice and in doing so, social structure is reproduced (Bourdieu, 1977, 1990b). Bourdieu expresses these relations in terms of 'the dialectic of the internalisation of externality and the externalisation of internality' (1977, p. 22). In claiming that structures produce habitus, Bourdieu sees habitus as a product of history that 'produces individual and collective practices – more history – in accordance with the schemes generated by history' (Bourdieu, 1990b, p. 54). In this process of the creation of

habitus, it is crucial to recognise the effects of enabling and constraining features of social structures on habitus. Bourdieu assets that the habitus is 'durably inculcated by the possibilities and impossibilities, freedoms and necessities, opportunities and prohibitions inscribed in the objective conditions' (Bourdieu, 1990b, p. 54).

The internalisation of externality occurs when the agent learns the structural properties (rules, capital and positions, sense of the game) from those contrasting features of the social system and turn them into internal schemata. This is when individual habitus is produced. The externalisation of internality is the process whereby the agent uses his/her habitus to perceive, understand, assess and judge surrounding environments of the field in which he/she lives so as to take practice. Through this process, social practices reproduce social structures (rules, capital). So, whenever the agent takes action, his/her habitus 'in the forms of perception, thought and action' regulates his/her action (1990b, p. 54). In viewing social structures in terms of a field, Bourdieu points out the duality between field and habitus:

> The relation between habitus and field operates in two ways. On one side, it is a relation of conditioning: the field structures the habitus, which is the product of the embodiment of the immanent necessity of the field (or of a hierarchy of intersecting fields). On the other side, it is a relation of knowledge or cognitive construction: habitus contributes to constituting the field as a meaningful world, a world endowed with sense or with value, in which it is worth investing one's energy. (Bourdieu, in Wacquant, 1989, p. 44)

One can relate Bourdieu's claim of such a dialectical relationship to Giddens' (1984) claim of 'the duality of structure'. From a structuration perspective, the relations between structure and agency are dual in the sense that structure is both medium and outcome of social conduct (Giddens 1984). In other words, social structures provide conditions for social agents to enact their agency and take action, but only through the practices of these actions, social structures are produced and reproduced.

Habitus is durable because it is the product of social structures or field (Bourdieu, 1977, 1990a, b). Durability is long-lasting and resilient in response to change. Jenkins (1992, p. 49) notes that the durability of habitus in Bourdieu's sense:

> is a reflection of their foundation in learning during the early years of life, of their habitual, unreflexive nature, of their adjustment to the objective conditions of existence, and of their inscription in bodily hexis. These make the habitus almost immune to major

> upset. Once acquired it underlies and conditions all subsequent learning and social experience.

As habitus is often regulated by fields, this concept is criticised for leaving little room for 'conscious, rational behaviour' (Edgerton & Roberts, 2014, p.199). According to Bourdieu in response to ever-changing situations of social life, social agents do not have enough time, 'the complete information and the skill to appreciate it' so as to make rational thought and actions (Bourdieu, 1990b, p.62). To put it another way, social agents in the social world must leave things taken for granted because they are not capable of questioning everything all the time (Jenkin, 1992, p. 43). To make things work, agents mostly leave the rules or normative models aside and instead, use habitus and improvisation which are less conscious and rational, to respond to emerging conditions and needs (Jenkin, 1992, p. 43). According to Bourdieu:

> Each agent, wittingly or unwittingly, willy nilly, is a producer and reproducer of objective meaning. Because his actions and works are the product of a modus operandi of which he is not the producer and has no conscious mastery they contain an "objective intention", as the Scholastics put it, which always outruns his conscious intentions… (1977, p. 79)

Thus, for social agents their habitus becomes the 'quasi-natures' – the internal framework that is ready to give them a direction for for thought and actions. In Bourdieu's own words: 'The 'unconscious'…is never anything other than the forgetting of history which history itself produces by realizing the objective structures that it generates in the quasi-natures of habitus (Bourdieu, 1990b, p.56). As such, social agents often take themselves, the social world and their intervention in it for granted. Bourdieu expresses this phenomenon as 'doxic experience' – the perception of social worlds 'as self-evident, taken for granted'.

> The coincidence of the objective structures and the internationalised structures which provides the illusion of immediate understanding, characteristics of practical experience of the familiar universe, and which at the same time excludes from that experience any inquiry as to its own conditions of possibility. (Bourdieu, 1990b, pp. 25-26)

Bourdieu finds this experience analogous with fish and water (the agent and the field) where the fish does not usually feel the existence of water unless he/she comes out of water: when habitus encounters a social world of which it is the product, it is like a 'fish in water': it does not feel the weight of the water and it takes the world about itself for granted (Bourdieu &

Wacquant, 1992, p. 127). The agents who take the action, do not often question nor discursively explain why they do as they do unless someone (e.g., a researcher) asks them. This is due to the fact that what they do is facilitated and regulated by the habitus (both individual and collective) – which is a product of social structures. As they may not be aware of this habitus or the structure behind it, they tend to take things for granted.

Bourdieu, nevertheless, does not preclude the calculation of social agents. He uses the terms 'strategy' to refer the way the agents calculate strategically in specific situation. In his words:

> It is, of course, never ruled out that the responses of the habitus may be accompanied by a strategic calculation tending to perform in a conscious mode the operation that the habitus performs quite differently, namely an estimation of chances presupposing transformation of the past effect into an expected objective. (1990b, p. 53)

Yet, this 'strategic calculation' must be considered in parallel with the field in which social agents live. In Bourdieu's (1990a, p.116) own words:

> Habitus…is endlessly transformed, either in a direction that reinforces it, when embodied structures of expectation encounter structures of objective chances in harmony with these expectations, or in a direction that transforms it and, for instance, raises or lowers the level of expectations and aspirations

In other words, if there is a congruence between habitus and the field, that is, the agent's expectation matchs the field's structures of chances, habitus tends to motivate social practice (action) to continuously underpin the field. However, if the agent's expectation disagrees with the field's structures of opportunities, because of either the agent changes or the field changes, the agent will seek to change its habitus to adapt to the new conditions of the field or seek to transform the field. This quality of habitus opens the room for reflexivity and creativity: 'The habitus operates primarily in the background until the actor is faced with circumstances – a sufficient degree of habitus-field disjuncture – that may bring conscious deliberative action to the fore' (Edgerton & Roberts, 2014, p.200). As such, social agents are not understood just as a passive 'puppet' of the field, but rather the one who is 'capable of transcending the social conditions in which it was produced' (Reay, 2004, pp. 434-435). The improvision each agent takes is regarded as 'the art of inventing' (Bourdieu, 1990a, p. 55).

Both Bourdieu and Giddens, in their attempts to bridge the link between structure and agency, tend to focus on, not the agent, but social practice that the agent takes. Giddens advises that the

study of social sciences should focus on neither agency nor structure, but instead on social practice.

> The basic domain of study of the social sciences, according to the structuration theory, is neither the experience of the individual actor, nor the existence of any form of societal totality, but social practices ordered across space and time. Human social activities like some self-reproducing items in nature, are recursive' (Giddens, 1984, p. 2)

There are several implications that can be drawn from such advice. First, social practice should not be conceived just as a single action of a single agent/individual but rather as a pattern shared by a group, community or class. Bourdieu puts it: 'the subject is not the instantaneous ego of a sort of singular cogito, but the individual trace of an entire collective history' (Bourdieu, 1990a, p. 91). While each individual agent forms his/her individual habitus through his/her past and present experiences and social positions within a specific field, he/she also shares a collective habitus with others in the same group and occupies the same positions of a particular field. In the study of tastes, Bourdieu concludes that habitus 'forge[s] the unconscious unity of a class' in producing the same life-style or tastes when it comes to 'the tastes and dictates, sympathies and aversions, fantasies and phobias' (Bourdieu, 1984, p. 77). The collective habitus is created through a collective history (Jenkins, 1992, p. 49) which involves the evolution of social structures of the field of concern. This collective habitus is adjusted to the objective conditions of social structures (or the fields). So, it is expected that farmers of the same field share common social practices based on their collective habitus. Of course, the positions that they occupy, that endow them with different capital, can be used to explain further why each sub-group of farmers may have different types of practices in relation to risk-taking and rice cultivation. Second, social practice must be recursive in the sense it must be repeated over time so that social structures are reproduced. Once social practices are produced by the collective habitus, they belong to the collective rhythms to which each agent of the field must conform (Bourdieu 1977, p. 163). As collective practices are routinised, they become 'the habitual, taken-for-granted character of vast bulk of the activities of day-to-day social life; the prevalence of familiar styles and forms of conducts' (Giddens, 1984, p. 377).

Capital

Drawing on Bourdieu's work, I see resources or capital as the structural properties of social structures, embedded in specific fields and critical to social agents in achieving their goals. The concept of capital was first conceived as an economic asset generating profits over time which

was extensively explored by theorists such as Marx. However, this perception has changed since the introduction of neo-capital theory by social theorists such as Becker (1993, first edition in 1964), Coleman (1988, 1990), and Bourdieu (1986, 1990a, b). New types of capital have been proposed alongside economic capital. For instance, the term 'human capital' refers to an individual's knowledge, skills, and health which result from education, training or medical care (Becker, 1993, p. 16). Or the notion of social capital, existing in terms of social networks, trust, social obligations, norms, has been widely studied by various scholars (Bourdieu, 1986; Burt, 1992, 1997; Coleman, 1988, 1990; Flap, 1991; Flap & Völker, 1996; Lin, 1999, 2001; Lin & Dumin, 1986; Lin, Vaughn, & Ensel, 1981; Portes, 1998, 2000; Putnam, 1995, 2000a).

In vulnerability literature, the term 'capital' is often used interchangeably with the notions of assets/resources. These frameworks include many capitals other than the three types of capitals proposed by Bourdieu. From the sustainable livelihood approach (SLA), Chambers and Conway (1992) consider 'assets' as both material and social resources to be one of three components of a sustainable livelihood, along with the capabilities and activities required for a means of living. Inheriting this definition, DFID (1999) considers five types of assets/capitals essential to sustainable livelihood in the vulnerability context (i.e., the presence of shocks) that are: human capital (skills, knowledge, health and energy), social capital (networks, groups, institutions), physical capital (infrastructure, technology and equipment), financial capital (savings, credit), and natural capital (natural resources, land, water, etc.). Each person has a different combination of assets over time, representing in different shapes of pentagons. For instance, one person could have adequate access to financial assets but lack access to physical assets. These assets are strongly related as they connect in a specific order over time and can substitute for each other or transform from one into another (DFID, 1999). In their framework of the community capitals, Flora, Flora and Gasteyer (2016, pp.15-16; see also Flora, 2004) propose that a community has a stock of different capitals, including natural (i.e., the air, water, soil, wildlife, vegetation, landscape, and weather), cultural (worldview), human (education, skills, health, and self-esteem), social (mutual trust, reciprocity, groups, collective identity, working together, and a sense of a shared future), political (access to power and distribution of resources), financial (savings, income generation, fees, loans and credit, gifts and philanthropy, taxes, and tax exemptions), and built capital (infrastructure). It is critical to point out the difference between that assets/resources and capital. Only if those assets/resources are strategically and purposefully invested over time and used for achieving certain

goals/outcomes, are they are considered as capital (DFID, 1999; Flora et al., 2016; Magis, 2010). However, capital is by often seen through those frameworks as the assets possessed by individuals or agents, neglecting the structural root in social structures (Uekusa, Matthewman, & Lorenz, 2020, p.3).

Bourdieu's theory of practice (1977, 1986) offers a suitable insight to my study's approach. He considers capital as 'accumulated labor', that allows agents to 'produce profit' (Bourdieu, 1986, p.46). Capital does not belong to any individual agent because it is embedded in a certain field in which agents live. In Bourdieu's words: '[Capital]… is a *vis insita,* a force inscribed in objective or subjective structures,but it is also a *lex insita,* the principle underlying the immanent regularities of the social world' (Bourdieu, 1986, p.46). Capital in the field is scarce and because of 'the structure of the field', it is unequally distributed to different agents (Bourdieu, 1986, p.49). Hence, agents must compete with each other for the same resources available to them.

In addition to economic capital, which exists in the form of money or property rights, Bourdieu proposes the other two major types of capital: cultural capital and social capital (Bourdieu, 1986). These types of capital can be converted into each other. For instance, a friendship (social capital) allows one to borrow money (economic capital). In return, lending money to one's friend could result in a stronger friendship.

Cultural capital can exist in three forms including the embodied state, or 'long-lasting disposition of the mind and body', the objectified state (i.e., cultural goods such as pictures, books, machines), and the institutionalised state (educational qualifications) (Bourdieu, 1986, p.47). The definition of embodied cultural capital as 'disposition' leads to the confusion between this concept and the notion of habitus. However, it should be understood that 'the accumulation of embodied cultural capital and the formation of habitus are in actuality two sides of the same socialization process: the situated internalization of cultural schemas (Edgerton & Roberts, 2014, p.207). To put it another way, habitus as a certain disposition of thoughts and action that originates from a particular class/social group can be turned into embodied cultural capital if such a disposition can help the social agents gain ''profit' or advantage' when competing with other agents (Edgerton & Roberts, 2014, p.207).

Social capital is defined as 'the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition' (Bourdieu, 1986, p.51). There are at least two factors that

determine the volume of social agents' social capital: i) the size of the network of connections the agent possesses and can effectively mobilized for his/her own actions; and ii) the volume of all forms of capital (economic, cultural, or symbolic capital) possessed by the ones with whom he/she has relationships. Social capital, as other types of capital, is not 'a natural given… or a social given' (Bourdieu, 1986, p.52). It means that social agents, who wants to appropriate capital, must invest effort and energy over time so as to gain it: social capital is 'the product of investment strategies, individual or collective, consciously or unconsciously aimed at establishing or reproducing social relationships that are directly usable in the short or long term' (Bourdieu, 1986, p.52).

Various scholars have conceptualised social capital into three forms: bonding social capital, bridging social capital and linking social capital. Bonding social capital refers to the types of relationships that share the same socio-economic characteristics, that is, a 'high level of similarity', and they are often between people who have 'emotionally close' relationships with each other, for instance, family, relatives, and friends (Aldrich & Meyer, 2015, p. 5). Bridging social capital denotes the types of relationships across groups such as class, race, religion which are 'loosely connected' (Aldrich & Meyer, 2015, p. 5). While the first type is based on 'exclusive' tendencies – ties, strong cohesion, reciprocity and solidarity within members of group, it excludes outsiders; the second is inclusive – ties, connections between groups' members, open to outsiders and information exchange but looser towards inner relationships (Putnam, 2000b). These two types of social capital are similar to Granovetter's (1973, 1983) classification of 'strong ties' and 'weak ties', with the qualification that weak ties are more valuable in job finding. In contrast to bonding and bridging, linking social capital centres on the relations between people of different ranking or social stance, or having 'vertical distance' between them (Aldrich, 2011c, p. 62). Examples of those relationships are between citizens and authority officers, or between citizens and donors. Linking social capital can be present in bonding relationships such as between parents and children or in bridging relationships such as between a member of a village with another village's leader.

Capital is usually considered to have a positive impact on individuals, households or communities. On the one hand, capital can help them reduce vulnerability and cope with risks, shocks, contingencies (DFID, 1999; Chambers and Conway, 1992), or hazards (Wisner et al., 2004); on the other, capital is essential in achieving socio-economic goals (Gittell & Vidal, 1998; Labonte, 1999; Putnam, 1993; Putnam & Feldstein, 2003; Rohe, 2004; Woolcock & Narayan, 2000) and building resilience (Aldrich, 2011a, 2011b, 2011c, 2012a; Aldrich &

Meyer, 2015; Ganapati, 2012; Dynes, 2002; Flora et al., 2016; Hsueh, 2019; Joshi & Aoki, 2014; Marín et al., 2015; Minamoto, 2010; Magis, 2010; Norris et al., 2008; Wind, Fordham, & Komproe, 2011). However, social capital also has the downside of constraining its members in the shadow of collective (Aldrich, 2011a ; Portes & Landolt, 1996; 2000). There is a lack of research discussing if economic capital and cultural capital could also negatively affect individuals, households or communities in the time of crisis. The question is that if capital can boost resilience, can it exaggerate vulnerabilities? In this study, I consider capitals as prerequisite conditions for both of vulnerability and resilience. To be resilient as well as being less vulnerable, disaster-affected communities must develop capacities to effectively employ various capitals in obtaining desirable goals.

Towards a Conceptual Framework

This section aims to combine all the key concepts in a conceptual framework that helps explain for the ways they will be used throughout this thesis (Fig. 2.1).

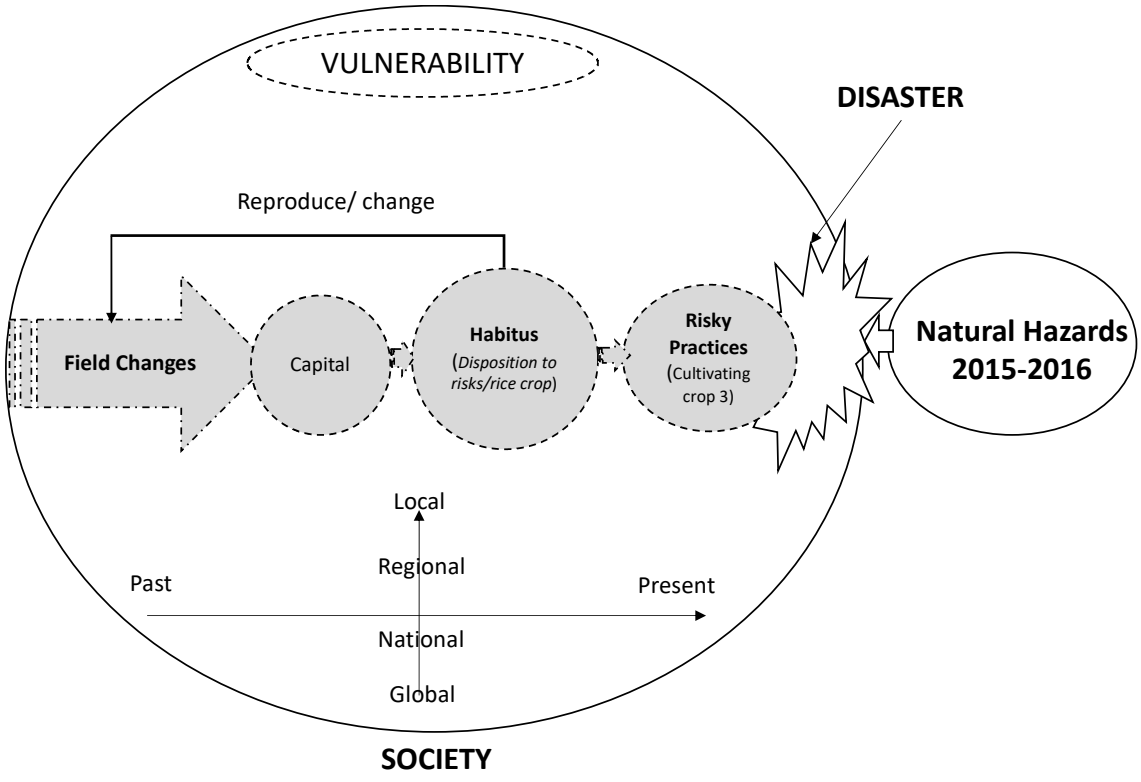


Figure 2.1. Conceptual Framework of Vulnerability Analysis

Source: Author

As seen in Fig. 2.1:

- *Disaster* is the outcome/process resulting from the development of social vulnerability when encountering external threats such as natural hazards, technological errors, biological diseases. Disaster is a social crisis that causes physical damages, social disruption and disorganisation to the affected society, requiring them to take unusually great effort in mobilising human resources and capital to respond to, cope with, adapt to and recover from the adversity.
- *Risk* is a projection of disaster or strokes that cause the society collective stresses (Beck, 1992). Risk is a property of social structures, that can both enable and constrain human action. *Risk perception* is a type of knowledge that is resulted from social agents' engagement with and making sense of their fields. *Risk taking, reduction, avoidance*, or *risk management strategies* are types of social practice.
- *Vulnerability* is social and structural in its origin, characteristics, and progresses (Quarantelli, 2000, 2005a, 2005b, 2006). It is structural weaknesses caused by sensitivity and the lack of capacities in projecting, coping with, adapting to risks and in recovering from disasters. These weaknesses are the result of the historical interaction between the structural imbalance in the transformation of the field (e.g., unequal distribution of power and capital) and social agents' habitus and practice in all spatial levels (from local, regional, national to global levels).
- *Social structures* are the objective conditions, rules and regularities that can both enable and constrain human action (Bourdieu, 1977, 1990a, b). *Structural contexts (*including social, economic, political, environmental, and cultural dimensions) refer to the presence, operation, and transformation of those conditions, rules and regularities in the contexts of the field(s).
- *Field*, as a representation of social structures, is a social space for struggle in which social agents live, strive for goals, and compete with others in reaching those goals. In a specific society, there are many fields which operate in interdependent relationships. Each field (also its subfields) has its own specific logic (including rules and the distribution of capital) that orient agents' action. The boundaries between fields are fluid and dynamic, and can only be determined by empirical research (Bourdieu, 1977, 1990a, b). Transformation in society leads to field changes, which would lead to the

changes in capital, habitus, and social practice. Habitus and social practices can reproduce or change the field.

- In this thesis, the *field of agriculture* or the agricultural field, as the space in which farmers as the main agents striving for food and profit by doing crop cultivation is the main focus. In relation to this field, the *field of politics* (or the field of power) refers to the political context including regimes and policies that affect not just the field of agriculture but also the whole economic field; the *field of economy* refers to the field of producing and distributing goods and services; the *field of non-agriculture* refers to any other sub-fields of economy (e.g., the field of wage job) that are not agriculture; the *field of disaster risk management* cutting across many fields is the field involving the rules and regulations in mobilizing social resources and human forces in coping with disaster risks and climate changes; the *field of natural resources management* refers to the management of natural resources such as land, water that also affects the field of agriculture.
- *Agents* are the social actors who, while living, working and striving for their own goals in the field, are regulated, enabled or constrained by the structural conditions of such field. A *class of agents* refers to the set of agents who share a homogeneous field (i.e., similar conditions of existence), *class habitus* (a similar set of dispositions), class practice (a set of common practices) (Bourdieu, 1984, p.101). In this thesis, farmers are the main social agents in the agricultural field. In addition to farmers, other agents such as the government and its officials, local social and political organisations (e.g., Women's Union, Farmers' Union), agricultural input suppliers, merchants, brokers, and so on are also included in the analysis. All of them have specific goals, occupy specific positions and compete for the stakes.
- *Capital* is the structural conditions of the field, enabling or constraining social agents' action in risk management (Fig. 2.2). In this thesis, I consider three types of capital including *economic capital* in the forms of money, assets, property rights; *cultural capital* in the embodied state is the mental and physical dispositions of social agents, knowledge, experience, cultural goods, language, and educational level; *social capital* is social networks possessed and used by social agents (Bourdieu, 1986). Capital does not belong to agents. To use capital, agents are required to invest in their field a continuous and enduring effort. The changes of field lead to the changes in capital volume, accumulation and configuration, which later shape habitus and practice.

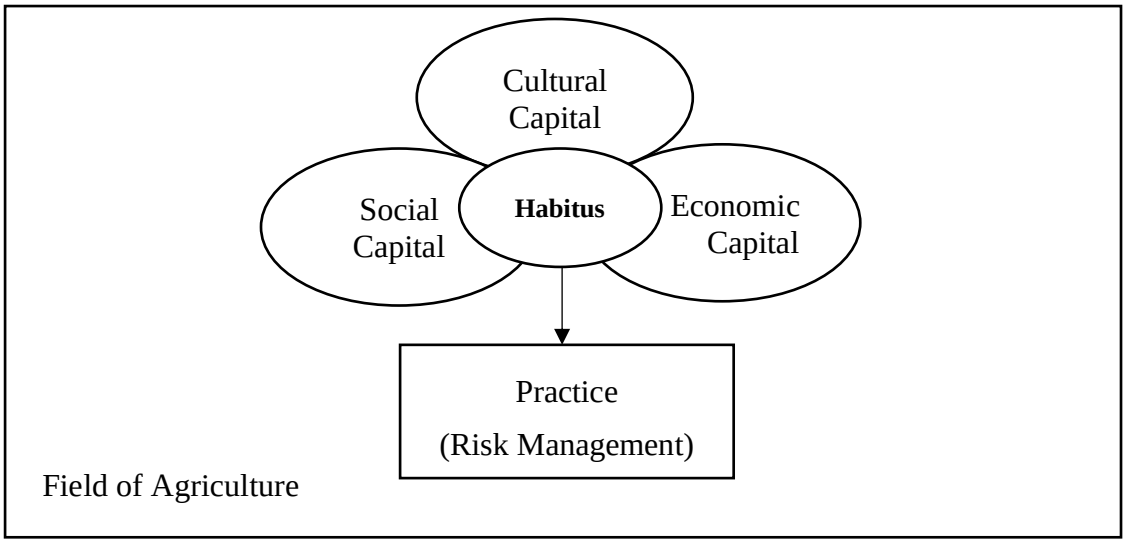


Figure 2.2. Capital, Habitus and Practice in the Field of Agriculture

Source: Author

- *Habitus* is a set of dispositions that guides all thought and action (Bourdieu, 1977, 1990a, b). Habitus exists as mental structures that often operate unconsciously. On the one hand, habitus is the product of social structures or the fields with which social agents engage; on the other, habitus is subject to emerging experience of its social agent during his/her engagement with the field's conditions.
- While each agent has his/her own habitus accumulated through his/her experience, they share with other similar agents in the same field a *collective habitus or class habitus*, which is 'the practice-unifying and practice-generating principle' (Bourdieu, 1984, p.101). In normal conditions, habitus tends to lead agents' action to maintaining the field. However, in the conditions where agents' expectation does not meet the field's conditions, agents will seek to change or transform the field in order to secure their goals. One of the examples of such circumstances is the crisis conditions during the occurrence of disasters.
- *Social practices* are social action or activities conducted by social agents. In this thesis, social practices are presented in the forms of economic practices, namely, crop cultivation. A *triple rice cropping system* refers to the farming system combining three rice crops a year, of which, *the third rice crop* or *crop 3 cultivated in the dry season* is the risky practice concerned in this study. The practice of this crop is risky in nature because of its sensitivity to natural hazards, market risks, and biological risks (e.g., pest or rice diseases).

CHAPTER 3. CASE STUDY METHODOLOGY

Designing Case Study in Rural Settings

Research Approach

To answer the research questions proposed, this study employs a qualitative case study approach (Yin, 2014; Creswell, 2007; Gerring, 2004, 2008; Stake, 2005). Case study is considered by some as 'a methodology, a type of design in qualitative research, or an object of study, as well as a product of the inquiry' (Creswell, 2007, p. 73), 'a choice of what to be studied' (Stake, 2005, p. 443), a research strategy (Yin, 1981), and a research method (Yin, 2014). Creswell (2007) puts case studies under qualitative inquiry, along with four other major approaches including narrative studies, phenomenology, grounded theory, and ethnography. He defines this approach as 'the study of an issue explored through one or more cases within a bounded system (i.e., a setting, a context)' (Creswell, 2007, p. 73). Yin's (2014) model offers a practical manner to design case study research which focuses on the central phenomenon of disaster vulnerability in rural areas of Vietnam's Mekong Delta – a 'real-world context' (see Yin, 2014, p. 16).

This study is qualitative in nature, although it also employs quantitative data in supporting the overall thesis. Qualitative research, as Braun and Clarke argue (2019, p. 3), is about 'meaning and meaning-making, and viewing these as always context-bound, positioned and situated, and qualitative data analysis is about telling "stories"'. This type of research offers me an ability to answer the research questions by uncovering the meaning and stories of farming households and relevant stakeholders in the agricultural field over time and space. Quantitative data are only used to provide basic statistics such as frequency and crosstabs, instead of being used to generalise to broader population. These quantitative data from qualitative research can also be interpreted in a qualitative manner.

It is necessary to state that my research was not limited in either the type of exploratory or explanatory methods used, as Yin (2014) identifies. I believe that research on complex phenomena such as disaster vulnerability requires both exploration and explanation. For instance, this study did not only explore farmers' risk perception but also the formation and development of vulnerability that originates in deeper levels of social structures. The case study

research design enabled me to collect data from multiple techniques to analyse and illustrate the phenomenon of interest. In-depth interviews with farmers and key stakeholders, direct observation, documentation, and archival records were used.

From Research Questions to Theoretical Propositions

In order to establish the rationale for applying the case study approach, it is necessary to explain the links between the research questions, key concepts, and theoretical propositions (see Appendix 1). This explanation also sets out some of the underlying propositions or prior knowledge that I gained from the literature which informed my understanding of the topic and approach to data collection. Theoretical propositions are statements of what should be studied proposed in the research design stage (Yin, 2014, p. 30). Unlike other qualitative research approaches such as ethnography, narrative studies, phenomenology (Creswell, 2007), and especially grounded theory methods (Corbin, Strauss, & Strauss, 2014; Strauss & Corbin, 1967) which require researchers to remain theory-free (theoretically) before conducting research, a case study research design, as proposed by Yin (2014), acknowledges that researchers have their theoretical propositions preceding to fieldworks. These propositions are based on the existing literature on the topic under study (Yin, 2014, p.38). Chapter 2 presents key concepts and theoretical propositions that have grounded my prior comprehension of the phenomenon of interest (vulnerability). Of which, two propositions stand out. First, disaster vulnerability is a structural problem that is resulted from the historical interaction between and the evolution of field, capital, habitus and social practice. Second, farmers' social practice is produced by their habitus and the use of capital (economic, cultural, and social capital), which are produced by the field in which the agents engage. Theoretical propositions do not limit my case study; instead, the use of qualitative methods including semi-structured interviews and thematic analysis (TA) (Braun & Clarke, 2006, 2009) allows me to remain open for the emergence of themes during the data collection and data analysis stages.

Single-Case Embedded Design

Based on what Yin (2014) proposes, this study utilises a single-case embedded design. This design focuses intensively on a single case of interest. The single embedded design (see Fig. 3.1) allows me to delve deeper into the case and research its sub-units. Given the research questions, the topic of this study is the practice of cultivating the rice crop 3 or Spring-Summer or the late Winter-Spring crop in the dry season that was vulnerable to drought and saline

intrusion. To study this topic, I selected the Tan Hung commune of Long Phu district, Soc Trang province, which lies in the coastal region of the Vietnamese Mekong Delta (VMD) as the main case. Within this case, single farming households of two selected villages were chosen as the sub-units to illustrate the cultivation of crop 3 and its social structures. This case is closely related to other stakeholders who made up the context for the case. This includes not just stakeholders or agents/institutions in Bourdieu's terms such as local governments, agricultural input suppliers, brokers, and scientists, but also the socio-economic and institutional contexts of the wider society.

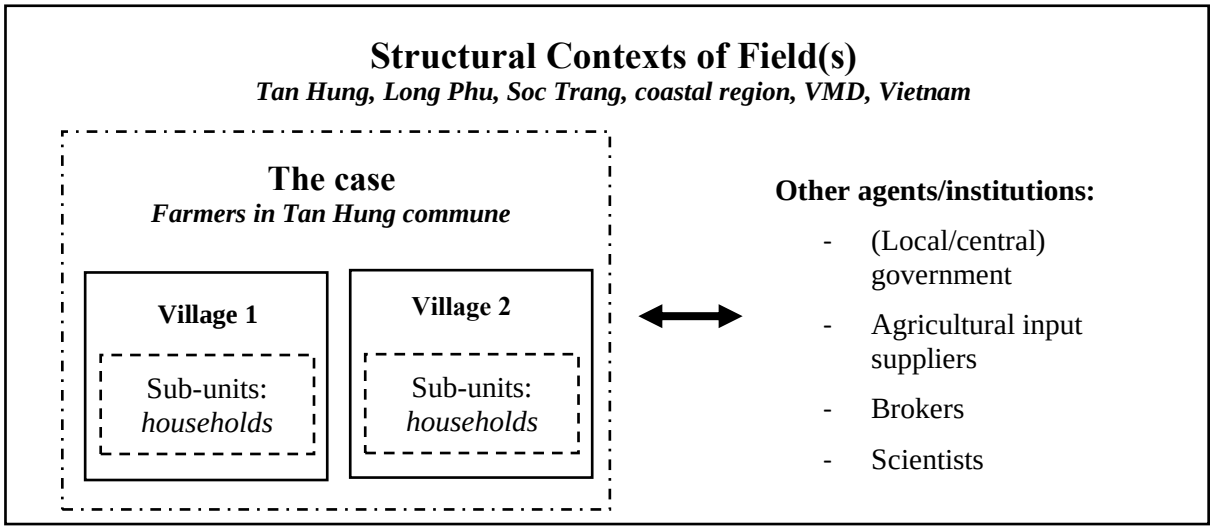


Figure 3.1. The single embedded case study design
Source: Author's figure, based on Yin (2014, p. 50)

Locating the Case

The single-case embedded design locates Tan Hung commune as a bounded system where the topic was studied. The selection of Tan Hung commune as the case was based on the criteria of a 'common case' and a 'revelatory case' (Yin, 2014, pp. 51-53). As a common case, Tan Hung is a typical rice-based commune. According to the land use database in 2018 (Soc Trang PPC, 2018), the commune's percentage of agricultural land and rice cultivation land area in its total land area were 90.5 per cent and 77.8 per cent. These figures ranked third and first among 11 towns and communes in Long Phu district (see Fig. 3.2). Additionally, the commune was also typical for a triple cropping system that is found in many other provinces of the VMD's coastal region. This system was highly vulnerable to and affected by saline intrusion and drought (FAO, 2016; V. G. Nguyen & Ngo, 2016, 2017; United Nations, 2016a, 2016e).

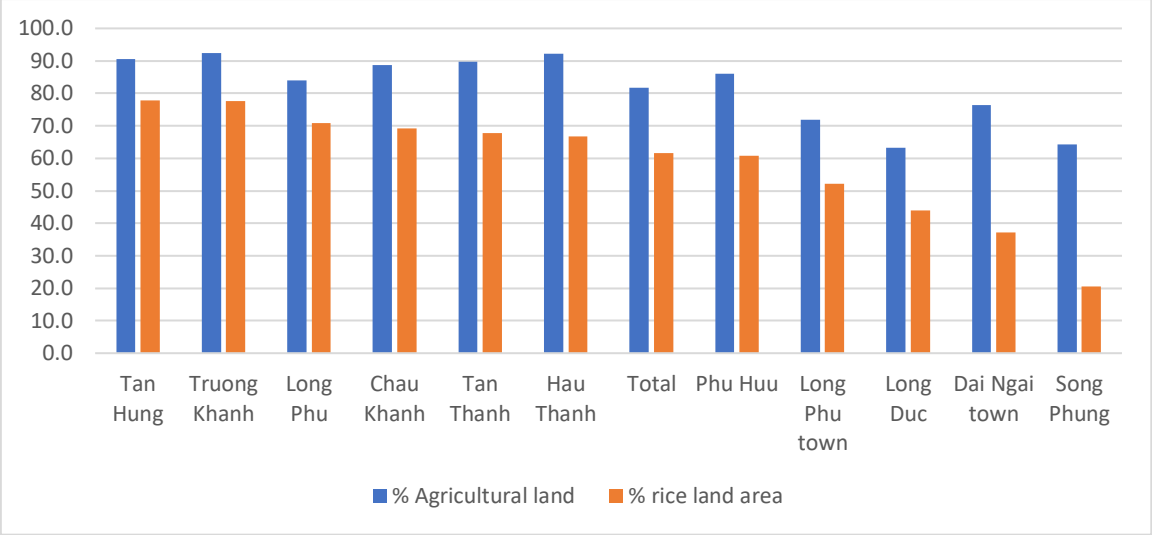


Figure 3.2. Percentages of agricultural land and rice cultivation land in Long Phu District in 2018

Source: Soc Trang PPC (2018)

As a revelatory case, Tan Hung was one of the most severely affected communes in Soc Trang province in the historic 2015-2016 disaster (see Fig. 3.3). The commune lost 916 ha (accounting for 19.3 per cent of Long Phu District's total affected area) and had 582 affected households (or 14.3 per cent of the district's total affected households) - second only to Truong Khanh commune. Tan Hung also received VND 1.59 billion (about US$16,500) - the highest amount of disaster relief aid from the government for a single commune (Long Phu DPC, 2016). The suffering, which was the worst in 90 years due to the combination of drought and saline intrusion, was also a rationale for conducting this research.

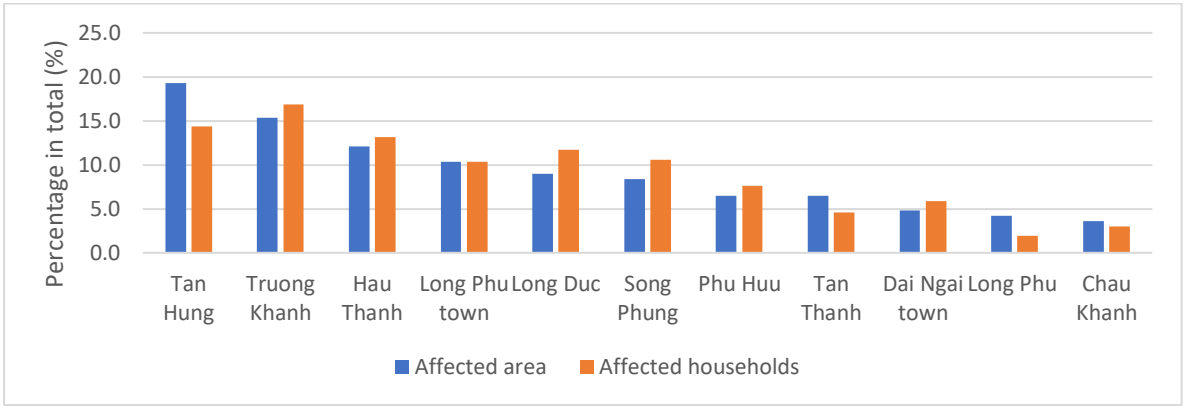


Figure 3.3. Percentage of affected area and affected households in Long Phu district in the 2015-2016 drought and saline intrusion

Source: Long Phu DPC (2016)

In an area of 263.72 km², the average population of the Long Phu district was 114,010 people in 2017, which made up the fourth most densely populated location in Soc Trang province (432

people/ km²), only behind Soc Trang city, Ke Sach and Chau Thanh districts (Soc Trang Statistics Office, 2018, p.63). According to the district's annual reports, the district's practice of crop 3 is common, especially since 2010 (Long Phu DARD, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017). Located alongside the Bassac River and about 20 km away from the Tran De sea gate, the district is subject to annual saltwater intrusion. In the first six months of 2016, the Long Phu station located on the Bassac River reported one of the highest salinity concentrations present in river water (8.5 gram/litre), ranked third among eight stations distributed around the province, only after Tran De and Tham Don. Under the severe conditions of saline intrusion, the district lost about 81.9 per cent of annual rice production and 62.9 per cent of rice planted land in the 2015-2016 disaster, making it the most impacted area in the province. Moreover, according to Save the Children and CARE reports (V. G. Nguyen & Ngo, 2016, 2017), this district has a high percentage of Khmer people – one of the 52 ethnic minority groups of Vietnam – and is a typical district in the VMD.

The delta in the southern part of Vietnam, which is considered Vietnam's 'rice bowl', was the most affected region in the 2015-2016 El Niño-induced disasters. Ten out of the 13 provinces and city of the region were severely impacted, and nine out of these ten provinces were disturbed by both droughts and saltwater intrusion (United Nations, 2016b, 2016c). Soc Trang province, according to GSO (2020c), has been the leading province in cultivating the Winter-Spring rice crop (or crop 3) in the coastal region of VMD. The planted area for this crop in Soc Trang reached and maintained triple figures since 1998 (137.2 ha), which was much more than those of any other coastal provinces such as Bac Lieu, Hau Giang, Ben Tre, Tra Vinh. Therefore, during the El Niño-induced disasters in 2015-2016, the province's rice crop faced the most devastation in the delta, leading to the declaration of a State of Emergency in February 2016.

Setting the Case's Boundaries

Once the case and its context were identified, the next task was to identify the case's boundaries (Yin, 2014). Methodologists have identified space and time as the main boundaries for identifying a case (Gerring, 2004, 2008; Creswell, 2007). In designing a study, nevertheless, researchers can choose other 'explicit' boundaries to make the case standout (Yin, 2014). In this research, I combine space and time with field – the concept proposed by Bourdieu (1977, 1990) and the agent (farming households) in building boundaries for the case of interest (see Table 3.1).

Table 3.1. Defining the case study

Indicators	Description
The topic	The practice of cultivating rice crop 3, a rice crop planted from late December to March or April in the dry season.
The case	Farmers, as social agents, in Tan Hung commune who cultivated crop 3 and were vulnerable to the 2015-2016 disaster.
Population	Farmers in the coastal region of Vietnam's Mekong Delta who cultivated a triple rice cropping system including crop 3 in the dry season.
Sub-units	A single farming household from two villages of Tan Hung commune who cultivated crop 3 and suffered from the 2015-2016 disaster.
Temporary boundary	Farmers' practice of cultivating crop 3 in the 2015-2016 season. Historical practice of the crop prior the 2015-2016 season. The practice after the 2015-2016 season.
Spatial boundary	Farmers living in two villages A and B of Tan Hung commune, Long Phu, Soc Trang. Context: Tan Hung commune, Long Phu district, Soc Trang province. The coastal region of VMD. The Mekong Delta. Vietnam.
Field boundary	Rice cultivation, as a sub-field of the agricultural field. Relevant fields: The political field (the field of power). The field of economy and its sub-field such as the field of wage job The field of disaster risk management. The field of resources (water/land) management.

Source: author

Regarding the agent, the selection of farmers who cultivated rice crop 3 in a triple cropping system and were vulnerable to the 2015-2016 disaster clearly sets the boundary for this social group. First, the case separates the studied farmers from other farmers living within the same commune who did not engage with crop 3 or triple cropping. The latter group was not susceptible to drought and saline intrusion so that they were not the object of this research. Second, the case puts the studied farmers in a broader population, that is, those who cultivate triple rice crops in the coastal region of the VMD. Farmers in Tan Hung share with those who live in the coastal region of the VMD some similar vulnerability characteristics, or risk position in Beck's terminology (1992), such as living and planting rice crop in a susceptible geography where they are exposed to saline intrusion in the dry season from December to May; their crop production is protected by a system of dikes, sluice gates, pumping stations, which store freshwater and prevent saline intrusion in the dry season. Third, living in salinity-vulnerable regions make the studied farmers very different from farmers residing in the VMD's Plain of Reeds and Long Xuyen Quadrangle who face the problem of flooding and inundation. As such, the two groups of farmers experience a different type of disaster vulnerability. In addition to

these aspects, this study focuses on farmers as farming households – a unit of shared residence and economy, who were residents of Tan Hung commune. Farming households from two villages of Tan Hung commune were chosen as sub-units for the fieldwork.

These single households were observed within three other boundaries including time, space, and field. Concerning time, the focus is on the farmers' practice of cultivating crop 3 during the 2015-2016 season – the time when the historic disaster that combined saline intrusion and drought occurred. As the study was interested in the formation and development of vulnerability, the temporal dimension went beyond the immediate timeframe to include two other periods: the historical practice of cultivating crop 3 prior to the 2015-2016 season since its initiation, and the practice after the 2015-2016 season until the end of 2018 when the field work ended. The study of these two periods helps illustrate the temporal evolution of the practice in focus.

As regards to space, Tan Hung commune with two chosen villages, Village A and B sets the geographical boundary for the case. This boundary distinguishes the selected farmers from those living in other villages of Tan Hung commune, from those living in other communes of Long Phu district, and those living in other districts of Soc Trang province and those living in other coastal provinces of the VMD such as Ca Mau, Bac Lieu, Hau Giang, Ben Tre, Tra Vinh). Moreover, this boundary also identifies the spatial contexts of the case including the context of Tan Hung in general, of Long Phu district, of Soc Trang province, of the coastal region, of the VMD, and broader context of Vietnam.

As regards field defined as a space of struggle (Bourdieu, 1977), the practice of cultivating crop 3 belongs to the field of agriculture. This field is considered as the social structure that provides conditions (rules, resources including risk information) that enable and constrain farmers' perceptions and actions when it comes to crop production. In this field, farmers are agents who have a capacity of planning and taking strategic actions in regard to their crop production. Farmers cultivate their crop in relation to many other agents/institutions: the government (an institution representing the political field); mass organisations (socio-political organisations such as Women's Union, Farmers' Union, representing partly the political field); agricultural input suppliers, dealers (representing the economic field); and scientists (representing the scientific field). The field of power or the political field of Vietnam is the one, as Bourdieu would argue, that governs and dominates the field of agriculture. The field of politics should be considered in the context of a country ruled by a one-party state or a socialist regime. The agricultural field is also strongly associated with other fields such as the field of

disaster risk management, the field of resources (water, land) management, and the field of other economic sectors (e.g., industry, services).

Research Process

According to Yin (2014), the case study research consists of six steps: plan, design, prepare, collect data, analyse data, and finally share findings. The research design is considered as a plan connecting the research questions to data collection, data analysis and developing conclusions (Yin, 2014). Based on this approach, this thesis considers research design as plans for selecting the case and its sub-units, approaching target objects, conducting observation, key information interviews (hereafter referred to as KIIs), household interviews (HHIs), gathering archival records and documents, conducting preliminary data validation and analysis, and sharing the findings. Research preparation includes any logistic tasks getting the fieldwork ready, ranging from preparing documents (e.g., interview consent, research introduction, research tools), contacting local people, arranging meetings for interviews, documents and archives collection, and observation. Data collection refers to the actual data gathering process, including conducting observations, HHIs, KIIs, collecting documents and archival records. Data analysis refers to the process of managing and analysing data collected including reading/listening and re-reading/listening to data records, transcribing, data cleaning, data validation, memo-writing, diary writing, diagram developing, story writing. Sharing refers to the process of presenting and publishing research findings.

It is of great consequence, for Yin (2014), to see research as a 'linear but iterative process' (p. 53) because it does not just go straight from Step 1 to Step 6. From the stages of data collection and data analysis I could go back to the research design to adjust and make the design more suitable to the reality of the fieldwork. This makes the research process an 'iterative' rather than a straightforward process. In this study, I place greater emphasis on this feature by designing a research process that is iterative until the sharing step (see Fig. 3.4). What I propose is different from Yin's (2014) model. Instead of just using the feedback loops in data collection and data analysis stages, I also use this loop in the sharing stage. The feedback loops were designed in the two seminars conducted in Hanoi and in Ho Chi Minh City between the two main stages of data collection, helping present preliminary findings from the first stage and get feedback so as to prepare better data collection in the second stage.

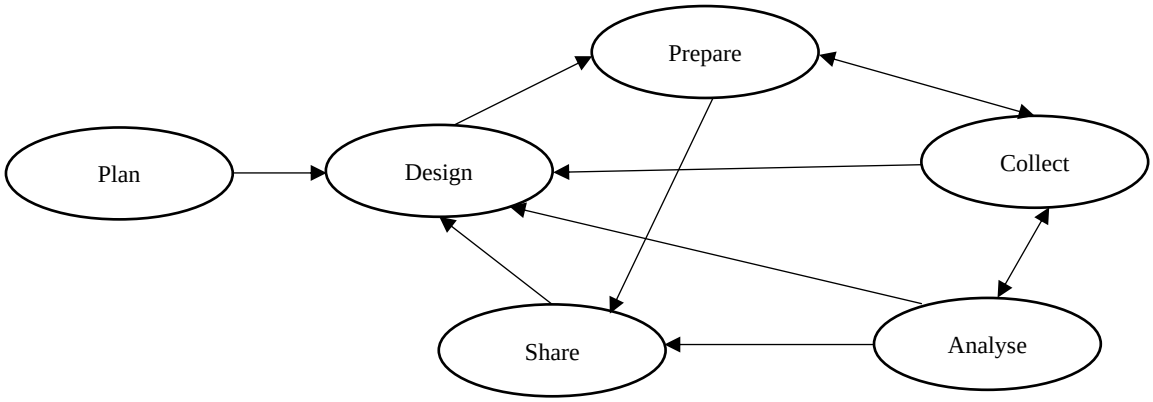


Figure 3.4. Research process
Source: Adapted from Yin (2014)

My research plan was developed in Melbourne, Australia from March 2017 to January 2018. In this period, I developed research proposal including conducting literature review, formulating research questions, and the case study protocol. The case study protocol contains the design of the study, including information such as the project profile, ethic clearance documents (e.g., consent forms), sampling procedures, interview guidelines for different target groups. The fieldwork was conducted in Soc Trang province of Vietnam from late January to late December 2018, with an additional short data collection in May 2019, when I asked the local staff to collect information on the 2018-2019 crop 3. The final data analysis and report writing was conducted between January 2019 to March 2021 interspersed with periods of leave. The research fieldwork was an iterative process (see Fig. 3.5). This process was not entirely a data collection stage; rather, it contained research design, preparation, data collection, data analysis, and sharing. This design process was roughly done by the end of the pilot study. From the stages of data collection, data analysis and sharing– I came back to research design and more data collection when needed. This approach gave me enough room for flexibly coming back and forth between data collection and data analysis and adjusting data collection if necessary.

The preparation for the data collection took place after the research design. I chose to rent a room in Soc Trang city to live during the fieldwork process. It was located 14 km away the research site and took a 30-minute motorbike trip to get there. On the one hand, living there gave me sufficient access to necessary facilities (power, the internet, markets, printing services, etc.) for long-term fieldwork. On the other hand, it was not too far away and allowed easy access to the research site even during rainy days.

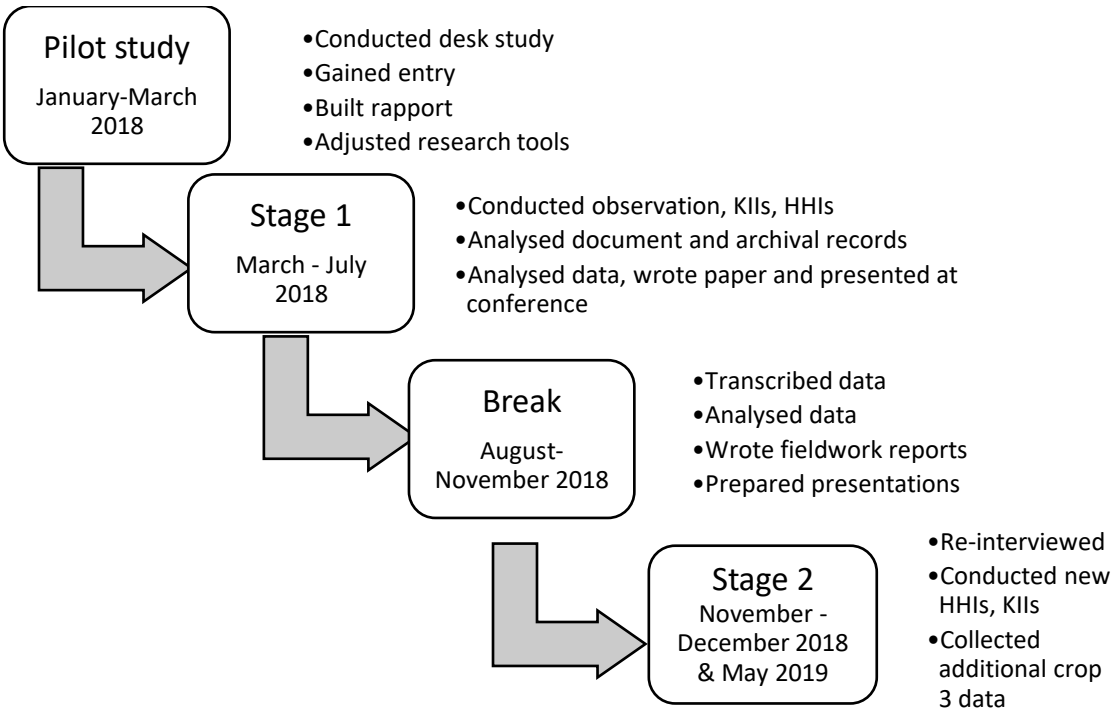


Figure 3.5. The fieldwork timeline in 2018-2019

Source: author

The data collection, spanning from January to December 2018 – two years after the 2015-2016 disaster occurred, included a pilot study and two main stages as shown in Figure 3.5. This pilot study started from the time I arrived in Ho Chi Minh city on January 25, 2018 until March 20, 2018. This study helped obtain general knowledge of the research sites and the phenomenon of interest, seek information for case selection, and gain entry to and establish rapport with relevant people in the research sites. In this period, combined with the knowledge obtained from desk study, I sought consultation with experts (consultants, project managers, researchers, or professors) who were knowledgeable about disaster risk management, Vietnam's Mekong Delta, rural studies and other relevant areas so as to gain general knowledge of the phenomenon and provide inputs for decision-making on case selection and connect with local people. From January 25 to March 12, I consulted with eight experts, who were from different organisations including the Institute of Sociology of Vietnam Academy of Social Sciences (Hanoi), Can Tho University (Can Tho city), and the World Wide Fund for Nature in Vietnam (Hanoi). From March 13 to 19, I began interviewing provincial officials from the Department of Natural Resource and Environment of Soc Trang province to gain an overview of the 2015-2016 disaster and local vulnerability. With the support of local people, I undertook direct observation to understand the local terrain, the natural environment and environments and the social settings around Long Phu and Tran De districts. At the end of the pilot study, I combined the

information from the desk study, expert consultation, direct observation and initial interviews, to finalise the case study locations (Tan Hung commune, Long Phu district, Soc Trang province), develop a fieldwork plan, and adjust my data collection tools. The reasons for selecting the research site were discussed in Section – Locating the case.

The first stage of the fieldwork occurred from March 21 until July 31 and was focused on collecting preliminary data on household profiles, the impact of the disaster, household recovery including social networks, and risk taking behaviours. In this process, there were 18 KIIs, 23 HHIs in addition to observations and document and archival records collection. In the second stage from November 26 until December 27, 2018, relying on the information arising from the first phase, I focused on investigating the history of crop 3 and the root causes of disaster vulnerability. The second stage added three more KIIs (two commune officials, one Women's Union's staff), five more HHIs (two from Village A and three from Village B), making a total of 21 KIIs and 28 HHIs. As I already went back to Australia in January 2019, the information on the 2018-2019 crop 3's production was collected in May 2019 when this crop was harvested with the support of village staff and farmer. I used telephone call to collect this data.

Preliminary data analysis was conducted immediately after the first case of interviews. The initial data analysis was focused on getting interviews transcribed, reading and re-reading of transcripts, writing diary and memos, along with writing reports and a paper. These analyses aimed to provide an initial understanding of the data and offered chances to sharpen or adjust data collection tools and sampling strategies. Preliminary data analysis was embedded in the data collection process.

Sharing included report sharing and presentations. Report writing was shared with my supervisors in regular emails. Three presentations were conducted at three events. The first took place in Stage 1 at an international conference in Singapore in May 2018. The second at Hanoi's Institute of Sociology and the third at Ho Chi Minh City's Institute of Southern Social Science Academy in November 2018, after the second stage of data analysis (August to November 2018). These sharing events showed the reflective process where I regularly conducted data analysis and sharing of initial findings so as to get feedback on research tools, data collection, and research conclusions. This process helped manage and mitigate any predetermined biases or those that arose during the data collection process.

Data Collection Methods

There are many available data collection methods to qualitative research such as observations, interviews, audio-visual materials, and document or textual analysis (Creswell, 2009, pp. 179-180; Silverman, 2011, p. 43). Yin (2014) proposes six sources for case study research: documentation, archival records, interviews, direct observations, participant observation, and physical artifacts. A case study research design allowed me to employ various complementary techniques in collecting data.

In this study I employed five techniques: direct (or non-participant) observation, documentation, archival records, key informant interviews (KIIs), and household interviews (HHIs) (see an overview of these methods in Appendix 2). The HHIs focused on farmers as the main agents in the agricultural field. It explored how farmers perceived risk and conducted and explained for their risk-taking endeavours. The KIIs focused on other agents/institutions who had strong connections to farmers in the field of agriculture. Excluding HHIs, the other four methods provided information on external conditions including the natural and built environments and the socio-economic structures, which enabled and constrained farmers' ways of perceiving, making decisions and taking action. Documentation and archival record analyses provided secondary data relevant to the topic of interest. Direct observation along with the KIIs and the HHIs offered primary data on the topic. Archival records provided secondary quantitative data while the other four methods concentrated on qualitative data. Data collection methods included five methods as presented in Appendix 2.

The HHIs and KIIs were the main qualitative tools in this project. Interviewing was designed to collect information that cannot be observed such as feelings, perceptions, attitudes, intentions, experiences, and sense-making (Patton, 2002, p. 341). The KIIs and HHIs were designed in a semi-structured format with the support of an interview guide (Creswell, 2007; Patton, 2002). This format is different from 'unstructured interview' which has no predefined lines of topics or questions or no 'priori conceptualisation', and from a 'structured interview' which is designed with close-ended questions within 'preestablished categories' (Frey & Fontana, 2005, p. 706; Patton, 2002, p. 342). The semi-structure format was guided by several general topics that derived from the requirements of the research questions. These topics were designed in 'interview guide[s]' (Patton, 2002), which constitutes a set of sub-topics or issues of interests to form a 'line of inquiry' (Yin, 2014, p.110). The predetermined topics ensured

covering enough necessary information and staying within the general direction of the research topic and questions. Information such as socio-demographic characteristics of interviewees and households (e.g., age, gender, ethnicity) was fixed. However, the guidelines remained open to any relevant insights emerged from interviews. The interviews were conducted as 'an active emergent process' (Fontana & Frey, 2005, p. 706), in which I probed more to explore further the information provided by the participants (Loftland, Snow, Anderson, & Loftland, 2006; Patton, 2002).

Direct Observation

Direct observation or non-participant observation is different from participant observation, which requires the researcher to participate in the research participants' activities so that he/she can understand their meanings from the insider's perspective (Patton, 2002; Spradley, 1980). In the former method, the researcher maintains his/her outsider role, avoiding participating in/intervening the daily lives of the participants. In this study, my role was disclosed to respondents before doing any observations or interviews.

The goal of direct observation was twofold: First, it was designed separately to collect information on the landscape (e.g., rice fields, rivers), built infrastructure (e.g., dike systems, sluice gates, canals), and social settings (e.g., social gathering places such as café). Second, it served as an adjunct to conduct interviews. Observation provided general information about the local context, facilitating a better engagement with the research participants in following-up interviews.

In this study, the observations were conducted on several occasions (see Appendix 5). Each observation was logged in field notes and sometimes photographed to aid memory. Photos were mostly about physical appearances. Taking photos of farmers was conducted only if they consented to do so.

Documentation and Archival Records

Documentation is the technique dealing with numerous types of documents relevant to the topic of interest (Yin, 2014; Creswell, 2018). They can be government's policies, laws, news items or donor reports. Archival record collection is the technique dealing with different forms of data (often quantitative) recorded by different organisations/individuals. While documentation refers to the context/content analysis of the available texts, the use of archival records

represents secondary analysis of quantitative data, supporting the information collected from other sources (Yin, 2014). Documentation and archival records tend to be official, consistent and cover broad ranges of time and space. Although they are created for other purposes and often written or produced in different perspectives, the use of these sources was fundamental to my study. As they are mostly from the Government of Vietnam (GoV) and the Communist Party of Vietnam (CPV) at all levels, they offer information on the social structures of various fields, spaces, and times. Using these data to crosscheck with information from HHIs and KIIs has helped to understand the context in which farmers have been both enabled and constrained. As Yin (2014) points out, one of the challenges of these two methods are how to access them. To facilitate this access, I employed both informal and formal networks to approach relevant organisations or sources at different levels (see Appendixes 6 and 7). Most documents and archival records at the national level could be accessed online, whereas those from local levels had to be obtained through contacts with local officials at the Tan Hung commune, Long Phu district, Soc Trang province levels.

Key Informant Interviews

These interviews aimed to collect information on the context and social structures. There were other agents/institutions chosen because of their association with farmers in the crop production. The selection of these stakeholders employed a purposeful sampling strategy (Patton, 2002). Each group of stakeholders had their own criteria.

Government officials were critical in representing the political field, providing and executing laws and policies which both enables and constrains the behaviour of farmers in crop production, using resources (water, land), or approaching livelihood opportunities. They were chosen from different administrative levels. At the provincial level, officials from the Division of Irrigation from the Department of Natural Resources and Environment (DONRE) who were in charge of managing water resources were chosen. At the district level, staff members from the Division of Agriculture and Rural Development who managed the irrigation systems and agricultural development of Long Phu district were chosen. As the commune level was the focus of the study, officials from Tan Hung Commune People's Committee including the chairman, cadastral official, agricultural official, and labour and social affairs officials were chosen. At the village level, village heads were chosen in order to gather information regarding the villages' socio-demographic characteristics, crop production, disaster impact, and crop

history. For an overview of village information in Tan Hung commune, a village head from Village C was also included in the sample.

Mass organisations, typical to Vietnamese politics, can be regarded as the intermediary between the political field and farmers; as such, they are socio-political organisations. The 'political' aspect of this type of organisations is that they were initially formed to help Vietnam's Communist Party (VCP) and the State in gathering people en masse and implementing their policies. They are the channel through which farmers can be introduced to the government's rules and access resources. These organisations are considered by some (Nørlund & Dinh, 2006) as the political one that propagandises the State's policies to farmers. Yet, they also conduct 'social' functions so as to to facilitate social welfare at a grassroots level (Nørlund & Dinh, 2006). The Women's Union, Farmers' Union, Youth Union, War Veteran's Association, General Federation of Trade Unions are five of the most common mass organisations in Vietnam (W. Taylor, Hang, Tu, & Tuyet, 2012, p. 8). However, the level of activeness of each organisation is dependent on each locality. In my research site, only the Women's Union and the Farmers' Union were popular. The Youth Union was inactive due to the lack of young people, as most had migrated to big cities in search of income. The War Veteran's Association and the General Federation of Trade Unions were also inactive due to the lack of membership. In addition to the Farmers' Union and the Women's Union, I also included the Elderly's Association in Village A and the Fatherland Front in Village B.

Agricultural input suppliers were chosen due to their strong association with farmers in crop production. They are retailers who provide farmers with crop inputs (e.g., fertilisers, pesticides, agricultural tools) but also support farmers with different mechanisms (e.g., cash lending, credit sale). The selection of suppliers is based on the interviews with farming households. In HHIs, they identified the list of suppliers they often worked with. In Tan Hung commune, suppliers are located at the commune's centre, alongside the Provincial Road 6. Village A, one of two villages having developed a small town centre (local people called *phố*, an urban-like street concentrating restaurants, markets, cafés), also has several suppliers located there. Big suppliers, nevertheless, are located in Long Phu town of Long Phu district and Soc Trang city of Soc Trang province, both around 12-14 km away from the commune. Based on the list of suppliers and the introduction of farmers, I came to these locations to ask them for interviews. The approach to suppliers was not always easy, even with an introduction letter from Tan Hung's chairman. One supplier in Village A, one in Long Phu town, and two from Soc Trang city declined to be interviewed.

Experts were those knowledgeable about the State's policies and the VMD's development. They also provided information on the disaster risk management and climate change adaptation, and the rice production in the VMD, which were relevant to the analysis of disaster vulnerability. Due to the scope limit of this study, only two experts were chosen, including one officer at Ministry of Agriculture and Rural Development, and another from an university in Can Tho city.

In total, there were 21 stakeholders selected, including two experts, seven officials (three at the communal level), three village heads, and five representatives (often chairman/chairwoman) from mass organisations (see Table 3.2 and Appendix 3).

Table 3.2. Key information interview compositions

Category	Quantity
Officials	7
Mass organisation leaders	5
Village Head	3
Agricultural input suppliers	4
Experts	2
Total	21

Source: author

The KIIs, especially those from government and mass organisations, were often conducted at the beginning of the fieldwork. Some were carried out in the pilot study; some were done at the start of Stage 1. Interviews with agricultural input suppliers, however, were conducted at the end of Stage 1, after the interviews with farmers. All the KIIs were conducted with the intention to reflect on farmers' social practice and triangulate information collected from the HHIs.

The KIIs were designed for one-on-one interview. This rule was manageable in the case of the KIIs with government officials as these participants could arrange time for a meeting in a separate office that avoided external interruption. Most of the KIIs were conducted at their offices, but some were conducted at their homes (village staff) or their shops (agricultural suppliers). Interviews with government officials often involved requests for access to relevant documents and archival records.

Government officials at three administrative levels (from the provincial to district and commune levels) were interviewed. The KIIs with these stakeholders in Stage 1 provided the opportunity to review the local situation for facing disaster, the government's perspective on

the 2015-2016 events, their support to farmers, and reflection on local recovery. Stage 2's KIIs with these officials attempted to confirm information emerging from Stage 1, including focusing on the history of crop 3 in the locality and the perspective of government on managing water resources and irrigation systems for the triple cropping system.

Representatives of mass organisations (MOs) provided insights into local socio-economic conditions, their regular activities with farmers, and their support to farmers during the disaster recovery. The KIIs with MOs provided different perspectives on the impact of the disaster on local farmers. The heads of villages were interviewed to reflect on their village situation after the disaster, and to obtain information on the farmers' recovery and risk-taking behaviours. As the village heads were also farmers, they were also included in this study under household interviews. Table 3.3 presents the interview topics for KIIs with officials, village heads, and mass organisations' staff. The detailed guidelines were attached in Appendix 8.

Table 3.3. List of topics covered in KIIs with government officials, village heads and mass organisation's representations

Topics	Stage 1	Stage 2
Interviewee's general information	Yes	Yes
Perception of the 2015-2016 disaster	Yes	No
Government's/MO's/village's support during disaster recovery	Yes	Partly
Reflection on local prevention, coping with, and recovery from disasters	Yes	Partly
History of crop 3 in locality	No	Yes
Blame on the responsibility for the 2015-2016 event	Partly	Yes
Challenges of water management concerning the triple cropping system	No	Yes
Government's/MO's/village heads' perspective on disaster management	Partly	Yes
Confirming research findings and concepts	No	Yes

Source: Author

Agricultural input suppliers were of great importance in providing information on their relationships with farming households, and how they supported farmers before, during and after the 2015-2016 disaster (see Table 3.4 and Appendix 9). They also reflected on how farmers approached, perceived, and took risks. They were interviewed once in Stage 1 after interviews with farmers.

Table 3.4. List of topics covered in the KIIs with agricultural input suppliers

Topics	Stage 1
Interviewee's general information	Yes
Brief history of supplier	Yes
Perception of the 2015-2016 disaster in the locality	Yes
Relationship with farmers	Yes
Support for farmers before, during and after the disaster	Yes

Source: Author

Experts were consulted in both Stage 1 and Stage 2 (see Table 3.5, Appendix 10). In Stage 1, the interviewees were asked to provide reflections on the 2015-2016 disaster and the local context. In Stage 2, the KII with experts was conducted to reaffirm information and findings found out in Stage 1, focusing on national policies on rice production, irrigation system, the VMD's development strategies, the disaster risk management, climate change adaptation and the challenges of crop 3.

Table 3.5. List of topics covered in the KIIs with expert

Topics	Stage 1	Stage 2
Interviewee's general information	Yes	No
Perception of disaster risks concerning crop production in Mekong Delta	Yes	Yes
Perception of the 2015-2016 disaster	Yes	No
Reflection on triple cropping system's challenges	No	Yes
Reflection on government policies concerning VMD, rice production, irrigation system, environmental problems, etc.	No	Yes
Confirming research findings and concepts	No	Yes

Source: Author

Household Interviews

The Household Interviews (HHIs) were the key data collection technique, focusing on the main subunits of the case study; that is, farmers or faming households.

To select them, this study employed the stratified purposeful sampling strategy (Patton, 2002). Based on this strategy (see Fig. 3.6), from Tan Hung commune I chose two villages A and B, and from these two villages, chose the target households. Village A and B are two villages located 4 km away from each other; are separated by the Provincial Road 6; and have contrasting socio-cultural characteristics. The purpose of this selection was to diversify the sub-units (households). While Village A is home predominately to Kinh people (accounting for 83 per cent), Village B is home mostly to Khmer people (accounting for 95 per cent). Village A is the more populated village but has the smallest percentage of poor households, while Village

B is the least populated and has the largest percentage of poor households. Local government data showed that these two villages were among the most disaster-affected villages in the commune. Village A had 143 affected households with 157.01 ha of crop lost and Village B featured 130 affected households with 115.99 ha lost (Nguyen-Trung, Forbes-Mewett, & Arunachalam, 2020).

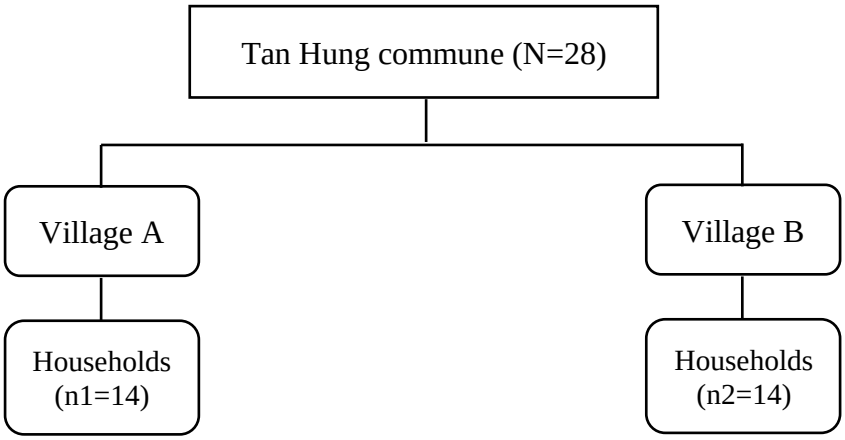


Figure 3.6. Stratified purposeful sampling

Source: Author

Selected households from each village are intended to diversify the sample. The following criteria were designed to serve this purpose: (1) Vulnerability to the 2015-2016 disaster. By this criterion, households selected were the ones who had annually cultivated crop 3 in the dry season and somewhat suffered from the disaster in the 2015-2016 season. (2) Reflecting the villages' ethnic composition. The ethnicity of households was defined by the ethnicity of the household heads. Given the settlement of ethnicity groups, more Kinh- and Chinese-based households were chosen in Village A, more Khmer-based households were chosen in Village B. (3) Reflecting varying socio-economic levels. In this study, socio-economic levels were mostly based on the categorisation of household poverty (non-poor versus near-poor and poor) and land holdings (ha). In this study, the identification of household poverty was founded on my consultations with village staff and Tan Hung Commune People's Committee's (CPC) official records of household poverty which were calculated based on the criteria issued by the Decision Number 59/2015/QD-TTg by the Prime Minister of Vietnam (2015).[1] This database was often accompanied by annual list of poor and near-poor households.

[1] The classification of household poverty was changed in 2015 – the year Vietnam started to use a multidimensional poverty assessment method to rank poor households. The Vietnamese official poverty line is calculated by the Ministry of Labour, Invalids and Social Affairs (MOLISA) based on the National Census on

The following procedure of recruitment was used to facilitate the selection strategy. In the pilot period from March 2 to 19, 2018, I approached Long Phu district and Tan Hung commune to become accustomed to the local sites and local people. In the pilot stage, some households were randomly chosen to test out the interview guidelines and get an overview of local crop production and disaster impact. During Stage 1, from March 20 to July 24, 2018, I approached and recruited households with the help of local officials, village heads and mass organisations' leaders. In Stage 2, the approach to farm households was much easier, as rapport has been built and developed. The following procedures were conducted:

- I asked the Tan Hung commune's People's Committee to provide the *list of households receiving relief funds in 2015-2016 disaster* and the *list of poor and near-poor households in Tan Hung commune in 2017*.
- I was then introduced to the village heads of two selected villages.
- These two village heads helped to identify and select households matching my criteria.
- The number of target households, however, was not determined at the beginning of the fieldwork. Rather, I let the data collection and primary data analysis guide the recruitment. Once saturation of information was reached, I stopped conducting the interviews.
- The village heads were the first ones who guided me to visit and recruit identified households at the beginning of the fieldwork.
- In subsequent interviews, the role of those two village heads were replaced by village staff including representatives from the Village Women's Union (Village A), and the Village Farmers' Union (Village B). When I established rapport with local farmers in the two villages, I sought supports from them to connect with other households identified on the two lists.

Poverty undertaken every five years. According to the Decision No. 09/2011/QD-TTg, between 2011 and 2015, a rural poor household is a household with each member earning an average income of up to VND400 thousand per month (or VND 4.8 million per year), and a rural household in danger of falling into poverty (i.e., near-poor household) is a household with each member earning an average income of between VND401 thousand and VND520 thousand per month.
According to the Decision No. 59/2015/QD-TTg, from 2016 to 2020, Vietnam applies multidimensional poverty levels to the poverty classification by addition of 10 indicators of the lack of access to basic social services. A rural poor household is a household meeting one of two criteria: (i) having an average monthly income per capita of up to VND700 thousand or (ii) having an average monthly income per capita of between VND700 thousand to VND1 million and lacking three or *more* indicators of accessing basic social services. A rural near-poor household is a household having an average monthly income per capita of between VND700 thousand to VND1 million and lacking less than three indicators of accessing basic social services.

- With the reference from the village heads and Tan Hung commune's officials, all of the pre-identified households agreed to interviews.
- In several cases, the households pre-identified on the lists were not available, I recruited other farming households based on the suggestions of village staff or farmers.

In Stage 2, the recruitment of households was more theoretically focused in the sense that I selected households in accordance with the theoretical intention. The intention for Stage 2 was to reconfirm the findings that emerged from the data analysis of the first stage and to explore in-depth the topics of interest. For the first purpose, I concentrated on recruiting and re-interviewing households within the sample of Stage 1. In total, there were 28 household interviews (see Table 3.6 and Appendix 4).

Table 3.6. Household sample composition

Categories of households	Village A	Village B	Total
By ethnicity of HH head			
Khmer	1	13	14
Kinh	11	1	12
Chinese	2	0	2
By gender of HH head			
Male headed household	12	9	21
Female headed household	2	5	7
By poverty status in 2017			
Poor/Near-poor households	3	6	9
Non-poor households	11	8	19
By land use in 2018			
Under 1.8 ha	6	11	17
1.82 ha and above	8	3	11
Total	14	14	28

Source: Author

Interviews with farmers were not conducted on a one-off basis. Farmers were always occupied by their daily activities such as preparing to spray pesticide, buying fertiliser, taking children to school, or inspecting their rice fields, hence, setting up an appointment in advance was not always feasible. At first, when I was new to the local area and people, I relied on the support of local staff. I avoided asking government staff from the commune level and above because their presence could impact on the participants, especially in discussing topics relating to the government. In this case, local staff including village heads/vice-heads and village mass

orgnisations (Farmers' Union, Women's Union), who were believed to stay much closer to farmers and stand at neutral stance between the government and farmers, were my selection (see more discussion of the presence of local staff in Section – Ethical Issues).

In these meetings, including those that followed, I was required to carry an introduction letter signed by the Tan Hung Commune People's Committee's chairman. This letter played a role of 'local passport' for moving around the commune during the time of fieldwork. This manner was kept even in Stage 2 when I re-entered the commune for another major data collection. Local staff almost never made any appointments with farmers in advance. At best, they could make a phone call to the target farmers to check if they were at home so that we could visit for interviews. However, not all farmers used mobile phones, especially those from poor/near-poor families or not all of them answered phone calls. They might forget their phones while working in the fields or leave them at home. At some first interviews, the village staff often led me directly to farmers' houses, introduced me to them, and then I asked them directly to join my interviews. Each interview only began after the participant gave consent to me. Each interview usually last 45 minutes to one and a half hours. In exceptional situations where there were presence of two or three farmers, the interviews could last longer, from two to three hours.

Building rapport with the research participants was the key to my study. Although my fieldwork did not involve participant observation, it did span almost a year, allowing me to develop a rapport with local people and research participants. During this period, being honest, humble, naïve and eager to learn, along with being considerate, engaging in conversations and maintaining contact even during the fieldwork break were strategies enabling me to gradually develop trust with the research participants (Loftland et al., 2006; Taylor & Bogdan, 1984). The outcome was that I could join them in more personal settings such as family partying (*nhậu*), picking up their children from school, or having a drink at a café (Fieldnotes). Research has shown that informal, casual social gatherings such as drinking at café or home celebrations could be pivotal for farmers in accessing information or exchanging knowledge (T.A. Tran, James, & Pittock, 2017, p.7). Hence, participation in these settings enhanced my comprehension of farmers' daily life, and eventually improved the openness and quality of my interviews.

As discussed within Section - Research Process, my fieldwork was iterative in the sense that data collection was initially analysed so as to provide inputs to adjust the design of the data collection tools. For instance, my original focus in Stage 1 was to answer what made farmers take risks and be vulnerable to drought and saline intrusion. The information that came out of

the first stage of interviews indicated that it was not the action of single farmers that induced vulnerability. In other words, it became evident that is was not just the role of farmers, but also the role of the State and social structures. This engendered me to adjust my research design to include expanding my research questions to cover not just farmers but also social structures, and subsequently to alter my data collection tools in Stage 2 to focus more on the history of crop 3, and the historical interaction between the Vietnamese state and farmers.

As such, the guides for the HHIs between Stage 1 and Stage 2 were designed with different foci (see Appendixes 11 and 12). At Stage 1, the interview guide for the HHIs focused on what happened directly before, during, and after the 2015-2016 event. This guide covered pivotal topics such as the perception of risks in everyday life, the perception of the 2015-2016 event (drought and saline intrusion), the risk-taking behaviours and the reasons for risk-taking, as well as the recovery process including social networks and the types of support received. At Stage 2, the interview guide focused on the history of crop 3 production, especially the reason for engaging with this crop in the past, the relations between farmers and government, the policies and built environment during this engagement, their blame for the responsibility during the 2015-2016 disaster, and crop data in recent years. In particular, the HHIs for Stage 2 focused on confirming with the participants the information arising from Stage 1. For instance, the data analysis of Stage 1 found out that some farmers in discussing their perception of the 2015-2016 disaster tended to blame the role of government in managing water resources, especially the sluice gates system that led to the occurrence of the 2015-2016 incident. This information was discussed in more details with both farmers and government officials in Stage 2, with the latter stating their challenges in balancing water resources for farmers in different regions who cultivated a different crop calendar.

The HHIs were designed to collect information on a single farming household. At best, I asked to interview household heads or the main breadwinners of the household of interest. However, sometimes, there was more than one person in the household joining interviews. That was because of many reasons, ranging from the psychology of requiring security when meeting a stranger (me) to the simple reason that one person could not know all the information of their households. The interview with one household at a time was preferred. However, in some cases, farmers of different households unexpectedly participated in my interviews, which resulted in an individual interview of one household becoming a group interview of more than one household (see Appendix 13).

Mixed Method Data Analysis

Creating and Managing Database

As suggested by Yin (2014), the key to data analysis in a case study is to create and manage a database. This task was initiated as early as I developed my research proposal in 2017 and regularly maintained throughout the fieldwork and writing up of results. Creating and managing the database included collecting documents and archival records, storing printed documents, storing interview audio records, getting interview recordings transcribed, and arranging electronic files onto my computer. In general, my strategy was to transform all the data inputs into electronic files so that I could manage all of them on my computer. To ensure the safety of data, I used three strategies to regularly back up files: (i) used Macbook's Time Machine; (ii) used online cloud services such as Dropbox, Google Drive; (iii) used external hard drives. When data was ready, data analysis began and was conducted in close connection with the data collection stages, research design, and data management. Each stage of collection was accompanied by analysis with different foci as set out in Appendix 14.

The database included all the data collected from various sources. In this study, the data collection used five methods to generate data from various sources and produced different data inputs for analysis. The use of methodological triangulation during the fieldwork was crucial to building a consistent database (see Appendix 15). Additionally, the practice of reflections through diary, theoretical notes, discussions with supervisors and sharing contributed to identify my biases and enhance my comprehension of empirical data (see Appendix 16). Data inputs were arranged and analysed by three main strategies: secondary analysis of existing quantitative data which dealt with various databases collected from archival records; analysis of quantitative data from the HHIs; and thematic analysis of qualitative data collected from documentation, direct observation, the KIIs and the HHIs. Table 3.7 sets out these strategies.

Table 3.7. Data inputs and different data analysis strategies

Methods	Sources	Data Inputs	Strategies for data analysis
Archival records	Various organisations	Various databases in various formats (e.g., .cvs, .xlsx)	Secondary analysis of quantitative data Changed database's formats and imported them into Microsoft Excel; Adapted and adjusted existing databases to serve the case study purpose; Proceeded quantitative data and produced designed outputs.
Document Analysis	Various organisations	Files, print documents	Thematic Analysis Transcribed from audio-recordings; Scanned files; Organised files in NVivo; Coded files; Wrote memos; Built diagrams/models; Built matrixes; Built themes; Wrote case stories.
Direct observation	Author	Field notes, photos	
Key Information Interviews	Key stakeholders	Voice records, field notes, transcripts	
Household Interviews	Farming households	Voice records, field notes, transcripts	
			Analysis of Quantitative data. Built a code scheme. Entered data into Excel. Calculated descriptive statistics to produce designed outputs.

Source: author

Secondary Quantitative Analysis

As mentioned in the section on archival records, different databases were managed and analysed for use in this study. The problem of these databases, as pointed out by Yin (2014), was that they were produced for different purposes. Therefore, it was necessary to adapt them so that they could fit the purpose of the case study. The following sets out the strategy I employed for their analysis.

The first step was to form a link from the case to its context. Using Tan Hung commune as the locus, I attempted to link Tan Hung data with the data of the higher administrative/geographical levels. Thus, from Tan Hung commune, I expanded my research for data in Long Phu district, Soc Trang province, the Mekong Delta, and Vietnam. The second step was to form different topics of interests, which guided the compiling and adapting of data from those levels (Table 3.8).

Table 3.8. Key topics for secondary quantitative data analysis

Topics	Description
Population	Average population, area, population density, female/male population number/percentage, age distribution (e.g., labour age and age dependence), ethnic composition, education (e.g., literacy), and migration rates (e.g., in- and out-migration rate).
Economy	GDP, GDP per capita, contribution to GDP from different economic sectors (e.g., agriculture, industry and construction, services), income, poverty (e.g., headcount rates, household poverty), and employment rate.
Agriculture	Household type structures according to three economic sectors, cereal production (area, production, yield), rice production (area, production, yield; local varieties versus high yield varieties).
Land Use	Land area, land use types (e.g., agricultural land, forestry land, special-use land, residential land), land use for rice cultivation, average agricultural land per household/capita.
Disasters	Numbers/frequencies of various natural hazards, the impact of the 2015-2016 disaster (e.g., economic loss, affected area, affected households, relief fund), salinity concentrations measured across time and stations.
Transportation	Volume of freight traffic by waterway/road, volume of traffic carried by waterways/road.

Once these databases were arranged by topics and by levels, the next step was to create basic statistical tables and graphs that assisted drawing a broad picture and establishing general patterns of the local contexts, matching these patterns with primary data collected from the research sites.

Quantitative Analysis of Household Data

The Household Interviews generated much quantitative data such as socio-demographic characteristics (age, gender), livelihood, land and crop area. Although it was not my purpose to generalise the data to bigger populations, it was necessary to analyse the data in order to build up an overview of household profiles.

In order to analyse the quantitative data from the HHIs, I set up a code scheme in Microsoft Excel to cover key variables of households (see Appendix 17). The relevant data from the HHIs were entered into Excel using the scheme allowing calculation of descriptive statistics including mean, frequency or crosstabs. These data were also supportive in analysing the qualitative data.

Thematic Analysis

Thematic analysis was the main data analysis method in this study. This method, developed by Braun and Clarke (2006, p. 79), provides a simple but efficient approach to 'identifying, analysing and reporting patterns (themes) within data' and offers interpretations of those themes in response to the research questions posed in the research design. Later on these authors called the approach a 'reflexive thematic analysis' to emphasise the central role of researchers in producing knowledge (Braun & Clarke, 2009). Themes, as 'stories about particular patterns of shared meaning across the dataset', are derived from 'the intersection of the researcher's analytical assumptions, their analytic resources and skills, and the data themselves' (Braun & Clarke, 2019, pp. 4, 7). This nature reflects that themes are not things existing out there and waiting to be discovered, but rather they are the product of the researcher's reflexive choices based on the availability of data (Braun & Clarke, 2016, 2019).

One of strong points of thematic analysis is flexibility (Braun & Clarke 2006, p. 78) since it can work across 'a range of theoretical and epistemological approaches' without the need to be bounded/limited to specific schools such as grounded theory (Charmaz, 2006; Corbin & Strauss, 2008; Glaser, 1978; Glaser & Strauss, 1967; Straus & Corbin, 1998; Strauss & Corbin, 1994), interpretative phenomenology (IPA) (Smith, Jarman, & Osborn, 1999; Smith & Osborn, 2015) or conversational analysis (Hutchby & Wooffitt, 2008). Another characteristic of thematic analysis is the flexibility in the logic of generating codes and themes. Researchers can work from a data-driven approach or inductive logic, which is 'a process of coding the data without trying to fit it into a pre-existing coding frame, or the researchers' analytic preconceptions' (Braun & Clarke, 2006, p. 83). By contrast, researchers also can work from an analyst-driven or deductive approach, which is the process led by their own theoretical interests (Braun & Clarke, 2006, p. 84). The reason for a theory-driven approach is that it is impossible to analyse data in a theoretical vacuum (Braun & Clarke, 2006, p. 84). In this study, I found it useful to use the logic of abduction that 'moves back and forth between induction and deduction' (Morgan, 2007, p. 71). Even grounded theory method theorists like Charmaz (Charmaz & Keller, 2016) have advocated for the use of abductive reasoning in grounded theory. For instance, from the codes arising from some first interview transcripts, a coding scheme was gradually formed. This coding scheme was used to code for the rest of the manuscripts.

Once the database was created, the data analysis process has taken the six subsequent, but iterative, steps as proposed by Braun and Clarke (2006): 1) getting familiar with the data; 2)

generating initial codes; 3) searching for themes; 4) reviewing themes; 5) defining and naming themes; 6) producing the report. Iteration means that these steps were not linear; instead, they could be creatively taken to reflect the interaction between my reflexive choices and the availability of data. For instance, during Stage 1 (March to July, 2018), as time was limited and the data were rich, I only focused on finding the themes for the topic of social support in disaster responses and recovery. In the subsequent break (August to November), when I had more time, I was able to extend the analysis by including data for the topics from sub-question 1 and sub-question 2. In the data analysis period after Stage 2 of data collection, I focused more on how crop 3 was started and evolved across time (sub-question 3). Thus, I could move back and forth between these six steps so as to focus on specific topics needed.

Step 1 was familiarisation with the data. In this step, I tried to get used to the data including interview transcripts, field notes, and documents. This step involved transcribing some of the interviews, listening to the interview records, reading and re-reading the transcripts, observational notes, relevant documents and writing initial notes so as to establish a general understanding of the data. I did not personally transcribe all the interviews, but rather hired assistants from the local regions to help me do so. These assistants' familiarity with the local accent and words were helpful in producing as exact a transcript as possible. At this step, qualitative data was imported into NVivo. The guides by Bazeley & Jackson (2013) aided my utilisation of NVivo in managing and analysing qualitative data. Documents, interview manuscripts, field notes (e.g., diary, theoretical notes) were arranged into different folders under NVivo's Data Section.

Step 2 was generating the initial codes. Codes are defined as 'the most basic segment, or element, of the raw data or information that can be assessed in a meaningful way regarding the phenomenon' (Boyatzis, 1998, p. 63). Initial codes are considered as the first codes generated from the first group of the raw data (e.g., first transcripts, field notes). At this stage, I was open to any ideas or points relevant to research questions arising from reading. I chose to start first with the HHIs so that I could grasp the understanding of this main group before going to extend my code into other stakeholders. The coding began with one of the first transcripts from the HHIs transcribed during Stage 1. I worked with one transcript at a time from the beginning to the end in order to fully grasp each household as a case. Codes were generated by the following principles: First, the basic socio-demographic characteristics of the household and its representative – the interviewee(s), formed the first initial codes (see Appendix 17). For the household as a unit, the codes were: household ID, number of members, gender of household

heads, number of livelihoods, landholding, crop data (investment costs, inputs, etc.) and so on. For the interviewee's personal information, the codes were: name, pseudonym, age, gender, ethnicity, education, livelihood, experience in agriculture and in crop 3. Likewise, codes reflecting individual information was also coded for stakeholders such as officials, suppliers, or village heads, albeit with adaptation to their characteristics. Second, in addition to these basic codes, it was important to generate codes in response to my research questions. Although Braun and Clarke (2006) do not mention the use of the research question in navigating coding at this stage, I thought it would be useful to rely on the general research question which directs me to think about the role of agency and social structures in the evolution of farmers' disaster vulnerability. This general question touched on key concepts surrounding the core/central concept of 'disaster vulnerability' including 'agency', 'social structure', 'farmers', and 'evolution', which provided a sense of a broad direction in identifying initial codes. This approach directed me to which data segments required more attention, as each HHI consisted of more information than I was able to cover. This approach, however, did still allow the possible generation of ideas relating to the key concepts to emerge.

After coding the first transcript, a draft of the coding scheme was generated. This coding scheme was applied to code for the next transcripts of the HHIs. The coding scheme was not fixed, but rather remained open to be changed (e.g., renamed, re-coded, adjusted, mixed, moved, and so on) to reflect the reality of the raw data. In parallel, I also coded the KIIs with stakeholders. While there were some codes could be shared between the HHIs and the KIIs (e.g., crop 3, risk perception), unique codes for these stakeholders were also generated to reflect their situations.

Step 3 was searching for themes. After generating initial codes, I then sorted them into themes and sub-themes. In doing so, I referred to my research sub-questions in order to make sure that the coding went in the right direction. As seen in Appendices 18, 19, and 20, three sub-questions contained many specific interview topics/sub-topics generating surrounding one central sub-questions. These topics/sub-topics indicate the domains/sub-domains that are of significance to my research. However, topics/sub-topics as domains are not themes/sub-themes (Braun & Clarke, 2019, 2020), as the former were pre-determined in the research questions by the research design, whereas the latter were formed through the process of data coding.

The search for themes was based on the patterns of meaning that appeared in my data (see examples in Appendices 18, 19, & 20). This patterning refers to the sorting and grouping of codes into these themes, which were dependent on the similarities between codes (Braun &

Clarke, 2006). For instance, for the topic concerning local perception of risk, there were many codes demonstrating the ways local farmers described risks such as 'bad luck', 'risk-taking', 'following others risking life', 'risk caused by saline intrusion', 'fear but doable', '50/50', 'absence in locality', 'gamble with climate', 'unexpectedness', 'harmful possibility', 'must be acceptable', and 'lacking activeness'. Based on the similarities between them, there could form the following themes: 'risk as good/bad balance', 'something worth risking one's life', 'inabilities', 'risk by saline intrusion'. Risk as a balance between good and bad resulted from the combination of the expressions including bad luck (*hên xui*), fear but doable, 50/50, gambling with climate (containing implication of sometimes win when climate is good, sometimes lose when climate is bad); something worth risking life resulted from two codes risk-taking and following others risking life; inabilities result from unexpectedness (something going beyond forecasting) and lacking activeness (i.e., there is a risk if one cannot be active); risk by saline intrusion from risk caused by saline intrusion (the frequent hazards cause obsession). Some codes, such as risk is absent in locality, which were only found in one answer were not included in the themes.

When the themes were initially formed, I also sought to form matrices; an analytical task that was not present in Braun and Clarke (2006). Building matrices (Miles & Huberman, 1994; Miles, Huberman, & Saldana, 2014) refers the step of putting themes into classification of cases, such as household categories (i.e., devised by their socio-economic characteristics), where applicable. The key categories of interest were household poverty, land holding, location (village), ethnicity, and the age/gender of household heads. For instance, concerning the theme of starting to grow crop 3, there could be classified into three groups of farmers who began growing crop 3 in different periods: the period from 1997 to 2000; from 2001-2009; and from 2010-2012. I found out that each group was different in socio-economic characteristics including age, year of experience in starting agricultural production, reasons for starting to grow crop 3. Thus, the building of matrixes helped illustrate the themes in a clearer picture.

Step 4 was reviewing themes. This step started when a set of themes and sub-themes was identified. The refinement and review of themes and sub-themes was based on: (i) Considering the support of data (Braun & Clarke, 2006). This meant considering each themes/sub-themes had enough data to support its validity. Some themes/sub-themes or codes were removed because of the lack of data. For instance, in the themes of social support during and after the disaster, the social support from brokers/merchants were not found in farmers' statements. Therefore, this sub-theme was dropped. The social support theme eventually focused on the

government, agricultural suppliers, and family/relatives from whom farmers received most support. (ii) Considering the consistency, relevance, cohesion of individual themes to the entire dataset (Braun & Clarke, 2006). This process involved refining and reworking the themes if needed. For instance, in response to my research question 'Why do farmers take risk?' I found that in addition to the reasons that farmers directly answered, such as lack of available livelihood options outside rice crop, age disadvantage, profit seeking, and risk perception, social support played a vital role in facilitating their risk taking. As farmers found social support as their buffer in coping with disaster risks, they had more courage to take the risk of cultivating crop 3 during the 2015-2016 season, in particular, and other seasons, in general. Therefore, I reworked and put the theme 'Reliance on social relationships' as part of reasons serving the topic 'Reason for risk-taking'. In addition, the review of themes also considered the classification of farmers based on their socio-economic characteristics, which was started in Step 3.

Step 5 was defining and naming themes (see Appendix 21). In this step, each theme and sub-theme was defined and given a general description to ensure construct validity. This act refers to identifying the essence of what each theme/sub-theme is about. This step helped to connect all themes and sub-themes with households' characteristics so as to paint a full picture in response to the research questions.

Step 6 was presenting and producing the report. A key task in this step was to write an overall story to connect all the themes and sub-themes. This story included both analytic narratives (see Appendix 22) and data extracts that support to illustrate the analyses (Braun & Clarke, 2006). The analytic narratives were in responses to the overall research questions and three sub-questions. In other words, it contained my claims in answering those research questions. In doing so, I attempted to connect my data analyses with the theoretical framework of Bourdieu's theory of practice. Data extracts are examples or illustration for analytical narratives. Braun and Clarke (2006, p.93) advise that the choice of data extracts must offer 'a concise, coherent, logical, non-repetitive and interesting account of the story the data tell within and across themes', showing 'the prevalence of the theme' while capturing 'the essence of the point' under discussion. Therefore, in selecting quotations to demonstrate my analyses, I first prioritised the data extracts most suitable to my claims. A secondary criterion in choosing data extracts was diversity, which meant data extracts must come from different types of households if applicable. A third criterion was that the data extracts must be fascinating.

Responding to Ethical Concerns

The study's ethics application (Project number 11022) was developed, submitted to, and approved by Monash University Human Research Ethics Committee (MUHREC) by December 15, 2017. The project was classified as low risk research. Based on MUHREC's guidelines, ethical issues were paid due attention throughout the study. The following practices were conducted in accordance with the requirements of Australia's *National Statement on Ethical Conduct in Human Research.*

I kept a project profile entailing the project number, key contacts, Consent Forms, Explanatory Statements (for each target group) on Monash letterhead and the Monash University complaints clause during the fieldwork in Vietnam. I introduced myself and presented this profile to local authorities and any research participants to ensure that they received all necessary information about me and the project before getting involved. My role of researcher was disclosed to local people and research participants at all times.

I gained consent from local authorities to access the local area. For instance, before I entered Village A and B for interviews, I had to ask Tan Hung Commune People's Committee (CPC) to provide a signed letter to authorise access. In Stage 2, when I resumed my fieldwork, I had to ask for another letter before re-entering the research sites. The interviews and observations conducted in local areas did not include any children under 18 years old.

Before any interviews and data collection (e.g., collecting documents or archival records), I asked the research participants to provide their consent for collecting information and audio-recording the interviews if needed. The consent was done in either oral or written form. Oral consent was more often used since not every farmer was familiar with the formalised practice of research ethics. The use of the written consent form with the requirement of participant's signature could break the smooth transition from greeting to the interview process, formalise the interview atmosphere, and prevent the participants from comfortably joining the interviews and being open to the interviews. Thus, signing the consent form was mainly asked when the interviews had been completed (see Appendix 23). The participants were explained that they did not need to put in their real names, and their signatures could be just a nickname. I also read aloud or gave the participants the Explanatory Statement (see Appendix 24), which provides general information and necessary contacts of the project for them in case of complaints. Interviewees were informed that they could stop or leave the interviews or ask to

stop being recorded at any time during the interviews. They were also informed that they could ask for the recordings and transcripts of the interviews to be destroyed after the interviews, if they wanted. There were some interviewees who did not allow me to use audio-recorders so that manual note-taking was used. The research participants at local levels were recompensed either in cash or kind to compensate for their time and information. This amount was mentioned before each interview and given to them when it was done.

There were two situations where local staff presented at the interview sites: (1) when I needed them to introduce me to the interviewees and (2) when I needed translators in the interviews with six Khmer households who were unable to speak fluently Vietnamese language. Regarding the first situation, after the introduction, I asked the staff to wait outside the interview sites so that the participants and I had private time during the interviews. Regarding the second situation, I acknowledge that the presence of translators (also local staff) during interviews may constrain farmers' free expression. Nevertheless, it was important to keep this effect at the minimum effect. In these cases, I asked the staff to translate as much exactly as possible the participants' words and opinions. I also asked questions from different angles to make sure the translations provided was consistent; this would help me identify if the translator precisely conveyed the participants' meaning. Following-up interviews with each farm household further assisted this consistency.

All the names of the interviewees in the thesis are pseudonyms. Interviewees were not asked to provide their real names in the consent forms. Each of interviewees were given a pseudonym to ensure the confidentiality. I have kept their real names only to ensure the integrity of the research and have not disclosed their name to any third parties. Village names were also pseudonyms to ensure the safety of the research participants.

The research assistants who transcribed the interviews were also required to sign an agreement to maintain the confidentiality of the information they were given access to and not to disclose to any third parties (see Appendix 25).

Methodological Limitation

The case study contains some limitations. First, the study was conducted entirely in the Vietnamese language. Although the interviews with some Khmer farmers, who were old and

unable to speak fluent Vietnamese, had the support from translators, my inability to speak the Khmer language prevented me from having deeper conversations with them.

Second, this study was only my second comprehensive study conducted in the VMD and I was basically new to the region, especially local history of irrigation systems and water management. This may have impacted my judgement and choices during the fieldwork, data analysis, and write-ups. Hence, I tried to keep the research process iterative with the research design remaining open to emerging information from the field and feedback from peers throughout the fieldwork.

Third, although covering many different groups, my sample size was relatively small, which may affect my generalisation of the case's conclusion to a broader population. Additionally, despite containing households who were little affected by the 2015-2016 disaster, it may have been better to include the disaster-unaffected households in my sample.

CHAPTER 4. THE CONTEXT OF RESEARCH

This chapter locates the case, namely, the Tan Hung commune, within the wider society, touching on the geographical and socio-economic backdrops. In the beginning of the chapter, I offer an overview of Vietnam then narrowing down to the Vietnamese Mekong Delta (VMD), Soc Trang province, Long Phu district, and Tan Hung commune. In this process, I also discuss the contexts in terms of geography, socio-demography, economy, and interaction with natural hazards. Finally, the 2015-2016 event is described as it happened and how this event affected the research sites.

Socio-Economic and Geographical Background

Vietnam

Vietnam, officially known as the Socialist Republic of Vietnam, is a country located on the Indochinese peninsula, Southeast Asia region. It shares a land border of 4,550 km with China to the north, and Laos and Cambodia to the west. With a coastline of 3,260 km, Vietnam faces the Gulf of Tonkin and East Sea (known as the South China Sea) to the east, and the Gulf of Thailand along its southwest (Fig. 4.1).

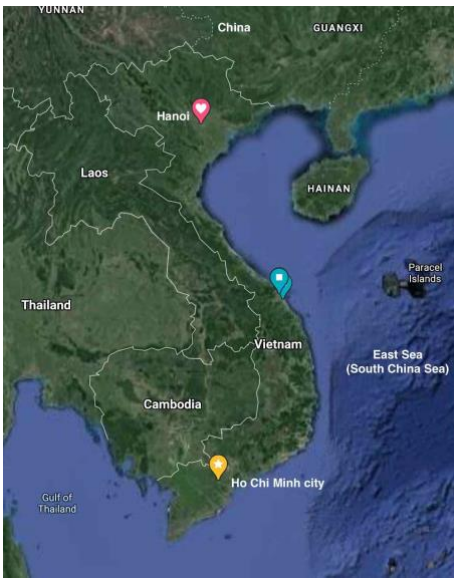


Figure 4.1. Vietnam Map
Source: Adapted from Google Map

Vietnam's population in 2019 was about 96.4 million people, nearly double the population in 1975 (around 48.7 million) – the year when Vietnam reunified the south and the north after the American war (1954-1975), and almost triple the total in 1960 (about 32.6 million people) (World Bank, 2020) (Fig. 4.2). During the war time (1960-1975) the population managed to increase approximately by 1 million people on annual average. This figure was significantly higher during 1976-1986 (1.2 million) and 1987-1997 (1.3 million). After the implementation of stricter population policies along with family planning solutions, the annual rise in population decreased to around 878 thousand people a year from 1998 to 2019. The percentage of the female population was approximately 50.1 per cent in 2019, having decreased from 50.7 per cent in 1975 (World Bank, 2020).

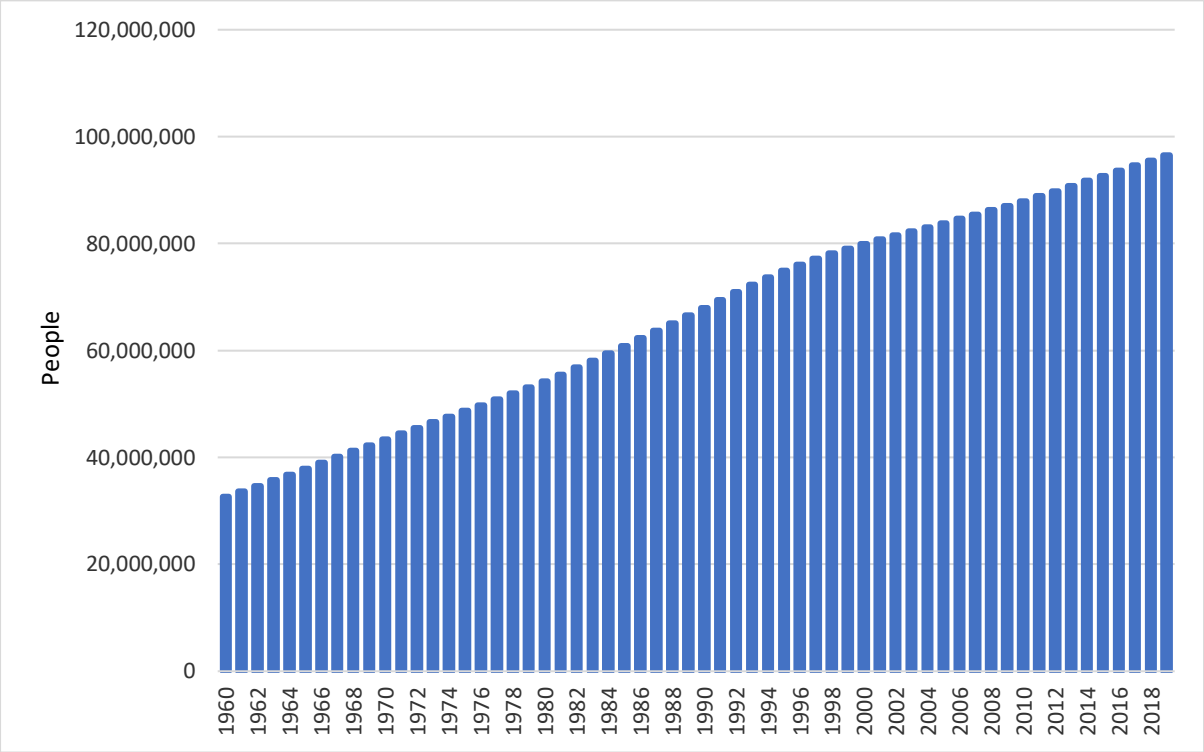


Figure 4.2. Vietnam's population from 1960-2019

Source: Adapted from World Bank (2020)

Vietnam is currently enjoying the golden population structure with the large share of the population of working age (Fig. 4.3). In 2019, the population aged 15-64 was about 66.8 million people (accounting for 69.2 per cent), followed up by children aged 0-14 with around 22.4 million people (23.2 per cent) and the elderly aged 65 and above with about 7.3 million people (7.6 per cent). This structure has significantly changed since 1975, with the share of the 0-14 age group remarkably decreasing from 42.6 per cent, while the elderly and those working

increased from 4.9 per cent and 52.5 per cent, respectively. The age dependency ratio between the child and the working age groups was 33.5 per cent, while between the elderly and working age groups was 10.9 per cent (World Bank, 2020). While this population structure offers Vietnam great opportunities for their socio-economic development, the share of the elder-age group will rapidly approach 10 per cent of total population (UNFPA, 2011) with a projection of reaching 26.1 per cent by 2049 (Giang, Nguyen, Nguyen, Le, & Tran, 2020). This means that Vietnam will soon go into the 'ageing phase' with the attendant challenges of creating social protection and health platforms for an aging population (Giang et al., 2020; UNFPA, 2011).

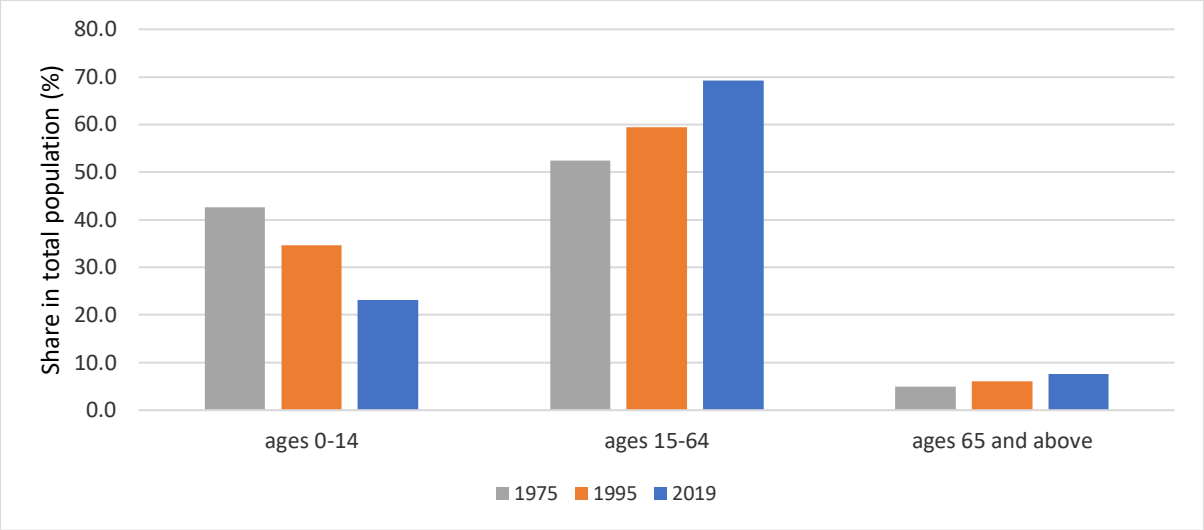


Figure 4.3. Vietnam's population structure, 1975, 1995 and 2019

Source: Adapted from World Bank (2020)

Under the effect of the East Sea, Vietnam enjoys a tropical monsoon climate, characterised by high temperature and high humidity. As the country spreads out over the length of 1,662 km and various terrains, the climate varies throughout the country (MONRE, 2010). Basically, the north belongs to a tropical monsoonal climate with four distinct seasons including Spring-Summer-Autumn-Winter; whereas, the south belongs to a tropical climate with two distinct seasons, the rainy and dry.

With such climatic characteristics and a long coastal line, Vietnam is considered as one of the most disaster-vulnerable countries in the world, recently ranked 43/181 in terms of vulnerability to disaster risks, improving from a highly vulnerable position of 18/173 during 2012-2017 (Bündnis Entwicklung Hilft, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020). In a statistic from 1953 to early 2021 provided by EM-DAT (2021), Vietnam experienced 245 natural hazards events, which caused 27,237 life losses, injured 93,373 people,

and affected 92,714,453 people. During the period 2011-2021 (Fig. 4.4), there were 73 events 1,494 deaths and an economic loss of US$ 14,919 billion (63.7 per cent of total damages from 1953 to 2021). According to Vietnam Disaster Management Authority (*Tổng cục phòng chống thiên tai*) (VDMA, 2021), from 2006 to the first six months of 2020, Vietnam suffered an economic loss of VND 281,834 thousand billion (about US$ 2,111 thousand billion) to a variety of natural hazards, especially storms, floods.

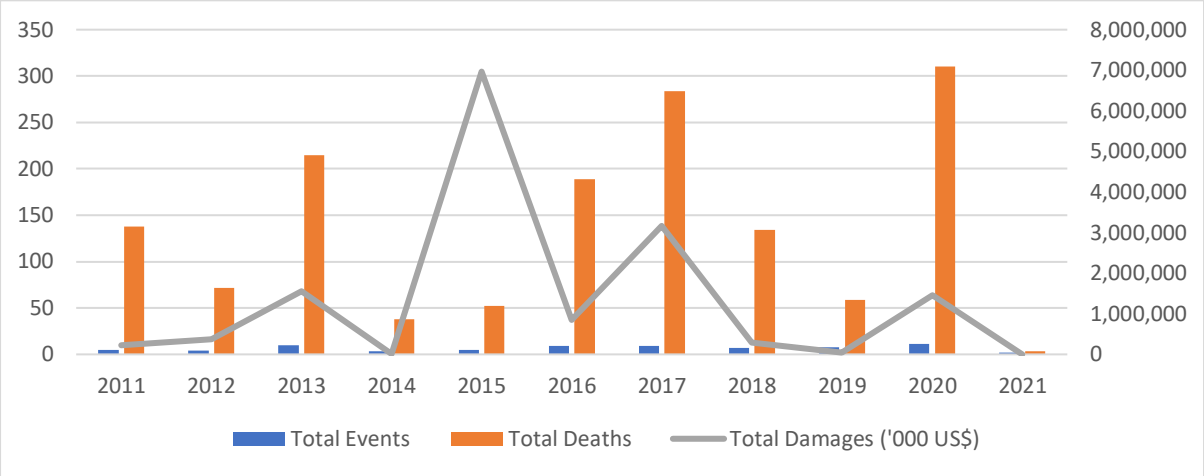


Figure 4.4. Natural Hazards, Deaths and Damages, 2011-2021
Source: Author calculated from EM-DAT (2021)

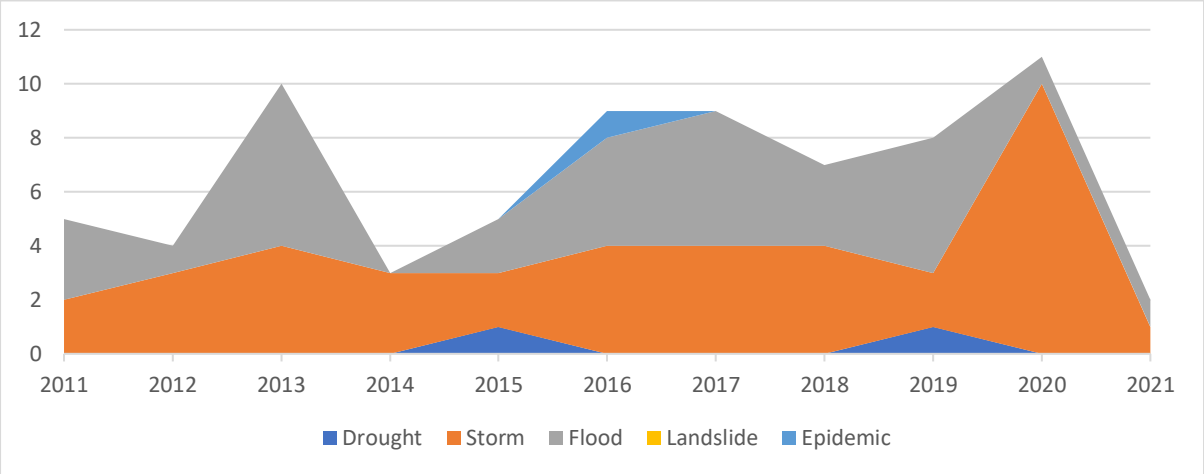


Figure 4.5. Natural Hazards, by type, 2011-2021
Source: Author calculated from EM-DAT (2021)

By type (Fig.4.5), the period 2011-2021 witnessed 39 storms, 31 floods, two droughts (in late 2015 and 2019) and one epidemic. In another database (DesInventar, 2021), the number of events were higher. From 1989 to 2010, Vietnam experienced 1469 natural hazards: floods

occurred 715 times (48.7 per cent of total events), hailstorms (20.9 per cent), storms (12.6 per cent) and flash floods (7.2 per cent).

The Mekong River Delta

The Mekong River Delta of Vietnam (hereafter referred to as VMD), located in the south of Vietnam, is one of the two biggest deltas of the country. The Delta consists of 13 provinces and city (Fig. 4.6). It is bordered by Cambodia to the northwest and the South East region including Ho Chi Minh city to the northeast.

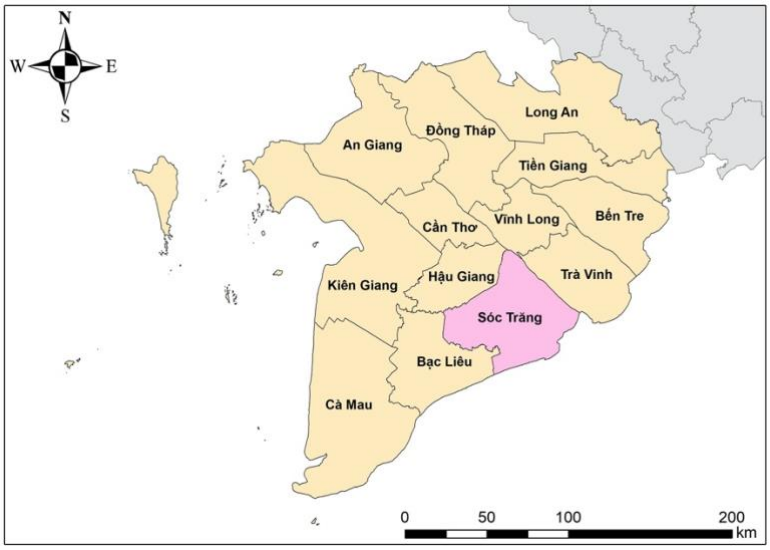


Figure 4.6. Map of VMD with Soc Trang province
Source: Adapted from original shapefiles at gadm.org, accessed in October 2018

According to the General Statistics Office (GSO) database (2019), by the end of 2019, the VMD had an area of 4.08 million km^2, ranked fourth among six socio-economic regions of Vietnam, while its population was 17.2 million, ranked third among those regions. Compared to the end of 2015 before the historic disaster, the Delta's average population and population density decreased by 307.9 thousand people and 11 persons/km2, respectively. The Delta was also the third densest region behind the Red River Delta and South East with 423 persons per km^2 (see Table 4.1).

Table 4.1. Vietnam's area, population, and population density in 2019, by region

Regions	Area (Km2)	Average population (Thousand persons)	Population density (Person/km2)
Whole country	331,236.0	92,484.00	291
Northern Central Area and Central Coastal Area	95,875.8	20,220.40	211
Northern Midlands and Mountain Areas	95,221.9	12,569.30	132
Central Highlands	54,508.3	5,861.20	108
Mekong River Delta	40,816.4	17,282.50	423
South East	23,552.8	17.930.3	761
Red River Delta	21,260.8	22,620.20	1,064

Source: Adapted from Vietnamese General Statistics Office (2019)

The Delta's agricultural land area is the largest among all regions of the country, with 2.6 million ha at the end of 2018, which is more than three times the area of the Red River Delta (789 thousand ha) (GSO, 2020c). Although the Delta only accounts for 22.7 per cent of total agricultural production land (about 11.5 million ha), it contributes about 50.7 per cent (24.4 thousand tons) of Vietnam's total production of cereals and 55 per cent of total paddy production[2] (GSO, 2020c). The Delta also made up 95 per cent of total rice production exported and 60 per cent of fish production exported (GoV, 2017). This is the reason why the VMD is termed the 'Rice Bowl' of Vietnam.

The VMD is the downstream region of the Mekong River Delta system. The river starts from the Tibetan Plateau, running through six countries including China, Myanmar, Lao, Thailand, Cambodia and Vietnam. The river has a total length of 4,800 km and covers an area of 795,000 km^2 (307,000 sq miles), producing an average annual water discharge of 470 km^3 (Lu & Siew, 2006). When entering Vietnam's border, the river splits into two main rivers, the Hau (Bassac) River (which runs through Soc Trang province) and the Tien River. In the past, the Hau river divided into three tributaries (Dinh An, Tran De, and Ba Thac), while the Mekong river into six tributaries (Tieu, Dai, Ba Lai, Ham Luong, Co Chien and Cung Hau), leading local people to labelling the region as the 'Nine Dragons' River Delta. Nonetheless, today there are only eight tributaries left, with the Ba Thac was gone due to the sedimentation (N.A Nguyen, 2018). In addition to these main rivers, the region is characterised by a dense network of canals, constructed about 300 years ago by the Nguyen Dynasty (for a brief summary see Tuan, Chu Thai Hoanh, Miller, & Sinh, 2007, p. 20). These networks are crucial to the uniqueness of the

[2] Paddy crop is one of the main annual crops in Vietnam, along with maize, sugar-cane, cotton, peanut, and soya-bean. The planted area for paddy crop is always largest among these crops, recorded at 7.7 million ha in 2017, having peaked at 7.9 million in 2013 (GSO, 2020c).

region's ecological environment, transportation, settlement, culture, and water-related livelihoods.

The Delta has two weather seasons a year that correspond with the tropical monsoon circulation: while the dry season, characterised by dry, hot conditions and lower levels of rainfall, concurs with the northeast monsoon (November to April) and the rainy season, characterised by high humidity (89 per cent) and high levels of rainfall (85 per cent of annual rainfall), with the southest monsoon (May to October) (Lee & Dang, 2020). Observing the period of 1984-2015 in the VMD, the lowest average rainfall of approximately and below 100 mm was recorded from December to March, whereas the highest average rainfall of about and above 200 mm was witnessed between June to October (Lee & Dang, 2020).

Due to its climatic characteristics, diverse ecological systems, and dependence on agriculture, the VMD is among the most hazard-prone regions in the country due to its sensitivity to many natural hazards including flooding, salinity intrusion, sea rise level, drought, storm, and river bank erosion (Birkmann et al., 2012; Chinh, Bubeck, Dung, & Kreibich, 2016; Ehlert, 2011, 2012; Hoang, Tuan, Miller, & Sinh, 2007; Ling, Tamura, Yasuhara, Ajima, & Van Trinh, 2015; V.K. Nguyen & James, 2013). As shown in Table 4.2, during the period (2000-2011), the VMD experienced 54 hazardous events, and was ranked fourth out of eight regions in terms of the number of hazards encountered. The North Central Coast is the region that has experienced the largest number of natural hazards with 101 events, followed by the South Central Coast (77 events), the Northeast (61) and the Mekong River Delta (54). Although the VMD only faced five droughts during this period, its frequency is among the highest. This is reflected in literature presented in the next section.

Table 4.2. Types of natural hazards in Vietnam's eight regions for 2000-2011

Region	Flood	Storm	Landslide	Drought	Other	Total
North Central Coast	42	44	5	6	4	101
South Central Coast	29	32	6	5	5	77
Northeast	23	31	2	2	3	61
Mekong River Delta	24	10	7	5	5	54
Northwest	10	12	3	1	5	31
Southeast	11	9	4	1	6	31
Central Highlands	9	8	3	2	2	24
Red River Delta	7	6	26	1	2	22
Total	158	152	32	23	32	397

Source: Adapted from Vu and Noy (2016, p. 3), with the data for epidemics excluded.

Drought occasionally occurred in the VMD, in particular, and Vietnam, in general. McElwee et al. (2010, p. 12) highlight the regularity of drought in Vietnam over the past three decades: the 1997-1998 El Nĩno-related drought in the Central Highlands and the VMD; the 2002 drought in the VMD; the 2003 serious drought in the North-Central Coast, Northeastern and Northwestern mountains; the 2004 drought across the nation, especially in South-Central Coast and the Central Highlands (McElwee et al. 2010); and recently the 2006 moderate and severe drought in the North-Central and the South-Central Coast regions, the Northwestern Uplands and the Red River Delta. The 1997-1998 event was considered the most devastating drought, causing the loss of 15,900 ha of winter crops, estimated to be around VND 5,000 billion, and affected 3 million people (McElwee & et al., 2010, p. 12). Drought was responsible for 28 per cent of total economic damages in 2015 (VND 8,113 thousand billion), 40 per cent in 2016 (VND 39,726 thousand billion), and 64 per cent in the first six months of 2020 (VND 3,933 thousand billion) (VDMA, 2021).

Drought is seen to cause water scarcity that not only affects irrigation and agricultural production but also increases the risk of salinity intrusion, especially for the regions like the VMD. Apart from the effect of the El Nĩno phenomenon, some scholars have attributed the lack of water with recent upstream hydro-power dams (Abedin, Habiba, & Shaw, 2014; Kuenzer et al., 2013; Tuan et al., 2007; Le, Nguyen, Wolanski, Tran, & Haruyama, 2007; Lu & Siew, 2006; Pearse-Smith, 2012; Ringler, von Braun, & Rosegrant, 2004; Smajgl et al., 2015; Trung, 2014; Van et al., 2012). Regardless of the determinants, the risks of water-related hazards (drought, salinity intrusion) are becoming a potent threat to daily life of the VMD's local people; especially for those engaged in agriculture.

Soc Trang

Soc Trang province, formerly known as Ba Xuyen province under the government of South Vietnam during the Vietnam War (1954-1975), has one city, two towns, eight rural districts, and a total of 109 communes, wards, and towns under rural district government as of 2018 (Fig. 4.7). The province had 1.315 million people as of 2018, an increase of about five thousand people from 2015. The natural increase rate of the population is 6 per 1000 people, dropping from 8.1 per 1000 people in 2015. The female population makes up 50.4 per cent of total population with a sex ratio (males per 100 females) of 98.4 per cent. The population density is 397 persons/km2 with most of the population living in rural areas (69.4 per cent). The labour force at 15 years of age and above makes up just 56.1 per cent (737.7 thousand persons) of

which, 89.9 per cent was literate and just 11.2 per cent trained. The unemployment rate of the labour force at working age is low (3.3 per cent).

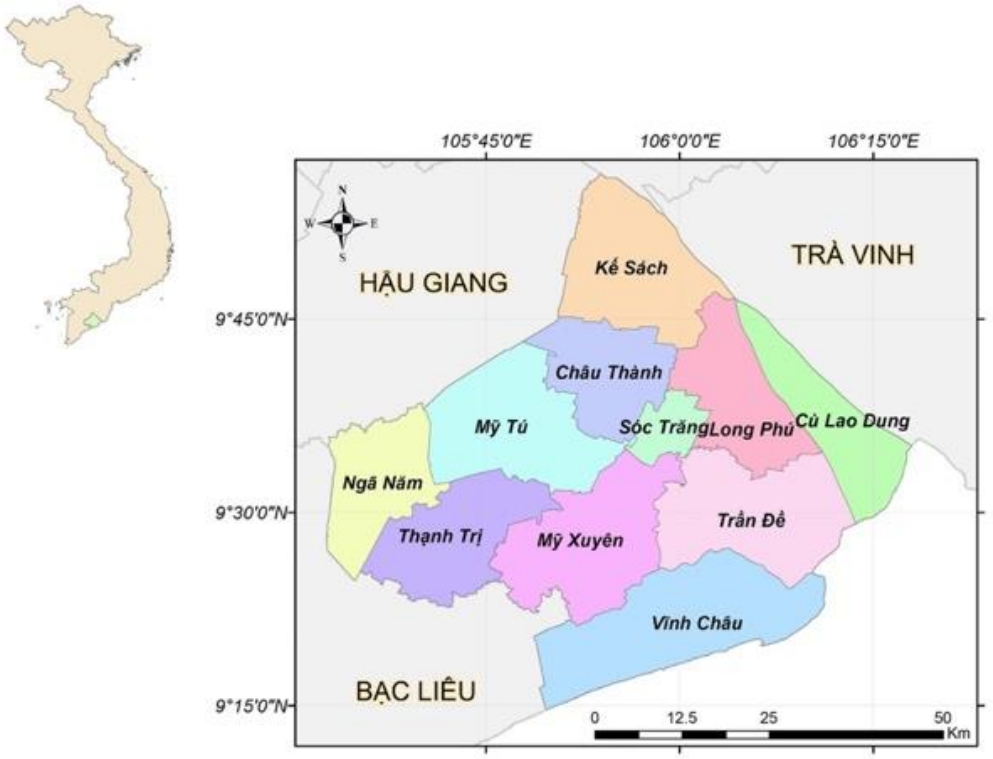


Figure 4.7. Map of Soc Trang province and its city and districts
Source: Author

Soc Trang is located in the coastal region of the VMD and alongside the end of the Bassac (*Hau*) river before it meets the sea. The province borders on Tra Vinh to the north, Hau Giang to the northwest, Bac Lieu to the southwest and the East Sea (South China sea) to the southeast with a coastline of 72 km. It should be noted that Soc Trang province is located in two types of ecological systems, the system of middle-in-land and the system of coastal and island. The province can be situated in the East Sea coastal region, which, together with the Ca Mau Peninsula, belongs to the zone exposed to saline intrusion in the dry season (see Fig. 4.8) (Tuan et al., 2007; Miller, 2007; Xuan, 1975; MARD, 2009; Prime Minister of Vietnam, 2006). The saline intrusion zone makes up about 47 per cent of total land area of the Delta, features Ca Mau (Ca Mau Peninsula), Bac Lieu, Tra Vinh provinces, and part of Kien Giang, Soc Trang, Hau Giang, Ben Tre, Tien Giang and Long An provinces (the East Sea Coastal Region) (Prime Minister of Vietnam, 2018). The high-flooded region features two regions – the Plain of Reeds

(*Dong Thap Muoi*) spreading over Long An, Tien Giang and Dong Thap provinces, and Long Xuyen Quadrangle (*Tu Giac Long Xuyen*) covering Kien Giang, An Giang and Can Tho city. The fresh-water zone covers parts of An Giang province and Can Tho city, and Vinh Long province, which are not affected by saline intrusion.

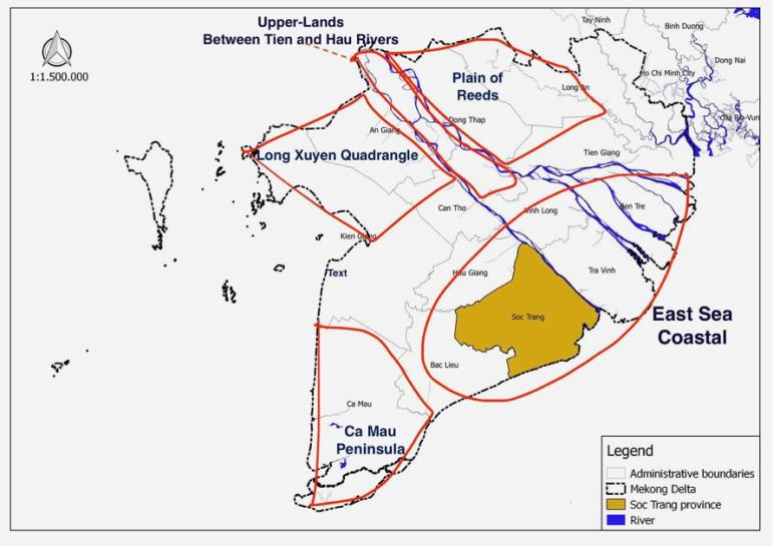
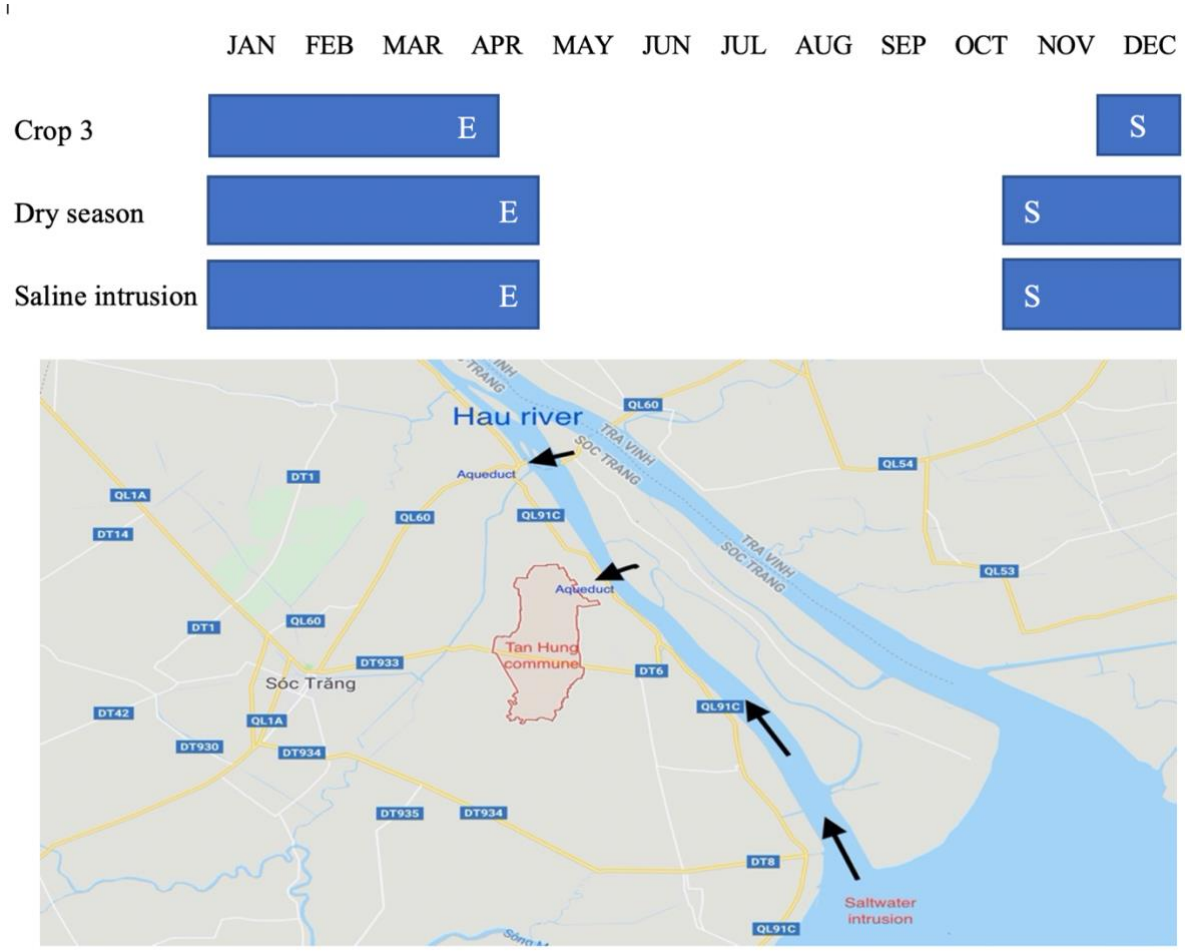


Figure 4.8. Main Water Regime Zones in the VMD

Source: Author adapted according to Tuan et al. (2007)

It should be noted the crucial distinction in the ecological systems and cropping patterns between Soc Trang and the coastal regions in the downstream area with the high floodplain regions in the upper part of the VMD. The latter part is blessed with four-to-six months of inundation covering an area of up to 1.9 million ha, which helps them cultivate a rice crop even in the dry season (Tuan et al., 2007). While their natural risks are flooding, saline intrusion and drought (water scarcity) are the risks facing the Soc Trang and the coastal and downstream provinces of the VMD (Birkmann et al., 2012; Miller, 2007). Saline intrusion is an annual natural phenomenon, occurring the dry season, starting around December, peaking from February to April and decreasing in the following months. Saltwater encroaches on inland through main river and canal channels, leading to water scarcity in agricultural production (Fig. 4.9). As such, Soc Trang and other coastal provinces must depend on human regulation of dike systems, sluice gates and pumping stations to irrigate their rice fields during the dry season. Rice crop 3 (the late Winter-Spring or Spring/Summer crop) in Soc Trang, cultivated from December to March or for some, April, is susceptible to saline intrusion and water scarcity due

to a low river flow rate, low rainfall, and tidal movement (T.B Nguyen, 2015). Thus, by nature, the *late* Winter-Spring crop in Soc Trang and the coastal region generally is very different from the Winter-Spring crop in the Plain of Reeds and the Long Xuyen Quadrangle, even though they could be called and calculated under the same name.



Note: S: Start, E: End

Figure 4.9. Coincidence between crop 3 and saline intrusion in the dry season

Source: Author, Lee & Dang (2020), Google Maps

As regards land use, the province has 331.2 thousand ha, of which agricultural land accounted for 64.2 per cent (212.6 thousand ha) (see Fig. 4.10). Put this into perspective, this rate is much higher than that of the VMD (22.7 per cent) and Vietnam (34.7 per cent) in the same year (GSO, 2020a). Compared to the figure as of 2015, agricultural land area has decreased slightly from 213.4 thousand ha.

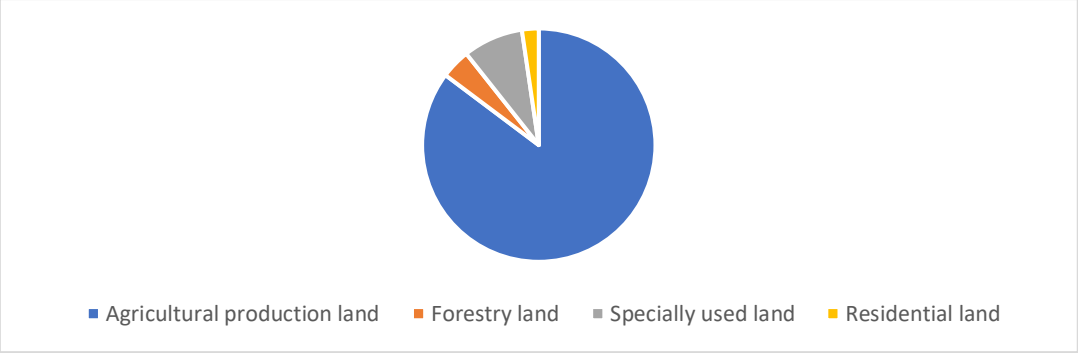


Figure 4.10. Soc Trang's land use by type of land (per cent)
Source: GSO (2020a)

As of 2018, Soc Trang has 495 agricultural farms, of which cultivation farms account for 51.3 per cent, followed up by fishing farm (30.1 per cent), livestock farm (16.2 per cent) and others (2.4 per cent). The share of cultivation farms has sharply increased from just 42.9 per cent (194 farms) in 2015. Farmers cultivate two cereal crops including paddy and maize on a planted area of 355.9 ha. Paddy crops account for 98.8 per cent of total cereal crops. In addition, local farmers also cultivate 2,246 ha of tuber crops including sweet potatoes and cassava, 8,537 ha of annual industrial crops including sugarcane, peanut, and soya-bean, and 24,035 ha of main perennial crops including orange, lemon, mango, longan, banana, and pomelo. Recent years have witnessed a change in the direction of cropping with the planted area of cereal crops, tuber crops, and industrial crops significantly decreasing by 11 ha, 575 ha, and 2,611 ha from those of 2015. Meanwhile, the planted area for perennial crops increased 1,729 since the same year of comparison. Although the number of fishing farms in 2018 decreased by 20 farms from 2015, the production of fisheries increased by 19.3 per cent (or 42.2 thousand tons) in the same period. Aquaculture including shrimp and fish farming dominates over fish catching, with aquaculture constituting the largest share of 73 per cent in 2018, increasing by 1.7 percentage point from 2015. Pigs are the most popular livestock with 261.1 thousand heads in 2018; whereas, the number of cattle and buffalo are small (30.6 and 2.7 thousand heads, respectively). Poultry raising is also popular with 6,327 thousand heads, an increase of about 1.3 thousand since 2015.

Agriculture, forestry and fishing contributed about VND19.6 billion to the province's Gross Regional Domestic Product (GRDP), accounting for 40.6 per cent as of 2018 (see Fig. 4.11). The service sector topped the chart (42.1 per cent) with the industry and construction sector in third position (13.8 per cent). The profile has significantly changed since 2015 with the agriculture sector having had the largest share (44.1 per cent), followed up by the services sector (39 per cent) and industry and construction (15.7 per cent). It is worth noting that the growth index of the agriculture sector at constant 2010 prices dropped from 102.1 per cent in 2015 to 96.5 per cent in 2016. All of these changes could partly attribute to the effect of the disaster by late 2015-early 2016 (GSO, 2020a).

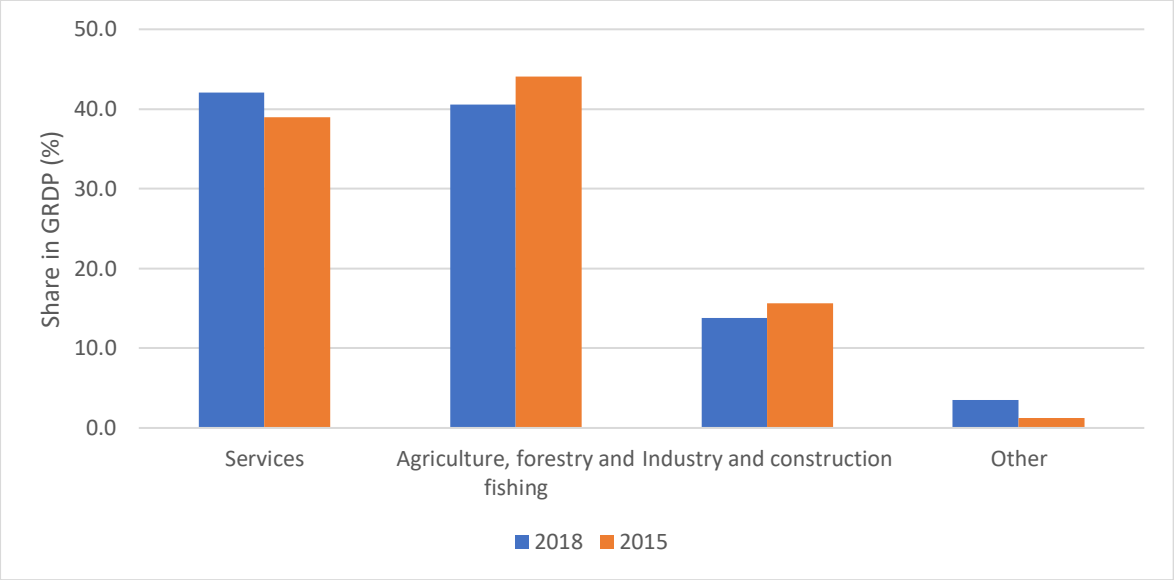


Figure 4.11. Soc Trang's Structure of Gross Regional Domestic Product (GRDP) by year
Source: GSO (2020a)

As seen in the VMD, waterways play a critical role in Soc Trang's local transport. The volume of freight carried by local transport is about 6.2 million tons; of which, the volume carried by waterways accounts for 43.5 per cent (about 2.9 million tons). The contribution of waterways to local transport was very high in the past; the percentage of volume in total freight carried was 72.9 per cent from 2000 to 2008, and only dropped to below 50 per cent from 2011 until 2018. Indeed, the 2018 figure is very impressive compared to the countrywide figure of 20.6 per cent (GSO, 2020d), but lower than the VMD figure of 68.1 per cent (Fig. 4.12).

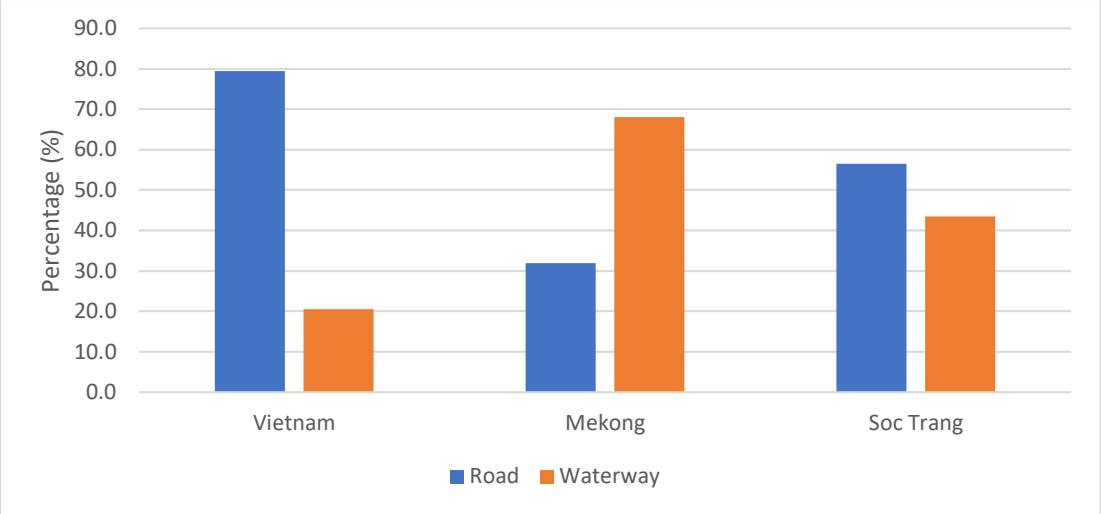


Figure 4.12. Volume of freight carried by local transport by type
Source: GSO (2020d)

Long Phu and Tan Hung

Long Phu district is a rural area located at the end of the Bassac (Hau) River before it enters the East Sea (or the South China Sea) (Fig. 4.13). The district consists of two towns and nine rural communes. As of 2016, the district has 28,174 households with 113,856 residents. The female population accounts for 50.5 per cent of the total population. Most people live in rural settings (77.7 per cent or 88.5 thousand people) (Soc Trang Statistics Office, 2017).

Figure 4.13. Map of Long Phu district and Tan Hung commune
Source: Adapted from Google Earth

As of 2020, the district area is about 26.4 thousand ha, with 81.5 per cent (21.5 thousand ha) used for agricultural production (Table 4.3). Of total agricultural land, that used for rice cultivation was 75.9 per cent (16.3 thousand ha), increasing just 0.6 percentage points since 2018 (Soc Trang PPC, 2020).

Table 4.3. Land use in Long Phu and Tan Hung, 2018-2020

Indicators	Location	2018	2019	2020
Total land area	Long Phu	26,372.1	26,372.1	26,372.1
	Tan Hung	3,226.8	3,226.8	3,226.8
Total agricultural land area	Long Phu	21,564.9	21,556.7	21,483.5
	Tan Hung	2,919.5	2,920.0	2,918.4
Rice cultivation land area	Long Phu	16,255.7	16,297.5	16,316.5
	Tan Hung	2,510.0	2,513.6	2,511.5

Source: Compiled from Soc Trang PPC (2018, 2019, 2020)

Tan Hung commune is located within Long Phu district, about 12 km from the Bassac River and 31 km from Tran De sea gate. The commune lies along the Provincial Road 6, which helps local people reach Soc Trang city (the centre of Soc Trang province) and Long Phu town (the centre of Long Phu district) in about 30 minutes by car, as both are 14 km away.

As of 2020, Tan Hung's area was 3.2 thousand ha, which has increased by 0.6 ha (1995), 62 ha (2000) and 88 ha since (2005) (see Table 4.4).[3] As of 2017, 89.9 per cent was devoted to agricultural land, 8.6 per cent for non-agricultural purposes, and 1.5 per cent for housing. As of 2020, the percentage of agricultural in total land area increased slightly to 90.4 per cent (2,918.4 ha). Since 2000, the share of agricultural land area has slightly decreased 1.85 percentage points from 91.7 per cent (2903 ha), which could be ascribed to the increase of the shares of non-agricultural areas and land for housing construction.

Table 4.4. Land use in Tan Hung commune in 2000, 2005 and 2017

Indicators	2000	% in total	2005	% in total	2017	% in total
Total area (ha)	3,164.8	100.0	3,226.7	100.0	3,226.8	100.0
Agricultural land	2903.3	91.7	2911.2	90.2	2,900.0	89.9
Residential land	37.6	1.2	46.6	1.5	48.0	1.5
Non-agricultural land	221.8	7.0	267	8.3	278.8	8.6

Source: Compiled from Soc Trang PPC (2005), and Tan Hung commune's People Committee

[3] The increase of land area could be due to the recalculation of land statistics on maps and the use of unused land area.

As of 2015, the average population of Tan Hung commune was 12,084 people with 3,078 households. Of the total households, about 51.9 per cent (1,597) reported to base their livelihood largely on agriculture. Around 63 per cent of the population were of working age, lower than the national average figure (69 per cent) (Tan Hung CPC, 2018). However, this cohort, especially young people, often migrates out of their hometown in search of income. It is worth noting that the net-migration rate[4] of Soc Trang was minus 10 per 1000 people in 2010 – for every 1000 people the province lost ten people a year due to migration. This figure reduced to minus 5.2 in 2015 but increased back to minus 7.7 in 2017. With the population of Soc Trang in 2017 recorded at 1,3 million people, the province lost 10.1 thousand people due to the higher out-migration rate over the in-migration rate (GSO, 2018b).

At present, the average natural area per capita and the average agricultural land area per capita are 0.27 ha and 0.24 ha, respectively. These figures slightly decreased compared to those of 2005, 0.2725 ha and 0.2468 ha, respectively, which could be due to the increase of population from 11,841 people in 2005. If counting only for agricultural households, the average agricultural land area per household was at around 1.82 ha (Soc Trang Steering Committee of Land Statistics, 2005; Tan Hung CPC, 2017, 2018). This was higher than the VMD's average (1.7 ha/household) and national average (1.5 ha/household) and far higher to the Red River Delta's figure (0.6 ha/household) (GSO, 2018b).

Tan Hung commune is ethnically diverse with the Khmer group making up the largest share of the population (63.9 per cent), followed up by the Kinh population – the ethnic majority in Vietnam (35.2 per cent), and Vietnamese Chinese (*the Hoa)* and others (0.2 per cent) (Soc Trang Statistics Office, 2017). In terms of settlement, each of the first two major ethnicities often occupy different villages, except for some people or households of each group living within each other's territories due to migration and marriage. Vietnamese Chinese people tend to live in Kinh majority villages. Some Vietnamese Chinese tend to declare/register themselves as Kinh ethnicity (Chin Ro, HH28). The Khmer population is currently living mostly in Village B (accounting for 95 per cent of the total village population), followed by Village E (88 per cent), Village D (87.1 per cent), Village C (64.4 per cent), and Village A (just 10.3 per cent) (Tan Hung CPC, 2018). Although living more or less in separate villages, farmers of different ethnic groups tend to cultivate rice fields that are located across villages due to the dynamics

[4] Net-migration rate reflects the status of in-migration and out-migration of population from a territorial unit in the reference period. It is the difference between the number of in-migrants and number of out-migrants of a territorial unit on average per 1,000 population of that territorial unit (GSO, 2018b, p. 70).

of land exchange and rental. Farmers of one village owning, renting, and cultivating rice fields across other villages is a common practice.

According to the Tan Hung commune's household poverty database, at the beginning of 2018, there were 13.8 per cent of households (424 households) classified as poor households and 5.1 per cent as near-poor households (158 households) (see Table 4.5).

Table 4.5. Poor and near-poor households of Tan Hung commune early 2018

#	Village	Total households	Poor households	% in total	Near-poor households	% in total
1	Village A*	804	73	9.1	20	2.5
2	Village C	567	87	15.3	46	8.1
3	Village D	718	81	11.3	21	2.9
4	Village B*	480	93	19.4	24	5.0
5	Village E	509	90	17.7	47	9.2
Total		3078	424	13.8	158	5.1

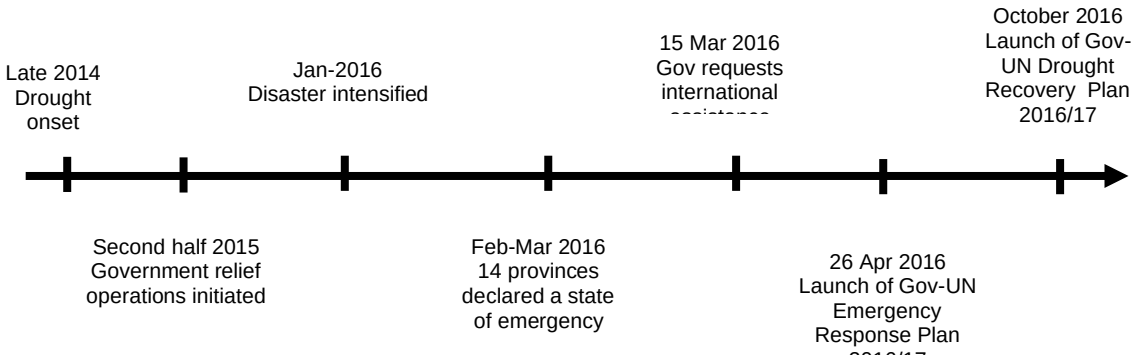
Note: * The two villages chosen for my study. The names of villages and participants in this research are pseudonyms.

Source: Compiled from Tan Hung Commune People's Committee (2018) and (Nguyen-Trung et al., 2020)

Khmer households constitute the largest share of poor households – 83.2 per cent by late 2014, 81.2 per cent by late 2016, and 79 per cent by early 2018. In Village B, this rate was absolute (100 per cent), while in Village A, the figure was at 21.9 per cent.

The 2015-2016 Disaster

At the time of my fieldwork (2018), three years have passed since the historic disaster (late 2015-early 2016). Indeed, the disaster had gathered momentum one year prior to its full-blown event (Fig. 4.14).



Note: Gov- Government; UN- United Nations

Figure 4.14. The timeline of the 2014-2016 event
Source: Adapted from (United Nations, 2016a)

In late 2014, an El Niño phenomenon – understood as the abnormal increase in temperature of the surface seawater – was believed to cause Vietnam's worst drought and saline intrusion combination in 90 years (United Nations, 2016b, 2016c). According to the classification of disaster risks in the Decision on Disaster Risk Classification (Prime Minister of Vietnam, 2014b), the 2015-2016 event can be considered at the highest level in both drought and saline intrusion disaster categories. Concerning drought, the 2014-2016 drought lasted for over 20 months (the Decision's highest level of drought is 6 months) with water shortages in the drought-affected areas up to more than 70 per cent compared to yearly averages. Concerning saline intrusion, the level of salinity concentrations in the 2015-2016 event exceeded 4‰ (or 4 gram/litre) described in the Decision. In many sea gates, salinity even intruded up to 90km (Southern Institute of Water Resources Research, 2016). In terms of national and international responses after the onset of the drought in late 2014, the GoV started to request international assistance by March 15, 2016, then launched the GoV-United Nations Emergency Response Plan in April 2016 and the GoV-United Nations Drought Recovery Plan in October 2016

(United Nations, 2016d). The declaration of a State of Emergency of eighteen provinces including ten in the VMD highlights the event as a national/collective crisis.

Although there were early warnings and proposed measures commanded from the highest governing body in disaster risk management, the impact of intensified drought and saline intrusion was still severe. In 52 out of 63 provinces suffered, 18 provinces declared a State of Emergency from February to June 2016. In the VMD, nine out of 12 provinces and one city declared it as well with the exception of An Giang, Dong Thap, Can Tho, and Hau Giang. Up until late April 2016, the government provided 5,221 tons of relief food for three affected regions and allocated 1008 billion VND (about 45 million USD) for national drought relief (United Nations, 2016d). Subsequently, the government requested international assistance as of 15 March 2016, launched the Government – United Nations Emergency Response Plan for 2016-2017 with an estimation of 48.5 million USD required as of 26 April 2016, and the Government – United Nations Drought Recovery Plan 2016-2017 as of October 2016. After 24 months of drought and with the peak of intensified saline intrusion during the 2015-2016 dry season, there were many impacts on local provinces including water shortage, insanitation, human and animal diseases, food emergency need, and a considerable disruption in local communities' livelihoods (FAO, 2016; United Nations, 2016a).

According to Soc Trang Statistics Office (2018, p.40), the total rainfall of 1,394 mm in 2015 was lowest since 2010 (2,142 mm). From November 2015 to April 2016, the monthly average total rainfall was 16.2 mm, with the first four months of the latter year recorded almost no rainfall (Soc Trang Statistics Office, 2018, p.40). This drought condition sharply deteriorated saline intrusion, with the salinity concentration level in the river in the dry season 2015-2016 increased by 2.4 from the previous year to 8.6 grams per litre and penetrated deeper into the rice fields (Soc Trang SCPFSSR, 2016).

At Long Phu station located in the Long Phu district the monthly average salinity concentration level stood at 8.53 grams per litre over six months, from January to June in 2016. The maximum concentration was recorded at 23.1 grams per litre, which increased from 14.5 grams per litre in 2015. An increase of 8.6 grams per litre was highest among the eight cities, towns and districts of Soc Trang province. A similar pattern was found in previous years, with the highest increases often seen in March or April. The figures seen in 2010, 2013, and 2015 came close to that of 2016, with the average salinity concentration level recorded at 5.6 grams/litre, 5.26 grams/litre, and 4.83 grams/litre, respectively (Fig. 4.15).

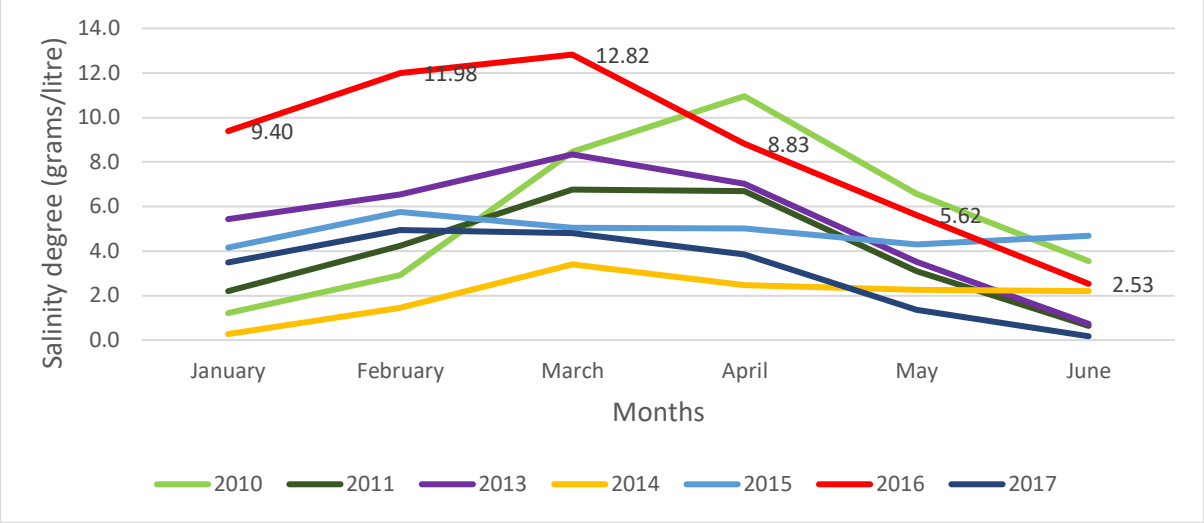


Figure 4.15. Average salinity concentrations measured at Long Phu station of Soc Trang province, 2010-2017

Source: Soc Trang's Steering Committee for Preventing Floods and Storms and Rescue (2017a)

The 2015-2016 disaster caused significant damage to 31,560.15 ha of rice crops, vegetable crops, sugarcane crops, fruit trees, and fishing areas across the province. The event caused an estimated economic loss of VND 908 billion, accounting for 73.3 per cent of total estimated economic losses (VND 1,238 billion) in eight years from 2010 to 2017 (Soc Trang SCPFS, 2010, 2011, 2012, 2013; Soc Trang SCPFSSR, 2014, 2015, 2016, 2017b) (Table 4.6). In 2016, the provincial agricultural production areas with an over 70 percent drop in crop production were 12,314.7 ha, and those with a 30 to 70 percent drop were 19,245.5 ha. Between 2010 and 2017 (excluding 2012 which suffered a large flood), there were under 3,000 ha of crop losses. Both 2010 and 2013 were affected by saline intrusion, yet those losses were far less, with 5,690 ha and 12,274 ha of crop losses, respectively (Soc Trang PPC, 2010, 2011, 2012, 2013; 2014, 2015, 2016, 2017). It can be seen from Table 4.6, although saline intrusion is an annual phenomenon, it was only recorded causing significant damage in the years of 2010, 2013, 2015, and 2016, when drought attacked.[5]

[5] It is worth noting that in these four years, drought was recorded in 2010 and 2013; however, it was surprisingly missing in the provincial reports of 2015 and 2016 – the two years experiencing the combination of this hazard with saline intrusion. This fact somehow shows the lack of awareness of the devastating effect of drought by the provincial government.

Table 4.6. Estimated economic losses and affected agricultural production area in Soc Trang, 2010-2017

Year	Main hazards	Affected agricultural production area (ha)	Estimated economic loss (billion VND)
2017	Heavy rain and flood	2,418.6	12,634
2016	Saltwater intrusion, strong winds, riverbank and beach erosion, whirlwind, and thunder.	31,560.2	908,121
2015	Saltwater intrusion and flood	504.7	9,014
2014	Flood	90.6	16,358
2013	Saltwater intrusion, flood and drought	12,274.0	72,379
2012	Flood	14,583.5	84,563
2011	Flood	2,811.2	52,129
2010	Heavy rain, flood, saltwater intrusion and drought.	5,690.0	83,077

Source: Compiled from Soc Trang PPC's reports (2010, 2011, 2012, 2013; 2014, 2015, 2016, 2017b).

The 2015-2016 disaster caused the most serious damage to the Spring-Summer or late Winter-Spring crop (namely, crop 3) (Long Phu Division of Agriculture and Rural Development, 2016). In Long Phu district, the occurrence of drought and saltwater intrusion caused a dramatic decline of 81.9 percent of the total crop 3 output from 109,148 tons in 2015 to 19,661 tons in 2016. The planted area also significantly dropped from 13,273.48 ha in 2015 to 6,449.7 ha in 2016 and 3,297.7 ha in 2017 (Fig. 4.16).

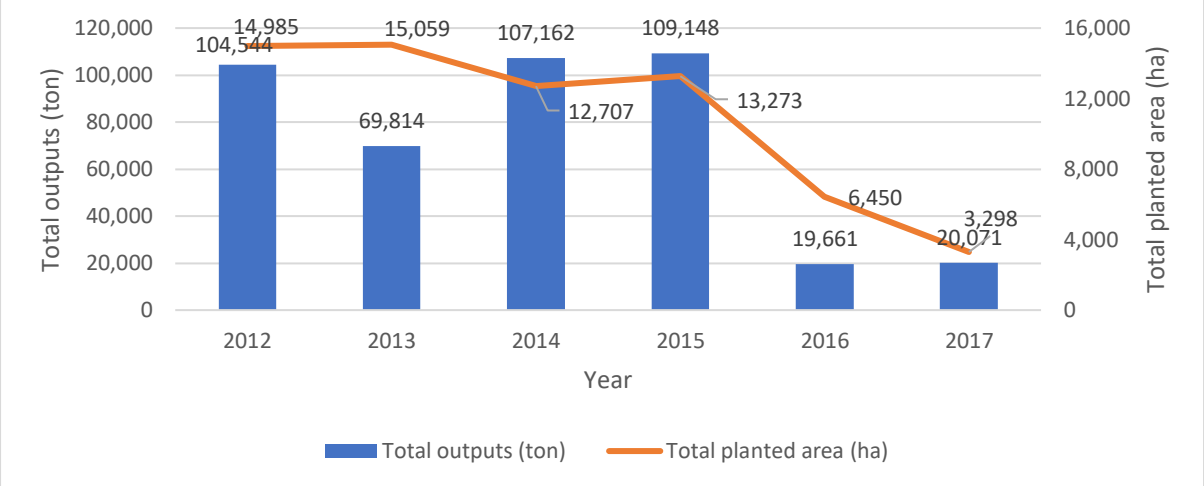


Figure 4.16. Long Phu district's planted area and total output of crop 3 from 2012-2017

Source: Consolidated from Long Phu district's Division of Agriculture and Rural Development (2012, 2013, 2014, 2015, 2016, 2017)

A loss was also evident in Tan Hung commune's agricultural production, which saw a decline from 31.49 per cent to 15.66 per cent in the total output and planted area of three crops in 2016, compared to those of 2015 (Fig. 4.16).

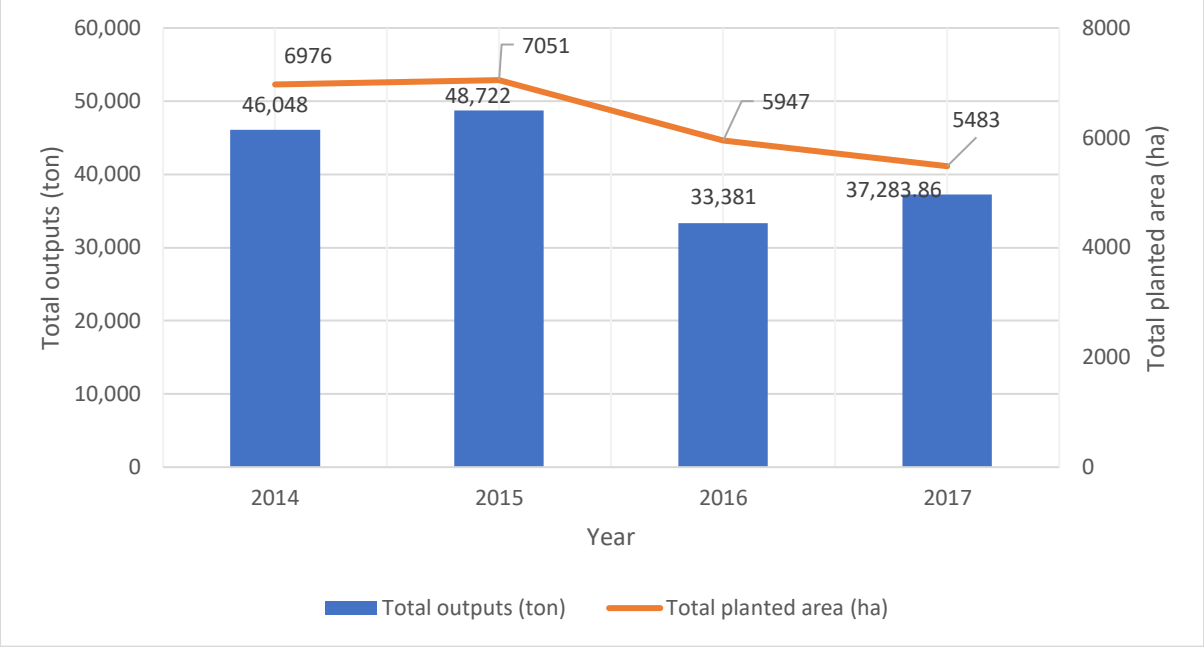


Figure 4.17. Tan Hung's planted area and total output of annual paddy production, 2014-2017

Source: Consolidated from Tan Hung commune People's Committee (2013, 2014, 2015, 2016, 2017)

There was a total of 4,401 affected agricultural households in Long Phu district, of which, the Tan Hung commune had 645 households (14.6 per cent), that were reported to have lost 30 to 100 per cent of crop 3. Under the effects of the 2015-2016 disaster, total poor households and near-poor households in Tan Hung commune increased from 464 and 207 households by late 2014, to 531 and 222, respectively, by late 2016. This means an increase of 12.2 per cent from a total of 671 poor and near-poor households by late 2014. The government spent nearly VND1.6 billion to support the affected households in the Tan Hung commune, which was the highest amount of support among the 11 towns and communes of the Long Phu district.

CHAPTER 5. FIELD TRANSFORMATION LEADING TO PRESENT VULNERABILITY

According to Bourdieu (1977, 1990a, b), habitus is the product of social structures or fields. Fields are part of a wider society and subject to its transformation in economic development, technological advancements, social differentiation, and modernisation (Jenkin, 1992). As Edgerton and Roberts (2014) comment, when the field changes, it creates a disparity between the habitus and the field, which motivates agents to deliberatively transform their habitus to adapt to new conditions. The changes of habitus produce social practice accordingly.

Fieldwork data suggests that the vulnerability shown in the 2015-2016 disaster comes from farmers' cultivating rice crop 3 in the dry season (social practice) when saline intrusion and drought often occur. Such practice and its triple cropping system, however, only gained popularity in Tan Hung commune in the early 2000s. Prior to then, the practice of single or double farming system that was mostly cultivated in the rainy season allowed farmers to avoid the risk of annual saline intrusion. In other words, farmers in the past did not face the same risk of disasters as do current farmers. Thus, the question is what prompted the change from a single cropping system to the triple system that has endangered them to the risk of drought and saline intrusion? Answering this question demands a thorough examination of the history of the field of agriculture, where farmers have lived and struggled. It is also demanding to situate the field analysis within the transformation of the wider society, namely, the broader social structures of Vietnam. Based on the combination of contextual analysis, secondary data analysis and qualitative data analysis, I attempt to trace the structural contexts (i.e., social, economic, political, environmental changes) of Vietnam and of the agricultural field since the 1970s-1980s. These contexts proved significant in leading to the Vietnamese government's soft and hard policies and VMD's development strategies, which constituted a critical transformation in the field of agriculture and the field of economy as well as the field of disaster risk management. I also examine how farmers as social agents reacted and adapted to such structural transformation so as to develop their new habitus and new crop practices that are susceptible to risks.

Context of Field Transformation

The significant transformation of Vietnamese society can be dated back to 1975, the year when the country reunified the South and the North after decades of war (1954-1975). In the decade that followed, the country was based on the centrally planned economy; a model derived from Marxist-Leninist ideologies. The economy was highly controlled and driven by the political leadership of the Vietnamese Communist Party (CPV). After the reunification, the one-party state rebuilt its power by enforcing many top-down policies, especially agricultural collectivisation. This policy used agricultural cooperatives to regiment farmers, forcing them to give up their private land rights and work for the collective interests rather than for their individual needs. As a result, agricultural production failed to produce enough food for its citizen, pushing the country deeply into a comprehensive crisis that saw them facing high inflation rates, extreme poverty, food shortage, and even famine (Cazzuf, McKay, & Perge, 2017; Harvie, 1996). With about 49 million people as of 1975, the country had a Gross Domestic Product of around US$14 billion and GDP per capita of US$231 (World Bank, 2020), making it one of the poorest countries in the world at the time with the poverty headcount ratio at $1.90 a day (2011 PPP – Purchasing Power Parities) recorded at 51.9 per cent in 1992 (World Bank, 2020). From 1975 to 1988, the country encountered several food crises that made it a net rice importer (Pingali & Xuan, 1992) (see Fig. 5.1).

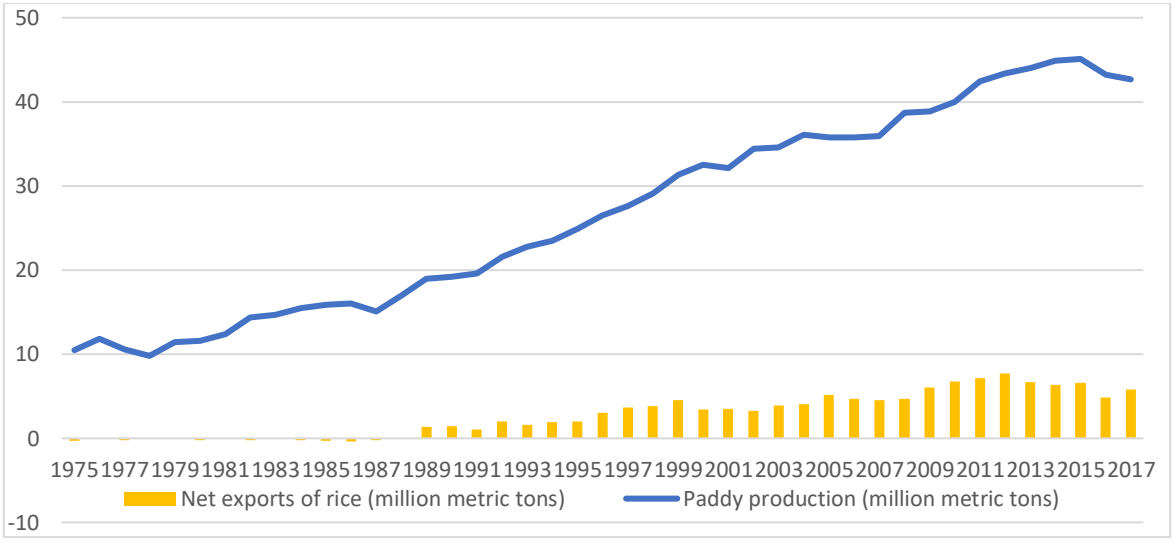


Figure 5.1. Vietnam's net export of rice and paddy production, 1975-2017

Source: Consolidated from GSO (2020c), Vietnam Food Association (2018), and Minot and Goletti (2000)

The context of crisis in the decade that followed the reunification has set the stage for the State's critical reform (*Đổi Mới*) in 1986. The reform allowed the country to combine industrialisation (*công nghiệp hóa*) (e.g., transforming the rural/agricultural economy into a modern economy based on industry and services) and modernisation (*hiện đại hóa*) (e.g., outsourcing of government functions). Until the 9th National Congress of the CPV (2001), the Vietnamese leadership started propagandising the idea of obtaining 'industrialisation and modernisation by 2020', which further promotes their ideology of and the approach to the country development planning and modernisation (Tan, 2012).

The resultant economic resurgence successfully transformed the country from one of the poorest nations into a low middle-income country by 2010. In 2019, the population reached about 96.4 million people with GDP recorded at approximately US$262 billions and GDP per capita at US$2,715. Since the introduction of the reform, the average annual rate of GDP and GDP per capita growth reached 6.5 per cent and 5.1 per cent a year, respectively. From more than 50 per cent of population were living under the poverty line, the poverty headcount ratio at $1.90 a day (2011 PPP) had decreased to just 4 per cent in 2010 and just 1.9 per cent in 2018 (World Bank, 2020). Although most of the population still lives in rural areas (around 64.95 per cent or about 62.6 million in 2019), this figure has sharply decreased from 80.49 per cent (or 53.1 million) in 1990 (GSO, 2020e).

The above-mentioned social, economic, and political contexts or the transformation of social structures within the Vietnamese society greatly influenced the field of agriculture (T.B. Nguyen et al., 2021). As the reforms proceeded, agriculture's contribution to the country's commodities exports increased from just 48 per cent in 1990 to 56 per cent in 1995 (Khan, 1998, p. 79). After 14 years following the reunification, Vietnam transformed from a net rice importer to a net rice exporter by 1989 (Niimi, Vasudeva-Dutta, & Winters, 2004; Pingali & Xuan, 1992). The country produced 19 million metric tons of paddy in 1989, nearly double that of 1975. The paddy output increased annually and reached its peak at 2015 with 45.1 million metric tons before decreasing to 43.2 million metric tons in 2016 and 42.7 million metric tons in 2017 (GSO, 2020c). From the net import of minus 0.3 million metric tons of rice in 1975 and minus 0.4 tons in 1986 (Minot & Goletti, 2000, p. 44), Vietnam recorded a net rice export of 1.37 million tons in 1989 and 5.72 million tons in 2017, after peaking at 7.72 million tons in 2012 (VFA, 2018), and even surpassing Thailand to be the largest-rice exporter in 2011 (Pham & La, 2014). At present, Vietnam is one of the five largest rice producing countries in

the world, only behind China, India, Indonesia and Bangladesh, and is the second largest rice exporting country, behind Thailand. Although Vietnam's transformation of agriculture has been discussed (e.g., T.B Nguyen et al. 2021), its link with contemporary vulnerability to disasters has not been paid due attention. Thus, in the sections that follow, I try to demonstrate that the State's responses to crisis and developmental strategies have significantly transformed the field of agriculture in the VMD, which has led to the substantial changes of farmers' habitus, capital accumulation and crop practice.

Transformation of Field of Agriculture

In this section, I will show that the changes of the field of agriculture led to the changes in capital and subsequently farmers' habitus and practice (Fig. 5.2). This transformation comprised of three significant areas: food politics, soft structures, and hard structures, which accordingly led to the changes in capital configuration and habitus and practice.

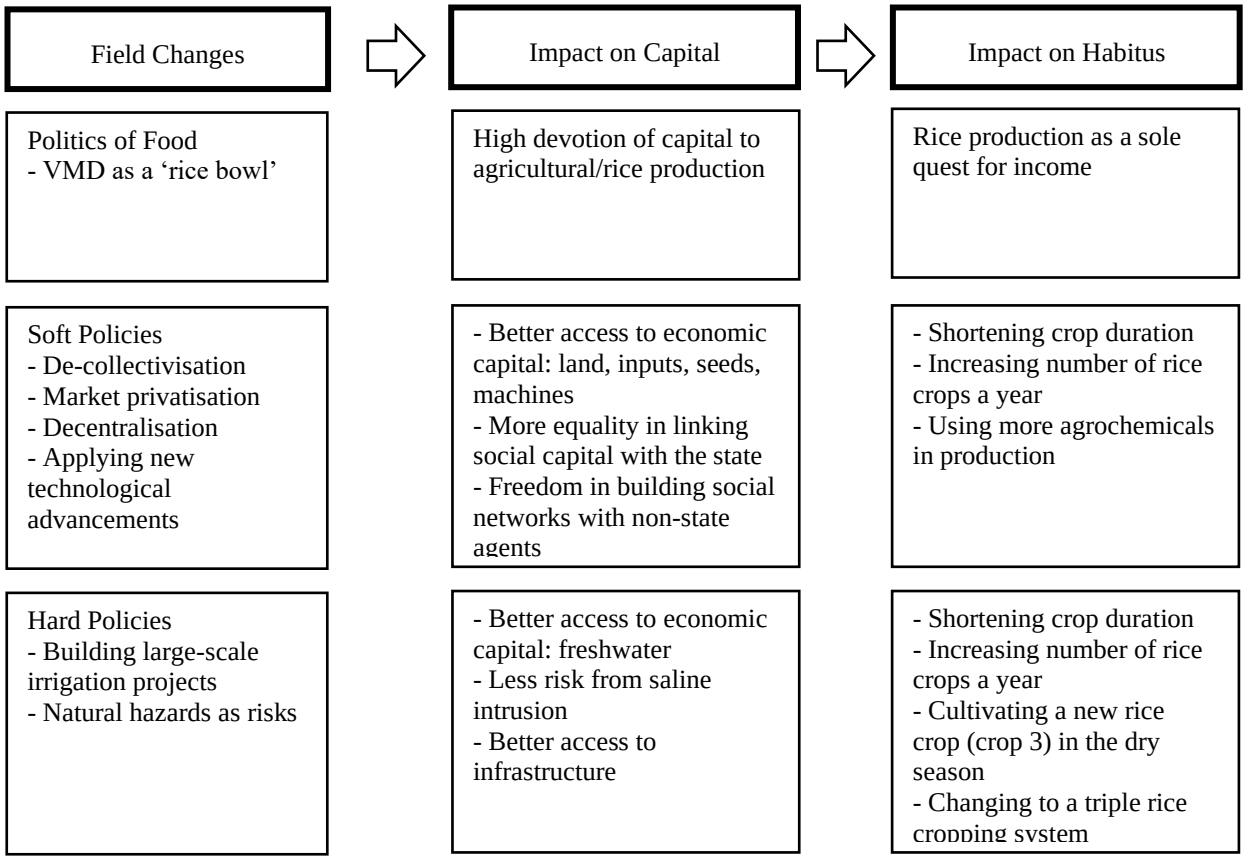


Figure 5.2. The transformation of field, capital, and habitus in VMD

Source: Author

Food politics refers to the Vietnamese state's approach to food security and the role of VMD. Soft and hard structures are social structures constituting the rules and regulations within the field of agriculture, which helped generate capitals (economic capital, cultural capital, and social capital), farmers' habitus and subsequently, their crop practice. Hard structures refer to the rules and regulations regulating the relations between farmers and their natural and built environment. Hard structures exist in the forms of water resources management laws and policies including those concerning the building of large-scale irrigation systems (e.g., large-scale sea-dikes, sluice gates, canals) which aim to control natural risks including flooding and saline intrusion. Soft structures here refer to rules and regulations regulating the relations between farmers with the State and the market, existing in the forms of laws and policies concerning market reforms (e.g., commercialisation of agricultural inputs, land), technological advancement (e.g., use of agrochemicals such as fertilisers, pesticides, high-yield varieties, mechanisation) and de-collectivisation. I develop this classification based on the terms 'soft' and 'hard' policies. These are two types of policies concerning agricultural production. 'Hard' policies refer to the approach and use of engineering measures (e.g., building compartment infrastructure) to solve the problems for agricultural production and disaster risks, whereas the 'soft' policies refer to the use of non-engineering measures from the use of high-yield varieties and agrochemicals to institutional capacities that help govern those 'hard' options (Can, 2011; Smajgl et al., 2015; T. A. Tran & Tuan, 2020). It is essential to note that the distinction between soft and hard policies that I have made so far only serves analytical purposes. In reality, these structures are intertwined in the creation of both expected and unexpected outcomes, as seen in other countries in the Mekong River Basin (MRC, 2003; Vormoor, 2010). The significant changes in soft and hard structures occurred in parallel with the agricultural modernisation in the early 1960s, which started gaining momentum on both sides of the war-separated country with increasing use of high-yield rice varieties, agrochemicals, mechanisation, and hydraulic engineering in water control management (Fortier & Thi Thu Trang, 2013; P. Taylor, 2007).

Politics of Food: VMD as a National Rice Bowl

Under the one-party rule, Vietnam's politics has strongly shaped the developmental direction of the Vietnamese Mekong Delta (VMD). In this contextual analysis, I demonstrate that the national strategy after the reunification and especially after the Doi Moi, significantly transformed the region into a food-producing machine serving for political needs rather than actual needs. Prior to reunification (1975), the VMD was already crucial to the country's rice

production. In 1973-1974, the Delta planted about 2 million ha of paddy, accounting for 72 per cent of the total planted area of the country. The Delta was also ahead of the country average in terms of rice yield, with 2.52 ton/ha compared to 2.48 ton/ha, respectively, and thus, produced up to 73.1 per cent of total rice production (5.14 million tons) (Xuan, 1975, p. 99). Therefore, after reunification, it was natural that the Vietnamese state immediately positioned the VMD as the focal point for their rural economy development and national food security (Khan, 1998). The Communist Party of Vietnam (CPV), the highest level of national leadership, realized such a political direction in its national congresses that are often held every four or five years. As seen in Table 5.1, the themes of national food security and the role of VMD as a rice bowl were significantly related throughout in CPV's directions.

Table 5.1. Concerns for food security and the Mekong Delta's role in the CPV's strategies

National Congress (year)	Food security	Vietnamese Mekong Delta (VMD)
Fourth National Congress (1976)	The foremost problem.	A potentially important rice bowl for the country.
Fifth National Congress (1981)	The most pressing and basic problem.	Together with the Red River Delta, VMD is to be the focal point for the country's comprehensive food and agricultural production.
Sixth National Congress (1986)	Food is the number one focus, vital for survival, one of three major economic programs, alongside consumer goods and export goods programs.	VMD is to be the largest commodity rice producer in the country; the Red River Delta to be the focal point of rice production in the North.
Seventh National Congress (1991)	Food is still key but not urgent. Food production to ensure both national demand and export.	One of the most substantial producers of food, vital for commodity food production.
Eighth National congress (1996)	National food security always needs to be ensured.	Together with the other deltas, has a strategic mission to ensure national food security.
Ninth National Congress (2001)	Food production continues to be a crucial activity to ensure national food security.	The country's largest commodity, vegetable, fruit and aquatic product production region; stabilising rice growing areas.
Tenth National Congress (2006)	National food security is always vital.	Alongside the Red River Delta, VMD is a major place serving national food security.
Eleventh National Congress (2011)	Ensuring national food security is one of the missions of agricultural production.	No explicit link between VMD and rice production, food security, and export. Areas specialised in large-scale commodity rice production; step up intensive rice production.
Twelfth National Congress (2016)	Ensuring national food security is one of the missions of agricultural production.	No explicit link between VMD and rice production, food security, and export.
Thirteen National Congress (2021)	Ensuring national food security in relation to each area/region's strength and climate changes	No explicit link between VMD and rice production, food security, and export. Focusing on aquatic products-fruit trees-agricultural production

Source: Author, compiled from the CPV's National Congress Documents

In response to a prolonged food crisis, in the first two decades after the reunification, farming in the VMD in particular and Vietnam in general focused on building 'subsistence farming and household food security' (Can, 2011, p. 2). From 1976 to 1991, CPV addressed food security first as the 'foremost problem' (Fourth National Congress), then 'the most pressing and basic problem' (Fifth National Congress), and 'the number one, vital-for-survival focus' (Sixth National Congress), strongly associated with national defence and security (CPV, 1977, 1982, 1987). In parallel, the Delta's role in rice production and food security was notably increased, being uplifted from just as 'a potentially important rice bowl' (CPV, 1976) to the 'the largest commodity rice producer' (CPV, 1986).

From the Seventh National Congress in 1991, in light of the reform's success in increasing rice production and exports, food security was no longer considered as urgent; nevertheless, it continued to be a 'vital' activity that agriculture must always ensure. From 2000, as addressed in the CPV's Ninth National Congress's 5-year socio-economic plan (2001-2005), the country was declared to overcome the crisis and focus on achieving 'high, sustainable and effective growth' (CPV, 2002). In the new direction, the country concentrated on pushing industrialisation and modernisation while directing agriculture to the development of 'specialized farming commodity production zones suitable to the climate, land and labor potentials and advantages of each region and locality' (CPV, 2002; Tan, 2012). From 1991 to 2006, the VMD was firmly positioned as the country's 'major', 'largest' food producer with a strategic mission to ensure national food security (CPV, 1992, 1997, 2002, 2007). This emphasis on food security was strongly incorporated in Vietnam's reform policy (Can, 2011; Cazzuf et al., 2017). The link between national food security and the VMD has not been explicitly repeated only in the most recent three national congresses (from the eleventh to thirteen), which have focused more on the development of this region on its strengths, its ecological system, and climate changes.

In addition, the CPV also enforced agricultural intensification on the VMD's regional development. The CPV began to sow this idea in the Fourth National Congress (CPV, 1976): 'To highly concentrate all the strengths of the whole country, of branches and levels to create an outstanding development in agriculture… in order to firmly address the national demand for food' (CPV, 1977). In this general policy, rice cultivation and intensification were considered to be the leading activity, being designated to be developed in key rice-specialised areas (*vùng trọng điểm lúa*) (CPV, 1976) or high-yield rice areas (CPV, 1981). The State strongly propagandised its 'rice everywhere' campaign and an 'all rice strategy' especially after

suffering from the severe flood of 1978 (Biggs, Miller, Hoanh, & Molle, 2009) and food shortages in the 1980s (Hoanh et al., 2003; Tuong et al., 2003). The direction for developing rice cultivation was based on 'intensive farming, crop and productivity' (*thâm canh, tăng vụ, tăng năng suất*) by reclaiming fallow land, extending cultivated areas with the aid of irrigation systems and developing new rice varieties (CPV, 1982). Even in a national effort to transform rice monoculture into agricultural diversification (rice, coffee, cashew and pepper) such as the Resolution number 09/2000/NQ-CP (GoV, 2000), rice was still deemed 'a highly advantageous production branch of our country, particularly in the Mekong River and Red River deltas', which had to shoulder national food security, national reserve, and export.

The symbolic position of VMD as a 'rice bowl' that shoulders national food security and export was firmly realised by the government's strategies. The Decision number 1581/QĐ-TTg released in 2009 by the Prime Minister planned to turn the VMD into 'a big agricultural production region in the global market' by 2050 (Prime Minister of Vietnam, 2009). This aim was repeated in the Decision number 2270/QĐ-TTg issued in 2013 by the Prime Minister, which worked on making the Delta a central agricultural production area utilising modern approaches (Prime Minister of Vietnam, 2013). The Decision number 1005/QĐ-TTg issued in 2014 by the Prime Minister stressed that the VMD must be responsible for 'national food security and agricultural and fishing output exportation to global markets' (Prime Minister of Vietnam, 2014a). If we compare those government's policies with the CPV's directions, it can be seen that although since the Eleventh National Congress (2011), the CPV did not explicitly tie VMD with the role of ensuring food security, the government continued to maintain this tie, reflecting the fact that their general approach to the VMD has not entirely escaped from national food politics.

To ensure rice export and food security, the government issues a fixed quota for rice products and export (Khan, 1998). Rice production quotas were always 'kept stable… for consumption, reserve,… and for export' (GoV, 2000). Although the rice export quota was removed in 2001 with the Decision No. 46/2001/QD-TTg on Vietnam's Export-Import Management Mechanism for 2001-2005 (Nielsen, 2002, p. 7), the setting of quotas for rice production seems to continue in effect, especially for the VMD that includes provinces with large rice production systems. For instance, in the Decree 12/2006/NĐ-CP released by the Government in 2006 concerning international purchases and sales of goods, the people's committees of provinces with large local output of rice goods, such as the VMD's provinces, must manage to meet the 'annual export of rice' and ensure 'the food security' (GoV, 2006, Article 10). The execution of the

policies required that each province in this region had to set the cultivated area and total output targets for agricultural production in general and rice production in particular for each year (Smajgl et al., 2015, p. 168).

The food politics by the CPV and the government set the stage for the transformation of the VMD's field of agriculture, and subsequently created the rules, regulations, and capitals for farmers (or agents) and their agricultural practices. The food politics brought about the conditions that institutionalised the rice/agricultural focus into the VMD's agenda, directing this region (local governments and farmers included) to devote energy and resources to rice/agricultural production. In doing so, the political field firmly built barriers that have obscured local governments and farmers to break the rice production cycle, or more general the boundaries of the agricultural field. Consequently, although the VMD was set to change its economic structure in the direction of reducing the share of agriculture and fishery and increasing the shares of the industrial, construction and service sectors, the pace of this transformation was very slow. According to the results of the Rural, Agricultural, and Fishery Censuses in 2016 (GSO, 2018a), the share of agricultural households (i.e., those engaged in agriculture, forestry, and fishery livelihoods) of the VMD in 2016 still occupied over half of total households in the region (57.9 per cent). This figure was higher than those of the whole country (53.7 per cent), the North Central and Central coastal areas (56.9 per cent), the Red River Delta (35.5 per cent), and the South East (31.4 per cent). The decrease of the share of agricultural households in total households of 2016 over 2011 of the VMD was 7.7 percentage points, which was less than that of the whole country (-8.5), the Red River Delta (-11.9), the North Central and Central coastal areas (-9.6) (Nguyen-Trung, 2019). Furthermore, the region development has also significantly lagged behind many other regions, with its contribution to the country's GDP decreased from 167.7 per cent of Ho Chi Minh City and 27 per cent of the whole country in 1990 to just 67.6 per cent and 17.7 per cent in 2019 (VCCI, 2020, p.XXV).

Soft Structures: Relations with the State and Market

The agricultural intensification policy began in 1988 with the VMD as the focal point (Can, 2011) was the realisation of the above-mentioned food security focus. This policy aimed to increase rice production per unit and to maximise land area for rice cultivation (V.K. Nguyen & Pittock, 2016, p. 6). This intensification in the forms of soft structures included the introduction of modern rice varieties, the privatisation of input markets (e.g., agrochemicals), land reform, and de-collectivisation.

In VMD, the introduction of modern rice varieties in VMD has started under the administration period of Nguyen Van Thieu's government of the Republic of Vietnam (South Vietnam). Farmers began familiarised with higher yield rice varieties (HYV) around 1966-1968 (Can, 2011; Cummings, 1978; Nguyen, 2016; Xuan, 1975). Initially introduced in May 1966 in Tien Giang province (formerly known as My Tho), IR8, later named *Thần Nông 8* (*TN8*, God of Agriculture), was the first HYV cultivated on a mass scale in 1967, denoting the start of the Green Revolution in Vietnam (Dat, 2010; Ut & Kajisa, 2006).

The HYV immediately showed its capacity in producing a much higher yield per ha than local varieties. In 1968, local varieties occupied 2.3 million ha with a production of about 4.2 metric tons and a yield per ha of 1.79 tons. By comparison, in an area of just 41 thousand ha, the HYV produced 163.3 metric tons and obtained 3.98 tons/ha, which were 2.2 times higher than the yield of local varieties. Until 1973, the planted areas for local varieties declined quickly to 1.9 million ha while HYV reached 890.4 thousand ha. Despite being cultivated in a smaller area, the HYV produced nearly the same production as did local varieties (about 3.2 metric tons compared to 3.8 metric tons) and always generated higher yields (nearly 3.58 tons/ha compared to just 1.98 tons/ha) (Xuan, 1975, p. 89). As a result, farmers quickly spread the cultivation of HYVs to 33 per cent in the total rice planted area of the VMD in 1975, rising from just 1 per cent in 1968 (Ut & Kajisa, 2006, p. 169). Although HYV rice required the high concentration of labour and capital (Cummings, 1978, p. 237), they allowed farmers to plant and harvest in a shorter duration, enabling them to cultivate more than one crop a year. Thus, the adoption of HYV rice engendered the change in the makeup of local rice production in the VMD, facilitating the change from traditional rice cultivation pattern with a single cropping system to double and triple cropping systems (Can, 2011; Xuan, 1975). In addition, agricultural modernisation allowed farmers in the VMD to access to agrochemical inputs such as fertilisers and pesticides in the 1960s. This explains why following reunification and collectivisation (1975-1988), it was reported that farmers in the VMD already engaged in private markets for these inputs despite the efforts of the State Trading Corporation in controlling the retail trade in agricultural inputs (Pingali & Xuan, 1992, p. 708).

Although the emergence of agrochemical use and adoption of new rice varieties in the VMD occurred as early as the 1960s, under the effects of the Vietnam War (until 1975) and the collectivisation period (1975-1988), agricultural modernisation had been stagnant with the country falling into multiple food crises (Pingali & Xuan, 1992; Ut & Kajisa, 2006). The period from 1975-1981 witnessed Vietnam's effort in facilitating agricultural collectivisation which

aimed to control farm households within agricultural cooperatives. Individuals and households had no access to economic capital including land tenure rights, their production inputs (e.g., fertiliser, pesticides). Their access to social capital was controlled by agricultural cooperatives, with a limited chance of building their own networks with other agents in the agricultural market such as input suppliers or output buyers. The linking social capital (between officials, agricultural cooperatives and farmers) overpowered bonding and bridging social capital. Of course, the agricultural collectivisation policies were less strict and efficient in the VMD than in the northern regions as just 5.9 per cent of farmers joining the cooperatives and in a shorter period (three to four years) (Pingali & Xuan, 1992; Phong, 2014; Ravallion & Van de Walle, 2008, 34). Farmers also attempted to breach the State's prohibition of land transfer/sale as they 'transferred their land to others (*sang đất*) by just giving each other a handwritten agreement (*thỏa thuận giấy tay*)' (HH20). Such voluntary practices by local farmers may have been the result of their experiences under the Republic of Vietnam government (1955-1975) in the South whose policies were based on a private system rather than the collective system executed in the North. Nonetheless, the field of agriculture in the VMD was still subject to the regimentation of the one-party state and its state-own enterprises. Farmers did not have their own economic interests and encouragement in investing in crop production and were forced to serve the State-supported cooperative habitus. This resulted in a sharp decline from 7 million tons before reunification to just 6 million tons right after (Pingali & Xuan, 1992, p. 706).

The 1986 reform helped turn the centrally planned economy into a market oriented socialist economy under state guidance (Beresford, 2008; Harvie, 1996). The core of this reform was to transform the collective production system to a private production system. This entailed a process of de-collectivising the economy, especially the field of agriculture with the introduction of the contract system in 1981 by the CPV's Directive 100 CT (April 1981) (Pingali, Khiem, Gerpacio, & Xuan, 1997). This policy provided farmers with the right to participate in a contract with the cooperative. This contract, on the one hand, still put crop production including land preparation, irrigation, input distribution services under the management of the cooperative; on the other hand, it gave farmers more freedom in crop production, selling outputs at a fixed price to the State, and keeping the output produced beyond the contracted amount for their own consumption or trading (Dat, 2010; Pingali & Xuan, 1992). As a result, the rate of the aggregate rice production growth rose from just 1.9 per cent during the 1976-1981 period to 2.8 per cent during 1982-1987. As Pingali and Xuan (1992, p. 707) noted, this positive change should be seen as the result of an increase in yields per ha per crop

(the soft policies) instead of planted area expansion (with the support of the hard policies). Nevertheless, the contract system eventually failed because of maintaining the State's top down management, creating many structural problems in virtually every part of production from input supplies to crop investment, production, and output sale (Pingali & Xuan, 1992, p. 707). Farmers still lacked access to capitals with no land tenure, a reliance on the State's provision of inputs, and a predetermined price of their outputs. The failure of the contract system resulted in famine in 21 provinces and cities in the north of Vietnam and a series of emerging conflicts in rural areas (Marsh, MacAulay, & Hung, 2006, p. 17).

The CPV and the State continued their reforms by introducing policy changes in land allocation, privatisation of output markets, introduction of a land tax, and decentralisation of input suppliers (Pingali & Xuan, 1992). The land reforms were central to the change. With Resolution number 10-NQ/TW in April 1988, the State de-collectivised agriculture at a greater extent by allocating land to individual farm households instead of maintaining it under cooperatives. One farmer (Bong Ro, HH16) remembered that obtaining his own field in the late 1980s gave him and his family much more freedom in dividing and assigning land to others. Under the changes, farmers had a better access to one of the most important economic capital in rice production: land. Since the state assigning land to farmers on lease terms of 15 or 20 years, they felt much more assured of land security. Additionally, they also could privately own the means of production such as machines, animals and tools (Marsh et al., 2006, p. 17).

Land Law 1993 (revised in 1998 and 2001), Land Law 2003, and Land Law 2013 (NAV, 1993a, 1998, 2001, 2003, 2013a) continued to reform land policies. This series of land laws has provided farmers with more land use rights, from five rights (exchange, transfer, lease, inheritance, and mortgage) in Land Law 1993 to eight rights (exchange, transfer, lease, sublease, inheritance, donation, mortgage, and contribution of land use rights as capital) in Land Law 2013. With the Directive 10/1998/CT-TTg (February 1998) of the Prime Minister (1998) and the Circular 346/1998/TT-TCDC (March 1998) of the General Cadastral Department of Vietnam (1998), the State introduced land use certificates (LUCs or the *red book, Sổ đỏ)* to recognise the land use rights of individuals/households. This certificate can be seen as a crucial institutionalization of economic capital as Bourdieu (1977, 1990a, b) would argue. The State also allocated land to farm households and individuals for long-term and stable use. The duration of land allocation has changed from just 20 years of land used for annual crops and aquaculture and 50 years used for perennial crops in Land Law 1993 (Article 20,

Chapter 2) to 50 years of land used for agriculture with a possible renewal in Land Law 2013 (Article 126). Since 1989, with the Ordinance number 170 of the Council of Minister (November 1988), farmers can own all products they produce and sell their outputs to private traders after paying land taxes (Pingali & Xuan, 1992, p. 708). This transition allows individual farm households to be an independent economic unit of production, liberated from collective cooperatives and have land use rights to authorise their own livelihood activities as well as the right to make decisions regarding 'resource allocation, crop choice and crop management' (Pingali & Xuan, 1992, pp. 698-699). The consequence of those land and production system change policies motivated farmers to invest more in their rice production (Do & Iyer, 2008), contributing greatly to the overall success of the reform (Khan, 1998; Minot & Goletti, 2000; Niimi et al., 2004; Pham & La, 2014; Pingali & Xuan, 1992).

In parallel with the de-collectivisation, Vietnam resumed the adoption of HYVs to agricultural production that had already began in the 1960s. The rate of such adoption rose from just 17 per cent in 1980 to almost 90 per cent in 2000. At the country level, the yield from HYVs also increased from around 2-2.5 tons per ha in 1980 to 3-5.5 tons in 2002, depending on different producing locations (Ut & Kajisa, 2006, p. 168). The development of the second generation of HYVs that had strong resistance genes to brown plant hopper, rice blast diseases and salinity (such as IR42) has been crucial to the transformation from single cropping to double and triple cropping (Ut & Kajisa, 2006; Xuan, 1995). In the 1990s, the third generation of HYVs with a shorter duration (80 to 90 days) such as *Omon Chin Som* (OMCS2000), OMCS21, VND95, VND96 in the VMD and C70, C71, DT, DT11 in the North was developed to further improve rice production (Ut & Kajisa, 2006; Xuan, 1995). The rate of HYVs adoption dramatically increased from just 9.7 per cent in the VMD in 1980, lower than the country's average (16.9 per cent), to 99.5 per cent in 2002, higher than the country's average (94.2 per cent) (Ut & Kajisa, 2006, p. 174).

Moreover, the marketisation of agricultural inputs such as agrochemicals was also central to increasing rice production (Fortier & Thi Thu Trang, 2013). According to the estimation of the FAO, the import quantity of pesticides by Vietnam has dramatically increased from just 2 thousand tons in 1990 to 69 thousand tons in 2010, 157 thousand tons in 2015, and 111 thousand tons in 2017. The quantity of different fertiliser products imported also increased sharply: Ammonia anhydrous rose from 41 thousand tons in 2002 to 180 thousand tons in 2018; Ammonium nitrate quantity rose from 633 tons in 2002 to 94 thousand tons in 2018; and Ammonium sulphate rose from 472 thousand tons in 2002 to 746 thousand tons in 2018.

Available data from the FAO also showed that the use of fertiliser (kg per ha) also sharply increased (see Table 5.2). The increasing use of these chemicals in crop production can be seen as a vital factor advancing the crop productivity. The VMD's farmers' early engagement with private markets of these inputs was maintained during the collectivisation period (1975-1988) and further facilitated by the decentralisation of input supplies since the latter half of 1988. Under this new policy, the provincial authorities gradually acquired the power from the central government to manage input import (Pingali & Xuan, 1992). This means that the changes in Vietnam's society significantly influenced the operation of the field of agriculture in local areas. The access of local authorities to input markets facilitated their farmers' access to essential capitals required for their crop production.

Table 5.2. Key fertiliser use in Vietnam's agriculture in selected years between 1961 and 2018 (kg/ha)

Year	Nutrient nitrogen N (kg/ha)	Nutrient phosphate P2O5 (kg/ha)	Nutrient potash K2O (kg/ha)
1961	2.33	12.46	-
1975	31.09	16.06	5.74
1988	67.21	17.08	6.01
1990	66.63	16.56	4.57
2000	163.19	62.18	53.21
2018	136.45	65.09	50.22

Source: FAO (2020)

In sum, the reform appeared to be in harmony with the global trend that outsources the State's functions to the private sector (Lash, 2002, p. xi). The changes in soft structures led to the remaking of capital (especially economic capital in the forms of HYVs, agrochemicals, market accesses) within the field of agriculture, motivating farmers to obtain higher agricultural production (Fortier & Thi Thu Trang, 2013; Kerkvliet, 1995). These alterations subsequently changed farmers' habitus, or disposition towards rice cropping, preparing conditions for the transition from the single/double cropping system to the triple cropping system. Yet, this transition needed other substantial conditions offered by the changes in hard structures.

Hard Structures: Relations with Natural Environment and Infrastructure

Vietnam's culture is often portrayed as 'river-water civilisation' (*văn minh sông nước)* or 'canal-creek civilisation' (*văn minh kênh rạch*) due to the strong connection to water (Biggs, 2004, p. 1). This connection is evident in the relationship between people (including organisations at all levels) and water landscapes (rivers, canals, seas). Looking at the history

of the country, especially of the Red River Delta in the North and the Mekong River Delta in the South, the Vietnamese have been inclined to settle along rivers to facilitate rice production (Gourou, 1955; Tana, 2004). Vietnam started its first wave of modernisation during the latter half of the 19th century in the first encounters with Western civilisation, especially since the French colonial invasion started (1858). The French colonials brought to Vietnam the first mechanical dredgers, adopted 'the Dutch like strategy' for flood control in the late 1930s (Biggs, 2011). They built irrigation systems (e.g., dike or polders systems, canals), facilitating transportation and governance, protecting agricultural production from natural hazards (e.g., flood or drought) and opening up the VMD (Biggs et al., 2009; Biggs, 2004; Miller, 2007). The strategy was inherited during the period under the Republic of Vietnam (1955-1975) with the support of the United States and Asian firms such as Nippon Koei (e.g., building saline intrusion barriers and maintain flood dikes) (Biggs, 2011, p. 40). Technical consulting groups to the Republic of Vietnam government (1955-1975) continued to propose the idea to 'seal off the agricultural lands of the delta from floods, from high river stage, from the tides, and from the encroachment of salinity' to serve agricultural production's purposes (Joint Development Group, 1970, p. 524). However, those plans were largely hindered by the political changes, war, and the post-unification collectivisation policies (Miller, 2007, p. 195).

After reunification (1975), the Vietnamese state had a choice between continuing the technocratic approach to irrigation development and following a more sustainable and comprehensive path for the VMD in the long run. Simply adopting Western technical approach to hazard management is not suitable for developing countries (Oliver-Smith, 1999a). The State unfortunately chose such the approach. In its first National Congress post-1975, the CPV immediately identified irrigation as 'the first measure' to support agricultural development so as to overcome food crises (CPV, 1977). Deeming the VMD inefficient in meeting full agricultural production potential, the CPV quickly pointed out the need of increasing the land use efficiency by using irrigation in this region (CPV, 1977, 1987). The CPV and the State also acknowledged that the two long-standing challenges facing the region's agricultural development were saltwater intrusion and flooding, which needed to be solved by 'dredging old canal systems, digging more new canals, and building dams' (CPV, 1977). The new direction was concretely demonstrated in the government's irrigation development strategy for the VMD. The investment in agriculture, especially in water resource management was dramatically increased, with approximately 62 per cent of total investment in agriculture of the country spent on water resource management from 1976 to 1989, with the priority on the VMD

(Miller, 2007). In 1990s, the GoV adopted the 'Mekong Master Plan' (NEDECO, 1991) developed by a Dutch consulting company and commissioned by the World Bank and the Mekong River Commission on advice from the Dutch. This plan can be considered as a follow-up of the total water control management plans proposed by Dutch and American engineers to the Republic of Vietnam governments in the 1960s (Vormoor, 2010).

Between 1976 and the mid-1990s, although affected by collective crisis, the idea of closing-off the system started taking shape. In terms of irrigation development there were two parts: the building of flood control infrastructure such as secondary dike systems and pumping stations in the upper part of the Delta (including provinces sharing borders with Cambodia such as An Giang, Dong Thap); and the construction of salinity control works such as dike systems, canals, pumping stations, and sluice gates in the lower part (including coastal provinces such as Soc Trang, Ben Tre, Tra Vinh provinces) (Can, 2011). One of the notable works in the 1980s was building of the Hong Ngu canal (1984) with a length of 75 km connecting Hong Ngu of Dong Thap province to the Vam Co Tay river (Tuan, 2016, p. 140). The total length of canals grew from 2,400 km after the French colonial era (1862-1954) to reach around 5,000 km in 1990, 20,000 km in 2000, and around 91,000 km (all canal levels) in 2012 (Biggs, 2004; Tuan & Ty, 2016; Vormoor, 2010). As a result, out of the total 4 million cultivable areas of the VMD, the irrigated rice area surged from just around 1.6 million ha in 1979-1980 to 3 million ha in 1999-2003 (Hoanh et al., 2009, p. 145; Miller, 2007, pp. 197-198). Nevertheless, this infrastructure was regarded as ineffective since the construction focused more on short-term problems with a lack of thorough consideration of actual uses and environmental impacts in the long-term (Tuan, 2016). This outcome may have been due to combining different, incomprehensive water management plans with limited data developed by different organisations including the old Ministry of Irrigation, the Government of the Netherlands, and the Southern Institute of Water Resources Research (SIWRR) (Tuan, 2016).

Since the mid-1990s, preventing flooding, acidity, and saline intrusion has been Vietnam's fundamental programs (CPV, 1997). As they did in the wars, the CPV and the GoV showed their strength in mobilising large numbers of people for building irrigation works (Beresford, 1989; CPV, 1992, 1997). While farmers were organised to work for the tertiary level system, they had 'no or little opportunity … to influence decision-making at higher scales' (i.e., main waterways, primary canals, and secondary canals) (Miller, 2007, p. 197). Under the new investments in irrigation and water control works, since the mid-1990s, the irrigation

development in the VMD was more dramatically expanded (Tuan, 2016; Miller, 2007). The development was guided by key policies and irrigation planning (see Table 5.3).

Table 5.3. Key Irrigation Plans from 1996-2012

Plans	Documents	Goals	Period	Number of works	Estimated budgets
1996	Decision 99-TTg (1996) on long-term direction and the 1996-2000 plan for irrigation development, transportation and building rural areas in Mekong Delta.	Gradually forming a complete irrigation system including works serving water supply and drainage, alum removal, saline prevention, and flood control so as to expand planted area for rice cultivation.	1996-2000	71	VND 2,600 billion
2006	Decision 84/2006-QD-TTg adjusting and supplementing plans on irrigation in the VMD in the 2006-2010 period with the orientation towards 2020.	Developing an irrigation system to protect and develop water resources and mitigate the negative effects of water (especially flooding and saline intrusion).	2006-2010	79	VND 14,000 billion
			2010-2020	72	
2009	Decision 1336/QD-BNN-KH on Approving "Irrigation Plan in the Southern Ca Mau Peninsula".	Building an irrigation plan for the Southern Ca Mau Peninsula to appropriately use water resources (preserving freshwater and preventing saline intrusion) suitable to both short-term and long-term needs, serving agriculture, aquaculture, and living, mitigating the damage from disasters and developing socio-economic targets.	2009-2015	36	VND 7.564 million
2012	Decision 1397/QD-TTg approving irrigation planning in VMD in the period 2012-2020.	Developing an irrigation plan to gradually adapt the irrigation system to climate change and sea level rise.	2012-2015	203	VND 41,400 billion
			2010-2020	173	

Source: Author compiled from mentioned policies (MARD, 2009; Prime Minister of Vietnam, 1996, 2006, 2012)

One of the first crucial irrigation plans was Decision 99-TTg (1996) issued on 9 February 1996 by the Prime Minister which aimed at gradually establishing a comprehensive irrigation system including irrigation, drainage, pickling, alum removal, saline prevention, and flood control

works. This plan concerned two parts of the irrigation development: one, building flooding control infrastructure in the upper part of the VMD including the Plain of Reeds (*Dong Thap Muoi*), the Long Xuyen Quadrangle and the West of Hau River, and; two, implementing a 'sweetening project' with salinity control and freshwater storage works (dikes, sluice gates, earthen weirs, pumping stations) in the coastal part including Ca Mau, Go Cong, and South Mang Thit (see also Can, Duong, & Miller, 2007, p. 75).

If the focus of Decision 99-TTg (1996) was on supplying freshwater and expanding the planted area, that of Decision 84/2006-QD-TTg was to expand irrigation works in order to (i) develop an agriculture in harmony with the dry season with low river flows and saline intrusion; (ii) prevent flooding in the direction of 'living with the flood'; (iii) develop agriculture in areas with alum; (iv) and maintain agriculture in areas vulnerable to salinity together with effectively changing production structure in coastal areas (from agriculture to aquaculture). Decision 1397/QD-TTg (2012) started to pay attention to adaptation of the irrigation system to the conditions of climate change and sea level rise. With the development of the irrigation system, the government also paid attention to building specific irrigation plans for different irrigation planning regions from the Plain of Reeds, the Long Xuyen Quadrangle, to the Ca Mau Peninsula. For instance, Decision 1336/QD-BNN-KH (2009) was devoted to building the irrigation system in the Southern Ca Mau Peninsula. Although having different foci, the common point of view throughout these decisions was to treat flooding and saline intrusion together with acid sulphate as 'negative effects'. For instance, in Decision 99-TTg (1996), the 'negative effects' were associated with flooding, whereas Decision 84/2006-QD-TTg and Decision 1397/QD-TTg linked these effects to both flooding and salinity. Biggs and colleagues (2009, p. 210) commented on this approach: 'Saline water was, in the State's point of view, a constraint to agriculture rather than a resource for aquaculture, as farmers view it today, and flood a threat and constraint to intensification'. This stance has led to the approach of building and continuous extending large-scale irrigation works to prevent flooding and salinity rather than to foster development in harmony with these phenomena. For instance, the Ministry of Agriculture and Rural Development (MARD), who received the total amount of annual budget second only that of the Ministry of Transport (MIT) in 2006, devoted 63.9 per cent of VND 3,154 billion to infrastructure and irrigation development (Hoanh, Suhardiman & Tuan, 2014, p.62). This approach was also seen in the government's attempt to allocate donors' financial support to construction of those large-scale infrastructures such as the Cai Lon, Cai Be sluice gates (Hoanh, Suhardiman & Tuan, 2014, p.62).

The development of irrigation systems has generated different impacts on different regions of the VMD. In the saline-affected regions such as the East Sea coastal region and Ca Mau Peninsula, this development has engendered a formation of a system of saline intrusion prevention infrastructures such as sea and estuarine dike systems, canal embankment systems, pumping stations, and sluice gates (Tuan et al., 2007, p. 47). The dike systems built in almost all provinces of the VMD are employed to prevent flooding or saline intrusion from intruding inside local fields; canal systems for water transportation, supplying water to crop production and for household consumption; pumping stations for pushing water transportation serving drainage and consumption; sluice gates for water regulation, flood drainage, and preventing saline intrusion (Tuan & Ty, 2016, pp.165-171). The canal systems consist of four levels: main canals which get water from main sources such as rivers; level-1 canals which get water from main canals and transfer it to level-2 canals; level-2 canals get water from level 1 and transfer it to level 3; and level-3 canals get water from level 2-canals and transfer it to on-farm canals (Tuan & Ty, 2016, p. 165). Currently, the whole delta has over 3,000 km of main canals, 11,000 km of level-1 canals, 27,000 km of level-2 canals, 50,000 km of level-3 canals and on-farm canals; 80 sluice gates with a width of 5 m or over, over 800 sluice gates with a width of 2 to 4 m, and over 20,000 km of small sluice gates; over 1,000 large and medium electric-based pumping stations and thousands of small pumping stations; 450 km sea dikes, 1,290 estuarine dikes, and 7,000 km of local dikes (Tuan & Ty, 2016, pp.171-174).

The project brought about the opportunities for expanding agricultural production to farmers in Soc Trang. The development of irrigation system has been conducted under the scheme of Quan Lo – Phung Hiep irrigation project, which was approved in 1991 by the former Ministry of Irrigation. This project currently covers 403,335 ha of five provinces including Ca Mau province (Cau Mau Peninsula), Bac Lieu, Soc Trang and Hau Giang (Eastern Coastal region), Kien Giang (Western Coastal region). Of which, Soc Trang accounts for 55 per cent (182,065 ha) of total project area, while Hau Giang and Kien Giang only contribute 4 per cent (MARD, 2020). The project supplies water and regulates irrigation for an agricultural production area of 328,808 ha, of which rice planting areas account for 71 per cent (231,652 ha). There are 148 sluice gates, 733 km of 37 level-1 canals, 8,624 km of level-2 canals, 1,042 km of dyke system, and in-field canals (MARD, 2020). There are three sub-projects (MARD, 2020; M.T. Nguyen, 2019) including: 1) The Long Phu – Tiep Nhat, built in 1993-1994 and 2003-2004, covers an area of 46,094 ha of Long Phu and Tran De districts, Soc Trang province. 2) The Ba Rinh – Ta Liem project, built in 1993-1994 and 2003, covers an area of 35,492 ha including My Tu

district, Soc Trang province. The Quan Lo – Phung Hiep project, built in 1992, covers an area of 247,222 ha of Bac Lieu and part of Soc Trang. In the Long Phu – Tiep Nhat system covering Tan Hung commune, there are 29 sluice gates helping preventing saline intrusion (MARD, 2020). This system helps Long Phu – Tiep Nhat area produce 11,313 ha of triple rice crop, 29,485 ha of double rice crop, 4,419 ha of aquatic products, and 877 ha of forest (MARD, 2020).

The construction of irrigation systems has increased the irrigated area for agricultural production, creating 'protected zones' for agricultural production where rice farmers can safely cultivate rice without the fear of being attacked by flooding or saline intrusion (Can, 2011). If the rate of irrigated area in the VMD in 1980 was only 41 per cent, lower than the whole country's average (46 per cent), this rate soared to an impressive 91 per cent as of 2002, ahead of Vietnam's average (85 per cent) and only behind the Red River Delta (100 per cent) (Ut & Kajisa, 2006, p. 173). It is also noted that the rate of irrigated area in 2002 jumped by almost 27 per cent since 1995, the year before the commencement of the big irrigation projects authorised by Decision 99-TTg (1996). Put it in perspective, the expansion rate of irrigation of 4.6 per cent during the period from 1988 to 1994 was nearly double the peak of growth at a global level during 1971-1980 (2.2 per cent) (Hoanh et al., 2009, p. 154; Molden, 2007, p. 8). In other words, not just land, but also freshwater was made accessible with the support of the newly built infrastructure. This change in economic capital proved to be crucial in the transformation of cropping patterns in the downstream region of the VMD.

The choice of the Vietnamese state has substantially changed the field of agriculture and its relation with natural environment. This change turned the region from a 'naturally regulated water regime to a closed system, where human regulation of water has taken on greater importance with the construction of complex regulatory structures' (Miller, 2007, p. 204). This change reflects an ideological shift from traditionally flexible adaption to a 'modern technocratic control' ideology where the Vietnamese state aims to subsume water resources and disaster risks under their control (Biggs et al., 2009, p. 1). This was very different from the purposes witnessed in the Nguyen and French colonial period from the 1600s to 1954 (focusing on opening up the delta, extending the frontier, and serving military sakes) and the period under the governance of the Republic of Vietnam from 1955 to 1975 (intensifying production) (Miller, 2007, p. 191). Strictly speaking, the Vietnamese state's approach is strongly associated with Western cultural norms (Bankoff & Hilhorst, 2004; Biggs et al., 2009). Such norms place emphasis on physical agents (i.e., natural hazards) and largely rely on technological solutions

(e.g., infrastructure) to solve the problems of disaster risks and agriculture (Bankoff & Hilhorst, 2004). These norms are strongly associated with the hazard perspective dominant in the early 20th century that has been replaced by the vulnerability approach in the 1970s-1980s (Perry, 2007; Quarantelli, 2000). It can be pointed out the parallel between Vietnamese hard policies with the global expansion of irrigation since the 1960s. According to a summary by Molden (2007, p. 8) from the World Bank and FAO data, irrigated area worldwide had increased from below 160 million ha in 1960 to about 300 million ha in 2000. In the Lower Mekong Basin (LMB) countries (Laos, Cambodia, Thailand and Vietnam), the irrigated land has risen from just 4.9 million ha in 1979-1981 to 7.5 million in 1989-1991 and 8.4 million in 1990-2003 (Hoanh et al., 2009, p. 145). In this overall trend of increasing irrigated area, the application of large-scale irrigation systems in humid areas in Vietnam's Quan Lo – Phung Hiep (including Soc Trang province and the research site) reflects one of five global irrigation system typologies (Hoanh et al., 2009; Molden, 2007).

The choice of the GoV can be explained by the alignment between the technocratic control approach in irrigation and Vietnam's socialist ideology in which the party-state tends to keep hold of their power and their priority is to ensure 'uncompromising economic growth' (Bruun, 2020, p. 2). Vietnam's technocratic authoritarian approach to irrigation is indeed in line with a broader outlook set out in the National Target Programme on New Rural Development (NTP-NRD) since 2009 (Bruun, 2020; Nguyen-Trung & Minh, 2015). This Programme focuses on building a very static, mechanical model of a 'new rural area' (*nông thôn mới*) with the development being concretised into 19 criteria, many of which focus on construction of infrastructures and buildings (Nguyen-Trung & Minh, 2015). This technocratic measure often leads to the increasing dependency on the protection of infrastructure and barrier technologies which requires regularly increasing amounts of resources for maintenance and upgrades, especially in the context of unstable environmental and climatic conditions (Fortier & Thi Thu Trang, 2013; Miller, 2007).

The changes in the goals of the fields of agriculture and water resource management have led to the transformation in the field of agriculture, capital configuration, and farmers' cropping habitus. The government, however, did not anticipate the unintended consequences or side-effects of these hard policies.

Farmers' Habitus and Practice Adaptation

The socio-economic context and policies in agricultural and irrigation development set out in the preceding sections have provided structural conditions for the arrival of new forms of crop practice in the research site. In this section, I connect farmers' habitus and practice adaptation with the newly emerging conditions of the agricultural field, showing how the structural changes have transformed the way farmers perceive risks, crops, and livelihood, and practice their crop cultivation.

Changes of Farming Patterns

In parallel with the introduction of soft and hard policies, farmers in Tan Hung in particular and Soc Trang province started to change their habitus in rice cropping (Table 5.4).

Table 5.4. Timeline of rice cropping transformation in Soc Trang province

Timeline	Structural conditions	Rice cropping events
Prior to the 1980s	Vietnam reunified (1975), started collectivising agriculture, country fell into crisis.	Farmers cultivated a single rice crop (the winter crop).
Late 1980s-early 1990s	Started reforming, de-collectivising, building irrigation systems.	Farmers planted overlapping double rice crops, combining the early rice crop with the winter crop.
Mid-1990s	Maintained rice export, invested intensively into large-scale projects including 'sweetening Ca Mau peninsula', Long Phu-Tiep Nhat project	Farmers cultivated separated double rice crops, forming the Summer-Autumn crop (crop 1) and the Winter-Spring crop (crop 2).
2000s	Started to shift focus to industrialisation while maintaining agricultural production, kept extending irrigation system (e.g., Long Phu – Tiep Nhat).	Farmers experimented and extended the third rice crop (the Spring-Summer crop) in the dry season.
2010-present	Emphasised industrialisation, maintained agricultural production and irrigation systems.	The third crop was expanded to be a dominant crop.

Source: Adapted from Nguyen-Trung (2019)

In the 1970s when there was no dike system or sluice gates, Soc Trang province was classified as a single transplant region where farmers cultivated a traditional single rice crop in the areas not prone to severe flooding and which could utilise natural rainfall to irrigate and prevent saltwater intrusion (Miller, 2007; Xuan, 1975). As a result, although in the dry season the saltwater intruded into one third of the Delta, the practice of traditional single cropping and the 'natural regulation of the river flows by the Tonle Sap Lake in Cambodia' meant that local

farmers in the lower part faced no risk of saltwater intrusion (Miller, 2007, p. 190; Xuan, 1975, p. 93). In other words, as of the 1970s, there was an absence of the risk of disasters that occurred in the 2015-2016 historic season. So, prior to the 1980s, local farmers only cultivated a single rice crop. Dien Kinh, a female farmer in Village A of Tan Hung commune who started joining her family's agricultural production at the age of 13 (1966) recalled that up to 1975, villagers cultivated only one crop a year and needed about six months of hard work to harvest such a crop (HH23). Information from local officials offered systemic information that farmers needed approximately 145 days or 4-5 months (long-duration crop) from land preparation to harvesting for a traditional single crop. This information seems matching the growing duration of the samples of 1,000 local rice varieties (earlier/medium/late/float varieties) cultivated in the VMD before 1967 collected by Can Tho University, which ranged from 130 days to 240 days (H.C. Nguyen, 1994). Land preparation, sowing and transplanting were often done around July to August, and harvesting ended between December and February (Ka Co, official, KII3). At a provincial level, local farmers cultivated a single crop but did so in varying timings with late, early and medium varieties (Xuan, 1975, p. 92). With all three varieties, land preparation and sowing begin between mid-May to mid-June; the late varieties are transplanted in August and harvested in January, whereas the early varieties are transplanted between early July and late August and harvested between mid-October and mid-November and the medium varieties transplanted between the latter half of July and August and harvested in late November to January. The break between land preparation and transplanting was considered a necessary period allowing salts in the soils to be washed off by the rain during the wet season (Xuan, 1975, p. 97). Cultivating rainfed rice crops faced no risk but yielded very low outputs of approximately 2-3 tons per 1.3 ha, which was just below half of current yield (6-8 tons/1.3 ha).

The introduction of HYV in 1968 was the first breakthrough for local farmers in Soc Trang province in particular and the VMD in general to change their traditional cultivating patterns. It appears that in some places in the VMD up to 1975, the adoption of HYV aided local farmers to change from a traditional to modern cropping pattern. In particular, the move from single to double and triple cropping systems occurred among those farmers who were close to water sources in the floating rice region of the Delta – the region blessed with inundation during the rainy season such as An Giang, Chau Doc (part of An Giang province), Vinh Long province (formerly known as Dinh Tuong province). In some other places of 16 provinces under the government of South Vietnam such as Soc Trang province, the attempt to replace local varieties with HYV was conducted, albeit in varying degrees (Xuan, 1975). In the crop year 1973-1974,

farmers in Ba Xuyen (or Soc Trang) cultivated 218 thousand ha of rice, 19.7 per cent of which was HYV varieties. They produced 630.7 thousand metric tons with about 27.3 per cent contribution from HYV varieties (Xuan, 1975, p. 99).

Under the impact of the Green Revolution and HYV, farmers in Soc Trang particularly the VMD generally started to change their traditional single cropping pattern to double and triple cropping patterns. Despite the success, the adoption of HYV rice did not entirely transform the rice cropping system of Soc Trang in particular and the VMD in general. Only farmers in the floating rice regions who were located close to water sources such as river and canals could transplant three crops. The remaining farmers were dependant on the irrigation system or rainwater to enact the change. Farmers in Soc Trang was no exception. They were not blessed with the benefits of the Mekong River and have to depend mostly on rainwater to cultivate double crops. Therefore, they were unable to completely break the traditional cropping patterns so as to completely change to double rice cropping pattern, let alone a third rice cropping one, as observed in 2010.

In addition, the effects of the reunification in 1975 and the decade of collectivisation that followed, the major constraint to the change of cropping pattern was water control or the irrigation system. With only 22 per cent of rice fields in the Delta irrigated by communal system or individual pumps (Xuan, 1975, p. 101), it was impossible for farmers to completely change from a single cropping system to a double or triple cropping system. Only after the reforms began in 1986 and agricultural intensification started with the expansion of the irrigation system in the mid-1990, did comprehensive change of the local rice cropping patterns occur.

From the early 1980s to the early 1990s, the changes in soft policies (e.g., from the introduction of the contract system in 1981, the reforms in 1986 to the Land Law in 1993) brought about new rules and resources, which altered the relationship of farmers with economic capital including land, production materials (e.g., inputs, agricultural equipment), and market access. At the same time, with the construction of new dike systems, pumping stations, and sluice gates, the relationship between farmers and economic capital (freshwater, arable land), and with their environment, including natural risks, were also significantly changed. Local farmers in Tan Hung commune particularly and Soc Trang province generally reacted to such changes by inventing an overlapping double cropping system, going beyond annual single cropping. The new system combined cultivating a short-duration rice variety (the early crop or *'lúa sớm'*, about 100 days) with the traditional Winter crop (*Mua* crop), with most farmers sowing the two in the same fields, and some in different fields (Ka Co, official). In the fields planted with both

crops, the early or short-duration crop was harvested while the winter or long-duration crop was still growing. Hence, local people called them overlapping double crops.

In the attempt of expanding irrigation systems, the Long Phu – Tiep Nhat project, first built in 1993-1994 and then again in 2003-2004, which focused on built dyke systems, sluice gates, and canals so as to serve double rice cropping (M.T. Nguyen, 2019), helped make available freshwater in the dry season. This effect, along with the use of short-duration HYV and agrochemicals, motivated local farmers to begin a separate double cropping system, combining a Summer-Autumn crop (crop 1) and Winter-Spring crop (crop 2). However, farmers did not stop at two crops a year (Nguyen-Trung, 2019).

While the State's purpose of building embankments preventing saline intrusion was to maximise crops, farmers were not passive. As freshwater was stored and saline intrusion was prevented, they took the opportunity to increase rice production. This time, they went from double cropping system to triple cropping system by inventing a third rice crop. I use the word 'inventing' here to refer to the acts of initiating a totally new crop in between the end of crop 2 and the start of crop 1. In comparison with the rice cropping structure prior to 2000s, in the current rice cropping calendar, farmers started their crop 2 earlier to make time for the final crop of the year (Table 5.5).

Table 5.5. Rice cropping calendar before and after 2000s in Tan Hung

Rice Crops	Dry Season						Rainy Season					
	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Double cropping system prior to 2000s												
First Crop								S			H	
Second Crop			H									S
Triple cropping system after 2000s												
First Crop							S			H		
Second Crop		H									S	
Third Crop		S				H						

*Note: * S= Sowing; E: Harvesting; **: the period of each rice crop is only relative according to common patterns. Some households/areas might start or end earlier or later than others.*

Source: Compiled from household interviews

As a result, the rice production system is now divided as follows: Crop 1 (Summer-Autumn) started earlier from April or May to August, instead late May prior 2000s. Crop 2 (Autumn-Winter, or early Winter-Spring) must start in September instead of October and end in November or December. Crop 3 starts right after crop 2, from late December or early January

to between mid-March or for some in early April. It is called by different names: the late Winter-Spring crop (*vụ Đông Xuân muộn*), or the Spring-Summer crop (*vụ Xuân Hè*), or the third rice crop or crop 3 (*vụ 3*).

Data from household interviews helped group interviewed farm households in three groups (Table 5.6). The earliest year when crop 3 was first trialled was 1997-1998. There were seven households which began cultivating crop 3 from 2000 backwards, eight households did so between 2001 and 2009, eight from 2010 to 2012, with five household heads incapable of specifying the time they started. The average age of the farmers (60.9, 48.4 and 49.1) suggests that the older the farmer, the earlier they began trying crop 3. Heads of farm households interviewed in both villages started their career in rice cultivation around the age of 22. As farmers in Village B had a higher age average than their fellows in Village A (56.4 to 50.9), the former began their career earlier than the latter (1984 compared to 1989). Consequently, the former had more years of experience in rice cultivation than the latter 34.4 and 29.1, respectively. Yet, the time frame for starting crop 3, nevertheless, was not so much different between farmers of the two villages.

Table 5.6. Year of starting to grow crop 3 and reasons for this choice

Period started	# HH (n=23*)	Characteristics
1997-2000	07	• Oldest group, aged 55 or above (age average: 60.9 years). Some younger (Bong Da) but worked for their parents • Most experienced farmers (average year of experience in agriculture): 40 years • Second-largest average land holding (2015): 3 ha • Main reasons: experimenting a new crop; enjoying the newly built canal system and dyke system; learning from farmers in other locations.
2001-2009	08	• Youngest in age average: 48.4 years • Second experienced farmers: 29 years • Largest average land holding (2015): 3.9 ha • Main reasons: enjoying the completely built canal system and dyke system; learning from the pioneers' successes; the favourability and productivity of crop 3.
2010-2012	08	• Second youngest age average: 49.1 years • Lack of human capital to cover triple crops (Xoai) • Least experienced farmers: 22.4 years • Smallest average land holding (2015): 2.6 ha • Main reasons: having practiced other livelihoods before converting to rice cultivation; learning and following the community practices; the favourability and productivity of crop 3.

Note: There were five household interviews in which farmers could not specify the years they started crop 3.

Source: Compiled from household interviews

The reasons why some of the first household group (1997-2000) did crop 3 were because of the availability of water thanks to the starting construction of salinity control works, learning from farmers living in other locations that were closer to water resources, and especially experimenting a new crop. When asked why they did crop 3 the first time around, the majority of farmers in the first group (1997-2000) cited having an adequate access to freshwater as the main reason. Mr Man, one of the first farmers to plant the crop in Village B, recalled the dynamics of crop pattern changes according to the building of the dike system and sluice gates. This dated back to the late 1980s when one of the first dikes and sluice gates were constructed: 'I started planting crop 3 very early. Around 1998 I already did. The earliest of this village.' Asked why he did crop 3 at that time, he replied:

> Here there was enough freshwater so I did [crop 3]. Before that time, it was impossible because of no dike and sluices preventing saline intrusion. The dike was first built in 1980. However, sluice gates were not closed at that time. They let saltwater run into rice fields. The dike [and sluice gates] were complete in 1985 but they also let water get in freely. They only closed the gates when there was saltwater coming. (Man, HH11)

This excerpt reveals that farmers had been well aware of the risk of saline intrusion in the dry season. The fear of this risk caused Mr Man to hesitate for some years before planting a crop 3. Asked why he did not start planting crop 3 in 1985, he asserted:

> At that time, I was not familiar with the new crop and scared of saltwater. I was afraid that I could not succeed and that no one dared to plant it at that time … Only when I saw some farmers succeed then I followed them. Another reason was that the State did not prohibit farmers from doing crop 3 at that time. (Man, HH11)

The process of defying the fear of saline intrusion as well as the 'definition of risk' – to use Beck's terminology (1992) – took time for each farmer to become an expert in assessing risky sources. Another Khmer farmer, Mr Tao, started crop 3 in 2000 but then gave up for several years before coming back to this crop. Under the guidance of his father, who was still alive, their family attempted crop 3 in the 2000s but heavily failed with a loss of two ha of the crop (his total land holding at that time) due to saltwater intrusion. Mr Tao then skipped the crop for several years until the dike system was completed in around 2010 to re-cultivate the crop. He explained:

> I decided to do the third crop again because the State has built the dikes and there was enough fresh water. From that time, I have done consecutively seven crop 3s … Before 2010, no farmers around my field dared to do the third crop because there was no dike protecting from saline intrusion. And after seeing that my crop did well, they followed. (Tao, HH3)

The story by Mr Man and Mr Tao demonstrate that the field of agriculture in Bourdieu's sense, gradually transformed the conditions of risk through the interaction between farmers and newly built infrastructure, resulting in change in farmers' risk perception and, therefore, adoption of crop 3. It is the point at which the habitus, or the disposition towards risk began to transform and adapt to new structural conditions.

After some first successes, the experiment was seen as a good model for a new source of income, which was critical in the circumstance that farmers' rice production was not sufficient to make a living (Bruun, 2020; Coxhead et al., 2012). Field data supports that assertion that in addition to the change in capital (fresh water) and conditions (risk), the shortage of income was also critical to farmers changing to crop 3. Farmers found out that crop 3 was more efficient than the other two crops: 'It was because that crop 3 generated higher productivity for our farmers. As such, double income but less labour compared to the Summer-Autumn crop and the early Winter-Spring crop [crop 2]. That was why farmers did it' (Bong Ban). Many farmers saw this crop as a new way to augment their income. A farmer explained why he did crop 3:

> Because our lives here have so many ceremonies and parties (*đám tiệc)*. If we don't do anything then we have no income to live on. We need to try even if it is risky … Since there's now the dike system, we feel confident of success so dare to do it. (Co Tuong, HH27).

At this point, there was another wave of farmers (starting between 2001 and 2009) joining the practice of crop 3, making this crop a common practice. This group were younger farmers who took advantage of completed water control system and the lesson learnt from the pioneers in growing crop 3. They became customed to the availability of freshwater and the absence of risk from saline intrusion. Consequently, they started the process of changing the disposition toward risk management. Co Vua, a Kinh farmer in Village A, who began cultivating crop 3 in 2004, illustrated this point: 'Cultivating crop 3 followed group patterns. At that time [the late 2000s], all the owners of the rice lands around my fields that situated along the river, started to

seed crop 3' (Co Vua, HH26). In addition to social learning, peer pressure was also observed. Mr Thanh Long, who did crop 3 firstly in 2008, explained this point:

> I did crop 3 because I had 6 months [between crop 2 and crop 1] with nothing to do. As freshwater was available, I tried to plant crop 3. I risked it following others. If they cultivated but I didn't, then my fields would grow all grass. (Thanh Long, HH4)

The third household group began cultivating crop 3 recently (2010-2012). They were not necessary the youngest among three groups but most of them have had experiences of migration and switching from other livelihoods to rice cultivation. When they returned home from other provinces, they inherited the triple cropping system that were already popular. For instance, Sau Rieng (HH6) and her husband returned back to Village B in 2011 after a long time of working as agricultural labourers across the Delta. In a similar case, Chay Ben and his wife (HH25) only came back to Village A in 2012 after a period of working as industrial/construction workers in Binh Duong province.

Observing the emergence of crop 3, Ka Co (official, KII4) reflects on the difference between governmental planning and farmers' choices in which the government did not expect the creativity of farmers:

> Long Phu was planned to be the area for rice production with a small area for shrimp raising. However, farmers saw the good price of paddy so that they cultivated another crop called crop 3. When they did so, the irrigation system could not supply enough water for this district because the original irrigation plan was to serve 2 crops. The triple cropping system was due to farmers' voluntary experiment.

The wide scale cultivation of crop 3 took several more years to be possible. Ji Co, a Tan Hung official, observed that before 2010 only farmers having rice fields in low-lying regions of Tan Hung commune did crop 3, as they had had sufficient freshwater for their production. He noted that there were more farmers joining the practice in 2013, and it was already widely cultivated since 2014, before the 2015-2016 disaster (Ji Co, official).

Government's Facilitation and Institutionalisation

The enthusiasm for crop 3 gained the notice of the State. Recalling the situation at that time, Mr Cau Long, a former government official of Tan Hung Commune's People's Committee in 1990, explained that the government took opportunities to engender a new crop pattern:

> Farmers had not yet planned to do crop 3 until the [Vietnamese state] encouraged them by its policies and the building of saltwater control dike and canal systems. Farmers didn't feel strongly about the new crop back then. It was only when the State encouraged them to look at how effective the third crop was, farmers started to follow … Then the State propagandised for increasing high rice productivity in order to push rice production and increase rice exports … So that the State, on the one hand, invested in new rice varieties which yield in a shorter time; and on the other, built infrastructure to prevent saltwater and store freshwater. (Cau Long, HH20)

Once the use of large-scale irrigation works commenced, the irreversible transformation of the environment for agricultural production took place. Besides the availability of new high-yield rice varieties that have a shorter duration, two important conditions of the agricultural field were changed. Freshwater is now available in the dry season with the storage and supply capacity of canal systems. The risk from saline intrusion was controlled by the dike system and sluice gates.

Reflecting on the impact of the State's policies and planning on local cropping, Quy Ro (40), an agricultural staff member in Long Phu district, agreed that the installation of the dike and canal systems was the key to the expansion of the new Spring-Summer crop from a few households to a widespread practice in Long Phu district. According to him, as of 2002 when he started his job at Long Phu district's irrigation development division, crop 3 was already cultivated in some places of the district.

> Prior to 2002, the local farmers here didn't cultivate crop 3. But the State dredged the second-level canal (*kênh cấp 2*) so that those with rice fields near the canal attempted crop 3 and succeeded … From that point, farmers started to more widely cultivate this crop; before that it was rare.

These structural changes have not only led to the change in farmers' perception of natural risks and crop production but also the increasing dependence of the State on the large-scale schemes. Although a policy shift from agricultural intensification to agricultural diversification (i.e., developing non-rice livelihood such as aquaculture) was activated since 2000 (Bosma, Udo, Verreth, Visser, & Nam, 2005; Hoanh et al., 2014; T. A. Tran, Pittock, & Tuan, 2019), there was a little change in the approach to the large-scale irrigation infrastructure. The use of these schemes has realised the State's goals in assuring national food security, increasing rice export, and obtaining fast economic growth on the one hand; has also required the State to keep

extensively developing them (Thang, Tran, & Luong, 2017, p.111). In addition to the construction of these infrastructure, the State has also established the institutions for governing these 'hard' measures by forming the administrative units, first at the central level, then at the local levels. These units are responsible for the operation, management, and maintenance of the new irrigation systems. The expansion of large-scale schemes and the operation of administrative units for irrigation management, intentionally or unintentionally, could be interpreted as an encouragement to farmers to completely transform a single cropping system into a triple cropping system (Biggs et al., 2009). As Beck (1992) would argue, the government used their authoritarian power to change farmers' risk perception, persuading farmers that risk was controllable. The change in farmers' definition of risk was, therefore, directed.

Furthermore, with the success of crop 3, understandably, the government began to institutionalise this crop. This institutionalisation firstly focused on the adjustment of land use. Each year, the provincial government reviews and adjusts the land use plan for each district of the province so as to serve the general agricultural and economic development strategies. According to the land use plan in 2005 (Soc Trang Steering Committee of Land Statistics, 2005), out of 45.3 thousand ha of the Long Phu district's total land area, 82.9 per cent (or 37.6 thousand ha) was used for agricultural activities including agricultural cultivation, forestry, and fishery. Of the total agricultural land under cultivation, the land area used for cultivating two to three rice crops accounted for 76.2 per cent (24,983.7 ha). As of 2020, the percentage of rice cultivation land was still 75.9 per cent, although the actual land area decreased to 16,316.5 ha due to the separation of Tran De district from Long Phu district (Soc Trang PPC, 2020). These statistics highlight that despite efforts in converting agricultural land and rice cultivation land into land used for other purposes, the conversion rate is very low. Rice cultivation remains dominant in Long Phu district generally and Tan Hung commune particularly.

The government's maintenance of land for agricultural production and rice cultivation in particular was related to the target they set for its yearly plans. With the wider acceptance of the third crop, local government especially at the district started to devise a quota for it; however, such a quota policy gradually intensified according to the expansion of the irrigation system and the area and productivity of crop 3.

> Initially, the State's quota for [crop 3] production was minimal because of the limited water storage capacity in the canals and low rice productivity … [At first] the State did issue a rice quota [for crop 3] but limited it to a small extent. The whole province only planned to have 5,000-6,000 ha of rice crop 3. (Quy Ro, official, KII5)

As such, from 2000 to 2015 – the year when saltwater intrusion occurred – the district authorities maintained a requirement of rice outputs for each commune under their administrative management. Consequently, each commune within the Long Phu district needed to meet a fixed quota of agricultural outputs proposed each year by the district's government, which followed the directives from higher levels of government. This quota policy was a barrier preventing the previously mentioned conversion in land use, as the commune authority had to protect their local land fund for agricultural cultivation so as to meet the targets set by higher authorities. Thus, the conversion of agricultural land area to land used for other purposes (e.g., for residence housing or for industrial construction) was impossible without the permission of higher-level authorities (Ji Co, commune official). The district authorities only removed the target set for crop 3 after the 2015-2016 incident (Quy Ro, official, KII5). The incident also changed the approach of local government to crop 3, from seeing the crop as a main part of the yearly agricultural production plan to excluding it. An official reflected this change in the provincial government's viewpoint:

> When salinity concentrations went up to 9 gram/litre, all areas were affected by saline intrusion. This meant that no water from the river could be used for rice production, causing a loss of 31 or 33 thousand of ha of crop. As a result, the provincial government has commanded local governments and people not to cultivate crop 3 ever since. (Ka Co, KII4)

In short, my findings have provided a detailed picture to reinforce the claim that the GoV has continuously motivated farmers to move from single cropping to multiple cropping for the sake of food security (Biggs et al., 2009; Hoanh et al., 2009). The GoV did not just build the irrigation infrastructure and introduce scientific advances (e.g., high yield varieties) for farmers to upgrade their single cropping to double cropping; they also institutionalised farmers' intervention in triple cropping. If the GoV's support in the transformation from single cropping to double cropping can be understood as a necessary means to address food crisis during 1975-1988, their facilitation of changing from double cropping to triple cropping in 1990s-2000s can be regarded as a risky strategy because the food insecurity was now in the past (CPV, 2002). Thus, the massive investment in large-scale irrigation projects that started with Decision 99-TTg (1996) was indeed a choice between economic development and environment sustainability. The country could have chosen a more sustainable approach to irrigation and agricultural development rather than having recourse to a 'technocratic control approach'

(Biggs et al., 2009). This approach has led to a new pattern with emerging challenges for farmers in particular and the delta in general.

New Farming Pattern in Soc Trang and VMD

At the district level, the transformation from the double cropping system to the triple cropping system can be observed in the Long Phu district's official records of crop production. Data show that the cultivated area of the third rice crop has been officially calculated since 2012. From 2012 to 2017, with the exception two years 2016 and 2017, due to the effects of the 2015-2016 disaster, the yearly planted area of the third crop was maintained above 12 thousand ha (see Table 5.7). Although this figure was lower than those of the other two crops, whose annual planted areas were always above 15 thousand ha during the same period, the total yields of the third crop in normal years (without saltwater intrusion and drought) were often higher than those of two crops. For instance, in 2012, the total yield of the third crop was 104,544 tons, while those of the first and second crops were 96,541 and 100,598 tons, respectively. In 2015 – the year before the disaster occurred, the total yield of the third crop was close to that of the first crop (109,148 tons) and higher than that of the second crop (99,297 tons). In 2016 and 2017, when the third crop production was heavily affected by the 2015-2016 disaster and its following crises, the total rice yields of the three crops also dramatically dropped from 317,593 tons in 2015 to just 211,628 tons in 2016 and 209,922 tons in 2017. These statistics indicate that the practice of the third crop has been crucial to Long Phu district's rice production in particular and agriculture in general.

Table 5.7. Total planted areas of three crops in Long Phu district (ha)

Rice crops	Years					
	2012	2013	2014	2015	2016	2017
Spring Summer (third crop)	14,985.0	15,058.7	12,707.5	13,273.5	6,449.6	3,297.7
Summer Autumn (first crop)	15,791.0	15,529.9	15,561.8	15,530.3	16,552.9	16,375.2
Winter Spring (second crop)	15,790.0	15,529.6	15,516.8	16,522.0	16,545.3	16,545.3
Total	46,566.0	46,118.3	43,786.1	45,325.8	39,547.8	36,218.2

Source: Compiled from information obtained from Long Phu Division of Agriculture and Rural Development (2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017)

At the provincial level, Soc Trang province has been the outstanding province in the VMD in the adoption of the triple cropping system with the plantation of crop 3 or the *late* Winter-Spring/Spring-Summer crop during the dry season. Back in 1995, the cultivation of this crop was limited in coastal provinces generally and Soc Trang particularly. Only 45 ha were cultivated in Soc Trang, 35 ha in Tra Vinh, 22.1 ha in Ben Tre, while there were no planted areas found in Hau Giang, Bac Lieu, and Ca Mau. Put in perspective, each province in the Plain of Reeds, cultivated this crop on an average area of 136.8 ha with Dong Thap province cultivating the largest area (175 ha), whereas, each province in the Long Xuyen Quadrangle cultivated 150.2 ha with the largest area recorded in An Giang (178 ha) (see Fig. 5.3). After 1995 with the development of irrigation and water control infrastructure, the Winter-Spring crop's planted area increased in the coastal provinces with Soc Trang being one of the leading locations. On average, each of the other coastal provinces cultivated this crop on an area of 32.9 ha from 1995 to 2019. Meanwhile, Soc Trang recorded the first triple figure of planted area in 1998 (137.2 ha) and kept this figure increasing to the peak in 2015 (196.7 ha) before decreasing in 2017 (183.9 ha) under the effects of the 2015-2016 disaster.

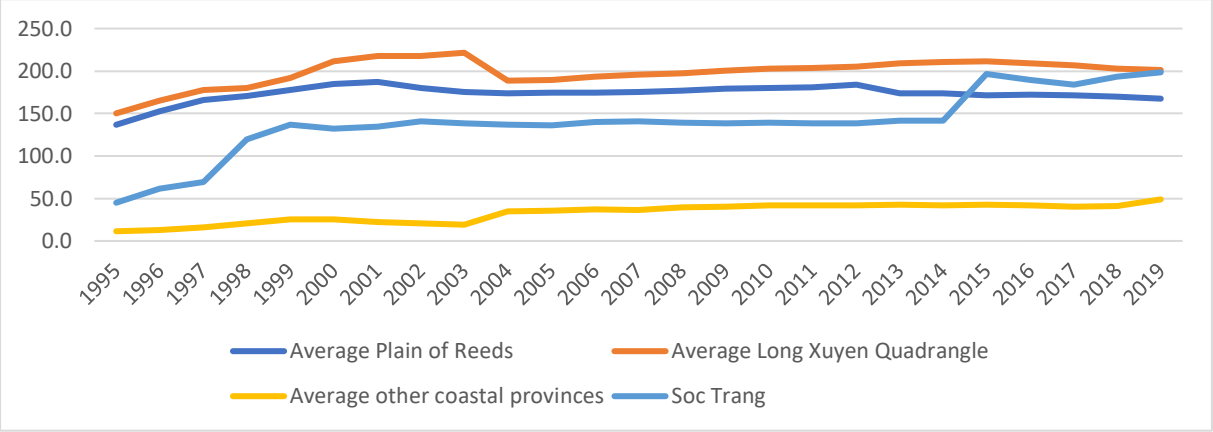


Figure 5.3. Planted area of Winter-Spring crop in Soc Trang and VMD's regions, 1995-2019 (ha)

Note: The Plain of Reeds includes Long An, Tien Giang and Dong Thap; The Long Xuyen Quadrangle includes An Giang, Kien Giang and Can Tho; other coastal provinces include Hau Giang, Bac Lieu, Ca Mau, Ben Tre and Tra Vinh.

Source: GSO (2020c)

If we look at the bigger picture, the changes of cropping patterns in Tan Hung/Long Phu particularly and Soc Trang generally reflect the general trends in the field of agriculture at the regional level. Indeed, the VMD began the conversion from single cropping to double cropping and triple cropping as early as the late 1960s early 1970s under the effects of the Green

Revolution (Demont & Rutsaert, 2017; V. K. Nguyen et al., 2018; Xuan, 1975). Yet, such transformation was seriously disrupted by the Vietnam War and the collectivisation period (1976-1988), only resumed and significantly expanded since the 1990s. According to a report by the Vietnam National Mekong Committee and the UNDP (1999, p. 56), from 1990 to 2000, while land use for single rice crops dropped significantly from 718 thousand ha to just 485 thousand ha, the figures for double rice and triple rice crops increased dramatically from 943 thousand ha to 1,209 thousand ha and from 97 thousand ha to 248 thousand ha, respectively. Although this data indicates that triple rice cropping was not popular in 2000, the increase of 165 per cent in planted area from 1990 to 2000 strongly showcases the changing direction in crop production in the VMD.

The increase of triple rice crops in the VMD was largely due to the surge in the planted area of the Winter-Spring crop (Spring-Summer paddy/crop 3 in Soc Trang province). The Delta's cultivated area for this crop was much larger than in the other five socio-economic regions of the country, accounting for 42.8 per cent (1,035 thousand ha) of Vietnam's total planted area in 1995 (Fig. 5.4). As a result of the construction of irrigation systems preventing flooding and saline intrusion in 1996, the figure increased to 45.3 per cent (1,152.2 thousand ha) in 1996, and about 50 per cent from 1999 to 2019, with the latest year recorded an area of 1,604.5 thousand ha.

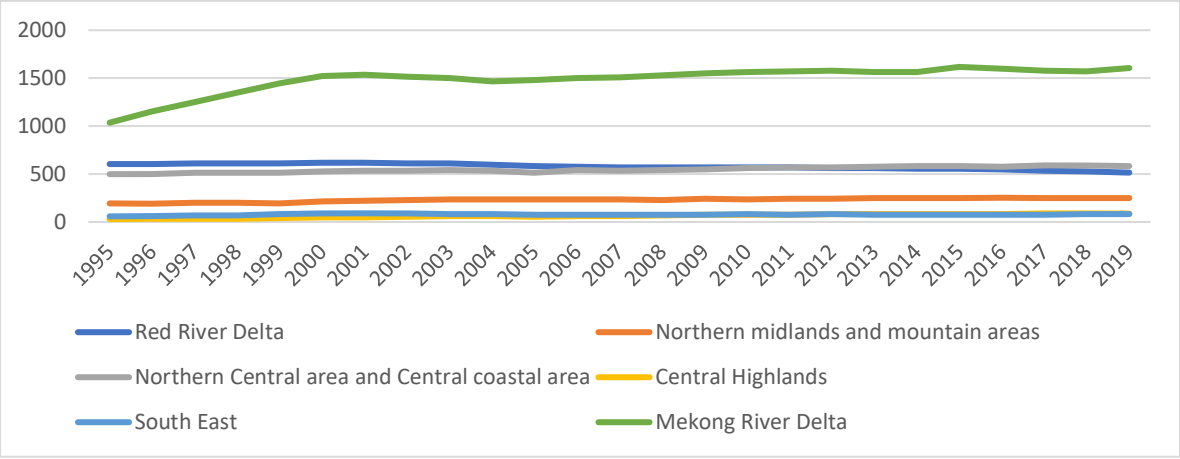


Figure 5.4. Planted Area of Winter-Spring Crop in Vietnam's Regions, 1995-2019 (thousand ha)
Source: GSO (2020c)

The transformation from double cropping to triple cropping in Soc Trang and the VMD has substantially contributed to the surge of the national planted area of paddy crop, from just around 5,600 thousand ha in 1980 (Khan, 1998) and 6,042.8 thousand ha in 1990 to 7,666.3 thousand ha in 2000 to above 7 million ha up to the present (Fig. 5.5) (GSO, 2020c). Of which,

the planted area of the Winter-Spring crop (regarded as Spring-Summer crop/crop 3 in Soc Trang) has risen most remarkably, from 2,073.6 thousand ha in 1990 to 2,541.1 thousand ha in 1996, to replace the Winter paddy as the most cultivated paddy crop of the country. In 2019, this Winter-Spring paddy was planted in 3,123.9 thousand ha, ahead of the Autumn paddy (2734.4 thousand ha) and the Winter paddy (1,611.8 thousand ha).

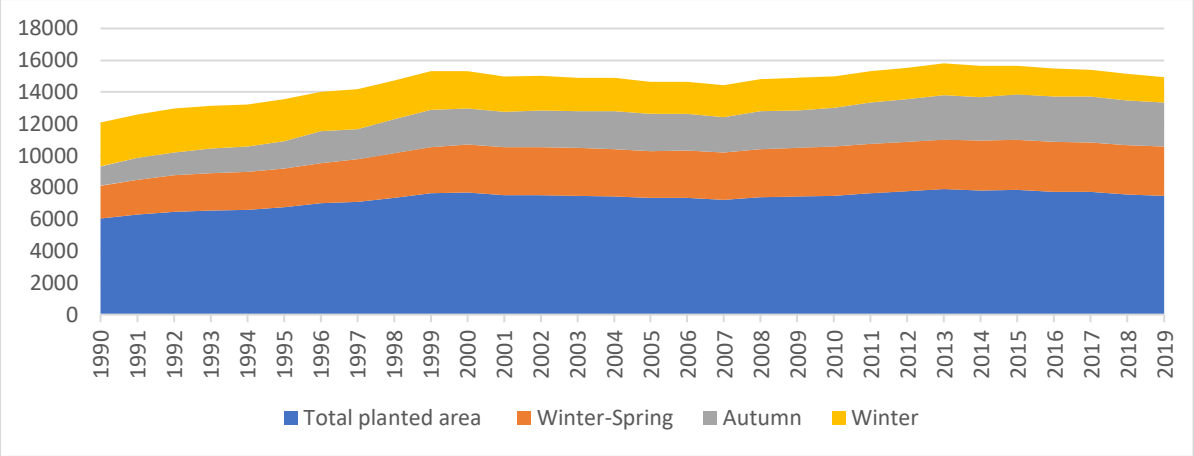


Figure 5.5. Planted area of paddy crops for Vietnam, 1990-2019 (ha)
Source: GSO (2020c)

At a global level, Vietnam was the only country in the LMB to develop third season irrigation area (281 thousand ha) (Hoanh et al., 2009, p. 147). The building of irrigation serving dry season crops was much more popular in the VMD in comparison with other countries of the LMB, with the former area accounting for nearly 80 per cent of total dry season irrigated area (1.699 million ha) (Hoanh et al., 2009, p. 147).

Consequences of Habitus and Practice Changes

The consequence of implementing the third rice crop and more generally the triple cropping system is more complicated than the calendar change. On the one hand, it helped farmers to generate more profits for their households than the other two rice crops; on the other, it has brought about many negative consequences.

The application of large-scale flooding and salinity control works has not only provided positive conditions for intensifying agriculture, but also significantly transformed the natural and physical landscape in the VMD with many potential unexpected consequences (Vo et al., 2017; T.A. Tran & James, 2017). The triple cropping pattern has posed a greater demand for

large-scale water drainage and supply system (V.K. Nguyen, Dumaresq, Howie, Blake, & Robins, 2016), engendered conflicts between rice farmers and shrimp farmers (Can, 2011), and more fundamentally altered local farmers' perception of their environments and disaster risks. I argue that this is the main cause that has pushed farmers to the edge of disaster risks that materialised in the 2015-2016 season. In the next section, I will discuss how this materialisation of risks has manifested in Soc Trang province.

The practice of triple cropping system under the closed water control system has created '[n]ew tensions between individual-collective interests, upstream-downstream users', different areas with different cropping calendars, and different types of farmers (Miller, 2007, p. 203). The core problem is the competition for meagre water resources because the current cropping system poses considerably increasing demands on water for crop production in the dry season. It was estimated that this demand would rise from just 9,000 to 16,460 gigalitres between 1990 and 2010 (Miller, 2007, p. 199). Those tensions were not separated but indeed complicatedly intertwined with each other. For instance, with regards to the individual-collective interest conflict, individual households aim at getting sufficient freshwater serving their crop 3 production so that they demand water control units to open sluice gates and store freshwater for their dry season crop. Nevertheless, from the perspective of government, they need to balance the water demand between farmers of different regions who have different cropping calendar. The fact is that there are farmers in many areas of Soc Trang province cultivating crop 3, yet they do so in different timeframes (Ka Co, official), which causes water management challenges. An interview with a sluice gate keeper revealed that opening sluice gates to get water for this area's crop plantation could result in flooding in other areas (Hai Co, official, KII7). Moreover, while the available water resources can sufficiently supply for a single or double cropping system, the system is not enough to do so when all farmers are triple cropping. When this is combined with the effects of upstream hydro-power dams activity and the lack of freshwater in the dry season when the river flow rates significantly decrease (Tuan et al., 2007), the conflict is exacerbated.

The lack of water has also led to the conflicts between rice farmers and shrimp farmers with the former needing to store freshwater and prevent saline intrusion, while the latter require brackish water and saline intrusion (Hoanh et al., 2003; Miller, 2003). Despite the government's effort in conciliation of these conflicts, an ineffective 'collaborative arrangements in the operation of the irrigation system among the provinces' seem persisting (Vo, Tran, & Luong, 2017, p.114). Interviews with officials also confirmed this information.

The conflicts between those two farmer groups were between rice farmers in Long Phu district and shrimp farmers in Bac Lieu province. Both areas belong to the Quan Lo – Phung Hiep irrigation system, which was part of the Ca Mau Peninsula's sweetening project. This project was built in 1996 and provided enough freshwater for double rice cropping until Bac Lieu province started converting rice farming to shrimp farming (around 130,000 ha) in the southern part of the National Road 1A. This shrimp farming required more saline water to raise shrimp, which led to saline intrusion to Soc Trang province, especially Long Phu district. Although the government had already developed a project on regulating freshwater-saltwater Soc Trang – Bac Lieu, there has been conflicts in managerial tasks between the governments of the two provinces (Ka Co, official, KII4). This tension could be one of the great obstacles preventing the State's attempts at facilitating inter-regional cooperation in the VMD from success (for instance, Prime Minister of Vietnam (2016) Decision No. No. 593/QD-TTg).

For rice farmers, the new farming pattern (i.e., the triple cropping system) pushes them to the edge of facing disasters (e.g., drought and saline intrusion) on a more regular basis. It can be seen that the cultivation of the third crop falls at the time of the dry season running from November to late April, with this crop entering the vegetative and reproductive phases varying from January to March, depending on the time it starts. Annual saline intrusion often occurs from January to May, with its peak in February to April. The presence of saline water in rivers, estuaries and canal systems means that local farmers cannot water their rice fields. The rice crop is very susceptible to salinity and cannot cope with salinity concentrations at 0.4 per cent or 4 grams of salinity per litre and above (Tuan et al., 2007, p. 41). As a result, local farmers often overexploited the groundwater to supply freshwater for crop production, which has led to significant reduction in the groundwater level (Vo, Tran, & Luong, 2017).

However, the most significant consequence of the pattern change was the transformation of farmers' habitus and capital accumulation of capital. In their habitus, the seed of normalising risks from saline intrusion in the dry season has been sowed and cared not just by farmers themselves but also by the political field and its institution (i.e., the government). This seed will grow into a full disaster when farmers' practices encounter natural hazards as we saw in the 2015-2016 event.

Conclusion

I have traced back to the structural context of Vietnam in 1975 when the country reunified its territories. Coming out of the war with a high expectation of socialism, Vietnam immediately adopted a collectivisation strategy, which pushed the whole country into food crisis and poverty. The Vietnamese state well responded to this crisis by launching the reform that has boosted a remarkable transformation of the whole society in its virtually every aspect. Yet, the State enforced agricultural intensification policies in the VMD so as to meet its goals of economic development and national food security. The changes they applied in soft structures (relations between farmers/agriculture and the State and market) and hard structures (relations between farmers and the natural/built environments) have engendered a transfiguration of the whole society in general and of the field of agriculture in particular. The alteration of soft structures saw the State liberating farmers from agricultural cooperatives, allowing them to have better access to economic capital (land, production materials, market access) and freedom in building their networks with non-state agents in pursuit of agricultural production goals. The modification of hard structures saw the State building large-scale irrigation systems to prevent disaster risks, enabling farmers to have the opportunity to use freshwater in the dry season and expand their arable land areas. In response to those new structural conditions and capital, farmers gradually altered their habitus toward risks, moving on from single cropping to double cropping system. Farmers, nevertheless, were not passive but also active in adapting to new conditions. They trialled the third rice crop then routinised it on a mass scale. During this process, the government, as a representative of the field of power, has supported farmers in institutionalising this crop to be an 'official' crop in local annual agricultural development plans. This transformation has resulted in a new farming structure; that is, a triple cropping pattern. This new structure is believed to have facilitated farmers' choice of crop 3 in the 2015-2016 season in which they suffered big losses to the disaster. In Chapter 6 and Chapter 7 I will move on to discuss the contemporary interaction between farmers and the field of agriculture in making decisions and choosing disaster risk management strategies.

CHAPTER 6. THE CONTEMPORARY FIELD OF AGRICULTURE AND RISK PERCEPTION

In this chapter I explore the contemporary field of agriculture and its conditions: risks and hazards. First, I unpack how farmers conceived of the nature, effects, and causes of the 2015-2016 event. Second, I try to discuss how farmers currently defined risk, recognised the threats present in the field of agriculture that could harm their crops, and ranked these threats according to their perception of potential severity. This helps portray the picture of the agricultural field and also reveal farmers' risk habitus. I show that farmers' risk habitus as their cognitive and adaptive schemas towards risk, stand behind how they approach to, value and define risk, and direct their risk taking, reduction, and avoidance.

Disaster Perception

Event in Farmers' Interpretation

From local governments' perspective, the 2015-2016 event appeared as a historic or lifetime disaster. With their better access to information and data, officials were able to identify the link between the event with the El-Nĩno phenomenon occurred before the outbreak of the disaster: 'The El Ninõ phenomenon was the stimuli initiated the 2015-2016 hazards of drought and saltwater intrusion. This phenomenon started in 2014 with little impression, then got worse in late 2015 and especially early 2016.' (Quy Ro, official, KII5). They were also able to draw comparisons between the historic event with other 'normal' years, highlighting its uniqueness in the history:

> The 2015-2016 year is once-in-100-year event because only in mid-January had salinity already intruded up to 30 km … while in a normal year, at that time saline intrusion is only starting. The 2015-2016 year is special, unique in the sense it was the most severe affected year. (Ka Co, official, KII4)

The focal point in officials' accounts of the event was its impact on local agriculture. For instance, one official described the event: 'It was the time when the rainy season ended too

early, salinisation seriously prolonged from late 2015 to May 2016, rice productivity in all over the [Soc Trang] province was affected' (At, official, KII3). This perception was also reflected in the way local governments calculated the disaster impact. The records such as the *List of affected households receiving relief funds in the 2015-2016 season* by Tan Hung CPC (2016b) and the report on the effects by the 2015-2016 drought and saline intrusion by Long Phu DPC (2016) simply focused on the impact on households' crop damages (affected rice crop area in ha). They identified two levels of damages including 30 per cent and 70 per cent of crop area lost by the disaster. While the accuracy of these records remained questionable by some farmers, there was obvious no assessment on other aspects of the disaster's impacts such as psychological impacts, losses of income, forced migration. This limitation has constrained the government's programs in supporting farmers' recovery.

The above-mentioned description of the 2015-2016 event was essentially built upon either experts' or governments' frameworks that used all available systematically organised knowledge to form judgement. Farmers, by contrast, did not often have access to such information sources. They must base their views on personal experience and the information sources they can access. In order to uncover how farmers see the event, I asked farmers to recall the image or impression they had of the event.

As the event was in the past at the time of interviews, their impressions of the event were not on the perception of risk, but rather, on the perception of disasters. When being asked: 'What was your impression of the 2015-2016 event?' farmers evoked an image of a crop loss/ failure (*thất mùa*) or crop generating no income (*thất thu*). They did not use the words such as 'disaster' or 'crisis' to label the event. This at first made me feel that they had forgotten the event's adversity or the event was not as seriously severe as I expected from a disaster perspective. Yet, such overall images conjured up many more detailed aspects that constituted a true collective stress. There were four themes reflected the image of the disaster in farmers' memory: physical damages, paddy effects, livelihood crisis, and psychological effects (Fig. 5.6). These aspects demonstrated both the physical triggering event (physical happenings) and social disruption (psychological effects, financial effects, and crop effects).

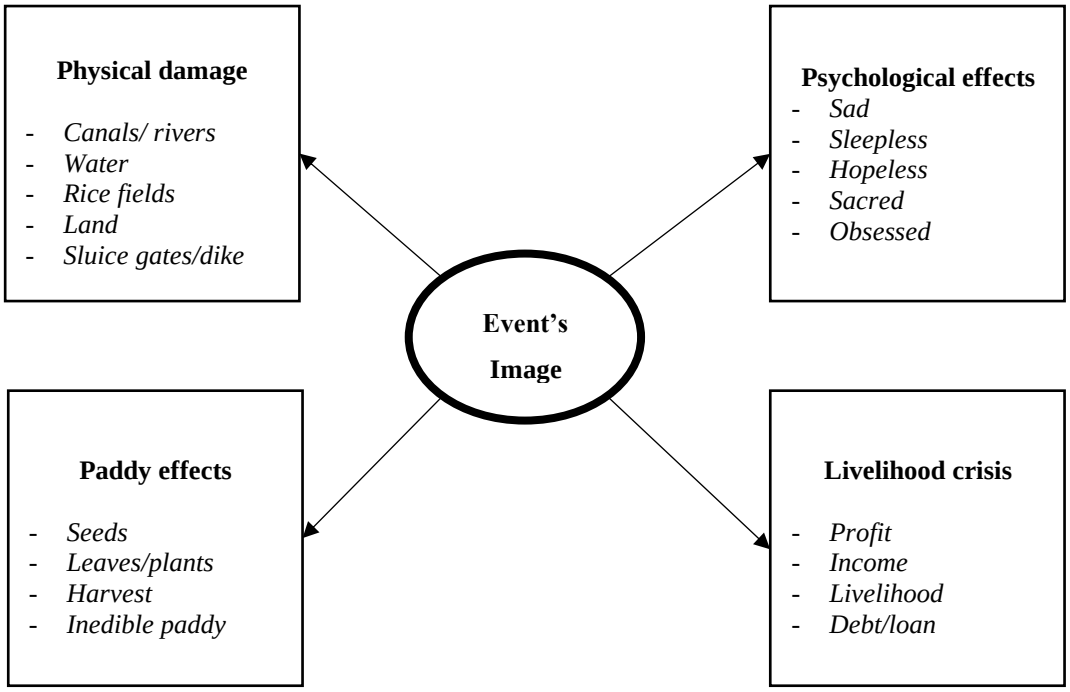


Figure 6.1. Memories of the effects of the 2015-2016 event
Source: Developed from Household Interviews

Physical damage represented the impression that farmers had when they observed the changes and damages in their surrounding environments. Some farmers recalled the presence of saline water by using words such as 'intruded' (*vào*), 'attacked' (*tấn công*), 'went up' (*lên*): 'That year saline water attacked' (Buoi, HH7). Other farmers remembered exactly that 'saline intrusion came when their paddy was about to burst and made the paddy unable to ripen' (Bong Ro, HH16). Some even could draw a comparison between that year's saline intrusion and previous years'.

> Salinisation isn't a recent matter. Years before [the 2015 event] salinity intrusion came in February or peaked in March. But in 2016 saline intrusion came when Tet holidays had just passed [around January or February]. It occurred earlier and lasted longer. (Cau Long, HH20)

The more popular image conjured up was the snapshot of dry canals/rivers. This is understandable because canals and rivers in the Tan Hung commune in particular and in the VMD in general are as crucial to local farmers as pulses to human's blood circulation. These waterways are crucial for human and goods transportation, irrigation, and drainage (Biggs, 2004; Nguyen, Han, & Cramb, 2020) so that any changes to them are noticed.

Most farmers reminisced the image of water scarcity and dried out canals/rivers. A Kinh elder recalled that sad memory: 'That year was so miserable. These rivers were dried out until we

could see its floor' (Bong Ro, HH16). The description of the event was the same as that of a Khmer man who disclosed:

> There was no freshwater. Canals were dried out because dike [and sluice gates] didn't not let the river water come in. The rice fields were dry and aluminated (*phèn*). We couldn't pump water to solve the problem. We also couldn't plant. (Thanh Long, HH4)

Canals were supposed to supply water for rice production, but they became 'dry and dead' (Luu, HH13). Some expressed this image in an ironical situation: 'Paddy harvesting machine could even run hundreds of meters on dry rivers' edges' (Bong Da, HH15). Farmers tried to save their crop by supply groundwater for rice fields:

> Canals dried out. That year I had around 30 [large] *congs*. I had to fill water into those water containers. 30 containers or so. And pulled them several kilometers from my house to the rice fields. (Bong Chuyen, HH17)

The reflection on physical effects highlights that rice crop was strongly associated with the natural environment and crop 3 has a great water demand.

The image of *paddy effects,* central to all farmers' memories, referred to the damages of paddies under the attack of saline intrusion. Most farmers noticed how the disaster had impacted their paddy's leaves. The image came to their minds was that 'Burned all the paddy at once' (Buoi, HH7) or their powerlessness when facing the impact:

> I was visiting my rice fields and recognised that the paddy leaves were not normal. The color of paddy leaves was so different to the color of paddy when attacked by rice diseases. For rice diseases, we could use pesticide to treat, [but this measure was impossible with saline intrusion]. (Thanh Long, HH4)

Drought and saline intrusion also caused paddy to be sterile. Grain sterility was reported as the most common eoccurence of salinity injuries: 'Paddy was burned before growing grains. They're empty' (Thanh Long, HH4). Nevertheless, what worried farmers most was not empty grains, but the consequences that followed. Although their paddy was dead, they must cut them to prepare for a new season. The cost for this was expensive:

> We didn't see any more grains left. The cost for hiring people to cut the dead paddy was high. We couldn't afford to pay for cutting empty paddy. We must allow people to collect the paddy having grains left. (Oi Dao, HH1)

These effects not only made the sale difficult but also led to no food for human consumption, nor for poultry feed: '[Of the total 12.5 ha crop 3 cultivated] we eventually collected and brought home just around 10 bags [each contains about 50 kg of paddy]. It was inedible. Even ducks refused to eat it. We couldn't sell [it]. (Oi Dao, HH1)

The concern about crop productivity and yield was of great importance. This opinion was expressed by Co Vua who compared the yield of the disaster-affected year with the other years:

> Saline intrusion occurred long before, but it didn't occur frequently every year. It was by far the worst that year [2016]. Other years, saline intrusion came but we still could harvest. (HH26)

It is fascinating to see farmers come up with different expression of their crop failure. Some tended to quantify their bad harvest by giving an estimate of loss based on the ratio of the affected areas and their total planting areas. For instance: 'On the scale of 10, I got 5 left. I didn't lose all of it' (Thanh Long, HH4). Some households quantified the quantity of paddy they could harvest from the destroyed crop. For instance, 'Every *large cong* [0.13 ha] we could harvest 6 bags', while normally this figure was 12-15 bags a large cong (Nhay Cao, HH18).

What is significant in their recollections was a sense of gloom, desolation and destroyed paddy: 'No, nothing left. All was lost. [We] got rid of all the crop (because of burning). There was nothing left, not a single paddy plant' (Buoi, HH7). Or there was a last futile attempt to collect paddy: 'When saline water stopped, I finally collected about 50 kg of paddy per *standard cong* [0.1 ha] … We hopelessly tried to collect what was left on paddy fields … by cutting each flower of paddy in order to get paddy …' (Dua Hau, HH5). The event also signified a turning point in farmers' cropping career: 'The 2015 crop 3 was lost. And since then crop 3 hasn't been as productive as before' (Chom Chom, HH12).

The crop failure was just a start of a *livelihood crisis*. To invest into a crop was to hopefully earn some profit at the end of the season. During the period of a crop cycle lasting around three to four months from preparation to harvesting, farm households must pay for many expenses including hiring labour (for preparing land, pumping, or harvesting), buying inputs (seeds, fertiliser, pesticide), and machinery fees (gas, oil). According to farmers' estimate, each area of one ha could cost them around 18 to 20 million VND for those expenses. This burden usually led to financial shortfall at the end of a crop even for non-poor households. Most households, if not all, bought those agricultural inputs from retailers on credit. This means with an unexpected loss caused by the 2015 event, farmers were easily pulled into a financial crisis:

‘After the crop of 2015, our labour returned no income. We worked for free 3-4 months without gaining any profit’ (Bong Da, HH15). Explaining in greater detail, Chay Ben disappointedly remarked:

> We’d invested a lot of money into that crop 3 with the expectation of having a successful harvest. Eventually, all the crop slipped away from our hands thanks to saline water. The previous year crop 3 returned some profit, but that year’s (2016) crop 3 was all gone. That year, some people who rented a lot of land to do crop 3 ran away from this commune to Binh Duong city [because of their crop failure]. (HH25)

Following the adversity, nine (Khmer) households used migration in search of a replacement of income, 10 households (most of them from poor and near-poor categories and from Khmer ethnicity) required emergent cash to ease food deficit, seven must ask remittance from their migrated family members, 12 demanded labour support from family/relatives to grow next crops, and 22 deferred agricultural input suppliers to overcome financial shortage (Table 6.1).

Table 6.1. The disaster’s effects on households

Categories	Cash need	Remittance	Migration	Labour support	Land mortgage	Deferred suppliers’ debt
Poor & near-poor	8	3	5	5	4	9
Non-poor	2	4	4	7	1	13
Khmer	9	3	9	8	4	13
Kinh and Chinese	3	4	0	4	1	9
Village B	6	4	8	8	4	13
Village A	4	3	1	4	1	9
Total	10	7	9	12	5	22

Source: Compiled from Household Interviews

The disaster caused more stresses on those households living near the poverty line. Seven non-poor households were dragged into poverty in the following years (2016 and 2017). Debt and livelihood crisis were the factors that exaggerated these households’ vulnerable conditions (e.g., poor health, lack of saving, lack of labour). The case of Mr Xoai (62, Khmer origin) was a typical example. As his wife was dead, his two elder sons were mentally disabled, and his youngest daughter was a student, he had to labour alone despite also being in poor health for the past four to five years. With hope, he cultivated all of his land (0.78 ha) during the 2015 crop 3 but the crop resulted in a total loss. He then had to mortgage 0.52 ha of his total land in order to pay for his debt: ‘My crop was lost, I was in debt. I had to mortgage my land to pay

the debt for fertiliser, pesticide, seed' (Xoai, HH9). Leasing out land like Xoai was the measure of most poor and near-poor households. Up to the time of the fieldwork (2018), five households including four poor and near-poor households must lend out their land to get immediate money.

Many households were *psychologically* impacted. As a result of devastating losses of crop, farmers evoked 'negative' feelings about the event. They used words like 'very sad', 'worried', 'miserable', 'scared enough to die', 'goose bumps', 'loss of the soul', 'obsessed', or 'sleepless': 'First we noticed water was low in around 20 days to 1 month after planting paddy seeds. Saline intrusion came with the salty fog. We realised that our paddy was done. We worried', opined Thanh Long (57) a Khmer male from Village B (HH4). The event created anxiety 'I'm old … I'm scared enough to die' (Bong Ro, HH16), or an obsession: 'My soul could be lost when recalling that event. What an obsession! I got goose bump remembering it' (Bong Chuyen, HH17).

Their feelings of great despair could be compared with thoughts of death. This was the case for Mr Oi Dao's family, a non-poor household from Village B, who lost 12.5 ha: 'I lost over one hundred *congs* or so. All was lost. I died' (HH1). Oi Dao's feeling that he could have been dead was understandable given that his family borrowed an extra area of 5.1 ha with a hope of winning profits from the 2015 crop 3. Taking into account that each ha needed an investment of around 20 million VND (around US$85.9), his family lost around 250 million VND, which represented an irremediable outcome.

These mental impacts not only occurred immediately during and after the disaster event but also lasted until the following seasons. The fear of saline intrusion got into farmers' head to make them to plant crop 3 with caution. This fear explained why 18 households reduced the planted area for the 2016-2017 crop 3, of which, six households completely dropped crop 3. This made the total planted area of this crop from the household sample (n=28) dramatically dropped from 84.5 ha in the 2015-2016 season to just 68.91 ha in the 2016-2017 season.

Causes of Events

After recalling the 2015 event, farmers were asked to give their opinion about what caused the disaster. Interview analysis shows that only a minority of farmers (three farmers) regarded the occurrence of the 2015 event to be caused by a single threat, while the remainder explained the event as subject to multiple threats (Fig. 6.2).

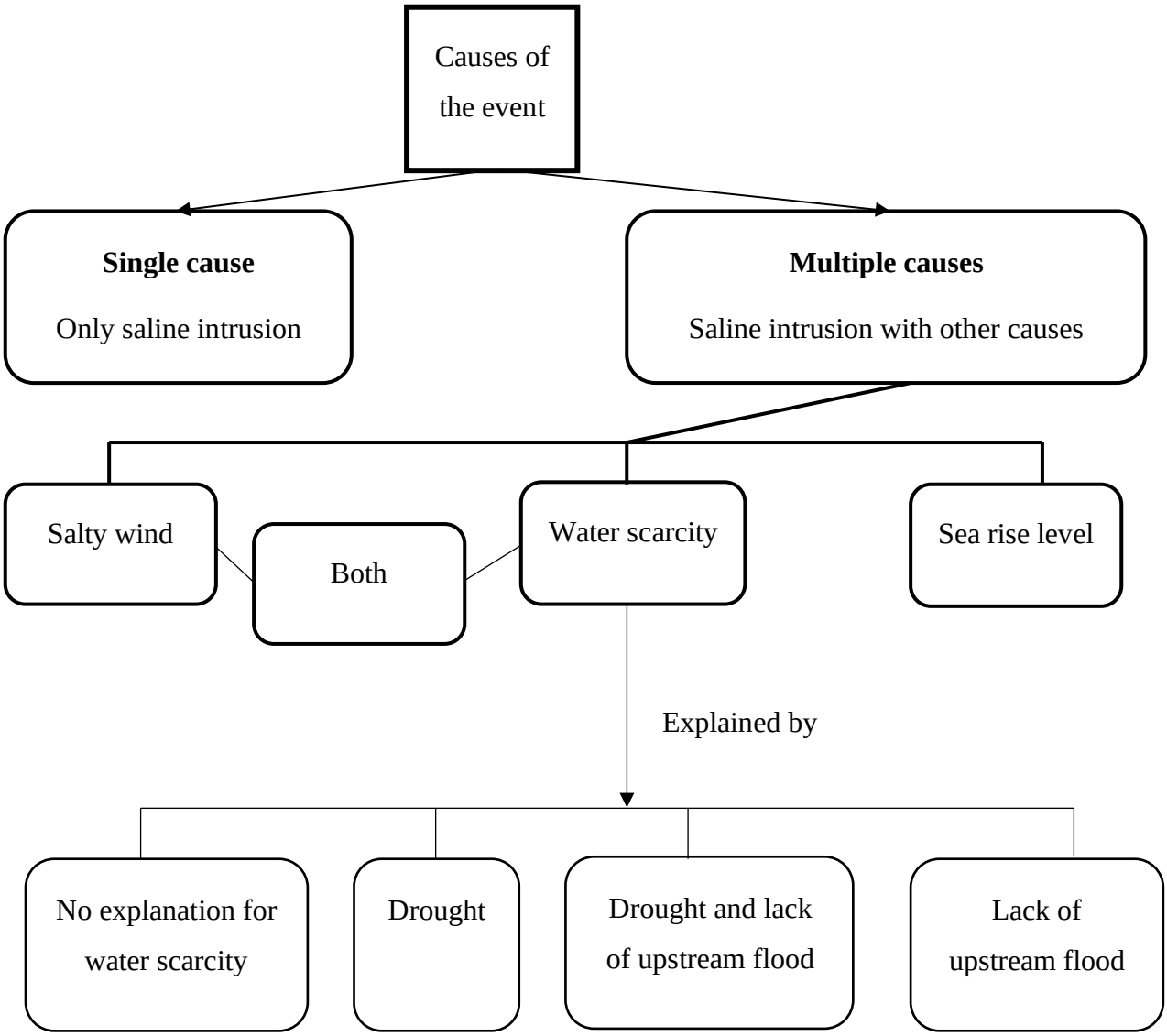


Figure 6.2. Farmers' Interpretation of the 2015-2016 Event's Causes

Source: Developed from Household Interviews

All farmers interviewed could recognise saline intrusion as the main cause of the event. In the interviews, sometimes it seemed that farmers attributed the event to only saline intrusion as they only mentioned 'saline water' (*nước mặn*) and 'salinity' (*mặn*) as the main catalyst for the event.

> [The crop was] being attacked by saline intrusion. Because of saline intrusion, they closed the sluice gates to prevent saline water getting in [inner fields]. If it got in, all field lands die. (Muoi Bich, HH14)

This attribution is understandable for many reasons. First, saline intrusion was not a strange phenomenon to local farmers. In Soc Trang province in general and Tan Hung commune in particular farmers started cultivating the third rice crop since around the 2000s. This was partly

because that they saw saline intrusion controlled by the dike and sluice gate system. Second, as noted in the previous section of threat recognition, farmers have their own ways of identifying the occurrence of saline intrusion, as it occurs nearly every year. They were able, for instance, to detect the intrusion of saline water if the governments close sluice gates in the dry season, the changes of their paddy (e.g., leaves are turned to yellow or red), or by the actual taste of the river and canal water. Third, as the current study was conducted three years after the event, the local government now regularly warns farmers about the risk of saline intrusion.

Although there was awareness of multiple causes for the 2015 event, with most farmers aware of the threat of water shortage, there were a few who mentioned the effects of salty wind and just one farmer who identified rising sea level. A small number of farmers told the interviewer that salty water was brought to rice fields by salty wind and fog. For instance, Dua Hau (57), a female Khmer from a poor household of Village B, identified saline intrusion as the true cause of the event noting that government officials had closed sluice gates to prevent saline water. However, when asked why saline water still affected rice crops even though the sluice gates were closed, she postulated: 'That was because wind, salty wind. Salty wind came and prevented paddy from blossoming. It destroyed all paddy … Yes, salty water [in the wind]. It even appeared in fog … If you don't believe me, then ask those who worked for the government'.

Out of those linking saline intrusion with the threat of water shortage, the majority were able to come up with a clear explanation of what caused this scarcity, while others could not. The latter could only describe the appearance of water scarcity but were unable to explain why. For instance, when asked what caused the 2015 loss of crop 3, Cam (33), a young Khmer farmer, asserted that saline intrusion was the first cause: 'Paddy was affected by salinity. After seeding, all paddy died. They were turned black and red. When we seeded, paddy leaves are green but they turned into red when saline water came' (HH8). He then added the lack of water: 'Because there was no freshwater, as these canals weren't dredged at that time. These canals were too dry so that we couldn't pump any water up'. However, he was unable to explain why water became scarce and how it was linked with saline intrusion. This situation happened to many participants. They seemed to limit their explanation at picturing the surface of the phenomena.

By contrast, those able to explain for water scarcity went beyond the appearance of water scarcity to explain the causal links between saline intrusion and water scarcity as well as providing the determinant of why water became scarce. Farmers attributed the event to the occurrence of drought, the lack of upstream freshwater, or combined both causes. Recognising

drought as the cause of the event required farmers to go beyond the physical effects of water scarcity to find origins in weather extremes and changes. For instance, Bong Chuyen, in reply to questioning about the reasons for saline intrusion, saw the causal link with water shortage: 'Because of the lack of water that year, the saline intrusion seems to go on forever'. This is in accordance with UNDP records showing that the annual saline intrusion was intensified and extended in duration due to the prolonged nature of the drought from late 2014 to early 2016.

In addition, only a few farmers were cognisant of the true reason why drought occurred. For instance, Quan Vot commented: 'Drought and saline intrusion was caused by lack of water which was due to lack of rain fall'. His explanation was standout because he could identify the lack of water was actually caused by lack of rainfall – an indicator of drought. He was also able to acknowledge the connection between drought and saline intrusion:

> Drought and saline intrusion are always together. If there's a drought then comes saline intrusion. If there's [enough water] then there's no saline intrusion. That year [2015) hit a peak of 9g/liter. Saltwater came as far as 60 km from the sea nearly as far as Can Tho city. That year's saline intrusion was historic. (HH21)

Such explanation was comparable to the opinions of some officials who were better informed. For instance, Mr At (official, KII3) explained:

> The 2015-2016 disaster caused by the fact that rainfall ended early which led to the prolonging of saline intrusion from late October 2015 to May 2016. In normal conditions, the Hau River carries water to downstream areas like Soc Trang, helping to remove saltwater that intruded in the dry season. However, the 2015-2016 season was the occasion when there wasn't enough river flow which made salinisation serious.

It can be seen that the official's awareness of the disaster sources was similar to the published reports such as CGIAR (2016), UNDP (2016), United Nations (2016), and various government documents.

In addition to the effect of drought as weather extremes, farmers also understood other causes of water scarcity. As Tan Hung and Soc Trang are in the low-lying region of the Mekong River, they are dependent on the flood from upstream regions located in other countries, from China, Myanmar, Thailand, Laos, and Cambodia. In the rainy season, the Mekong River brings the flood from upstream regions to downstream regions. This flood is not only the cure for farmers in the VMD, but also the key resource helping prevent the intrusion of saltwater from the sea. In every normal rainy season there is the flood. Thus, farmers in Tan Hung commune had a

habit of looking at the flood to cultivate their crop. However, the 2015-2016 dry season flood was abnormal 'because of lack of upstream flood flowing down [in the Mekong River] so it couldn't prevent the intrusion of saltwater as it usually did' (Quan Vot, HH21). In addition to the drought that was manifest in the lack of 'storms and rain', the lack of flood 'from upstream regions' was also a key factor (Chin Ro, HH28).

Risks in Field of Agriculture

Definition of Risk

It turned out that farmers did not often use the word 'risk' (*rủi ro/nguy cơ*) in their everyday life. Instead, the most common ways of expressing and defining risk was using informal words such as 'luck' (*hên xui*), or '50/50 chance'. This use denotes that farmers saw risk somewhat as a relative balance between chance and bad luck, winning and losing, positive and negative. Given that the notion of risk often refers to negativity, this way of expressing risk sounded more optimistic. A farmer clarified: 'We also use the term 'risk'… but more often the term of 50/50 chance, meaning not surely winning, but not surely losing' (Muoi Bich, HH14). This outlook on risk was popular among different groups of households, regardless of poverty, ethnicity or gender.

Some farmers, especially those from the poor and near-poor background, tended to display risk in terms of risk-taking behaviour, as something worth risking: 'cultivating crop without thinking about consequence' (*làm đại*), 'risk one's life cultivating crop' (*liều mạng làm lúa*). For them, risk-taking was a must because if they avoid risk, they would die from food deficit. In addition, these farmers viewed risk-taking endeavours as *a collective action*: '[Risk is] when people are successful with the crop, we also are; if they die with the crop failure, we follow' (Dua Hau, HH5). For some farmers who were better-informed and from better-off households, risk was defined in a more formal way, closer to an academic understanding of risk: 'A risk is just like the bad effect of weather. If we are active [in cultivating crop], there won't be risk. If we aren't, there is risk' (Cau Long, HH20). Risk for these farmers was because of their lack of coping capacity or forecasting ability. Some farmers, nevertheless, saw risk through the lens of specific phenomena that they had experienced or that left a marked impression on their memory; for instance, risk for some was saline intrusion.

In sum, Vietnamese farmers' perception of risk is very different from the definition of risk in academic mainstream thinking, which often delineate risk as equivalent to 'danger' or 'negative outcomes' (Douglas, 1992, p. 24). Although farmers' lives are filled with risks, they do not think of risk as entirely 'negative'. My study's finding is similar to the observation that lay understanding of risk is a mixture between negative and positive aspects (Lupton & Tulloch, 2002b). This reflects a habitus of accepting risks as a normal part of their everyday life.

Definition of Natural Hazards

In contrast to the academic literature that distinguishes between the notions of disaster (*thảm họa*) and natural hazard (*thiên tai*), there was little attention to the distinction between them in Vietnamese legal and everyday discourses. From the institutional perspective, the Vietnamese state has developed its perspective on 'natural hazard' in different legal documents such as the Law on Natural Hazard Prevention and Control (National Assembly of Vietnam (NAV), 2013) and its subsequent amendments (NAV, 2020), and the Decision on Disaster Risk Levels (Prime Minister of Vietnam, 2014b). In these documents, the term '*thiên tai'* is used to mostly refer to 'natural hazard' rather than 'disaster'. This is because the meaning of *thiên tai* largely delineated the magnitude and impacts of natural agents rather than exhibiting social aspects. Except for the Decision (Prime Minister of Vietnam, 2014b) where the government placed 'disaster' (*thảm họa*) as the highest one among five levels of natural hazard risks, in the remaining documents, the definition of *thiên tai* was as follows:

> an abnormal natural phenomenon, which could cause harms to people and damages to property, environment, living conditions and socio-economic activities, including tropical storms, tropical depressions, strong breezes at seas, tornadoes, lightning, heavy precipitation, floods, flashfloods, inundations; landslides and land subsidence caused by floods or runoff or droughts; water rise, saltwater intrusion, extreme heat, droughts, wildfires, cold under 13 degree Celsius, hails, frost, fog, earthquakes, tsunamis and other types of disasters. (NAV, 2020, p. Article 1)

At a local level, farmers also did not often use the term '*thảm họa*' as academics would use to refer to the collective crisis. Instead, similar to the legal discourses, they used more the term '*thiên tai*', which mainly referred to the notion 'natural hazard'. Inquiry about farmers' understanding of the term *thiên tai* revealed three common themes: natural hazards as God's power going wrong; natural hazards as specifically observed phenomena; and natural hazards as weather extremes. In the first theme, natural hazards were presented as holy forces that come

as *a fate without choices* or *God's power out of reach*. This explanation was often associated with those farmers who were of old age and from the poor/near-poor background. In some interviews, this sense outweighed farmers' reasonable judgement of the threats. Instead of blaming the changes in weather, they tried to involve the role of God (*Ông Trời*) or a divine force standing behind all of the changes in weather. This kind of explanation was volunteered mostly from elder participants and those from poor households. The explanation from Dien Kinh, a farmer from a near-poor household in Village A, was a prime example: "Natural hazard is when God is sick' and 'We cannot cope with natural hazards because it is "given" from above' (HH23). This perception could be seen as the reason why farmers had a mentality of acceptance of the fate that they would lose their crop if natural hazards occur.

In the second theme, natural hazards were understood as *climate/weather changes*. This opinion was linked with both experienced farmers of poor and non-poor households. In doing so, they combined their everyday life understanding with a scientific form of knowledge. This explanation of natural hazards captured the 'unexpectedness' feature of the phenomena. In this theme, farmers could explain the phenomenon by pointing out the unusual changes of weather appearance with the illustration of specific examples: 'Natural hazard is abnormal weather, for example, rainy, sunny or drought' (Bong Da, HH15) or 'Natural hazard is weather that changed unexpectedly. For instance, storm with heavy rain, or saline intrusion' (Buoi, HH7).

In the third theme, natural hazards were interpreted as *climate/weather changes coupled with social consequences*. This viewpoint was from some participants who had usually a high level of education and knowledge of crop production and a better-off background. In this theme, they linked natural hazards with social disturbance – a sense academics understand as disaster or a collective crisis. For instance, natural hazards were seen as the cause of disruption to their cropping pattern: 'Natural hazards, locally speaking, refer to the situation, for instance, saline intrusion that prevents us from planting our paddy seeds' (Bong Ban, HH19). Or they regarded natural hazards as a threat that caused damage to crop yield: 'Natural hazard is storm with heavy rain, caused by weather changes. For instance, it causes damages to our crop' (Quan Vot, HH21). By these delineations, those farmers came to an understanding of natural hazards more as disasters.

Risks as Perception of Structural Conditions

As agents in the field of agriculture, interviewed farmers were the best ones to know the risks facing their crop production. The ways they constructed their perception of threats to their

crops would reveal the characteristics of the field and farmers' social positions in it. My interviews at first focused on asking farmers' knowledge of general risks, which could affect their health, properties, livelihoods, and so forth. Nevertheless, farmers quickly associated what they considered as risks with their crop production, namely, for them, what mattered most was the risks facing the field of agriculture. Engaging this field and the risks deriving from this setting becomes a crucial part of their daily lives. This indicated the fundamental value of rice cropping as a livelihood in particular and the field of agriculture where they devote their lives in general to farmers. They do not think of risk further than what matters most to them: crop production. Therefore, talking about risk involved talking about the potential threats that could damage their crop. This is consistent with other studies showing that in farmers' perceived risks, crop production is the most critical issue (Le Dang, Li, Nuberg, et al., 2014).

The participants listed a wide range of dangers to this livelihood activity, which was arranged into three main themes: natural risks, risks from rice pathogens and insect pests, and economic risks (Fig. 6.3).

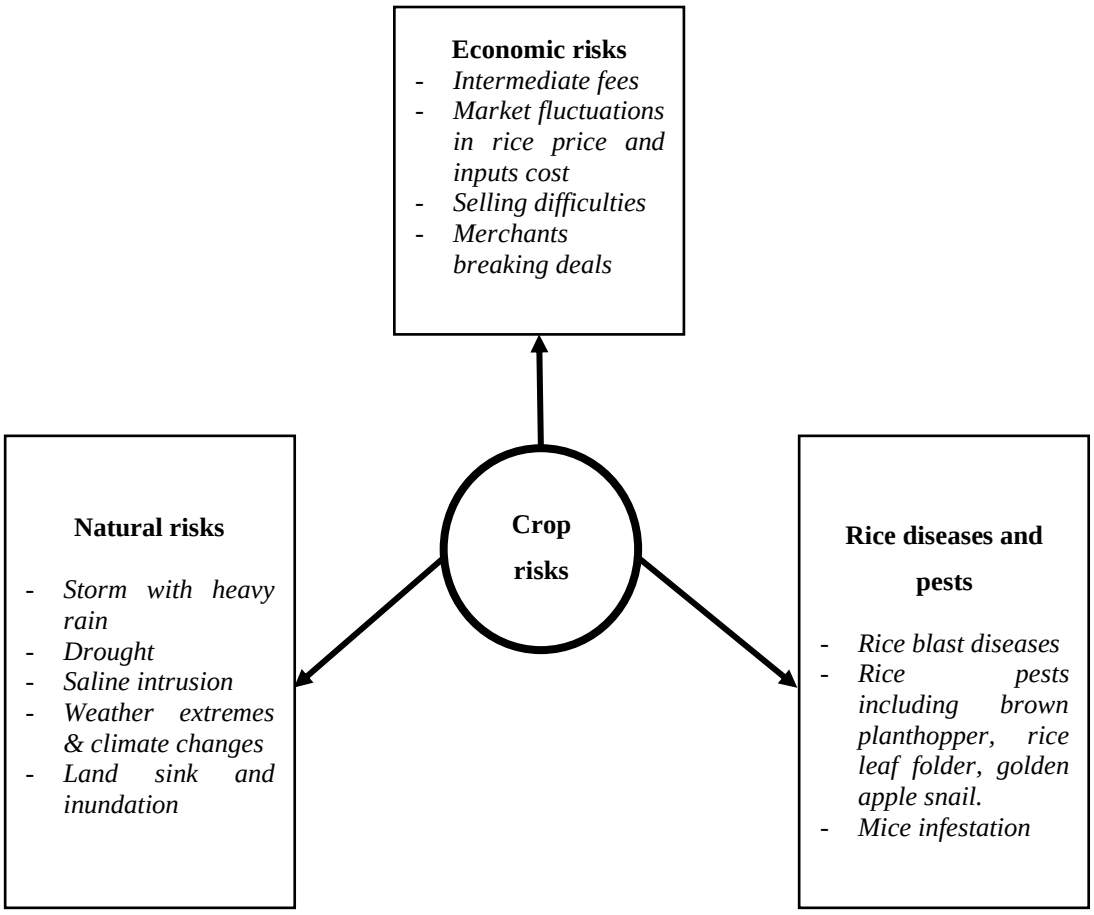


Figure 6.3. Risks to crop cultivation

Source: Developed from Household Interviews

The first threat to crop production was from natural hazards. This was of great concern to farmers and appeared as the most common threat in all household interviews. Farmers with their different experiences expressed their fear about different types of natural threats. Storm, saline intrusion, drought and water scarcity, and weather extremes were the most common dangers raised by farmers. Land sink and inundation (*ngập*) was cited in only one household interview with Sau Rieng whose rice field was located in low-lying region and exposed to these phenomena if it rains. Some farmers reported on the occurrence of storms with heavy rain (*mưa bão*).

Storms (*bão*) or tropical cyclones (*xoáy thuận nhiệt đới*) are among the most common natural hazards in Vietnam. From 1951 to 2013, there were 327 tropical cyclones from the East Sea (or South China Sea) approaching Vietnam's mainland, with most occurrences during July to November of the rainy season (Toan, Trinh, Tien, Trung, & Tien, 2014). From 2000 to 2011, the VMD experienced 10 storms, just behind flood (24 events) in the total of 54 disaster events this area faced (Vu & Noy, 2016, p. 3). When a storm comes, it usually brings dangerous wind, heavy rain, and sometimes flood. This is perhaps why local farmers often expressed 'storm with rain', rather than using each term by itself. Although some farmers such as Dua Hau indicated the infrequency of storms, most households stated otherwise. Nhay Cao's son (25) confirmed that: 'Here risks [to crop] are just storm with heavy rain' (HH18). Storms with heavy rain were viewed as the phenomenon in the association with weather extremes and sudden changes, as described by Boi Loi (38), a Kinh man from a non-poor household: 'Weather factors led to loss of crops. When we are doing the crop, the coming of a storm with heavy rain can cause the paddy to fall and then the crop is gone!' (HH22). Research showed that storms or tropical cyclones in Vietnam peak mostly between October and November – the end of the rainy season (Toan et al., 2014, p. 180). This was confirmed by farmers who informed that storms with heavy rain often came during the time of harvesting crop 2 (around October or November). Muoi Bich (male, 55) described this situation: 'There are storms and rain attacking when crop 2's paddy begins to burst. If there are storms and rain, it'll be a bad crop, no other way' (HH14). With the same experience, Bong Ro, a Kinh man (66) agreed that prolonged raining could mean the ruination of his crop.

> We blamed the damage of our crop on the weather mostly. For instance, if the crop is going to be harvested and it rains a lot it can cause the rice seeds to partially fill. With these weather conditions, the crop is dead, and all is lost. Eventually we have no productivity. (HH16)

While storm and rain were more common at the time of cultivating crop 2, drought and saline intrusion presented a more serious threat to crop 3. When saline intrusion comes earlier in the dry season, sluice gates are alarmingly closed, irrigation canals dry out and supply less water to rice production. This directly affects crop 3 that is cultivated during the dry season. This situation is likely to be worse if the effects of drought are present such as in the 2015-2016 event.

It is noteworthy that in the discussion with farmers, there was a small number of well-educated Kinh who went beyond describing the phenomena of natural hazards to link these threats to the State of climate changes, which have made global weather patterns different to those of the past. The opinion from Quan Vot (48), a male Kinh farmer from Village A, was a prime example.

> There are many factors [affecting crop production]. Firstly, it is the effects of weather. Secondly, it is rice diseases, especially brown planthopper, and thirdly, it is mouse attack. And now we face a big challenge with climate change, which means weather no longer has the same pattern as did it in the past. (HH21)

The second threat was from rice pests and pathogens. It appeared that the environmental and climate conditions of Tan Hung commune were conducive for the invasion of rice pests and rice blast diseases. Crop production was frequently infested with insect pests including rice leaffolders, brown planthoppers, golden apple snails, and mice infestation; and rice blast diseases. The first three pests are insect herbivores that eat rice plants. The most common threats to crop cultivation were the brown planthoppers (*rầy nâu*), rice leaffolders[6] (*sâu cuốn lá*), and rice blast diseases (*đạo ôn cổ bông*). These pest and rice diseases were described as annual threats to paddy. It is interesting to note that these threats were customised to each crop during the year:

[6] This pest's scientific names are Cnaphalocrosis medinalis G.

> Crop loss can be due to insect pests and rice diseases. It's scary to say that the success or failure of a crop depends on brown planthopper. But they are different to each crop … For instance, crop 1 has no pest, but crop 2 does. (HH1)

Crop 2, cultivated from around August/September to November, was deemed more susceptible to rice insect pest because this crop is planted and harvested during the peak of the rainy season spanning from May to November. Water inundates rice fields, especially the ones located in low-lying areas. Prolonged inundation could also lead to the emergence of the golden apple snail: 'When rice fields are flooded, rice plants could be eaten by the golden apple snail' (Sau Rieng, HH6). Brown planthopper was reported to have impacts on crop 2 in the 2016 season right after the 2015-2016 disaster. This was believed to drag Oi Dao's family into further challenging circumstances in the aftermath of the disaster.

The market risk was the *final threat* raised by farmers. In Tan Hung commune in particular and in the VMD in general farmers often sell paddy to merchants (*thương lái/lái buôn*), who, as observed in many studies (e.g. H.Q. Tran, 2018), often moved across provinces in the VMD searching for paddy sellers. In many cases, dealers/brokers (*cò*) played a role of intermediary in connecting merchants and sellers (i.e., farmers) with each other, also stockpiling paddy from farmers and selling it to merchants. As these merchants came from other regions, they were often not familiar with local paddy cultivation. They neither knew where specific varieties of paddy[7] were cultivated nor which farmers had a large quantity of paddy for sale. This was where brokers became crucial because they were often local farmers who were knowledgeable of local geography, rice production, and fields, had a strong social network with relevant stakeholders, and sometimes were highly regarded for their large land holding or success in rice production. As observed in some studies, after buying paddy from farmers/brokers, merchants sold the paddy to millers, then from there rice was sold to wholesalers and/or exporters (Demont & Rutsaert, 2017).

Farmers faced tremendous challenges to go beyond the traditional value chain so as to sell paddy directly to wholesalers and rice exporters. There were at least two reasons. First, farmers lacked organisations (for instance, farmer cooperatives) that helped them fully operate a large-scale sale to wholesalers and/or rice exporters (see more from H.Q. Tran, 2018, pp. 209-211). Thus, each individual farmer must find their own way to sell their own products. This weakened their power in negotiation with merchants. Mr Man, who worked as a paddy dealer and was

[7] Local farmers cultivated many varieties of paddy such as 5451, Dai Thom, and 504.

planning to form a farmers' cooperative in Village B, explained why farm households did not want to cooperate with each other: 'Each household was accustomed to working on their own, they don't want to share work with other farmers. Here they're only seeding the crop at the same time so that they can better harvest their crops' (HH11). The same reason was observed hampering the effectiveness of the Tan Hung farmers' cooperative founded in 2016. Although having over 30 households registered as members, this cooperative has not had any activities due to the farmers' lack of trust in this kind of activity (Cau Long, HH20). This was believed to result from the period of collectivisation (1976-1988) when the State attempted to contain private farm households in cooperatives. Thus, farmers in Tan Hung commune cooperated with each other only spontaneously on a small-scale. This cooperation could be among farmers with adjacent rice fields, for instance, who were able to see that without leadership and effective organisation, they lacked power in negotiation with merchants/buyers.

Second, as a result of the lack of organizational power, voluntary crop production of each farm household prevented them from meeting the standards of producing high quality paddy. The lack of organised routines prevented farmers from applying the same procedure in crop production, lacking consistency in procedures such as selecting quality seeds, seeding time, adopting cropping techniques, using appropriate fertiliser and pesticide, harvesting time, and selling price.

According to household interviews, these conditions engendered many disadvantages for farmers. *The first obstacle* was the intermediate fees. An estimate reported that only 4.2 per cent of total paddy was directly sold to exporters, while the remaining was sold to intermediaries such as collectors and millers (Pham & La, 2014). As such, the farm gate price of rice (i.e., the price of paddy sold by farmers) and farmers' earning from rice sales were very low compared to other actors in the value chain (Coxhead, Linh, & Tam, 2012; C. Tran, Do, & Le, 2013). The metaphor of '10 rice seeds' provided by Mr Bau Duc, an experienced farmer in Village A, well captured the burden of heavy intermediate fees:

> If you produce, from paddy cultivation, 10 rice seeds, you would lose one seed for fertiliser and pesticide. Then one seed for labourers whom we hire to harvest paddy by cutting machines. Then another seed for brokers. Next one more seed for merchants who, to pay for intermediacy fee for brokers, must downgrade our paddy price. So, we lost already 4 seeds [out of ten]. (Bau Duc, HH15)

Despite the fees given to dealers, farmers needed these agents. They were considered by farmers to be better at this business. Mr Bong Chuyen, a Kinh farmer from Village A explained farmers' dependence on dealers or collectors:

> Here we hire dealers to cut paddy for 280,000 VND per cong. We pay 20,000 VND for each *cong* [in order for them to collect and sell them to merchants]. If we complain the fee is too much, they'll deduct like 10,000 VND. The role of dealers is important because of their power in negotiation with merchants. Good negotiation could result in better price ... If we're acquainted with dealers, we can get a better deal. When merchants come to buy paddy, dealers have managed to assemble all paddy with one price only. (HH17)

The market showed greatest instability when disasters hit the commune. Disasters like saline intrusion often affects local waterways. Waterways including canals and rivers are the main transportation ways of not just Tan Hung commune but also the whole VMD. Normally, brokers access the rice fields, negotiate with farmers, and buy all the paddy products and then transport the products by boats via canals and sluice gates to reach places where merchants wait to buy in a large quantity. From there, merchants, take all the paddy and transport them to millers or wholesalers. With this dependence on waterways, the rice business can be halved by two conditions, one is the closing of sluice gates to prevent saline intrusion, and second, when river and canals dry out. When water becomes scarce, salinity intrudes along the main rivers and the government will have to shut down sluice gates to prevent salinity stress from permeating local canals and attacking rice fields. Thus, the closing of sluice gates results in merchants' loss of access to rice fields and also to the middlemen who transport the paddy to the merchants. Mr Muoi Bich (55, Khmer), who is the head of Village B, explained that the lack of water had the potential to decrease their farm gate paddy price.

> For instance, as was the case last time, if there's water [in the canals] so boats can get in the commune, merchants bought the paddy at the price of 5,500 to 5,600VND/kg. But if there's no water and boats can't get access, then merchants must transport paddy by other ways [for instance, by trucks or motorbikes on roads] … In normal conditions, merchants could charge 50,000 VND per ton of paddy transported, but in the conditions of water scarcity, then they charge you 200,000 VND/ton. This reduces our farm gate price. (HH14)

The second obstacle was *the difficulty in selling paddy*. Selling agricultural products was a big problem in Tan Hung commune in particular and Long Phu district and Soc Trang province in general. Although there is a system of agricultural extension services (*khuyến nông*) established at all government levels (central, provincial, district, commune/village) (Pham & Babu, 2018), their support in helping farmers approach market was indeed limited. The extension supports such as providing technical trainings (e.g., three decreases, three increases or *Ba giảm, Ba tăng),* experimenting non-rice plantation models, establishing agricultural cooperatives were reported ineffective. The dominance of merchants in deciding the paddy market was reflected in an official's opinion:

> In agriculture nowadays, any crop is facing a difficulty in selling outputs. In Dong Nai province, they got the support from enterprises and developed mmarketplaces, but here we don't have such a luxury. This is the problem facing the whole province [Soc Trang], not just our district [Long Phu]. Here merchants [lái] decide the price' (Quy Ro, official, KII5).

With the lack of support from the government and the underdevelopment of private markets, farmers were left to face merchants by themselves. Merchants do not just want to buy high-quality paddy but also buy them on a large scale. Meeting the quality standard is a challenge for all farmers, but especially those who are poor and small-scale. Interviews revealed that poor farmers often did not have the level of knowledge or techniques that ensured productivity of paddy production, as did non-poor farmers. This was one of the reasons why Ms Sau Rieng (48), a female Khmer living in Village B, was so concerned about market risks: 'If the crop isn't successful, we can't sell paddy. They [the merchants] say the quality of paddy is too bad so that they won't buy' (HH6). Poor farmers also faced a greater challenge in meeting the quantity of paddy for sale. Mr Chay Ben (37), a Khmer male from a poor household of Village A, explained how merchants buy paddy:

> Merchants these days only buy paddy in a large quantity, say, hundreds of *congs* [one *cong* =0.1 ha]. If you've got 100 *congs* they'd buy; otherwise, with just 10 *congs*, you can't sell to them. You have to sell by combining your paddy with other farmers … Merchants only buy one large quantity of paddy assembled. (HH25)

Under such circumstances, it was hard even for non-poor households with larger landholding to sell paddy by themselves because it was rare for each farm household to possess/hold as large as 100 planting *congs* (10 ha) to sell. Poor and near-poor farmers confronted an even

more serious barrier because of their low productivity. It was reported that poor farmers often produced less yield per cong (0.1 ha) than did non-poor farmers. For instance, the HHIs showed that in 2017, poor and near-poor farmers produced 3.87 tons/ha, 4.55 tons/ha, and 5.85 tons/ha for crop 1, crop 2 and crop 3, respectively. These comparative figures for non-poor households were 6.09, 6.10, and 8.37 tons/ha, respectively.

The difficulties in meeting the quality and quantity standards from output markets revealed the lack of farmers' organisation supporting their access to output market as raised in existing literature (Ba, de Mey, Thoron, & Demont, 2019; Demont & Rutsaert, 2017). Farmers ran their business spontaneously on their own or with some fellow farmers, lacking cooperation in crop production on a large scale (from seed quality selection to sowing timing, from the use of fertilisers and pesticides to harvesting and sale). My findings are consistent with some studies which point out that the lack of investment in certified seeds, the lack of investment in agricultural machinery, and the lack of post-harvest infrastructure such as storage facility hampers farmers from conformity to sustainable production standards such as GlobalGAP (Global Good Agricultural Practices) and VietGAP (Vietnamese Good Agricultural Practices) (Demont & Rutsaert, 2017, p. 12). Farmers lack incentive in pursuing high-quality paddy because of the cost-price squeeze (i.e., the costs of inputs increase but the price remains stable or decreases), as indicated in other studies (Ba et al., 2019; Demont & Rutsaert, 2017). This insufficiency had placed them in a vulnerable position in selling their paddy, and more critically instilled the psychological mindset of disadvantage when dealing with merchants/buyers (H.Q. Tran, 2018).

Third is the *possible breaking of a deal by merchants*. At the early phase of crop cultivation, merchants start looking for paddy to buy. They could place a deposit (*đặt cọc)* to buy paddy from rice fields that they thought to be potentially successful. To enact the deal, they must deposit an amount of approximately 200,000 VND (about $8.6 USD) per *standard cong* (0.1 ha). In doing so, merchants and farmers reach an informal agreement on buying/selling a certain area of paddy crop at a certain price after harvesting. This informal form of contract implies that even if the market price changes (either increasing or decreasing) at the time of harvesting, they would still proceed the sale on the agreed price. For merchants, this deal ensures that they can buy a sufficient quantity of paddy; while for farmers, it ensures they can successfully sell their paddy, regardless of market fluctuation. In theory, if farmers break the deal, then they must pay back the deposit to merchants; whereas, if merchants break the deal, they lose the deposit. However, in reality, farmers are in a more vulnerable position because

merchants are more likely to break the deal. There are many factors affecting merchants such as: (i) if the deposit price is higher than the market price at the time of harvesting; (ii) if the quality of paddy is bad due to damage from disasters, pests or pathogens; and (iii) if the quantity of paddy collected is less than anticipated at the time of deposit due to damage.

Despite the risks, farmers still needed the deposit agreement due to many reasons. First, sealing a deposit increases the chance of selling paddy after harvesting. A successful sale was a relief as they were usually in greater need of cash at the end of each crop. Such earnings were needed to pay back the debts they accumulated pre-season to buy inputs and pay for labourers throughout the crop cultivation. The high cost of inputs and labour throughout a crop season left little or no finance at the end of season, even for better-off households. Second, failing to seal a deposit with merchants at the outset requires farmers at the end of crop to find a buyer. Having to negotiate in a short time frame forces farmers to lower their farm gate price. Third, and more fundamentally, farmers could not store their paddy after harvesting because they did not have the facilities and space for this purpose. My fieldwork observations showed that farmers often stockpiled their paddy at a farmers' house, rice fields, or near waterways, covered them in nylon to prevent rain, and waited for merchants to collect and transport. Under these storage conditions, paddy could be easily damaged due to rain or mice predation.

Disasters and weather extremes, pest attacks and rice diseases, and market instability were regarded as the most common threats to crop production. However, the most feared factors depended on each farmer's experience and perceptions. To further understand which threats are most feared by farmers, my interviews asked participants to rank the risks they had mentioned (see Table 6.2).

Table 6.2. Ranking risks to crop production

Threat ranked as the most feared risk	Reasons
Market instability	- Market is unstable, out of control.
Pests and rice diseases	- Requiring frequent monitoring. - Finance constraints preventing lasting treatment of pests and rice diseases.
Disasters	- Having unexpected occurrence. - Intensifying other threats such as pests and rice diseases. - Causing biggest challenges for predicting, preventing and coping. - Being beyond human control.

Source: Consolidated from HHIs

Results demonstrated that 20 out of 28 households considered weather and hazardous conditions as the threats of most concern; six were most concerned by biological threats including rice pests, rice blast diseases and mice infestations concerning; while only two mentioned market threats.

In terms of market instability, Muoi Bich, a male farmer from Village B explained: 'Even if we've produced ample products, the market's unexpected ups and downs are the determinant … We're the slave of the market. It decides it all. The market is biggest' (HH14). A number of farmers chose rice disease and pests as the most feared threats as they required the rice fields to be monitored at all times. Not only was constant monitoring a challenge for some because their land plots were dispersed, but also, for most farmers, the seriousness of pests and rice diseases could be compounded with weather changes. Thanh Long (57), a male Khmer man from a non-poor household, explained this situation:

> I'm most concerned with visiting my rice fields [regularly to check for pests or rice diseases]. [We have to see] the state of water, rice disease and pests to decide if we need to put down fertiliser or not. We also have to look at the weather, rainy or windy, to spare pesticide and fertiliser. We can only use fertiliser and pesticide after rain and wind have stopped. (HH4)

For poor farmers, like Mr Cam and Ms Dua Hau, their biggest concern was not the insect pests or rice disease per se but the fact that their households cannot sustain the finance to buy fertilizer or pesticide to cope with the pest epidemic. For example, Cam (33), a Khmer man from Village B, commented: 'I'm concerned how to find the money to buy pesticide and tools to spray for my paddy' (HH8).

Although these two threats were serious, most farmers interviewed indicated that natural hazards were the most threatening factor. As the interviews revealed, natural hazards were the most unexpected stimuli:

> Crop loss nowadays, to be honest, is attributed to natural hazards. No hazards, no crop loss because we have scientists, we have television and the press to warn us, we are taught production techniques. Crop production for farmers is easy. (HH26)

In comparison with pest and rice diseases, farmers deemed disasters to be a bigger threat because of the *unmanageable* features. Feeling powerless was shown in the opinions of poor farmers 'I'm more concerned with disasters because we can't stay away from it. But we can prevent rice diseases and pest' (Buoi, HH7), as well as better-off farmers:

> Pest and rice diseases come every year. We can still cope with them. But we can't actively prevent the weather. All of these threats are of concern, when the paddy is young, the concern is about pest and rice diseases, and when harvesting, the concern is storm with heavy rain. (Boi Loi, HH22)

It was not just the inability to foresee the occurrence of disasters, but also the lack of ability to effectively cope with this threat that makes it incomparable:

> Disasters are the most concerning factor. Pest and rice diseases can be controlled; for instance, rice blast disease we can have pesticides to kill the disease, or we can use specific measures to prevent mouse attack. However, we can't cope with disasters. For instance, two years ago, television warned of a storm suddenly approaching the South that made us harvest paddy while still immature. So, losing 30-40 per cent of a crop is that easy. (Quan Vot, HH21)

Conclusion

I have examined the ways farmers memorised the 2015-2016 event. In this description, they did not portray the event using big words such as a 'crisis' or 'disaster' but as a crop failure. They expressed the event in four main themes including physical damage, productivity failure, financial crisis, and psychological frustration. Most farmers showed that they were knowledgeable agents who well understood the causes of the disaster. They could identify saline intrusion as the main cause of the event but only several of them could link this phenomenon to drought and upstream lack of flood.

In addition, I have also delineated the local ways of expressing and defining the key terms of natural hazards and risk. Natural hazards were differently perceived, with some believing their occurrence were due to an abnormal change of God's power, while some tended to describe them as climate changes, with a few explaining them in terms of social disturbance (e.g., crop pattern disruption). Risk was perceived as a seeming balance between positive and negative, entailing both opportunities and challenges. One of the highlighted ways of expressing risk was to portray it in terms of action – which was exaggerated in the image of risking one's life planting crop 3. Although they were asked to reflect on the risk to their lives, farmers tended to centre the threats on their crop production, which showed the importance of the agricultural

field to their life. They could map out three major threats facing them in the field of agriculture, including natural hazards, market instability, and rice pests and pathogens. Natural hazards were ranked as the most feared risk due to farmers' inability to cope with this type of threat. The knowledge of and approach to risk shows a disposition (habitus) towards risk: accepting risks and being willing to take risk. This will be discussed further in Chapter 7 when I highlight the role of farmers' habitus in negotiating between risks and structural conditions of the field and farmers' needs and capital.

CHAPTER 7. HABITUS AND CAPITAL IN RISK TAKING

Cultivating the third rice crop in the dry season is considered as a risk-taking endeavour. This is social practice in Bourdieu's theory of practice. Then, the question is that what drivers motivated and constrained such practice. To answer this question, I, replying on Bourdieu (1977, 1984, 1990a, b), try to answer why farmers took/reduce risk by examining these practices in association with their habitus and their access to capital in the field of agriculture. I start the chapter with the discussion of how farmers' habitus and their cultural capital formed the ways farmers approached risk and risk management strategies prior to the 2015-2016 event. I explain further this habitus towards risk by examining economic capital in the forms of money, land holding, and other relevant assets and also the structural conditions appearing in the field of agriculture and the field of economy. I finally discuss social capital, first by demonstrating the use of this capital in terms of information sources, then by examining linking social capital (farmers with the government's officials), bridging social capital (farmers with agricultural input suppliers) and bonding social capital (farmers with neighbours and fellow villagers).

Cultural Capital

'Live for Rice, Die for Rice'

On review of farmers' habitus, the ways they casted blame reflects their collective habitus and cultural capital. When being asked who should take responsibility for the crop failure, most interviewees (22) clearly indicated that farmers themselves should be the one taking the first responsibility in the bad harvest of the 2015 crop 3. The activeness and voluntariness of making decisions on engaging in crop production in the dry season was highlighted.

> This crop was done by the people, the people must take responsibility for [their loss]. There was warning [not to do crop 3] but the people did it spontaneously. For instance, this year, the provincial government issued an urgent warning [saying not to cultivate crop 3] but the people still decided to do it. We can't prohibit, it was stated that it's a

> warning, not a prohibition … It's farmers [who should] because the government never [told them to do it] … Because farmers did it by their own will. (Chin Ro, HH28)

Accepting blame on their part from the beginning was the prime example of defending their way of life (Douglas & Wildavsky, 1983), and therefore, to defend their habitus as Bourdieu (1977, 1990a, b) would argue. What is interesting in farmers' discourses was the terminology they used to accept blame. There was only one farmer who used the term 'I' (*tui*) which clearly indicated that it was her own personal responsibility rather than someone else's, although she also used 'we': 'It was no one's responsibility. Just risked it. I risked doing it. We tried to risk it. It's my responsibility, not the government's. Because I tried to earn food … Because of poverty' (Dua Hau, HH5). The remainder of interviewees used words like 'the people' (*người dân*), 'everyone' (*ai*), 'farmers' (*nông dân*), 'households' (*hộ gia đình*) or 'I/we' (*mình*). These terms often represented a collective entity rather a specific individual. Although this collective entity included the farmer participants themselves, it was like the 'other' – the object outside themselves. In other words, the interviewed farmers separated themselves from the situation, making themselves as a seeming observer rather than the persons who were actually involved in the event. Even use of the personal pronoun term *mình* is ambiguous, as it can be understood as either the singular 'I' (personal) or a plural 'we' (collective) depending on the context. It was apparent that farmers attempted to employ this vague identity to cover their own shame. By putting responsibility under a collective entity, farmers may feel less pressure from the blame. The blame, as apologies (*xin lỗi)* (T.K. Nguyen, 2015, 2016), could incur the fear of social criticism and self-responsibility, which were very serious for Vietnamese. Consequently, to reduce the burden of blame upon their own shoulders, farmers appeared to alienate themselves from the situation. This mindset or disposition seemed very close to the fashion in which farmers put themselves in the shadow of 'the people' when addressing responsibility. The personal guilt was lessened when being immersed in the collective culpability. For instance, instead of saying it was my own responsibility, Mr Xoai, a Khmer, articulated: 'It was due to the fact that *everyone* did, so did *I* (*mình*)' (HH9). In this statement, despite implying his responsibility, Xoai appeared to be placing the blame on the 'other'. The 'other' seems referring to not just the fellow farmers or the farmer's community at the present time, but also the 'farmers' in the genealogies. For them, the rice crop was not a personal choice; it was the inheritance of their family tradition. '… if we don't plant a rice crop, what else should we do? That's what rice monoculture [*độc canh*] is like [sticking to only rice crop] … That's it' (Bau Duc, HH15). Therefore, the choice of being 'farmer' or engaging in rice cropping is an

inherited habitus, and it has become a cultural capital because it equips farmers with substantial knowledge, skills, experience so as to be successful in farming career.

In defending rice crop, it was seen how farmers' habitus was formed, maintained, and operated in the mixture of different, even conflicting, forces such as failures/crop losses versus profits, rice fields/crop/farming career versus natural hazards, hunger/death versus survival, tradition versus modernisation. Their habitus tell them that there are no other ways of sustaining income outside investing in land, rice crops, and farming and accepting risks deriving from doing so. Some farmers confirmed this point by emphasising the fact that the locality was dominated by rice monoculture:

The following statement suggested that farmers took the risks during the 2015-2016's crop 3 even though they knew they were gambling. Thus, blaming reflected farmers' defense of their core values.

> There was warning [before the crop] but our people were too stubborn to follow. There was partly our people's responsibility. So, when the State blamed us, to think deeply we knew that it was our farmers' responsibility in planting the crop since they [government] didn't allow them to do so. The State told us that: 'This year saline water would intrude harder than ever, but we still did the crop'. We lost but as farming is our career, we can't drop this crop. We still risked it, it was a matter of *sinking* or *swimming*. Our crop is good if salinity doesn't intrude and rain comes early; rain comes late then we must bear the loss [smile]. (Dien Kinh, HH23)

The discourses such as 'We only have rice fields', 'We live for rice fields', 'We die with rice fields' emphasise the significance of rice cropping to local farmers. The farmers were not ignorant; they knew rice cultivation was filled with risks. In other words, they very well understood and willingly accepted that risk is a structural condition of the field of agriculture. As a structural condition, risks can be either suffering or rewarding. As such, they need to be patient. One farmer explained:

> Farmers live *for* rice fields, nothing else. If we lose this time, we already think about preparing for next time [*Thua keo này bày keo khác*]. We keep doing so. If this year is fortunately supported by good weather and high prices, farmers are good. Otherwise, we accept it. (HH16)

Thus, for the farmers, rice crop was not a once-in-a-life-time gamble; it was their lifetime game. It is blended with their ways of life, their habitus or the 'cognitive and motivating structures'

that direct how they see things, perceive risks, and act as they do. Farmers understand that they need to prepare for a long-term, continuous battle should they choose to engage in the rice cropping career. The habitus of '*Live for rice, Die for rice*' refers to not just rice but also its inseparable partner – land or fields. If rice equals livelihood, land or fields equals property. Farmers were discouraged by lack of land security during the collectivisation period (1976-1988), which strongly limited them from investment in crop production. However, after land reforms provided more land security, land or rice fields was again seen as a fundamental. Rice fields are much more than an economic capital; it has become a cultural capital, a representation of farmers' fundamental values thanks to farmers' habitus of living and striving for rice production. This habitus was explained further by Mr Bong Chuyen (40):

> I'm not scared of [saline intrusion]. We live for the rice fields so we keep doing it. We have rice fields; just keep doing it, no matter the outcome. Just think like that: Regardless of the outcomes. If this crop fails, we try for the next crop. It's normal. For instance, after the incident, we succeeded with crop 3 in 2017 and 2018. If we only did crop 1 and 2, we're done. Never get profit. (HH17)

In sum, for farmers, their habitus orbits rice cropping. So do any values, livelihood choices, income generating, risk-related choices, and disaster risk management strategies. Engaging with rice cropping was taken seemingly as a natural given. They did not question it.

Normalising Risks

To invest in crop production, knowledge of and experience with disaster risks are must-have qualities. It is reasonable to comment that farmers in the research sites have rich knowledge of drought and saline intrusion – two of the most common hazards occurring in the coastal region of the VMD. However, Ka Co (official, KII4) offered an opposite of such a comment: 'Local people in this area have *never* ever been affected by saline intrusion so that they *ignored* it [in the 2015-2016 crop 3 production]'. This opinion suggested an important truth: farmers indeed did not have much experience with the effects of saline intrusion – the main threat in the 2015-2016 historic event.

Interviews with farmers support such an opinion. The intrusion of salinity and its damage to crop production were observed, but seemed to have faded over time in the farmers' memory. For instance, in the following excerpt, Mr Bau Duc, an experienced Kinh farmer recalled that before the 2015 historic event, salinity occurred once in 2013: 'That year all the crops died [by

saltwater intrusion], merchants didn't buy our crop … I don't remember whether it was 2013 or 2014. That year all crops were lost' (HH15). Just two years passed, the loss in 2013 seemed to be forgotten. Or to be more exact, the memory of disasters was ignored. As such, Bau Duc and his son-in-law (Bong Da) kept cultivating the 2015-2016 crop 3. Bong Da (HH15) even invested more in the crop 3, upgrading his planted area from 6 ha to 10.01 ha. Bong Da and his wife explained why:

> Before the 2015-2016 crop 3, our family knew that saline intrusion would come but still planted the crop because we had cultivating this crop for a long time so it has become our habit. Its high yield fuelled our continuous cultivation (HH15)

So, it is clear that the farmers knew but still took the risks because of their habit and past successes. This suggests that successes can help form habit or patterns of practices. While memory of failure might be left to be faded, the experience of success seems to be kept for a longer time. This was the case of Mr Boi Loi, who leased an area of 5.85 ha to expand the 2015-2016 crop 3's planted area to 11.31 ha. He cited the previous crop 3's success as a reason for his choice: 'I saw the previous year yielded very good so that I borrowed more land for the 2015 crop 3. Unfortunately, salinity came [he said with a smile]' (HH22). In 2015, his crop 3's productivity was just 4.62 ton/ha, dramatically dropping from 9.23 ton/ha in 2014.

Past successes gave farmers a false sense of profit, whereas a lack of past failures gave farmers a fallacious sense of risk. In their history of cultivating crop 3, the Oi Dao family suffered from saline intrusion on only one occasion. This lack of experience with the serious consequence of saltwater intrusion made Oi Dao feel more secure in attempting the third crop in the 2015-2016 season. He took for granted that crop 3 would be risk free.

> Some time ago, maybe since the 2000s, I already did it [crop 3]. Before 2015, my crop only failed once, and with 2015 [the end of 2016] being the second time. So, from the 2000s until now we have failed only twice. (Oi Dao, HH1)

Lack of disaster experience and past successes can obscure farmers' rational calculation, making them normalise risk. After the 2015-2016 event at the district level, the Long Phu DPC attempted to persuade farmers to change crop calendar and structure by dropping crop 2 so as to cultivate crop 3 earlier to avoid the risk of saline intrusion. However, this attempt was unsuccessful because of farmers' resistance. A district official's remark reflected nothing but the concept of habitus in Bourdieu's sense:

> Indeed, our local people cultivate crops *without calculation*. Doing it in such *a way* [keeping cultivating triple crops] returns no profit … If crop 2 fails due to storm with heavy rains, there'll be little harvest. If there won't be a profit, why not dropping it to save time for crop 3? But they *still* plant the crop [to maintain triple cropping system] because they follow their *routine* [without concern of risk]. Our warning of risks is useless. They won't listen. (Quy Ro, official, KII5)

This comment indeed implies something bigger than just a single crop choice. It is the habitus that drove farmers' action in such a direction that they did not consciously assess the risk and profit of maintaining crop 3. They just simply followed their routines, which kept them away from listening to risk warnings and led them to take the risks of planting the 2015-2016 crop 3 without proper risk- avoiding or mitigating measures. If we combine Quy Ro's remark with Oi Dao's above story, it can be seen that the contemporary habitus and action pattern in farming crop 3 was connected to the evolution of the agricultural field discussed in Chapter 5.

Economic Capital

Economic Capital – Quest for Profit or Food?

Economic capital in the form of money (savings) or property rights (the rights to land use) is crucial to farmers in making decision in regard to risks. Data from field interviews showed that from a land use perspective, most households took risks as they went on to plant the 2015-2016 crop 3 (Table 7.1). Three types of strategies were found in preparing for the risks of the 2015-2016 crop 3 season's saline intrusion: reducing the planting area for the crop (four households), and expanding the planting area for the 2015-2016 crop 3 by leasing more land (11), cultivating all available landholdings (13). The last two groups took a more risky approach because they invested in the crop more than did the first group.

Table 7.1. Risk taking strategies in cultivating third crop in 2015-2016 season

Indicators	Land use strategies*		
	Reduced	Leased	Unchanged
Number of households (n=28)	04	11	13
Number of poor and near-poor households (n=9)	0	1	8
Number of non-poor households (n=19)	04	10	5
Average landholding in 2015 (ha)	7.61	2.93	0.97
Average planted area for 2015 crop 3 (ha)	1.66	5.91	0.97
Average land affected area (ha)	1.34	3.64	0.80
Average government aid received (thousand VND)	1,475	5,512	1,105
% of affected area in the 2015 total land holding	26	142	88
% of affected area in the 2015 planted area	63	51	88

Note: *Land use here denotes the land area farmers claimed to appear in their certificate of land use right. Land that was leased or mortgaged was not considered.

Source: Developed from Household Interviews and Tan Hung's list of households receiving government aid for the 2015 crop loss.

It can be seen that despite being the largest landholders with an average landholding in 2015 of 7.61 ha, the 'reduced' group only invested 1.66 ha (21.8 per cent) in the 2015-2016 crop 3. Meanwhile, the 'leased' group possessed an average land area of 2.93 ha in 2015 but they invested 201 per cent of such an area in the 2015-2016 crop. As a result of risk-taking, the 'leased' group was the one suffered most from the 2015-2016 disaster, with 3.64 ha affected area, while the 'reduced' group, despite their largest land holding, suffered just 1.34 ha. Put this in perspective, the total affected area of the 'leased' group was about 142 per cent of their total land holding in 2015, whereas, this figure for the 'reduced' group was just 26 per cent.

A look from a poverty status perspective makes it clearer the impact of socio-economic status on risk taking. All of the 'reduced' group were non-poor households (four), which implies that the households with larger landholding and better-off economic status were the one with more cautious in risk reduction and avoidance. Yet, most of risk-takers in the 'leased' group were also non-poor households (10 out of 11 households). By contrast, most of poor and non-poor households (eight out of nine) were present in the 'unchanged' group. Taking risk by expanding the planted areas was clearly not the option for poor and near-poor households because they did not have savings or assets to put up as collateral for leasing more land area. It was reported that to lease a land area of 0.1 ha for the whole year cost around 2 million VND. If the period was only for one crop, the fee for crop 1 or 2 could be 900,000 to 1 million VND, while for a crop 3 could be around 400,000-500,000 VND. The disparity was explained that as crop 3 was

more risky there were less people who wanted to lease land for it, hence the land rent was lowest. Regardless of the rent period, non-poor households had a better capacity (more savings and available cash) to extend planting area through this approach. As an example, while he only possessed 1.43 ha in 2015, Chin Ro (37, HH28) from Village A was able to borrow an area of 1.56 ha from his father and brother in Chau Khanh commune[8] for the 2015-2016 crop 3. Borrowing land from family and relatives for crop cultivation could help borrowers lower land rent fees, and eventually avoiding the risk of falling in debt if the crop fails. In addition to this advantage, Chin Ro also benefited from the fact that the earlier cropping timing in Chau Khanh commune, where farmers often started sowing earlier than did farmers in Tan Hung commune, helped him avoid the effect of 2015-2016 disaster. This was the reason why Chin Ro's crop 3 only lost the crop 3 he cultivated in Tan Hung. By contrast, poor households, while took risk of facing saline intrusion, had no choice but continued using their own land rather than seeking to borrow land from other landowners. Asked if they wanted to borrow more land for crop production, Ms Mit, a near-poor household in Village B, responded: 'We don't have money to lease land, my dear. People lend land but we don't have money to take on a loan' (HH10). These contrasting cases show that non-poor households were also the ones having more access to social capital, while poor and near-poor households did not have strong social capital that helped them have an immediate access to land or money. Having higher socio-economic status or having better economic capital is obviously in a close relationship with having higher volume of social capital.

In addition to the possession of land and savings, non-poor households were also the ones who possessed relevant assets to take or avoid risk. For instance, Mr Man (78), non-poor in Village B, actively took preparation to mitigate the 2015-2016 disaster because he possessed ploughing machine. He recalled:

> I heard the information of early saline intrusion from commune government and village staff so I planted the crop 3 earlier. So, when salinity intruded, my paddy was already matured. At that time, I didn't need to pump saline water so my paddy wasn't affected. I started my crop as early as late December of 2015, seeding at that time [because] I [was able to] use my *ploughing machine* to help me prepare the soil early for the crop. Other households only started by the end of January because they did not have

[8] A commune of Long Phu district locates near Tan Hung commune.

> machines. When their paddy began forming panicles [in the peak of saline intrusion], they needed to water their paddy with saline water. (HH11)

This strategy helped him plan ahead and mitigate the risk to the minimum, though he extended his planted area during that season. He reported that the 2015-2016 crop 3's productivity was 900 kg/0.1 ha, only slightly decreased from 1.2-1.3 ton/0.1 ha in the previous crop 3. Given the situation that many households' crops were completely lost, Man considered his crop a good harvest. Without his ploughing machine, Man would not have been able to plant the crop 3 earlier.

Although economic capital (land, assets, money) was important in explaining risk taking, reduction, and avoidance, there were some cases needing more insights. For instance, why non-poor households with large landholding were present in both the risk-taking group ('leased' group) and the risk-reduction/avoidance group ('reduced' group). If we follow the logic of the risk-reduction group, the non-poor households with large land holding in the risk-taking group should be more alert in expanding land area because they would lose more if the crop fails. Thus, besides economic capital, there is the habitus that pushed farmers in planting crop 3 for profit. This habitus has been well inscribed in farmers' farming system.

As mentioned above, local farmers in Tan Hung commune and many other places in Soc Trang province and the VMD's regional provinces use a triple rice cropping system. This system includes three rice crops a year with crop 1 (Summer-Autumn) and crop 2 (Autumn-Winter) as the main crops (*chính vụ* in Vietnamese) and crop 3 (Spring-Summer or late Winter-Spring) as a supplementary crop (*trái vụ* or *vụ nghịch*). The dichotomy of main/supplementary crops implies that originally only the first two crops are practiced in an appropriate timing; whereas, crop 3 is additionally cultivated during the fallow period. Nevertheless, the contribution of each crop to a farming household's earning was different. Discussion with farmers reported that one of the reasons why they cultivated crop 3 was that this crop was preferred over the other two crops. This preference firstly came from the opinion that crop 3 was more productive. To validate their opinion, I asked households to estimate roughly each crop's productivity per year (Table 7.2).

Table 7.2. Crop productivity comparison by year (unit: ton/ha)

Year/N	Crop 1	Crop 2	Crop 3
2018	5.60	5.62	8.04
N	25	26	24
2017	5.56	5.69	7.85
N	25	26	24
2016	5.11	5.30	7.40
N	26	27	19
2015	5.44	5.53	2.81
N	28	28	27

Note: N = number of households providing data on productivity.

Source: Developed from Household Interviews

As seen in Table 7.2, each household calculated productivity based on their unit of land area. Most farmers from Village B used the unit of *standard cong* (*công tầm điền*), with each cong equal to 0.1 ha. Most farmers from Village A used the unit of *large cong* (*công tầm lớn*), with each large cong equal to 0.1296 (or 0.13) ha. To compare between two villages, I calculated using the unit of ha, with one ha equal to 10 standard congs. The following table presents the productivity at ton per one ha from 2015 to 2018.

Crop 3 was reported to often produce higher yield per ha than the first two crops. Except for 2015 – the year affected by the disaster – crop 3 often generated from 7.4 ton or more per ha. Meanwhile, crop 1 and crop 2 only yielded around 5.11 to 5.69 tons per ha in the same year. Thus, it must be very successful to obtain a yield of 700-800 kg per 0.13 ha in the first two crops, but 'if you can only harvest 1 ton [per 0.13 ha for crop 3], it means your crop very much failed [that]' (Bau Duc, HH15). While the price for paddy varies season by season, it was noteworthy that price of crop 3 was often higher than those of crop 1 or crop 2. For instance, the price for crop 3 paddy in 2017 was 5,800 VND/kg, while this figure for the other two crops in the same year was from 4,700 to 4,800 VND/kg. If we use the 2017 price and the average productivity to calculate the income, one ha of crop 3 that produced 7.85 tons/ha could generate an income of VND 45.5 million (around US$1,955.6). This figure of crop 1 or crop 2, with the productivity of 5.56 tons/ha and 5.69 tons/ha respectively, could only produce an earning of from 26.4 million VND to 27 million VND (or US$1,134.7 to 1,160.6) respectively. Even Mr Quan Vot, the farmer avoided cultivating the 2015-2016 crop 3 despite holding the largest land area in my sample (15 ha), commented: 'Crop 3 is the most profitable crop in a year, almost as twice as profitable as the other two crops' (Quan Vot, HH21).

The advantage of crop 3 over crop 1 and 2 on market also indicates that the economic capital and habitus must adapt to the economic structure or the rules and conditions of the field of agriculture. Farmers, as agents in the agricultural field, were smart enough to understand which crops the market favours. And they also understood that high risk accompanies high return. This was why despite recognising the risk of saline intrusion, a Khmer farmer went on to plant all of his land holding (4.2 ha) in the 2015-2016 crop 3:

> Uhm, our people *must* cultivate crop 3 because this crop yields very good. Normally, each [*standard*] cong [0.1 ha] could generate an amount of paddy equal to the total yield that two congs of crop 1/crop 2 could do. So, although the State informed not to plant the crop, we still did. If we fail, we take the responsibility. But if we win, [smile] it's really good. [Thus] we risked our lives. (Tao, HH3)

The potentially high profit of crop 3 was believed to outweigh the potential risks of facing natural hazards. This motivated farmers to overcome fear and take the risk. There were few things that could stop them, including warnings from the local government. Bong Ban, a farmer who despite reduced 5.2 ha in the 2015-2016 crop 3 to avoid risk, acknowledged the influence of crop 3's promising profit in pushing farmers to take risk:

> The first two crops could generate around 800-900kg [per *a big cong* 0.13 ha] in the most ideal conditions [no storms or pest]. Crop 3 in general condition could produce 1.2 ton [per 0.13 ha], thus, our people like it very much. Even if you kill them, they still try to do it. (Bong Ban, HH17)

This statement shows that for some farmers, it was not that they ignored the risk; rather, they knew the risk and accepted this challenge. Seeking profit was the habitus that led Oi Dao to lease 5.2 ha in addition to his own 7.4 ha to cultivate the 2015-2016 crop 3. He, while acknowledging the risk, could not restrain from the idea of taking risk: 'The third crop is a gamble. If it succeeds, it will be very profitable' (HH1).

If non-poor households quested for profit, poor and near-poor households quested for food security or subsistence. For them, taking the risks of crop 3 was a must for survival. Asked why she did the 2015 crop 3, Sanh, Cam's wife, reckoned: 'We risked it, my dear … I calculated in my mind that if we didn't do it, we'd have no food. Hence, we had to try … I told my husband that: Just try, if we have God's blessing, we'll have something to eat. If we don't have, then just leave it like that' (Sanh, HH8). For Sanh, risk taking in crop 3 production thus was normal or at least, much less serious than suffering starvation. For Sau Rieng, there was no difference.

Risk taking for her family was clearly a compulsory path they must take in order to obtain food: 'It was no one's responsibility [for our crop losses]. [We] just risked it. We risked doing it. We tried to risk it. It's my guilt, not the government's. Because we tried to earn food … Because we're poor' (Sau Rieng, HH6). A similar sense of risk acceptance was expressed by Dua Hau whose household was dragged into poverty due to the 2015-2016 event: 'They [the government] informed that we couldn't plant [the crop 3], but if we didn't, there was nothing to eat. So, we risked our lives to do it. If the crop was successful, we were good, if it died, we accepted responsibility' (HH5). Between the potential risk and food deficit, poor farmers chose the latter.

In addition to the economic capital, it was seen that crop 3 was chosen because it received favourable conditions from the natural environment. First, the third crop is in the dry season from December to April. This timeframe ensures sufficient numbers of sunny days, which leads to less pest infestation and rice pathogens. With less use of insecticide and fertilizer, and less input costs, crop 3 is more productive. Second, as the crop harvesting time falls within the dry season – a period enjoying longer sunshine duration and less rain, harvested paddies are not wet so as no efforts and fees needed for drying out. This condition allows farmers to sell their harvests at a higher price than they do for the first two crops, which must be decreased to pay buyers the fees of paddy drying services. A farmer confirmed this point: 'growing the third crop is easier [because] the dry season makes it easier: less pests, yields more, higher price' (Chay Ben, HH26). Another farmer from Village A agreed with this opinion. He explained in more detail:

> During crop 1 and 2, it rains more often, so we are really worried. Because of it, productivity is low with lots of damage. For crop 3, we aren't scared of the rain or wind [because they rarely occur in the dry season]. Thus, its productivity is high. That is why the people are so determined to grow crop 3. (Bong Ban, HH20)

In other words, as crop 3's production was highly favoured by the climatic conditions, it can reduce the investment cost and increase benefits for farmers. As such, it was not surprising that farmers deemed this crop more critical to their income than the other two crops.

Field's Barriers Against Risk Avoidance

One of the questions might arise in examination of farmers' risk taking was that if crop 3 was a risky livelihood, why farmers did not convert rice-based livelihood to non-rice livelihood

(e.g., wage jobs, vegetable cultivation, animal husbandry). Answering this question unveils the characteristics of the agricultural field in particular and the economic field in general that prevent farmers from escaping the former field.

First, *age* was seen as a decisive factor in preventing farmers from joining non-agricultural markets. Being older could be a disadvantage in the non-agricultural job market. Indeed, as Dien Kinh (65, HH23) noted, in the wage job market, the old labourers cannot compete with younger ones whom employers often preferred to hire. This was one of the crucial conditions of social structures, which refrained farmers (agents of the agricultural field) from joining other economic fields such as the field of wage jobs.

Nevertheless, it was not just the structural conditions of the fields but also farmers' habitus that matters. Although only those aged 60 years or more are legally considered elderly (NAV, 2009), it is interesting to see how younger farmers viewed themselves in such a category. When asked why they did not find non-rice livelihood to avoid the risk of saline intrusion, farmers cited being 'an elder person' as one rationale. This rationale was proffered not just by those who were nearly 80 years of age like Man (HH11) but also by those who were only 56 like Mr Oi Dao: 'Me and my wife [55] are too old to go out for other jobs. No one would hire us and we also can't do anything else' (HH1) or Bong Da (Kinh, 42, HH15) who considered himself and his wife as too late to change to another job. It is interesting to see how farmers' disposition of working in rice cropping limits their search for other livelihoods.

The age factor is often accompanied by health issues. Households with their main breadwinner and/or household heads experiencing health problems have little choice outside rice production. In the case of Mr Xoai's family (HH9), they faced both aging and the lack of healthy labourers. While Xoai (62) lost his wife in 2014, his two older sons are mentally disabled and unable to contribute to the family's work. Xoai himself had been very sick for 4 to 5 years. This condition of Xoai has limited his ability to work his 0.26 ha of rice fields (the agricultural field), let alone finding other employment in other fields. It is not only those of old age, but also those younger, such as Cam (33), who faced tremendous challenges to work outside the agricultural field because of the health deficiencies. Asked why he did not search for a non-agricultural job, he spoke about his physical disability and inability to engage with farming work. Although he could go fishing, it did not generate much income. As his wife had to take care all of rice crop cultivation, she had no time for other work (HH8). In another case, Ms Mit (50) and her husband (55, HH10) also found it hard to change their traditional livelihood. Since before 2016, with their health problems, they were unable to work long in

rice production and have had to depend on their children's support to cultivate crops. So, although health and physical ability belong to agents' capacities, they were critical in the entry requirements for non-agricultural fields.

Besides age and health, the other fields of livelihood also require different skill sets than did the agricultural field. For instance, Mr Chin Ro (37) considered it was too late for him to learn something new, even planting another type of agricultural crop. Asked why he did not cultivate vegetable crops instead of rice crop 3, he replied: 'Apart from rice production, I don't have any experience of planting vegetables or fruits trees… Moreover, in this local area vegetables also can't cope with salinity' (HHI28). Farmers did not see benefits to change their traditional livelihood. Asked why they did not convert rice crop to vegetable crop, Mr Tao, a Khmer farmer, asserted: 'vegetable crops generate less benefits than the third rice crop, but require more labour effort in taking care of and monitoring the crops' (HHI3). Similarly, the household of Luu (HHI13), a Khmer family with both husband and wife under 40 years of age in Village B, once unsuccessfully tried growing chilly peppers and attibuted their failure to the lack of knowledge and skills.

In the broader picture, to succeed in non-rice fields, farmers faced the same challenges of finding markets for selling their products. To change from cultivating three rice crops a year to two rice crops and one vegetable crop, or change from farming to another livelihood such as fishing, the key problem was how and where to sell produce. As observed from my fieldwork, before the 2015-2016 event, individual households voluntarily experimented with vegetable crops, such as Luu (HHI15) or Tao (HHI3), but failed. Only after the 2015-2016 crop losses, local governments at the district and commune levels offered farmers support in linking farmers with produce markets. For instance, an attempt was made by the Long Phu's Division of Agriculture and Rural Development in late 2017 to change the third rice crop to a vegetable crop (maize). The government cooperated with a company to trial the model on the field of a household which had a member holding a position in the village branch of the Communist Party of Vietnam. The company signed a contract with the farmer stating that they would buy one kilo of fresh corn at the price of VND 4,000. However, at the time of harvesting, the company changed this arrangement by reducing the price to VND 2-3,000 per kilo of fresh corn because they asserted that the produce did not meet their standards. These standards, however, were not clearly explained in the contract with the farmer. From this failure, local farmers saw that a maize crop was not as effective as rice crop 3, so they decided to stick with

the latter (Cau Long, HH20). This example shows not just the lack of access to produce market for new crops, but also the dependence of farmers on government support.

In sum, to drop rice crop 3, it was necessary that local farmers have to not just equip themselves with basic capacities (age, health) but also to renovate themselves by learning a new skill sets, getting familiar with the new markets (new field conditions). These conditions were hard to obtain in a short period of time. As such, farmers are facing a dilemma: they find it hard to convert to non-rice livelihood but can barely live by rice farming, which leads them to have no other choices but taking risks. The observation that while farmers were stifled by the dominance of rice production, they could hardly generate more than basic subsistence from rice farming still holds true (Bruun, 2020; Coxhead et al., 2012; C. Tran et al., 2013). This is especially true for households occupying a more vulnerable position such as the poor and near-poor households. These households can fall into the so-called 'generalized vulnerability', which combines the lack of economic capital (e.g., low income, poor access to markets), spatial vulnerability (e.g., living in remote locations), and ecological vulnerability (dependency on livelihoods with limited access to natural resources or living in dangerous locations) (Wisner, 2013, p. 258). My findings show that the 2015-2016 calamity was already prefigured by households characterised by a lack of capital insufficient stock of human capital that is useful for their market accesses or livelihood conversion (e.g., low education level, lack of health and physical capacity) and/or low economic capital (low income, lack of relevant assets, small landholding). The 2015-2016 event, in turn, exacerbated such vulnerability and pushed them further into crises resulting in them having to sell their land, become landless, or to seek income from unskilled wage jobs in big cities (Ravallion & Van de Walle, 2008; P. Taylor, 2007). This situation reflects Vietnam's ineffective disaster management because there has been much focus on infrastructure construction but a lack of due attention paid to policies and safeguards supporting those vulnerable people in the face of adversities.

Social Capital

Social Capital as Information Sources

Social capital enables farmers to access to valuable information sources that prove to be critical to their judgement of drought and saline intrusion risks. One of the essential sources is from the government bodies who are important in disaster risk management. In Vietnam, the

Ministry of Agriculture and Rural Development (MARD) is responsible for managing agriculture and rural development. This ministry is also the governing body of the Central Steering Committee for National Disaster Prevention and Control which is responsible for disaster risk management. Each year this ministry and its relevant body must seek advice from The National Centre for Hydro-Meteorological Forecasting (NCHMF), a governmental body belonging to the Vietnam Meteorological Hydrological Administration (VMHA), whose responsibility is to issue forecasting/warning information for weather, climate, hydrology, water resource, marine weather (i.e., hydro-meteorology), and provide hydro-meteorology services. This centre works closely with central (e.g., Ministry of Agriculture and Rural Development (MARD)) and local governments (from provincial to district and commune levels) to provide up-to-date warnings of annual natural hazards. These bodies constitute the rules and regulations in the field of disaster risk management and emergency responses that are essential to farmers' disaster risk responses in the field of agriculture.

The analysis of the 2015-2016 disaster reveals that the risk of drought and saline intrusion-induced disasters was already detected by NCHMF in early 2015. On 27 August 2015, this centre issued 'A special issue on El Nino number 312/BC-DBTƯ' (NCHMF, 2015b), and a report number 350/BC-DBTƯ on October 6, 2015, 'Projecting the trend in weather, hydrology of the 2015-2016 Winter-Spring crop' in preparation for the 2015-2016 dry season (NCHMF, 2015a). The latter report contained a forecast that the 2015-2016 El Niño would reach the same level of the phenomenon in the 1997-1998 historic record with the gradual increase of sea surface temperature of about 2.2-2.4 degree Celsius. This phenomenon was projected to become the longest El-Niño of the last 60 years and 'last until the end of the 2015-2016 Winter-Spring crop' (NCHMF, 2015a).

This warning was received by MARD and its sub-bodies. After about a week, the Center Steering Committee for Disaster Prevention and Control, which is a part of Vietnam Disaster Management Authority (*Tổng cục Phòng Chống Thiên tai*) of MARD, sent an Official Order number 32/CĐ-TW on October 12, 2015 to provincial People's Committee and Steering Committee for Disaster Prevention and Control requiring these local authorities to take actions of mitigating the drought and saltwater intrusion. The order commanded local authorities to investigate water levels in their place; build solutions for water supply for agricultural production of the 2015-2016 Winter-Spring crop including adjusting the structure of crops, and livestock; and to dig canal systems to ensure leading water to fields. This order was strengthened by Directive number 8718/CT-BNN-TCTL by MARD on 23 October 2015,

which forecasted that the El Nĩno event had a 90 per cent possibility of lasting throughout the Winter-Spring crop and possibly until the Summer-Autumn crop and, due to the low river rate, intensified drought and saline intrusion would impact many places including Central Vietnam, the Central Highland, the Southeast region, and the VMD. The Directive required local authorities to be more proactive in preventing the drought and saltwater intrusion in 2016. It proposed temporary and response-oriented solutions for local authorities in investigating the possibility of drought and saltwater intrusion; developing a plan for saving water through dregding and repairing canals, and constructing a temporary dam for freshwater storage; measuring saltwater intrusion at risky locations; identifying low and high risk drought regions; and cultivating short period seeds. The local governments were also required to prepare an appropriate plan for freshwater distribution among different areas of agricultural production.

However, those warnings, albeit coming early, contained no advice encouraging farmers to skip the 2015-2016 Winter-Spring crop. This lack of seriousness was reflected in the way local governments informed their farmers. At the end of each year (often around October to December), the Long Phu District People's Committee (DPC) organises a district meeting with the chairmen of the commune level People's Committees (CPCs) under its authority to discuss the crop calendar for the next year. Prior to this meeting, these chairmen must collect information from their local staff and farmers to report to the district staff about their next year crop cultivation plan. In late 2015, although the district meeting was held with discussion of the risk warning, the 2016 crop calendar (including the 2015-2016 crop 3) was still planned out (Quy Ro, official, KII5). This signifies that there is a lack of freedom for local authorities to go against or go beyond the directions outlined by the higher authorities. This confirms some existing studies that local staff are afraid of proposing new changes or initiatives in regard to disaster prevention and management because they did not want to be misunderstood as confronting the higher authorities' strategies (Garschagen, 2013). As a result, the policies on disaster prevention seemed having placed too much emphasis on prevention and recovery/adaptation with the latter is understood as a result rather than a dynamic, iterative, and ongoing process (Garschagen, 2013).

Additionally, the government's warning of the 2015-2016 disaster risk was not effective and trusted by farmers. The warning system was reported to entail the local loudspeaker system in each village. However, this system was considered ineffective since the sound was small and hard to reach every household. Only eight among 28 households reported that they sometimes heard the announcement from the loudspeakers. Village officials (head/vice-head, leaders of

mass organisations) were more critical in spreading the warning: 'District officials informed commune officials and they let us know. Also, the village officials [head or vice head] come and informed us' (Dien Kinh, HH23). Yet, village staff's individual efforts were limited given their inability to cover such a wide area of each village where local households were sparsely located and their occupants were often absent due to being preoccupied by daily crop tasks. One of the formal channels that the government should have used to inform farmer was village meetings. However, this channel was reported to not be held prior to the 2015-2016 crop 3: 'There have been no village meetings [informing the warning of the saline intrusion]. I didn't hear directly from the commune government, only heard from some villagers who passed by' (Chanh, HH2). Therefore, several farmers did not receive any information from local government: 'Since 2015 we only received the warning of saline intrusion during the 2016-2017 season. Before the 2015 incident, we didn't receive any warning. The village head didn't inform us anything. People did it of their own will' (Thanh Long, HH4). Not only in this management arena, at a broader scene, most farmers reported a lack of engagement with local political platforms such as village meetings or mass organisations (Table 7.3).

Table 7.3. Participation in local organizations and activities

Organisations/activities	Number of HH having members joining	
	#	% in total (n=28)
Fatherland Front	0	0.0
The Veteran Association	2	7.1
Village Meetings	2	7.1
Women's Union	3	10.7
The Elderly Association	3	10.7
Communist Party of Vietnam	4	14.3
Farmers' Union	5	17.9
Youth's Union	5	17.9
Agricultural cooperative	5	17.9

Source: Household Interviews

Village meetings were supposed to a political platform engaging farmers with disaster risk management but were not efficient due to the lack of regular organisation and the lack of people participation. Some comparative studies (T.K. Nguyen & Bui, 2016; Luong, 2018) have indicated that VMD's farmers had significantly fewer (voluntary or formal) organisation memberships compared to their counterparts in the northern part of Vietnam. In this study,

most farmers reported that they had never or rarely participated in Women's Union or Farmers' Union because their activities were not helpful. This could be due to the fact that these meetings only organised activities to serve some specific groups such as poor or near-poor households (e.g., meetings to vote on poor households (*họp bình xét hộ nghèo*) or meetings on approving funds for poverty reduction (*họp bình xét cấp vốn giảm nghèo*) (official interviews). Local staff also voiced concern about the lack of members available both at the village level due to people's migration and employment engagement (Sau Bich, KII13; Bay Ro, KII15). Every year there were about 10-20 members who dropped out of the Women's Union in their struggle to search for income, and the Union was unable to reach better-off households (Muoi Chuon, KII17). These stories demonstrated that the current disaster risk management system was inefficient in communicating the natural hazard risks to its citizen.

There was a difference between poor and non-poor households in approaching information on disaster risks (Table 7.4).

Table 7.4. Access to information sources by poverty status

Groups of households	Average number of information sources	Popular information sources	Least access to
Poor and near-poor households	3.56	Commune and village staff, neighbours, family members	Television, radio, mobile phones with internet connections, café/restaurants, loudspeakers.
Non-poor households	8.47	Close friends, neighbours, television, commune and village staffs, family, café, friends from outside the village	Loudspeakers, Youth's Union staff.

Source: Developed from Household Interviews

The most common information sources for saline intrusion for poor households were village staff and their neighbours. They lacked access to advanced technological channels, such as television, radio, mobile phone, and the Internet. By contrast, non-poor farmers diversified their information sources, which saw them seek information not only from village and commune staff, but also from both advanced technological channels such as television, mobile phones with the internet connection and the traditional sources such as family, neighbours, and close friends. The capacities to buy and possess modern technological devices such as television or mobile phones show that economic capital can give non-poor farmers a better access to information sources. Yet, the more important capacity was that they were more active

in assessing risk information from their networks. For instance, better-off farmers were able to judge the government warnings more serious in order to better prepare for their crop. Mr Cau Long (64), a Kinh farmer working as the Tan Hung commune cooperative chairman, showed his capacity turning risk judgement into his final decision on crop 3:

> It was 2016 just past the Tet holiday, saline water had already intruded. It lasted longer. The experts forecasted, saying climate change is becoming more and more serious so that the Vietnamese Communist Party at the district level recommended not to culitvate crop 3… In the 2016 season, I only did 1.7 ha of crop 3 because this area was on a lower lying region and near the canal, so that water could flow to the fields without the need of using pumping machine. Other areas were higher, and the canal networks around them weren't dredged so I omitted planting the crop on those area. (HH20)

With this strategy, the impact was minimum. Cau Long reported that his household could harvest one ton per 0.1 ha – a reduction of about 100-200kg compared to normal conditions. Thus, the 2015 incident was not enough to drag them into crisis.

In addition, better-off households could better link with each other to find the most feasible disaster risk management strategies. This was the case of three households, Quan Vot, Cau Long, and Bong Ban, three Kinh, better-off households (HH21, 20, and 19). These farmers were living near each other and, more significantly, close friends and relatives. They often saw each other as a source of information and the ones with whom to discuss crop cultivation matters. In this group, Quan Vot was the most respected individual and was highly regarded not only because of his large land holding (15 ha) but also because of his extensive knowledge of agricultural production. He was proactive in seeking risk information not just from his close networks but also from bridging relationships (Box 7.1). His decision was seen to be the crucial factor that influenced the decision making of other farmers, especially his close friends and relatives such as Cau Long and Bong Ban. For instance, in the interviews with Bong Ban and Cau Long, Quan Vot was mentioned as close relatives with whom they often interacted and sought advice when needed. This strong connection resulted in these three households reducing their 2015-2016 crop 3's planting areas and receiving the least impact from the disaster.

Box 7.1. Actively assessing the risks of saline intrusion using bridging relationships

Although possessing the largest area recorded in the interviewed sample (15 ha), the Quan Vot household received the least effect from the 2015 incident. This result was due to his proactive approach to the risk of the 2015 saline intrusion and water scarcity.

He first assessed the status quo of water around the local canals, which hold freshwater for crop production. As the canal system around his rice fields was clogged, he knew that this system could not hold enough water for cultivating crop 3. In addition, he did not passively wait for the news of natural hazards from the local government and villagers, but proactively sought information from his relative in upstream regions of Vietnam's Mekong Delta. This region, borders with Cambodia and includes provinces like An Giang and Dong Thap. According to his experience, if the flood on the Mekong River in the upstream An Giang province happens to be small, there is a likelihood that there is a lack of water flowing to the downstream Soc Trang province. All of this information led his household to skip planting most of his land area. 'Because I heard the information [of saltwater intrusion]. I had a relative [in An Giang province] helping me assess the situation, so I didn't go ahead.'

He indeed only loaned out 0.3 ha out of 15 ha (0.02 percent) to his nephew while leaving fallow the remaining area for the rest of crop 3. This resulted in no loss from his side. Asked if he regretted not planting the crop, he explained: The chance of success was just 25 per cent, everyone else lost.

Social gathering at café, restaurants has been considered to be of vital importance to social learning among farmers in the VMD (T.A. Tran et al., 2017). My research confirms this finding as I found out that the non-poor farmers from Village A told that they were more active than those from poor and near-poor households of Village B in searching for information from semi-public spaces such as café. Concerning this case, Village B was deemed disadvantageous because the whole village only had one café and this was not located in its centre, causing inconvenience for farmers' access. The lack of engagement with a variety of information sources was the reason why most poor and near-poor farmers in Village B who did not come up with an explanation for water scarcity and how this linked with saline intrusion in the 2015-2016 event.

Linking Social Capital: Government-Farmers Conflicts

In addition to the inefficiency of disaster risk communication, there was also a disjuncture between the government's water management systems and farmers' farming practices. After the 2015-2016 disaster, farmers pointed their blame toward the role of local governments in managing water resources (see Table 7.5).

Table 7.5. Blame for government officials

Who is to be blamed?	What is to be blamed?
Sluice gate keeper.	Spontaneously opened sluice gates, allowing saltwater to intrude into rice fields.
Local officials at commune and district levels.	No degree in agriculture. Lack of mechanism for monitoring and managing sluice gate keepers. Having not dredged local canals for freshwater storage in order to supply water in dry seasons. Sluice gates were old and leaked but not maintained and fixed.

Source: Developed from Household Interviews

In this respect, interview data show that farmers directed blame at two groups of government officials. The first group was the sluice gate keepers. These officials were local people hired by the district's Division of Agriculture and Rural Development (DARD) for monitoring and closing/opening sluice gates. Sluice gates, together with pumping stations, canal systems, sea and estuarine dike systems are the main infrastructure built in the salinity-prone area. These structures are pivotal to water management including saline intrusion control, flood protection, and freshwater storage for production and domestic use (Tuan et al., 2007, p. 47). The sluice gates are an integral part of the dike system through connecting the inner waterways and canals with the Bassac River (*sông Hậu*) – one of the two main branches of Mekong River in Vietnam, together with Mekong/Tien River (*sông Tiền*) (Ministry of Natural Resources and Environment [MONRE], Ministry of Agriculture and Rural Development [MARD], & Dutch Government, 2013). They can be as small as one to two meters in width but also can be big enough for big boats and ships to get through. Those big gates do not just regulate water but also manage the flows of water transportation. Merchants and dealers drive their boats (*ghe*) or wooden longboat (*xuồng*) from big rivers to rice fields to buy paddy and transport them to outside the commune. Each district's DARD, through the sluice gate keepers, are responsible for sluice gates operation that regulates irrigation for crop production and drainage. In the wet season, sluice gate keepers are commanded to open sluice gates to get enough freshwater from big rivers for rice production and to store freshwater in local canals. In the dry season, the keepers, based on the salinity concentrations in river water measured at designated stations, open or close these gates to get freshwater or prevent saline intrusion that follows big rivers inland.

In the 2015-2016 dry season, under the effect of the prolonged drought started in late 2014, saline intrusion came earlier in November 2015 and lasted longer until April 2016. As saline intrusion came, sluice gates were ordered to close. However, as the merchants and dealers need

to use sluice gates to reach rice fields and transport paddy back to big river, the closing of sluice gates was considered an impediment. This led to the bribery of sluice gate keepers who spontaneously and irresponsibly opened sluice gates to let boats get in. According to farmers, these acts allowed saline water to intrude further into rice fields:

> Sometimes, some boat drivers could bribe the gatekeepers to open the gates [for their boats to come through]. If the gate was open, then saline water would intrude into the inner rice fields … Recently those bribing and doing wrong were caught and punished. (Chin Ro, HH28)

The misconduct caused many farmers unexpected harm. As farmers had utilised all freshwater from their surrounding dry canals after a long period of closure of the sluice gates, the opening of the gates meant an emergency relief. However, as some farmers pumped this saline water into their rice fields, they immediately knew that it was not good: 'As they'd opened the sluice gates without our knowledge, we were too happy to notice that we'd pumped saline water into our rice fields; but we then realised that it'd harmed our rice' (Thanh Long, HH4). It was not that they did not know the intake of saltwater would cause negative impacts on their rice crop; rather, they had no choice but took the risk of saline water so as to save their crop season.

For some farmers, the government's water resources management was not efficient. They cited the government's responsibility that let local rivers and canals become clogged with mud, sediment, and trash prior to the 2015 dry season. This malfunction of canal systems was believed to have led to their limited capacity to store freshwater for their crop production purpose. A farmer observed: 'This canal [in front of his rice fields] wasn't dredged at that time. The State hadn't had the meeting to activate the dredging plan … Because the canal wasn't scraped, there was no water' (Cam, HH8). Another farmer also confirmed such an observation and postulated that the dredging activities have only been recently done: 'The local government has recently helped people dredge canals. Annually, they scrape canals and on-farm waterways, regulating and storaging freshwater for us. A few years ago, this activity, however, hadn't been done, not yet completed' (Co Tuong, HH27). This inactivity was also evidenced in officials interviews. Only after the 2015 event, the governments at district and commune levels have dredged many canals for crop production. According to the local staff's information, in 2016, the district government invested in dredging a secondary canal to preserve freshwater, followed by dredging 10 tertiary canals in 2017 and 10 tertiary canals in 2018 (Ji Ro, KII8). This was the reason for the willingness of many farmers to re-cultivate crop 3 after the adversity.

The water resources management should be more time-responsive and farmer-oriented. Farmers claimed that if the government cared for farmers, they would have opened the sluice gates before the disaster to store freshwater for crop production. Some, like Bau Duc and Bong Da (HH15) postulated that if the government did so, farmers would have had enough water for the 2015 crop 3 production. Agreeing with this opinion, Cau Long, a current chairman of the commune cooperative (HH20), posited that the local government did not have a good backup plan for saving freshwater in case of increasing demand during the third rice crop. A farmer, Co Vua, even raised his concern for the quality of government officials' education in the sense that they did not have relevant degree for managing an agricultural commune. Speaking about the government's irresponsibility, he claimed:

> To be honest, there aren't any [quality] officials … I'm from the Northern region, the commune chairman had to have a degree in agriculture, but here, oh my … The officials here know nothing. Throughout their whole tenure, they never visit localities and ask us how we're going. They haven't studied agriculture. Honestly, for an agricultural commune, officials should have a degree in agriculture. (HH26)

However, the government officials thought otherwise. When asked why the sluice gates could not be opened in advance to get fresh water for crop 3 production, a sluice gate keeper in Long Phu district explained the difficulty of balancing competing demands for water from farmers inside the dikes:

> I'm often insulted by local farmers [because of sluice gate control]. [Indeed] I only manage the sluice gates according to the orders from my bosses [district's division of agriculture and rural development]. We can't voluntarily open the sluice gates to get fresh water. Because inside the dike system, there are high-lying regions [*đất gò*] and low-lying regions [*đất trũng*]. If those high-lying regions get inundated a little bit, low-lying regions get highly flooded. (Hai Co, gate keeper, KII7)

At a provincial water management level, the managerial task faced an even bigger challenge. The dissimilar calendars of crop production in different areas of Soc Trang province made this task puzzling. Eventually, the provincial government has to prioritise the majority over the minority; water management must favour larger areas of cropping over smaller ones. Ka Co, a provincial official, explained this matter:

> Local farmers start their crops at different times. There could be areas ready for harvesting, there could be others not ready. If you go sightseeing around Soc Trang

> province, you'll see there are places where rice seeds are being sowed, other areas rice crops are ripening, or elsewhere being harvested. It means that the crops of each of those areas have different demands of freshwater. If we open the sluice gates to get water in for some places, it will flood other places still waiting for harvesting…For instance, if there's a place preparing to harvest 8,000 ha of crop and there's another in need of water for crop growing, we cannot open the sluice gates to serve the latter because it would kill the former. (Ka Co, KII4)

The above stories suggest different opinions between farmers and officials. This fact signifies the lack of grassroot participation and miscommunication between authorities and people.

In sum, there was a lack of institutional capacities in local governments who were inactive and dependable on higher authorities. They often developed 'ad hoc' support to local farmers (e.g., opening/closing sluice gates) rather than developing a long-term agenda for disaster risk management. This temporary and short-term approach to disaster risk reduction is not effective and could lead to the people's dependence on the State's aid (e.g., waiting for the State's relief fund) and the ineffective employment of social capital in self-response and recovery (Rubin, 2013). Such evidence implies that the central government still retains its 'decisive role' in disaster risk management and climate changes adaptation, despite its attempt at decentralising power through its recent policies such as Ordinance number 9-L/CTN on flood and storm prevention (NAV, 1993b) and its subsequent Ordinance number 27/2000/PL-UBTVQH10 (NAV, 2000), the National Strategy on Disaster Prevention, Response and Mitigation to 2020 (Prime Minister of Vietnam, 2007), the National Strategy for Climate Change number 2139/QD-TTg (Prime Minister of Vietnam, 2011). Thus, although examples of local participation in disaster risk management and climate change adaptation found in some areas of the VMD (T.A. Tran, Pittock, & Le, 2019; T.A. Tran & Tuan, 2020), the maintenance of the central government power is still a crucial obstacle in preventing the State's policies from meeting local needs (Bruun & Olwig, 2015; Lohmann & Lechtenfeld, 2015).

Bridging Social Capital as a Buffer against Risk

I have reported elsewhere that while not every farm household could draw on their bonding relationships to cope with and recover from the effects of disasters, most farmers could draw on their linking relationships with agricultural suppliers (Nguyen-Trung, Forbes-Mewett, & Arunachalam, 2020). To understand why this relationship worked as a buffer accounting for the choice of crop 3, it is necessary to grasp the role of suppliers in rice value chains.

Agricultural input suppliers (*đại lý*) are those who provide different types of inputs including seeds, pesticides, fertilisers and agricultural tools. Some suppliers provide one of these and others provide them all. Suppliers are retailers of big companies who sell these inputs. Each supplier is tier 1 (directly importing products from companies), tier 2 (importing products via a retailer's tier 1), or tier 3 (importing products from tier 2). In our sample, suppliers were mostly located in Village A or other villages of the Tan Hung commune, Long Phu town of Long Phu district (14 km away from Tan Hung commune), or in Soc Trang city (14-15 km away). Suppliers were reported to be helping affected households, regardless of ethnicities, poverty status, land holding, or location; helping them mitigate the impact of the 2014-2016 disaster and overcome their crisis. The support received from these bridging relationships included three distinct but interrelated types: provision of cash, deferring debts from previous seasons, and allowing the purchase of inputs on credit. These three forms of assistance were ongoing season after season, becoming a permanent part of crop development and thereby allowing farmers to cope with risks and continue their circle of crop production.

Cash lending was one of the signature practices between farmers and suppliers. This was demonstrated in the case of suppliers located in the town of Long Phu – a centre of Long Phu district, 10 kilometres from the Tan Hung commune. Nuoc Tuong supplier is a tier 2 retailer located inside a central market of the town of Long Phu that has provided inputs including fertilisers, pesticides, and some agricultural tools to farming households around Long Phu district (which includes eight communes and one town) for approximately 20 years. This supplier not only enables credit sales but is also a moneylender to farmers. According to Mr Nuoc Tuong: '[The farmers] buy inputs on credit, and borrow money as well'. When asked if they lent money to the farmers, the response was, 'Yes, we do. In general, we take care of them from the beginning to the end of each crop' (supplier, KII20). Interviews with Soc Trang city's suppliers showed that they did not lend money and a few of them allow credit sales. This can be conceived as a reason why most Khmer households tended to buy inputs from suppliers in the Long Phu town instead of those from Soc Trang city. According to the Nuoc Tuong supply manager, this mechanism was perfectly suited to the farmers' household conditions, as they often had low levels of cash during their crop production. The money borrowed could be used to cover living costs or any emergent needs during the cropping seasons and not merely for agricultural production. The procedure for borrowing money from the Nuoc Tuong supplier was similar to buying input on credit. Only notebook confirmation was required as opposed to a formal arrangement.

The use of deferring debts and buying on credit were common among all households in our sample as it was observed in other places of the VMD (P. Taylor, 2007). The recovery from the 2015-2016 crop 3 was the prime example of farmers relying on this type of support to overcome challenges. With the severe effects of the disaster, most farmers more or less fell into crisis but their suppliers allowed them to defer part or all of their debts and allowed them to repay these debts after the next crop's harvest. In addition, suppliers also allowed affected households to buy new inputs on credit for their next crops. For instance, a farmer recalled the reaction from Ms Pho Ga, the Kinh supplier after the 2016 incident: '… I lost 100 per cent of my third crop. She sympathised with me and told me that I could pay the debt if my next year's crops were profitable' (Tao, HHI3). Reflecting on the support from supplier, Dua Hau remarked: 'She didn't allow you to starve' (HHI5). Dua Hau was allowed to defer her debt and buy on credit until the 2016 crop 2's harvest (around December 2016). Using this crop's income to pay part of her debt she went on to borrow again for the next crop. Such circle of buying on credit – harvesting and paying part of debt – deferring part of debts – buying on credit – harvesting and paying next debts is common practice in the relationship between farmers and suppliers.

There was a slight difference between non-poor households and poor and near-poor households in receiving suppliers' support. Poor and near-poor households were likely to be more dependent on the support from suppliers, who could apply a stricter mechanism for such support. For instance, when the Khmer household of Chay Ben – a poor family living in Village A – lost 1 ha of borrowed land, it was in serious debt to the tune of VND 9 million. Although he was allowed to postpone the debt, his supplier did not let him buy more inputs on credit. This led him to omit crop production and seek income from sugarcane cutting: 'After that, I went to do casual work to pay him. I was hired as an agricultural labourer and worked to earn money to repay the debt' (Chay Ben, HHI25). There were a few households who were refused credit for inputs for the new season. This was the case of Dien Kinh who failed to convince her supplier to get new inputs: 'That year I owed him around VND800 thousand. I begged him to skip the debt, but he refused. I had to get money from other sources to pay him in order to borrow get more credit. However, he didn't lend me any more' (Dien Kinh, HHI23). In some cases, as reflected by Mr Bong Ro (70) a non-poor , Kinh householder in Village A whose capacity in crop production was the key to suppliers' support: 'If they know you don't have capacity to pay debt, they won't allow you buy on credit. You have to borrow cash from other sources to buy.'

By contrast, non-poor households, which appeared to have more family savings, were less dependent on the support of suppliers. Asked if he bought on credit from suppliers, Mr Quan Vot (HHI21) replied: I only bought on credit at the end of crop because at that time I had invested most of my money … But I only owed them 1-2 months then I paid'. After 2015-2016, the household of Luu (HHI13) owed around 42 million to a supplier in the same village. Asked if they kept their debt on hold, Hong, the wife, responded: 'They were easy on our debt payment but after the incident, we paid, but not all of our debt. For instance, we owed 30 million, so we paid 20 million and borrowed some more'. In addition, non-poor farmers often did not have to pay extra credit for deferring debt: 'As I often buy a large number of inputs the supplier doesn't count the interest and allows me to pay the debt when I can', stated Boi Loi who cultivated 13 ha of the 2015-2016 crop 3 (HHI22).

Although the relationship between farmers and suppliers appeared as an economic relationship, it was much more than that. First, the flexibility shown in credit sales and deferring debt in this context had been developed and practiced before the 2015-2016 incident. It has been engrained in the relationship between farmers and suppliers so culturally deep so that even suppliers cannot change even if they want to.

Asked whether this mechanism caused them risks of bankruptcy, Nuoc Tuong, a supplier in Long Phu town of Long Phu district replied: 'Yes, but we have to bear it because some suppliers that tried to not use this mechanism went under' (KII20). Indeed, in my sample, Nhay Cao (a former input supplier, Village A, HHI18), was forced to close her business around 10 years ago because she could not bear credit sale. Suppliers who did not allow credit sale often lost their customers. For instance, another case was Ms Chay Nhanh who ended her connection with the Banh Xeo supplier – a supplier operating in Village A – even though her family was related to Banh Xeo's owner. Chay Nhanh recalled that this owner refused to let her buy inputs on credit. This upset Chay Nhanh and she sought other input retailers to work with (HHI24). Therefore, suppliers needed to alter their ways of conducting business and build a flexible bond with farmers. Asked whether they would allow farmers to delay their loans after the 2014-2016 disaster, a female owner of Nuoc Mam supplier in Long Phu district reckoned: 'Yes, we must. No other way! [Laughing aloud]. No one comes to solve this for us [suppliers]. We and the farmers have to sort this out alone' (KII21). 'Nowadays there are few households buying inputs by cash, almost all farmers buy on credit', noted Bong Ban (HHI19). Buying on credit, therefore, was a cultural way of doing crop production in locality.

This business practice created calmness for farmers facing the disaster. Asked how the mechanism helped farmers, Muoi Bich, whose household lost around 12 million invested in 0.6 ha during the 2015-2016 crop 3, asserted that despite the severity of crop losses, the subsequent impact was mitigated. This was reckoned as a result of the support of agricultural input suppliers: 'Suppliers understood the situation of the drought and impact of saline intrusion so that they allowed farmers to defer their debt' (HHI14). After three years, he was able to pay all the debt, with 2 million from each crop. When responding to the question of how substantial the credit sale was to farmers' crop production, Mr Bau Duc (70) a Kinh farmer living in Village A (HHI15) gave a clear explanation for why the credit sale mechanism between farmers and retailers was fundamental to their crop production. In the following excerpt he highlights the issue of having multiple expenses:

> For instance, if we cultivate one ha, we can generate VND 15 to 20 million revenue. With this money, we must cover our children's education, daily expenses, ceremonies [e.g., wedding, funeral, birthday, one-month-old ceremony, etc.] and investment in a new crop. All we earn from our crop has now gone. Therefore, when we start paddy sowing for a new crop, we need inputs … The debt is only partly paid before adding new debt, then paid and added in a repeating cycle. If we don't borrow input [on interest from suppliers], then how can we make money [to buy inputs]? I have to tell you that the fact that they [suppliers] allow us to buy on interest is good for us. Because we can owe inputs until we harvest and sell our crop. When we have sold our crop, we have money to pay them [suppliers]. If we buy everything in cash, where do we get money from?

Thus, for farmers, debt is just a part of their livelihood practice. The credit sale mechanism is a buffer not just for countering disasters but also for the vicissitudes of life.

The relationship between farmers and suppliers has long been built, maintained and grown along with rice cultivation. This process is based on the key element of trust. Only with trust and understanding are the suppliers able to accept variations to credit sales and debt repayment postponement. I observed that during the process of selling on credit there was often no formal deferred payment agreement, or no official credit-sale invoice or money lending receipt needed. In terms of buying on credit, each household was given a notebook to record their debt. This notebook could be either a printed notebook designed by a company and carrying information of that company and suppliers, or an improvised ordinary notebook. Every input

item owed or paid was recorded in this notebook. Blue colour indicated the ongoing debts while red colour denoted the part of debt that was paid. In addition to this notebook kept by farmers, suppliers also had a larger notebook logging the same information about the money and inputs owed by all debtors. Farmers were expected to bring their notebook whenever they came to get more inputs, purchase new items, or pay their debt. However, this was often not the case. As indicated by one supplier, 'sometimes they [farmers] just pop by and buy some inputs on credit without bringing their notebook' (Com Rang supplier, KII18). In another situation, a farmer was observed paying her total debt of VND 12 million to a supplier in Soc Trang city without her notebook or any signature. Only the supplier noted it in her notebook at that time (Bo Tai supplier, KII19). Sometimes, the business transaction was reduced to an oral agreement: 'Yeah, [sometimes] nothing at all, just by word of mouth' (Nuoc Mam supplier, KII21). When asked: 'If farmers have lost their crop due to saltwater intrusion, resulting in their inability to pay debt, do you still allow them to owe more?' A manager of Nuoc Mam supplier replied: 'Yes, we do, [there is] no other way! [laughing loudly]. No one comes to solve this for us [suppliers]. We and farmers have to sort this out alone'. These excerpts show that the grounds for credit sales or money lending between farmers and suppliers were heavily associated with trust. Trust is critical for the informal credit sale mechanism at work and it required engagement from both sides.

From the farmers' side, the support of suppliers cannot be taken for granted. Not every farmer received the support from suppliers to bounce back after the 2015-2016 incident. Indeed, to be able to ask for a suppliers' help, farmers had to have *built trust with suppliers* over time through their business. For Bong Chuyen, the relationship was built over a long period of time and knowing each other's identity and capacity was key:

> Mr T [supplier] will allow me to buy on credit as much as I want. But there are some farmers Mr T doesn't know, he didn't sell. Having done business with each other [between me and Mr T] is the key. Further, if you are from this village but he doesn't know you or your capacity, he won't sell to you. (HHI7)

Asked whether every farmer was allowed to buy on credit, Oi Dao stressed that close acquaintance and credibility in business were the most pivotal criteria: 'only those who are closely acquainted are allowed to buy new inputs on credit. No acquaintance and credibility, no credit sale. Thanks to this trust, we family could buy inputs from our close supplier every single crop'. For Tao, the key to the relationship was to show from the beginning that one is trustworthy. Asked if his supplier allows everyone to buy on credit, Tao reflected: 'No, she

judges you first before allowing you to buy on credit … If you are decent to her, she will treat you well. If you aren't trustworthy, then she won't be'. Credibility was also considered a key aspect for Mr Boi Loi's relationship with suppliers. In recalling his family's relationship with their current supplier, credibility was thought to be key to the growth of the relationship:

> My family and the supplier have known each other for very long time. My grandfather was Chinese Vietnamese and the supplier is also Chinese. Since my grandfather's time we have collaborated with each other. Therefore, we trust each other. She doesn't charge any interest on my owed inputs. Anytime I call her "I need this, I need that" she will transport them to me. (Boi Loi, HHI22)

From the suppliers' side, it was also a long process of building up brand-reliability. The reciprocity is depicted in the demand that suppliers must be fair toward farmers. Discussion with three male farmers, Quan Vot, Cau Long, and Bong Ban raised the point that farmers also chose suppliers with whom they would work. The selection was based on the fact that suppliers must be reliable in introducing fertilisers or pesticides of high quality. According to Mr Quan Vot (HHI21) there were some suppliers who would introduce to farmers a different brand of products of poor quality to get a commission from companies. These suppliers tended to be avoided when buying next time. Understandably, farmers communicated with each other about which suppliers were trustworthy. In this regard, Mr Boi Loi recounted how local farmers do not compromise on the lack of trustworthiness.

> Several years ago, my cousin worked as a middleman providing pesticides for farmers of this area. He could earn enough with providing pesticides to all of my relatives because there were many of them engaged in rice production. However, due to supplying poor quality seed and expired pesticides, my relatives stopped buying products from him. They preferred better quality. Since then, my cousin has had to change his job. (Boi Loi, HHI17)

At the village level, suppliers had opportunities to learn more about the circumstances of those in debt. For instance, the Com Rang supplier reported to me that they know everyone of their 70 debtors. One of the grounds for trust in debtors is the fact that they have lands in Village A. When asked: 'Do you have any methods to ensure that the farmers will pay their debt?', the Com Rang supplier's owner replied: 'We only know they have original land … it means the land they possess is here [in this village], not the land they lease or mortgage from other

villagers.' So, knowing that debtors possess lands in specific locations is the key for the trust in farmers. No land certificate is needed for collateral (Com Rang, KII18).

The information from these farmers was also confirmed by the interviews with suppliers from Soc Trang city. While some suppliers sell fake or poor-quality products, the Bo Tai supplier only sells products from reliable companies/producers who have brand names. The female owner of this supplier told a story of developing trust in her customers:

> We sell products at cost price ... For instance, a bag of pesticides of Tan Thanh [company] has an original price at VND 9,000. Nonetheless other products have similar names or fake products only cost VND 4,000 a bag. This is a big gap. When customers come to us, we tell them the price of VND 9,000. They responded that they only paid VND 8,500 at suppliers located in their commune. We had to explain to them that our product has brand name while products sold in their commune were different, and advised that they should only pay VND 5,000 for those products. However, only those who know us well believed in us. The unfamiliar customers do not believe us. (Bo Tai, KII19)

It was evident that suppliers must also be honest and fair to be able to keep their customers. If farmers could exchange information about suppliers, it is vital for suppliers to sell high quality products to attract more farmers to do business with them. In sum, my research have shown that farmers have extensively replied on their bridging social capital with suppliers (e.g., credit sale, deferred debt payment, cash lending) to cope with disaster risks. As seen in elsewhere (Chamlee-Wright & Storr, 2014; Grube & Storr, 2018), the conversion of economic relationships into social capital proved to be pivotal insurance that farmers could employ in the face of adversity. Nevertheless, the dependence on this type of social capital can contribute to the decision-making that underestimates natural risks.

Bonding Social Capital as a Facilitator to Risk Taking

Crop 3 was not an action of individual households; it was a commune practice. Fieldwork data suggests that taking part in planting the third crop was a form of bonding community solidarity among farmers that was hard to resist. Their decisions, choices and actions were affected by their close peers. For instance, Chanh (50) explained how peer connections influenced her households' decision of investing in crop 3. Prior to the crop, Chanh and her family were aware of the news that saltwater could intrude. However, she still borrowed 2.3 ha in addition to 0.4

ha of her own land to cultivate the 2015 crop 3. The season ended in crisis with the loss of the total crop (2.7 ha, with an estimated economic loss of VND 56 million). Asked why she went on to cultivate this crop, she replied:

> If the farmers living nearby don't do the crop 3, I dare not do it. So, the crop is a community practice because people look at their neighbours [to decide whether they should do crop 3] … [This crop] is a symbol of facilitating the farmers' collective movement [*ý nghĩa phòng trào*]. (Chanh, HH2)

The point Ms Chanh highlighted here is critical, as it showed that cultivating crop 3 was regarded as a symbol of community solidarity. The crop was neither an individual matter nor a family matter; it is a community matter. When farmers formed this collective connection among those who did crop 3, they felt more secure. In short, they felt less risk when acting as part of a community. Planting the crop together seemed to be like taking the same boat; that is, facing the same risks and reaping the same rewards. Although the reward may not be bigger than that of others, the risk seems to get smaller through being shared. In other words, community strength played a role of reducing the fear of risk and encouraging farmers to take opportunities, at least in the habitus of farmers. What Ms Chay Nhanh felt in the following quotation was the fear not just of being not included in the possibility of reaping a high-yield crop, but also of being not included in the community solidarity:

> The commune officials did inform [about the risk of saline intrusion], but we did the crop as we wished. Our people risked it. If we win, we all win, if we lose, we all lose. Here people all planted the crop, there was no reason why I should drop it! Could be a waste of a chance. (Chay Nhanh, HH24)

In addition to that feeling, the cultivation of crop 3 was reported to be under community pressure. This was where bonding social capital showed its 'dark side'. Some farmers observed that it was hard for them to omit their third crop while their fellow farmers, whose rice fields share the same borders with theirs, kept growing it. Sharing the borders meant sharing the irrigation and drainage systems. Water including fertilizer and pesticide flow from one rice plot to the next. Therefore, for Luu, a Khmer farmer in Village B, there was no other way: 'We learned from each other. If others cultivate the crop but I don't, I'd regret it. They do the crop so I have to do it. If I left it fallow, grass would grow' (Luu, HH13). Similarly, Mr Bong Ban stated:

> If people do crop 3, we have no choice but follow them. Otherwise, when they pump water into their rice plots, water will also flood into our rice plots and give rise to grass. After a season, the grass will be higher than the paddy and we'll have to hire a harvesting machine to cut it. (Bong Ban, HH19)

Thus, for those farmers who do not grow crop 3 while their peers did, they would likely face the expense of grass cutting. This problem was not new, it had been present in the locality for some time. Mr Cau Long noted that he once tried to stop the crop in 2006 because of his concern about the lack of water for 0.7 ha of the field located on a high-lying area. 'I wasn't sure of success with the crop that year so I decided to rest the land', remarked Cau Long (HH20). Nevertheless, farmers who shared the rice fields with him continued the cultivation of crop 3 and when they pumped water into their field plots, water ran into Cau Long's rice plots. This water brought fertiliser and facilitated the growth of grasses in his rice fields.

> At the end of that crop 3 season, I had to buy 7 bottles of pesticide to kill the grass that covered all of my rice plots. I also had to hire people to spray the pesticide and cut grass. (Cau Long, HH20)

Skipping crop 3 could still generate loss. Thus, between gambling on the crop with possibly facing risks of saltwater intrusion versus quitting it and facing a (probable) certain loss, farmers seemed to choose the first. Farmers like Mr Cau Long (HH20) seemed reluctant to criticise their neighbours or fellow farmers over the fact that their third crop could badly affect his own land. In his saying, 'I don't have any right to tell them to stop crop 3', Cau Long indicated that farmers in the research sites were probably facing a challenge from their own collective norms: compliance. They would choose to accept the negative effect from their neighbourhood rather than causing any conflict. The problem of neighbourhood, therefore, is not just a matter of economic profit. This is also a matter of cultural habitus and social capital.

Conclusion

In this chapter, I have examined the roles of capital in risk taking, reduction and avoidance. Although the headings of the sections are labelled as 'Economic Capital', 'Social Capital', and 'Cultural Capital', it is clear that those sections not only focused on capital or agents' asset. Indeed, by unveiling the use of capital, I have demonstrated that the use of capital can shape the formation of farmers' habitus in association with their positions within the field of agriculture and other relevant fields as social structures. Capital can affect either positively or negatively risk management practices. In the positive effects, they can enhance rational thinking and planning in preparation for and coping with risks. In the negative effects, they can create a false nature of risks or a false sense of security, or force farmers to engage with risk taking without proper coping measures.

In the use of cultural capital, farmers formed their knowledge of risks on the lack of disaster experience. As they did not experience much losses from drought and saline intrusion, they tended to normalise the seriousness of these hazards. But more importantly, it was their habitus orbiting rice cultivation drove them to take risks rather than avoiding risk. This habitus helps form cultural capital in the sense that farmers can use such capital in making choice and taking action in relation to risks. However, this cultural capital also obscures most of studied farmers' rational thinking in developing disaster risk management.

In the use of economic capital, the possession of land or rice fields was both a hinderance and a facilitator to risk taking behaviours. For some non-poor farmers, having large land holding made them more cautious to take risk. Nonetheless, for some other non-poor households, having large land holding tied them to the choice of taking risks. Non-poor farmers could draw on their strong social capital to access to land in risk taking. By contrast, poor and near-poor farmers were held back by the limited land area. The motivation for their risk taking was not the profit as in the non-poor households; rather their motivation was food security and subsistence. Risk taking was also constrained by the barriers created by the economic field in general and the non-agricultural field in particular. Age, physical health, skill sets, or the familiarity with job markets were the obstacles preventing farmers from avoiding risks of cultivating rice crop 3.

In the use of social capital, it was seen that poor and near-poor farmers were caged not just by their economic capital shown in the possession of advanced information technologies (e.g.,

television, mobile phones with the Internet connection) but also by their lack of effective social networking that can help them generate relevant information regarding risks. There was a lack of efficient linking social capital between farmers and the government due to weak risk communication, inefficient disaster risk management system, and farmers' low trust in the government. Farmers relied more on their bridging relationships with agricultural input suppliers who allow them to buy on credit or borrow cash when needed. Bridging social capital provides farmers a buffer against disaster risks and crop failure. By contrast, bonding social capital among neighbours and village's fellow farmers showed the downside of social capital as this form pushed farmers take risks and hampered them from risk aversion.

CHAPTER 8. CONCLUSION, CONTRIBUTIONS AND POLICY IMPLICATIONS

Conclusion

In this thesis, I addressed the structural causes of disaster vulnerability by applying Bourdieu's theory of practice and evidence to the case of farmers who suffered from the 2015-2016 disaster. In regard to the influence of past field on present habitus and practice, I have shown that the transformation of the field of agriculture initiated in the context of the post-reunification and reform can explain for the present disposition towards risk and choices of risk management practices. Stepping out of the Vietnamese War, the Vietnamese began to boost their project of building a socialist state by implementing collectivisation policies that were aimed at controlling farmers through agricultural collectives. This attempt failed badly, leading the country to economic crisis and food deficit. Responding to this crisis, the State led by the Communist Party of Vietnam (CPV) imposed a top-down approach that put food security as the main survival focus, and intensified agriculture with the VMD at the forefront. The State imposed soft and hard policies, which have contributed to the transformation of the agricultural field's structures (rules, regulations and conditions). In soft structures, the relations between farmers and the State and markets (i.e., the socio-economic and political structures) have been changed with the economic reforms including de-collectivisation and market privatisation, and agricultural intensification with the introduction of new HYVs, agrochemicals, and mechanisation. Farm households have been freed from the collective production system, gaining autonomy in access to and investment in their essential capital including land, production inputs (e.g., fertilisers, pesticides) and planning their economic activities. They have also enjoyed the benefits of modern seed varieties, which have helped them shorten crop duration and cope with rice pests, blast diseases, and salinity. These policies have been enhanced since the beginning of the 2000s when Vietnam successfully overcame the crises and moved from subsistence to modern and specialised agriculture. In hard structures, the relations between farmers and the natural and built environment (i.e., human-environmental relations) have been changed with construction of large-scale water control systems to prevent saline intrusion and provide freshwater for rice intensification. The protecting infrastructure has

offered farmers better access to key capitals (freshwater and land) and altered their perception of risks from natural hazards.

Under the new structural conditions of the field, farmers have adapted their habitus and subsequently their cropping pattern and risk-taking practices. The changes in their disposition towards risk were shown in their familiarisation and normalisation of risks from natural hazards (e.g., saline intrusion). As a result, they experimented a third rice crop or crop 3 in the dry season and subsequently turned the trial into wide-scale adoption. Their choices and innovations show their activeness and capacities in responding and adapting to the emerging conditions of the field of agriculture. Together with the practice of the farming community, the State and local governments played a key role in facilitating the transformation of farmers' habitus and access to capital. Their emphasis on national food security and rice export, maintenance and expansion of large-scale construction projects, and official acknowledgement of crop 3 in local agricultural development plans have led to institutionalising the new cropping pattern, thereby validating the farmer's risky farming patterns.

In regard to the perception of risk, this thesis highlights that farmers are knowledgeable agents who were able to map out the risks facing their field of agriculture including risks from natural hazards (especially saline intrusion and drought), market fluctuation and biological risks (e.g., pests). In discussing these risks, farmers also revealed their lack of collective cooperation in paddy production and sale, which made them suffered from the power of other agents including merchants. Yet, farmers did not see risks entirely challenges; instead, they valued opportunities and demands in taking risks.

In regard to the relations between capital and cropping practice, I have found out that farmers had different access to each type of capitals, which has shaped their disposition toward risk-taking, avoidance or reduction strategies. Farmers displayed a set of dispositions including normalising natural hazard risks and valuing their rice cropping tradition (cultural capital); questing for food (poor/near-poor households) or profit (non-poor households) (economic capital); and distrusting the government's risk warnings, replying on bridging relationships with agricultural input suppliers to withstand risks, and being motivated by neighbourhood practice of crop 3 cultivation (social capital). These dispositions have both positive and negative influence on risk management practices.

Theoretical Contributions

Vulnerability in Risk Society and Reflexive Modernity

In studying vulnerability to disasters, especially slow-onset ones, focusing on the present time frame is like taking a snapshot of the phenomenon. My research contributes a detailed explanation of the historical formation of disaster vulnerability to the efforts made by Oliver-Smith (1999a). In doing so, I have shown the link between the present-day risky practice with the evolution of human-induced vulnerability in the past (Bankoff, 2003; Bankoff & Hilhorst, 2004; Blaikie et al., 1994; Oliver-Smith et al., 2016; Wisner et al., 2004).

In this respect, my research revisits the theories of risk society and the reflexivity modernity proposed by Beck (1992, 2006) and Giddens (1984). Following their claims of reflexive modernisation and the 'side effects' of modernity, I deemed the present disaster vulnerability in the VMD the unintended consequence of Vietnam's political choice of modernisation. My contribution emphasises the role of the political field and the one-party state in transforming the fields of agriculture and disaster risk management, which then shapes farmers' habitus and practice. Contrary to the independence of the intellectual field of higher education observed in other studies (Naidoo, 2004; Bourdieu, 1996), it is clear that the field of agriculture is highly dependent on the changes in the political field. In a socialist regime like Vietnam, the role of the State seems to be equal to that of social structures or rules and regulations (see the studies of similar countries such as Taiwan (Hsu et al., 2015). It is not to categorically claim that the State is the only rules, but rather with its top-down approach and emphasis on control and stability, the Vietnamese state has subsumed and forced the field of agriculture, the VMD, and local farmers to serve its political goals (Bourdieu & Wacquant, 1992). The State's pursuit of its political missions including the status of one of the largest rice exporters and economic development has been achieved at the expense of not just environmental disasters (Hoanh, Suhardiman, & Tuan, 2014), but also the farmers' freedom, creativity and dispositions toward risks. In this respect, my study challenges the presumption that the reflexive modernisation leads to the liberation of agents from structural determination and 'the ever increasing powers of social actors, or "agency" to structure' (Lash, 1994, p.111). I argue that in Vietnam's version of reflexive modernisation, the process of individualisation (i.e., being freed from social structures' constraints) occurs in a much slower pace than that observed in Western societies.

Nevertheless, it is not that agents passively follow the order of the political fields or the conditions of the agricultural field. While it seems that Bourdieu's lack of focus on agency creating the impression that social agents and their habitus are mostly shaped by the social structures/fields in which the agents live (Reay, 2004; McNay, 2001; Edgerton & Roberts, 2014). However, this is not necessarily true since Bourdieu (1990a) also claims that habitus can transform the field in the situations where the field's conditions do not fit the agents' expectation. My research contributes evidence to the development of this argument as it shows that although agents were shaped by the field changes, they displayed an active adaptation of their habitus in accordance with the shifts in the field of agriculture. Their choice of cultivating and spreading crop 3 in 1990s and 2000s beyond the State's original design demonstrates agents' capacity to challenge and change the field. Farmers have also significantly contributed to the conditions of the contemporary field of agriculture that is vulnerable to natural hazards. In short, my research does not just cast blame on the evolution of social structures, but also on social agents as the active catalyst for field transformation that leads to contemporary disaster vulnerability.

Beck's (1992, 2006, 2009) risk society thesis and reflexive modernity are often criticised for his abstract level of analysis, which overgeneralises paradigms that abandon the historical context and lay people's everyday knowledge of risk (Zinn, 2008; Dean, 1999; Mythen, 2004; Lash, 1994; Alexander, 1996). In this respect, my research contributes a 'hermeneutic understanding of reflexivity' (Adkins, 2003, p.23) as laid out by Lupton & Tulloch (2002a,b). I have shown that for farmers, the concept of risk is different from the perception from expert systems. For farmers, the concept of risk is not dangerous; rather, it is continuous negotiation and choices between positivity and negativity, opportunities and challenges. In their habitus, risks from natural hazards as a part of their field of agriculture, their home, are often 'unconsicous as if inscribed in the[ir] body' so that they take them for granted (Lash, 1994, p.157). This accounts for why they tend to normalise risks as they engage with crop cultivation.

My research contributes a Bourdieusian analysis of disaster risk reduction, the field whose empirical research has been given little theoretical foundation (Uekusa, Matthewman, & Lorenz, 2020). In so doing, I demonstrate the effectiveness of Bourdieu's theory in analysing social fields as seen in education (Thomson, 2010; Sullivanm, 2002), organisation (Emirbayer & Johnson, 2008; Swartz, 2008), arts (Savage & Gayo, 2011), religion (Rey, 2004), and media and culture (Neveu, 2007; Hesmondhalgh, 2006).

Capital and Risk Taking

By using Bourdieu's theory of practice, this thesis research contributes to grasping the *structural nature* of capital in the formation of habitus towards risk and risk practice. Agents use their habitus to assess their conditions (opportunities or constraints) and invest in capital inscribed in a specific field, then mobilise available capital to achieve a certain action goal. In this process, agents must compete with other agents and mold their action in response to emerging circumstances of the field. Thus, although the existing capital studies in vulnerability and disaster research (e.g., those use DFID's (1999) sustainable livelihood approach) seemed offering a more detailed conceptualisation of the concepts of various capitals, they did not see the structural link among these capitals. For instance, human capital such as knowledge, skills, health are not agents' assets because they can only effectively use these assets by having a proper access to educational institutions or health care services, which are part of the field/social structures. These assets can be turned into economic barriers preventing farmers from transitioning from the field of agriculture to the field of non-agriculture. This shows that the dependence of capital accumulation and use on the dynamic interaction between different fields. In addition, I have shown that holding capitals and the acquisition of the social positions are interdependent (Uekusa, Matthewman, & Lorenz, 2020, p.3). For instance, poor/near-poor households have different positions to non-poor households, which give each of these groups different access to not just economic capital (cash, savings, credit) but also social capital (the strengths of relationships).

Additionally, I have pointed out that capital is not just positive but also negative in their influence on risk managements. My research confirms that bonding social capital (Portes & Landolt, 1996; 2000) and linking social capital (Aldrich, 2011a) have a dark side. While the first form puts pressure on its members in obtaining shared goals, the latter form leads to unequal or ineffective distribution of information and resources to agents. Furthermore, bridging social capital (e.g., farmers and input suppliers) can also negatively affect risk management. Even when this form of capital becomes a buffer against risks, it can give farmers a false sense of security, which encourages them take risk without proper measure. I have also contributed to the knowledge of negative effects of cultural capital and economic capital. In the case of cultural capital, the agents' cultural schema towards risk could impact on their rational thinking and choices of disaster risk management strategies. In the case of economic capital, the possession of economic capital (e.g., land) can bind them with risk taking practice

(cropping the third rice crop). In short, my research offers insights into the dynamics of capital as a structural condition, which could either assist or challenge agents.

Implications for Policy and Future Research

At the time of writing, it is almost five years since the 2015-2016 disaster. Although the event caused many immediate losses to farmers and temporary disruption to crop cultivation, the triple cropping routine has gradually resumed, especially since 2017, as similar to other observations in coastal areas like An Bien district, Kien Giang province (T.B. Nguyen et al., 2021), Farmers have re-engaged with crop 3 as if the crisis had never happened. After a dramatic drop from 84.5 ha in the 2015-2016 season to 68.91 ha in the 2016-2017 season, the total third crop planted area of the sampled households increased again to 80.62 ha in the 2017-2018 season and to 80.45 ha in the 2018-2019 season. At the beginning of my fieldwork (March 2018), farmers were harvesting their 2017-2018 crop 3 with a high hope of a profitable return. In May 2019, farmers reported a bumper harvest of crop 3 with an average yield of 8.04 ton/ha. On a night in April 2019, in an exchange with Bong Da, a farmer with whom I have kept in touch since the fieldwork, he joyfully told me that the 2018-2019 crop 3 was a bumper harvest. In late 2019, I asked him if he would cultivate the next crop 3 in the conditions of water shortage, he said he would because he did not know what else to do. Four months later, he sadly texted me that it had failed.

The 2019-2020 dry season was seen as a mirror to the 2015-2016 one, with the intrusion of saline concentration of 4 grams/litres having penetrated even further inland than in the 2015-2016 dry season (Tuan, 2020a; United Nations, Catholic Relief Services, & Save the Children, 2020). The saltwater intrusion occurred about 10-20 days earlier than the 2015-2016 event and 2.5-3.5 months earlier than the annual average (United Nations et al., 2020). Nevertheless, the impact of the 2019-2020 event was less, with only 13 provinces affected and only two declaring a State of Emergency (compared to 52 and 18 provinces, respectively, in the 2015-2016 event) (United Nations et al., 2020). This can be attributed to the government's earlier warning, reaction and preparation (United Nations et al., 2020), and more importantly to farmers' responses by planting crop 3 earlier and strategically preserving water from the flood season (Tuan, 2020a). Farmers' innovative solutions in coping with saline intrusion such as adjusting cropping calendar, growing alternative cash crops, digging internal ditches or placing canvas

under small ponds to preserve freshwater (e.g., T.A. Tran, Nguyen, & Vo, 2019, p.93) could help each household voluntarily confront saline intrusion. However, there is still a need of a comprehensive developmental plan to solve conflicts and sustainably support farm communities in a long term.

What we can learn from the 2019-2020 event is that the risk of falling into another similar disaster remains possible. According to an estimation by Naumann et al. (2018), if global warming increases 3ºC, the return period of drought will reduce from once in every hundred years to once in two to five years in many parts of the globe. Such risks of climate changes, equipped with the alarming decrease of water flow from the Mekong River due to the upstream hydro-power dams construction (Piman, Cochrane, & Arias, 2016; Pingali et al., 1997; Tuan, 2020b) make exposure to saline intrusion is high. In such situation, the emphasis should be put first on solving the existing disaster vulnerability within the VMD. Many farmers in coastal areas are still finding themselves dependent on the triple rice cropping system and crop 3 cultivated in the dry season (T.B. Nguyen et al., 2021). Similar to many coastal regions around the world such as Bangladesh (Islam et al., 2020; Dasgupta et al., 2018), this cropping pattern is largely dependent on water management based on salinity control infrastructure. While the solutions such as constructing, rehabilitating, and expanding the irrigation and reservoir systems have been proposed (N. A. Nguyen, 2017; United Nations et al., 2020), it is necessary to realise that the dependence on irrigation systems cannot sustain the water demand for triple cropping in the long run and such a strategy is very costly due to the need of continuous maintenance and yearly upgrades. Improving the early warning system (e.g., a real-time monitoring system for soil and water salinity) (CGIAR, 2016), educating and raising community awareness on disaster risks (United Nations et al., 2020), imposing allowable limits on crop cultivation in response to each year's state of risks of saline intrusion (N. A. Nguyen, 2017), setting cut-off dates for the Winter-Spring crop (CGIAR, 2016), or developing salt tolerant rice varieties (CGIAR, 2016) are helpful, but cannot solve the root causes of the disaster vulnerability. Therefore, instead of expanding and relying on irrigation systems to cope with natural risks, it is better to find a way to reduce the weight of water demand from the current irrigation system by diversifying farming systems (T.B. Nguyen, 2015; T.B. Nguyen et al., 2021; M.T. Nguyen et al., 2019). This direction should be considered for other coastal regions like Bangladesh whose rice production systems are dependent on irrigation and salt tolerant varieties to cope with salinity problem (Islam et al., 2020).

One of the possible solutions that could be done in a shorter term is to change the triple rice cropping system, starting by dropping crop 3 in the dry season (Tuan, 2020a). What I am proposing here is not just simply removing such a crop entirely from the calendar; but rather to transform the triple cropping system to a double or even single cropping system and develop a more sustainable livelihood replacement for local farmers. Instead of cultivating triple crops, farmers should consider cultivating double rice cropping by dropping either crop 1 or crop 2. This new crop calendar should allow them to save freshwater for crop 3 (in this case it will be the second crop) and to cultivate it earlier to prevent saline intrusion (crop 3 as the Spring-Summer or late Winter-Spring crop would be changed to the Winter-Spring crop). This proposal will surely face the resistance from farmers due to their durable habitus towards crop 3 production. Additionally, rice production should be aimed at high quality rice instead of quantity. Currently, although obtaining a high yield per ha, rice products often do not meet the quality standards such as VietGAP, which result in low price for Vietnamese rice on the international market (Ba et al., 2019; Demont & Rutsaert, 2017). Thus, in parallel with reducing the number of crops per year, it is necessary to switch from low- to high-value rice crops (Tuan, 2020b). In short, the change should be at the system scale and viewed on a long-term basis, rather than just focusing on a single crop and on a yearly basis.

The Resolution 120/NQ-CP (GoV, 2017) with a vision of transforming the VMD into a highly developed region based largely on ecological agriculture and high technology agriculture (80 per cent by 2050) was a right move of the government in response to increasing vulnerability to climate changes. The Resolution 120 and its subsequent General Action Program in the Decision Number 417/QD-TTg dated April 13, 2019 (GoV, 2019) have directed the VMD's agriculture from rice monoculture to the agriculture of three main products: aquatic products – fruit trees – rice. These changes denote the comeback to the respect of the natural laws. Yet, my research shows that there is still a long way ahead in achieving the goals of the Resolution. It is observed that although the quota-based policies have essentially been removed (Nielsen, 2002), the government's encouragement and requirement of maintaining rice monocropping are still observed in many areas such as Central Vietnam and the VMD (Bruun & Olwig, 2015; World Bank, 2017). This means that the mindset (habitus) of local agents may still binds them to a rice monoculture. What I have learnt from farmers' stories (or from elsewhere in the VMD, T.B. Nguyen et al., 2021) is that most would not give up on their traditional livelihood, or broadly speaking, their lifestyle surrounding land and rice, unless they can find a promising replacement of livelihood. If the new livelihood is within the agricultural sector, the most

important lesson is to build a strong value chain for new non-rice crops. Long Phu and Tan Hung governments so far have failed to persuade farmers to leave crop 3 and cultivate non-rice crops such as corns or vegetable crops. One of the reasons for this failure is the distrust in the government's solution due to the unsuccessful experiment of corn crops in Village A in 2017. In the case of Bong Da, for instance, he told me in February 2021 that in addition to the regular crop 3, he followed his fellow farmers to trial planting three *large congs* (0.39 ha) of an American corn variety, which only requires a shorter duration (80 days) and can be harvested in February. However, the problem is still finding appropriate output markets, for which he does not know. These failures demonstrate that the challenge does not lie with whether or not farmers should change their livelihood to non-rice crops or non-rice livelihood; it lies with how to solve the underdevelopment of farmers-companies or seller-buyer relationships should farmers convert rice-based livelihood into non-rice livelihood. Without such conditions, there is not persuasive enough for farmers to take risks of changing their habitus. Therefore, it is necessary for the government to develop a more comprehensive plan for livelihood development to replace the current spontaneous trials. In this plan, it is of vital importance to build a strong connection between not only input providers and farmers but also between farmers and buyers. In a broader picture, the general plan is to build strong connections among four stakeholders, the State, the farmers, the scientists, and the enterprises (*liên kết bốn nhà: nhà nước, nhà nông, nhà khoa học và nhà doanh nghiệp*). There is a need for future studies to find out which are the most feasible and efficient ways to do so. Future research should focus on identifying the major obstacles of building such connections that are derived from both a social structure perspective (e.g., structural constraints limiting those stakeholders from linking with each other) and from an agent perspective (e.g., motivation and perceived obstacles of each stakeholder in joining this network).

Additionally, the failure of local government in revitalising agricultural cooperatives implies farmers' lack of trust in the government's strategies, plans, and activities including warning information. There has been a theme rising from my study suggesting that the 2015-2016 disaster reinforced existing conflicts between farmers and the governments. Although they were shy in interviews when talking about the State, it was clear that they disagreed with the ways the government managed water and salinity control works which were believed by some to have led to the 2015-2016 crop failure. In addition, farmers also interpreted the government's solution of encouraging farmers to drop crop 3 as a prohibition from doing crop 3, which led them to criticisms of the government. Studying the ongoing conflict between farmers and the

State following adversity should be a good topic since there has been a little examination of this topic in both disaster research and social capital research (Nguyen-Trung et al., 2020).

Last but not least, there is always a need to take into account vulnerable groups when it comes to assess vulnerability and build a new livelihood plan. It was evident that farmer groups such as the elderly and those living with disability faced a bigger challenge to cope with and recover from the disaster, as well as to learn new skill sets for job switch. Disasters or livelihood crises would amplify the irreversible processes of land accumulation, concentration and landlessness (Bui & Nguyen, 2017; Ravallion & Van de Walle, 2008). While some farmers could take advantage of those processes to become a wealthy class in the countryside, others (often young, healthy farmers) could migrate to big cities in search of new incomes (M.T. Nguyen, Renaud & Sebesvari 2019; V.K. Nguyen & James, 2013; Prota & Beresford, 2012), the vulnerable ones are often trapped behind with a lack of resilience and capital in coping with adversities. This is worsened due to the growing risk of climate changes, the maintenance of disaster-prone crop 3 production, the proliferation of mechanisation, and the reduction in agricultural wage jobs (T.A. Tran & James, 2017; T.A. Tran et al., 2019). The development of new livelihood surely should include these groups.

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APPENDIXES

Appendix 1. Propositions behind Research Questions

Research questions	Propositions
Central question: How can vulnerability to slow-onset disasters be understood from the perspective of agency and social structure?	Disaster vulnerability is the outcome derived from the interaction between social structures and agency. Structural conditions of the field(s) negatively affect a certain group of agents in their access to, investment in, and use of capitals and in developing their suitable capacities to execute risk management strategies. Agency, or the ability of agents, contributes to the vulnerability as they make choice and act in the face of natural hazards. The formation and evolution of disaster vulnerability is the result of the transformation of the field in association with agents' habitus, access to capitals, and risk-taking practices across time and space.
How can past social structures explain present habitus and risk-taking strategies?	The habitus towards risk and risk-taking practice in the present time are rooted in the transformation of the field throughout its history. This transformation leads to the changes in agents' access to/investment in capitals and subsequently shape their habitus and practice. However, agents are not passive, but active in adaptation to and alteration of the field.
How do farmers perceive risks in everyday life?	The ways farmers perceive risks reflect their habitus towards risk, which is connected to the fields in which they engage, especially the field of agriculture. The perception of risks, thus, reflects how they see and interpret the structural conditions of the field.
How can the concepts of habitus and capital help explain farmers' risk-taking practices?	Farmers, as social agents, can have access to a variety of capitals (cultural capital, economic capital, social capital). Their habitus navigates the ways they judge, invest in, and use these capitals to develop risk-taking practices.

Appendix 2. Data Collection Methods

Level of information	**Methods**	**Objects**
Social structures or fields (or the social context of the case)	Document analysis	Laws, regulations, emergency plan documents; governments' plans and reports; donors' reports.
	Archival records	Census and statistical data; villages and organisations' records; survey datasets; maps.
	Direct Observation	Natural environment: rice fields (e.g., harvesting, sowing); built environment: sluice gates, dike systems, pump stations, canals, roads, bridges; social environment: café, social gathering locations.
	Key informant interviews	Experts; local officials; village staff; mass organisations' representatives; agricultural input suppliers.
Agency (farmers' perception, habitus, access to capital, practices, relations with other agents and social structures).	Household interviews	Vulnerable and suffered households.

Appendix 3. Key Informant Interviews' Participant Profile

#	Name*	Category	Organisation	Locations of interview
1	Ban	Expert	University, Research Institute	Office, café
2	Tu	Expert	Ministry of Agriculture and Rural Development	Office
3	At	Official	Department of Natural Resources and Environment, Soc Trang	Café
4	Ka	Official	Division of Irrigation, Soc Trang province Department of Agriculture and Rural Development	Office
5	Quy	Official	Division of Agriculture and Rural Development	Office
6	Ji	Official	Commune People's Committee	Office
7	Hai	Official	Long Phu District Division of Agriculture and Rural Development	Sluice gate keeper
8	Ro	Official	Tan Hung Commune People's Committee	Office
9	Bich	Official	Tan Hung Commune People's Committee	Office
10	Tam	Village Head	Village C, Tan Hung, Long Phu, Soc Trang	Café
11	Muoi	Village Head	Village B, Tan Hung, Long Phu, Soc Trang	Home
12	Chin	Village Head	Village A, Tan Hung, Long Phu, Soc Trang	Café
13	Sau	Mass organisation	Village B's Fatherland Front	Home
14	Bay	Mass organisation	Village A's Elderly's Union	Home/shop
15	Bon	Mass organisation	Village A's Women's Union	Office
16	Ba	Mass organisation	Village B's Farmers' Union	Home/shop
17	Chuon	Mass organisation	Tan Hung Commune's Women's Union	Office
18	Com	Supplier	Village A, Tan Hung, Long Phu, Soc Trang	Home/shop
19	Bo	Supplier	Soc Trang city, Soc Trang	Home/shop
20	Tuong	Supplier	Long Phu town, Soc Trang	Home/shop
21	Mam	Supplier	Long Phu town, Soc Trang	Home/shop

Note: * All the names used are pseudonyms.

Appendix 4. Household Interviews' Participant Profile

#HH	Names*	Village	Gender**	Ethnicity	Poverty in 2017
1	Oi Dao	Village B	Male	Khmer	Non-poor
2	Chanh	Village B	Female	Kinh	Non-poor
3	Tao	Village B	Male	Khmer	Non-poor
4	Thanh Long	Village B	Male	Khmer	Non-poor
5	Dua Hau	Village B	Female	Khmer	Poor and near-poor
6	Sau Rieng	Village B	Female	Khmer	Poor and near-poor
7	Buoi	Village B	Female	Khmer	Poor and near-poor
8	Cam	Village B	Male	Khmer	Poor and near-poor
9	Xoai	Village B	Male	Khmer	Poor and near-poor
10	Mit	Village B	Female	Khmer	Poor and near-poor
11	Mận	Village B	Male	Khmer	Non-poor
12	Chom	Village B	Male	Khmer	Non-poor
13	Luu	Village B	Male	Khmer	Non-poor
14	Muoi Bich	Village B	Male	Khmer	Non-poor
15	Bong Da	Village A	Male	Kinh	Non-poor
16	Bong Ro	Village A	Male	Kinh	Non-poor
17	Bong Chuyen	Village A	Male	Kinh	Non-poor
18	Nhay Cao	Village A	Male	Kinh	Non-poor
19	Bong Ban	Village A	Male	Kinh	Non-poor
20	Cau Long	Village A	Male	Khmer	Non-poor
21	Quan Vot	Village A	Male	Khmer	Non-poor
22	Boi Loi	Village A	Male	Chinese	Non-poor
23	Dien Kinh	Village A	Female	Kinh	Poor & near-poor
24	Chay Nhanh	Village A	Female	Kinh	Poor & near-poor
25	Chay Ben	Village A	Male	Khmer	Poor & near-poor
26	Cờ Vua	Village A	Male	Kinh	Non-poor
27	Co Tuong	Village A	Male	Kinh	Non-poor
28	Chin Ro	Village A	Male	Chinese	Non-poor

*Note: * Names refer household heads' pseudonyms; ** Gender of household head*

Appendix 5. List of Observations

Time	Goals	Locations/Activities
March 2018	To grasp an overview of the local natural environment (river), built infrastructure (dike systems), rice fields, and get used to local people.	From Soc Trang city, followed the Provincial Road 933 to the Provincial Road 6, I bypassed Tan Thanh and Tan Hung communes, reached Long Phu town of Long Phu district, then went along the National Road 91C to Kinh Ba Town of Tran De district, visited Ap Thoc village of Tran De and one village of Tan Hung commune.
March 2018	To capture the local landscape and social settings of Village B.	Together with a Farmers' Union's staff member, we drafted Village B's general map, then discussed the social settings of Village B, then we went around the village from this staff's house, followed local canals and visited local rice fields, housing, café. I conducted some short, informal conversations with local people.
April 2018	To capture the local landscape and social settings of Village A.	Together with a local farmer, we drafted Village A's general map, then discussed the social settings of the village, then visited local rice fields, housing, restaurants, café. I conducted some short, informal conservations with restaurant owners and local people.
July 2018	To understand the operation of the sluice gates system, accompanied the interviews with sluice gate keepers.	With the support of a farmer from Village A, from Tan Hung commune, I went alongside local canals, followed Saintard River to visit some sluice gates located in Phu Huu commune, then reached Dai Ngai bridge and Ba Xam sluice gates, followed the Provincial Road 91C to go back to Tan Hung commune.
December 2018	To understand the local markets and social gathering at 3am.	I went to Village B's and A's restaurants/café to witness how social gatherings occurred in the morning and how local farmers conversed about rice crops.

Source: Field notes

Appendix 6. Documents and Levels of Information

Level of information	Documents
National level	CPV's national progresses' documents and reports (1976-2020); GoV's laws, policies, regulations, strategies, emergency plans for coping with disasters and climate change, including drought and saltwater intrusion (1975-2020); GoV's laws, policies, regulations, strategies, and plans for rural and agricultural development (1975-2020); GoV's laws, policies, regulations, strategies, and plans for the Mekong Delta development (1975-2020); Other GoV's relevant laws and policies (e.g., land laws 1993);
Local levels	Soc Trang's Provincial People Committee's (Soc Trang PPC) Presentation on the results of land statistics collection and building the 2005 land use map for Long Phu district, Soc Trang province (2005); Soc Trang PPC's Land Use Plan Until 2020 and the Land Use Plan for the first five years 2011-2015 in Soc Trang province (2012); Soc Trang PPC's Decision on approving the land use plan for Long Phu district (2018-2020); Soc Trang PPC, Provincial Steering Committee on Flood Prevention and Rescue's reports on the outcomes of preventing and coping with natural hazards and solutions for consideration (2010-2018); Soc Trang PPC's Plan on preventing saline intrusion (2017); Soc Trang PPC, Department of Agriculture and Rural Development's Plan on Preparation for Preventing Saline Intrusion, Storing Freshwater in order to Cope with Drought and Saline Intrusion in the Dry Season 2016-2017 (2016); Long Phu District People's Committee's (Long Phu DPC) reports on Summarising Agricultural Development Achievements and Plans and Solutions for a New Year (2008-2018); The Communist Party of Vietnam Branch in Long Phu District's Action Plan on Restructuring Agriculture in the Direction of Increasing Value Added and Sustainable Development in Cooperation with Building the New Rural Area Program in Long Phu district from 2016 to 2020 (2015); Long Phu DPC's Plan for Agricultural Restructuring in the Direction of Increasing Value Added and Sustainable Development in Long Phu district until 2020 (2015); Tan Hung Commune People's Committee's reports on Socio-economic States and Plans and Directions for a New Year (2013-2017); Tan Hung Women's Union's reports on the Women's Movement and Women's Union's achievement and plans for a new year (2014-2017).

Appendix 7. Archival Records and Level of Information

Level of Information	**Archival Records**
National level	Vietnam General Statistics Office's (GSO) databases including: census, statistical yearbooks, databases on Administrative Unit and Climate, Population and Employment, Agriculture, Livestock and Fishery, Transport, Postal Services and Telecommunications, Socio-Economic Statistical Data of 63 provinces and cities, etc.; The World Bank's Vietnam Country Data including population, GDP, GDP per capita, poverty, and so forth; United Nations' Data on Drought and Saline Intrusion in 2015-2016; Databases from Emdat.be and Desinventar.net; Vietnam's Food Association's Vietnam Rice Exports Quantity from 1989 to 2017 (2018).
Local levels	Soc Trang's Division of Statistics Office's Long Phu Yearbook Statistics in 2016; Soc Trang PPC's Database on Land Use (2005, 2012); Long Phu DPC's Household Poverty Database (2015-2017); Long Phu DPC's Loss Statistics in the 2015-2016 season (2016); Tan Hung CPC's Household Poverty Database (2010-2018); Tan Hung CPC's List of Households Receiving Relief Funds in 2015-2016 (2016b); Tan Hung's Land Use Map; Households' Buying and Selling Records.

Appendix 8. Guide for KIIs with officials/mass organisations' leaders/ village heads

KEY INFORMANT INTERVIEW GUIDE – STAGE 1

(Authorities officials/mass organisation's leaders/village heads)

Place: Date:

Interviewer: Interviewee:

Introduction: giving instructions for the research purposes, the interview procedure and content, informing the participant their right to withdraw from the interview at any time, asking for the permission of audio-recording, and asking for completing the consent form.

Interviewee's information

- Age, gender, position, year of experience

General information

- Socio-demographic characteristics of Soc Trang province/ Long Phu district/ Tan Hung commune/village (asking for the socio-economic reports at least from 2015 to 2018).
    - Population, households, gender rate, age, ethnicity, education, employment rate, main economic activities, poverty rate.

The impacts of the disasters

- What are the risks affecting crop production (asking for reports, databases)?
- How do you perceive the 2015-2016 event?
- What are the impacts of the disasters on the province/the district/ the commune/village?

Recovery plans/ projects

- How has your organisation helped farmers in the disaster recovery?
    - Name of any specific plans/ activities
    - Duration of those plans/ activities
    - Location of those plans/ activities
    - Target groups of those plans/ activities
    - Types of support of each plan/ activities
    - The process of those supporting activities
    - Outcomes of those plans/ activities

Laws/ policies

- What are the laws, regulations, policies, and strategies that Soc Trang province's/ Long Phu district's/ Tan Hung commune's authorities have applied for agricultural production?
- What are the laws, regulations, policies, and strategies that Soc Trang province's/ Long Phu district's/ Tan Hung commune's authorities have applied for agricultural production?

Thank you for your time!

KEY INFORMANT INTERVIEW GUIDE – STAGE 2

(Authorities officials)

Place: Date:

Interviewer: Interviewee:

Introduction: giving instructions for the research purposes, the interview procedure and content, informing the participant their right to withdraw from the interview at any time, asking for the permission of audio-recording, and asking for completing the consent form.

History of doing crop 3

- When did local farmers start cultivating crop 3? Describe that situation?
- What do you think about the reasons farmers did crop 3?
- How did you participate in such a process?
- How did the government perceive crop 3 at that time?

Water management

- Farmers said that the occurrence of the 2015-2016 disaster because of the government's mismanagement. What do you think? Why?
- Farmers said that if the government managed irrigation well (e.g., stored enough freshwater during the rainy season), local farmers could not have failed the 2015-2016 crop 3. What do you think? Why?
- What are the biggest challenges to water management?

Responding

- How have your policies/perspectives changed after the 2015-2016 event? Why?
- How have you prepared for the 2018-2019 crop 3?

Thank you for your time!

Appendix 9. Guide for KIIs with Agricultural Input Supplier

KEY INFORMANT INTERVIEW GUIDE – STAGE 1

(Supplier)

Place: Date:

Interviewer: Interviewee:

Introduction: giving instructions for the research purposes, the interview procedure and content, informing the participant their right to withdraw from the interview at any time, asking for the permission of audio-recording, and asking for completing the consent form.

General information

- General information such as age, gender, ethnicity, education level,
- Position within the supplier
- History of the supplier
- Services and activities of the supplier
- Sources of inputs for the supplier
- Clients of the supplier

Perception of disaster risks

- Are you aware of the threats to crop 3? What are they?
- How did the 2015-2016 event happen?
- What was the impact of the events to farmers and the supplier themselves?

Support and policies

- What are the supplier's strategies and policies for supporting farmers?
- What are the supports they have given farmers? Why?
- Do you provide support in terms of cash lending, deferred debt payment, credit sale? Why?
- Who are they supporting and why? Have you built relationships with these farmers?

Thank you for your time!

Appendix 10. Guide for KIIs with Expert

INTERVIEW GUIDE – STAGE 1

(Experts)

Place: Date:

Interviewer: Interviewee:

Introduction: giving instructions for the research purposes, the interview procedure and content, informing the participant their right to withdraw from the interview at any time, asking for the permission of audio-recording, and asking for completing the consent form.

Personal information

- General information such as age, gender, ethnicity, education level, position

Perception of disaster risks in Mekong Delta

- What are the disaster risks in the Mekong Delta?
- How has the delta interacted with disasters?
- How did the 2015-2016 event happen?
- What does the 2015-2016 disaster mean to the Delta?

Government policies

- What are the government's strategies and policies for developing the Mekong Delta? Asking for relevant documents.

***

INTERVIEW GUIDE – STAGE 2

Government's policies

- How have the government's policies regarding rice production impacted local farmers?
- How have the government's policies regarding the irrigation system in Mekong Delta impacted local farmers?
- How have the government's strategies for the Mekong Delta's development affected local farmers?
- How have the government's strategies for the Mekong Delta's development impacted local farmers?

Crop 3 and triple cropping system

- What are the consequences of the triple cropping system?
- How has the government responded to those consequences?

Thank you for your time!

Appendix 11. Household Interviews' Topics in Stage 1 and Stage 2

Topics	Stage 1	Stage 2
Interviewee's general information	Yes	Yes
Household's socio-demographic characteristics	Yes	No
Household's economic profile (e.g., land, livelihoods)	Yes	No
Perception of everyday risks	Yes	No
Perception of the 2015-2016 disaster	Yes	No
Risk-taking crop production	Yes	No
Reasons for risk-taking	Yes	No
Disaster recovery and types of support received	Yes	No
History of and reasons for cultivating crop 3	Partly	Yes
Relationship with governments	Partly	Yes
Blame and responsibility	Partly	Yes
Crop data in recent years	Partly	Yes
Confirming research findings and concepts	No	Yes

Appendix 12. Guide for Household Interviews

HOUSEHOLD INTERVIEW GUIDE – STAGE 1

Place: Date:

Interviewer: Interviewee:

Introduction: giving instructions for the research purposes, the interview procedure and content, informing the participant their right to withdraw from the interview at any time, asking for the permission of audio-recording, and asking for completing the consent form.

Interviewee's information

- Gender; Age; Ethnicity; Education; Village.

Household's information

- Family members: age, livelihoods, year of experience.
- Expected income/expenses; poverty status.
- Type of house, assets, and facilities.
- Organisation memberships and local participation.

Assets related to agriculture

- Land area: possession, borrowing, mortgage.
- Agricultural activities: year of starting agriculture; input costs.
- Agricultural production: crop data

Year	Land holding (ha)	Planted area (*stand cong*=0.1 ha)			Production (ton)		
		Crop1	Crop 2	Crop3	Crop1	Crop 2	Crop3
1. 2018							
2. 2017							
3. 2016							
4. 2015							
5. 2014							
6. 2013							

Perception of risk/disaster

- What are risks? What are disasters? How do you describe them in everyday life?
- What are the risks affecting your life? How do they affect you and your family?
- How do you rank them on the order of importance? Why?
- What does the 2015-2016 event mean to you? Why do you perceive so?
- What do you think caused the event? Why?
- Who should take responsibility for the occurrence of the event? Why?

Risk-taking and reasons

- How much did you cultivate the 2015-2016 crop 3? Why did you cultivate/omit the crop?
- What were the measures you used to prepare for and cope with the 2015-2016 drought and saline intrusion?

- What were the impacts of the event on your households? Examples?
- Have you received a warning about the drought and saline intrusion before the crop? If yes, how did you respond to this warning? Where did you often get information regarding natural hazards?
- What channels did you often use to approach information about natural risks (e.g., drought and saline intrusion)? How did you use them? Why?

Disaster recovery and support received

- How do you describe your recovery since the disaster?
- What has your family done to recover and avoid future risks?
- Who has your family sought help to aid your recovery? Why did you look for this person/organisation? What types of social support (money, food, knowledge, etc.) has your family received from them? How have you built relationships with them? Are there any changes in such relationships during and after the disaster?
- How have the government/mass organisations supported your family?
- When facing difficulties (lack of money, sick, etc.), whom do you seek support from? Why?

Thank you for your time!

***

HOUSEHOLD INTERVIEW GUIDE – STAGE 2

Place: Date:

Interviewer: Interviewee:

Introduction: giving instructions for the research purposes, the interview procedure and content, informing the participant their right to withdraw from the interview at any time, asking for the permission of audio-recording, and asking for completing the consent form.

Interviewee's information

- Gender; Age; Ethnicity; Education; Village (if different from the previous interviews)

History of doing crop 3

- When did you start cultivating crop 3? Describe that situation? Why did you decide to grow crop 3? How did you change from single/double cropping to triple cropping?
- How did the government respond to the change?

Crop data

- How has your landholding changed since 2013? What were the planted area and production of your crops since that year? (Asking from the most recent year backward to the previous years)
- If there were changes in crop area/production, ask why?

Disaster experience

- Have you failed crop 3 before the 2015-2016 event? Describe the situation and the impact? Why did you continue if you had failed crop 3 before?
- Who should be responsible for the 2015-2016's crop failure? Why?

Confirming the findings from Stage 1

- Membership and local activities

Organisations/activities	Having members joining this […]? What activities?
Fatherland Front	
The Veteran Association	
Women's Union	
The Elderly Association	
Communist Party of Vietnam	
Farmers' Union	
Youth's Union	
Agricultural cooperative	
Village Meetings	

- Information sources

Information sources	How often access to this source for risk information? Why?
Café	
Television	
Radio	
Loudspeakers	
Internet/mobile phones	
Village staff	
Commune staff	
Mass organisation staff	
Family and relatives	
Close friends	
Neighbours	
Outside village friends	
Brokers/dealers	
Suppliers	
Companies	
Others	

Thank you for your time!

Appendix 13. Flexibility in conducting HHIs

Met with a household's two generations in one interview

Mr Muoi Bich, the village head of Village B, introduced me to a household of mixing ethnicity with Ms Chanh, a Kinh woman married to a Khmer man. Chanh, 50, showed that she was the household head at the time I came to ask for an interview. She accepted to represent the family to join the interview with me. In our interview, when it comes to crop production, especially crop timing and use of fertiliser, she had to call her daughter, Quyt, to join and answer my questions. The interview transformed from one-on-one to group interviews.

Neighbour suddenly joined the interview

I interviewed Mr Xoai, 62, whose wife died in 2014 and two sons were mentally disable. Our interview was taken place in front of his house. The house had no fence to separate his house and others. Suddenly, his niece, who lived nearby, heard the interview and disrupted our interview. Sometimes she answered one or two questions that Xoai did not remember, such as information on the time of the 2015-2016 drought and saline intrusion.

One HHI became three HHIs

I met Mr Bong Ban, a Kinh farmer in Village A at the rice field when he was about to harvest his crop 3. I asked him for joining my interview and asked him to introduce me to some farmers identified on my sampling list. Later, while I was interviewing him at his house, his wife Cau Mon joined us. She went back and forth between our interview and her kitchen. In the middle of the interview, Mr Cau Long and Quan Vot – two farmers on my list, popped by, Bong Ban called them to join my interview. My interview was suddenly transformed into a group interview. Thus, I extended my interview to cover three households. Later on, I also re-interviewed with Cau Long (once in Stage 2) and Quan Vot (one more in Stage 1, twice more in Stage 2) for missing information in the first interview.

Source: Field notes

Appendix 14. Data Management and Data Analysis

Stage	Data management	Data analysis	Outputs
Pre- and During-Pilot study (January-March)	Collected documents, archival records. Started organising the first collected data. Started a fieldwork diary.	Got familiar with the local context, documents. Wrote first field notes.	Inputs for case finalisation and directions for the main stages.
Stage 1 (March-July)	Got some interviews transcribed. Collected and stored documents, archival records. Organised collected data into different folders according to three data analysis strategies. Triangulated collected data and cleaned inconsistencies. Kept diary, notes and maintained regular correspondence with supervisors.	Got familiar with the first wave of data. Started initial analysis including reading, re-reading, coding, memoing, diagramming. Produced the case study report, prepared for a presentation on primary findings.	An initial coding scheme. A first collection of memos, diagrams. The first presentation on disaster recovery and social capital.
Break (July-November)	Fully transcribed interviews Stage 1. Converted all hard copies (documents/maps) into electronic files. Organised data collected into different folders.	Analysed data on the two themes of disaster recovery and vulnerability (coding, memoing, building themes) Wrote up the fieldwork report. Prepared presentations and manuscripts for book chapters.	A coding scheme. A potential thematic scheme. Two presentations on social capital in disaster recovery and root causes of vulnerability.

	Triangulated collected data and cleaned inconsistencies. Kept diary, notes and maintained regular correspondence with supervisors.		Directions for Stage 2.
Stage 2 (November-December)	Organised collected data into different folders. Triangulated collected data and cleaned inconsistencies. Collected feedback from seminars Kept diary, notes and maintained regular correspondence with supervisors.	Got familiar with the second wave of data. Continued thematic analysis (coding, memoing, building themes).	Confirming conclusions from the primary data analysis.
After Stage 2 (2019-present)	Fully transcribed the interviews in Stage 2. Converted all hard copies (documents/maps) into electronic files. Organised collected data into different folders. Triangulated collected data and cleaned inconsistencies. Kept diary, notes and maintained regular correspondence with supervisors.	Continued thematic analysis in response to the research questions (searching, refraining, defining themes and sub-themes, built analytical narratives including data extracts). Completed the fieldwork report. Prepared manuscripts/drafts for book chapters, research papers, thesis.	A fully developed coding scheme. A fully developed theme scheme. Data extracts and analytical narrative. Publications and thesis.

Source: author

Appendix 15. On Methodological Triangulation

Triangulation has long used as the technique of data validation. It was first systematically developed by Denzin who proposed that to 'completely reveal all the relevant features of empirical reality', researchers must use triangulation by applying 'multiple methods of observations' (Denzin, 1978, p. 29). This stance has been criticised by many scholars (Fielding & Fielding, 1986; Flick, 1992; Silverman, 1985) because it assumes that only research using multiple methods can produce valid data and findings, downplaying the fact that each source of data or method with a proper design can obtain such an outcome. Consequently, scholars argue that triangulation should be understood as a way to better grasp the phenomenon of interest. In this study, I agree with the viewpoint seeing triangulation as 'less a strategy for validating results and procedures than an alternative to validation … which increases scope, depth and consistency in methodological proceedings' (Flick, 2009, p. 445).

Although Denzin's (1978) stance on triangulation is outdated, his classification of four types of triangulation is useful. They are data triangulation, investigator triangulation, theory triangulation, and methodological triangulation (within-method and cross/between-method). In this study, the first and the fourth were used so as to grasp a deeper understanding of the social practices of local farmers in cultivating crop 3 and facing risk.

Data triangulation is the technique of using the same methods to examine different data sources in order to maximise understanding (Denzin, 1978, p. 295). Three interrelated dimensions should be taken into account: time, space, and person. These dimensions mean that data should be collected from varying persons who lived across time and space. For instance, in my study of local farmers, I tried to conduct interviews at different times, with Stage 1 occurring in a time of harvesting the 2017-2018 crop 3 (from March to July) while Stage 2 occurring in a time of harvesting the 2018 crop 2 and starting crop 3 (from November to December). These varying times allowed me to observe farmers in different times and ensured that my interviews would contain current opinion on what has just happened (e.g., the crop has been harvested) or what would be done in the near future (e.g., the crop was about to be planted). In addition, my examination on the history of cultivating crop 3 also took into consideration the relationship between the past choices and the ongoing cropping practices of different groups of farmers who started crop 3 in different decades (1990s, 2000s, and 2010s). The concern for space was also solved by choosing farmers from different locations (e.g., villages) who had rice fields at different locations (e.g., close to or far away from water resources).

Methodological triangulation refers to collecting data using different methods. In this study, I did not only rely on household interviews with the farmers, but also employed the KIIs with relevant stakeholders involved in the field of agriculture such as the government, mass organisations, village heads, and agricultural suppliers. In addition, the analyses of secondary data from documents and archival records as well as observing local places and activities contributed to ensuring the research topics were looked at from different perspectives.

One of the examples in using methodological triangulation was the selection of households impacted by the 2015-2016 event. At first, I relied on the *List of affected households receiving relief funds in the 2015-2016 season* [document analysis] released by the commune government. This list specified affected households with affected land areas and the fund they received. However, the real disaster impact was far more complicated than what being shown in the list. For instance, Quan Vot household (HH21) identified by the list as an affected household who got 0.3 ha of the affected area and received a relief fund of VND 300 thousand. The interviews with this household [HHIs] revealed that Quan Vot actively omitted the 2015-2016 crop 3 and lent this affected area to his nephew, who wished to continue this crop. Therefore, the impact of the 2015-2016 event on Quan Vot household was only indirect. Thus, I kept this household in the sample with a note on the indirect impacts and they chose to skip the 2015-2016 crop 3.

In another case, T.H was a household in Village B who was classified by the list as an affected household with 0.1 ha of the affected area and receiving VND 200 thousand. However, in interviewing with this household, they reported that they had stopped growing rice crop for over five years (before the 2015-2016 event) to engage in wage jobs. The affected area indeed belonged to their parents. Thus, it was impossible for them to be classified as an impacted household. Eventually, I excluded T.H from HHIs.

Information from village heads [KIIs] and other farmers confirmed that the identification of affected households and areas was done by district and commune officials whose assessments were based on short visits and did not fully reflect the disaster impacts on households. As the fieldwork went on, HHIs revealed different types of impacts, not just on the crop losses but also on physical changes, financial debt, and mental health. This led to a need to change my sampling strategy to include those who may not be included in the list but were affected by the disaster.

Appendix 16. On Reflection and Sharing

The act of carrying out qualitative research and of social research generally is never free from biases or assumptions. However, there is a need of recognising, understanding, and avoiding these biases so as to better manage the quality of the research. This can be done by reflexive practice (Braun & Clarke, 2019). Reflexivity refers to the practice of reflecting on biases, choices and decisions made concerning research design, data collection, data analysis and findings sharing. The research process, therefore, is a journey of continuous learning and evolving as a person and as a researcher (Braun & Clarke, 2019). The practice of reflection was done through keeping an operation diary, correspondence with supervisors, and presentation to colleagues.

Throughout the fieldwork period I kept an operational diary, which Strauss and Corbin (1998) regard as an operational memo. This diary was devoted to recording daily events, especially those of great consequence to my fieldwork such as meetings with local people or key persons. The diary plays a role of maintaining memory of events and reflecting on what has been done. In addition to this diary, I also developed other notes (e.g., theoretical notes) to reflect on ideas and findings that I obtained from data collection and data analysis. These memos not just enhanced theoretical understanding of the empirical data but also helped identify my biases arising during data collection and data analysis.

I regularly corresponded with my supervisors about my fieldwork through exchanging reports and emails. The process of reporting allowed time for reflection on events and their feedback to check if I got things right or there were biases that I needed to change. I also tried to present my first claims to them to see if these claims made sense.

During my fieldwork, I presented three official presentations on different topics, one in Singapore (May 2018), one in Hanoi and one in Ho Chi Minh city (November 2018). The first one was at an international conference while the latter two were Vietnamese seminars. These presentations included some preliminary findings on the topics of social capital, local networks, and disaster vulnerability that came out of my initial data analysis, and were aimed to receive feedback to address biases or adjust the research design/sampling.

Appendix 17. Quantitative Codes for Household Interviews

Code	Value	Description
HH#	HH1 to HH28	Household ID
Name	Text	Real name of household heads
Nickname	Text	Pseudonym of household heads
Village	Village A; Village B	The village where the household located at the time of interviews
Gender	Male; Female	Gender of household heads
Ethnicity	Kinh; Chinese; Khmer	The ethnicity of household heads
Birth	Number (year)	Birth of household heads
Education	0-12 (grade)	The highest grade that household heads reached
Literacy	1=Literacy; 0=illiteracy	Household heads' capacity to read, write
A-start	Number	The age that household heads started working in rice production
Y-experience	Number	Year of experience that household heads working in rice production
Y-crop3	Number	Year starting cultivating crop 3
f-mem.18	Number	The number of family members at the time of interview
f-mem.15	Number	The number of family members in 2015
#labour	Number	The number of labour/breadwinner at the time of interviews
#dependent	Number	The number of dependent members including children under 15, the sick who were unable to and those were a student at the time of the interview. The elder aged 65 and over was left out because many of them were their households' breadwinners.
Live.head1	Category	The first livelihood of household heads
Live.head2	Category	The second livelihood of household heads
Live.head3	Category	The third livelihood of household heads
Live.head4	Category	The fourth livelihood of household heads
#live.head	Number	The number of livelihoods that household heads engaged at the time of interviews
Live.other1	Category	The first livelihood of the household's other breadwinner
Live.other2	Category	The second livelihood of the household's other breadwinner
Live.other3	Category	The third livelihood of the household's other breadwinner
Live.other4	Category	The fourth livelihood of the household's other breadwinner
#live.other	Number	The number of livelihoods that other members engaged at the time of interviews
Remittance	1=Yes, 0=No	Household receiving remittance from members who migrated to other places
Poor17	0= Non-poor; 1=Near-poor; 2=Poor	The household's poverty status in 2017 based on their declaration and the commune's records
Poor16	0= Non-poor; 1=Near-poor; 2=Poor	The household's poverty status in 2016 based on their declaration and the commune's records
Poor15	0= Non-poor; 1=Near-poor; 2=Poor	The household's poverty status in 2015 based on their declaration and the commune's records
Poor14	0= Non-poor; 1=Near-poor; 2=Poor	The household's poverty status in 2014 based on their declaration and the commune's records
Poor13	0= Non-poor; 1=Near-poor; 2=Poor	The household's poverty status in 2013 based on their declaration and the commune's records
Mortgage	1=Yes; 0=No	The household's land currently being mortgaged/lent out
#plot	Number	The number of household's land plots at the time of interviews
Land18	Number (ha)	The land area held by the household at the time of interviews
Area1.18	Number (ha)	Planted area for crop 1 in 2018
Area2.18	Number (ha)	Planted area for crop 2 in 2018
Area3.18	Number (ha)	Planted area for crop 3 in 2018
Pro1.18	Number (ton)	Paddy production of crop 1 in 2018

Pro2.18	Number (ton)	Paddy production of crop 2 in 2018
Pro3.18	Number (ton)	Paddy production of crop 3 in 2018
Yield1.18	Number (ton)	Paddy yield of crop 1 in 2018
Yield2.18	Number (ton)	Paddy yield of crop 2 in 2018
Yield3.18	Number (ton)	Paddy yield of crop 3 in 2018
Land17	Number (ha)	The land area held by the household in 2017
Area1.17	Number (ha)	Planted area for crop 1 in 2017
Area2.17	Number (ha)	Planted area for crop 2 in 2017
Area3.17	Number (ha)	Planted area for crop 3 in 2017
Pro1.17	Number (ton)	Paddy production of crop 1 in 2017
Pro2.17	Number (ton)	Paddy production of crop 2 in 2017
Pro3.17	Number (ton)	Paddy production of crop 3 in 2017
Yield1.17	Number (ton)	Paddy yield of crop 1 in 2017
Yield2.17	Number (ton)	Paddy yield of crop 2 in 2017
Yield3.17	Number (ton)	Paddy yield of crop 3 in 2017
Land16	Number (ha)	The land area held by the household in 2016
Area1.16	Number (ha)	Planted area for crop 1 in 2016
Area2.16	Number (ha)	Planted area for crop 2 in 2016
Area3.16	Number (ha)	Planted area for crop 3 in 2016
Pro1.16	Number (ton)	Paddy production of crop 1 in 2016
Pro2.16	Number (ton)	Paddy production of crop 2 in 2016
Pro3.16	Number (ton)	Paddy production of crop 3 in 2016
Yield1.16	Number (ton)	Paddy yield of crop 1 in 2016
Yield2.16	Number (ton)	Paddy yield of crop 2 in 2016
Yield3.16	Number (ton)	Paddy yield of crop 3 in 2016
Land15	Number (ha)	The land area held by the household in 2015
Area1.15	Number (ha)	Planted area for crop 1 in 2015
Area2.15	Number (ha)	Planted area for crop 2 in 2015
Area3.15	Number (ha)	Planted area for crop 3 in 2015
Pro1.15	Number (ton)	Paddy production of crop 1 in 2015
Pro2.15	Number (ton)	Paddy production of crop 2 in 2015
Pro3.15	Number (ton)	Paddy production of crop 3 in 2015
Yield1.15	Number (ton)	Paddy yield of crop 1 in 2015
Yield2.15	Number (ton)	Paddy yield of crop 2 in 2015
Yield3.15	Number (ton)	Paddy yield of crop 3 in 2015
Land14	Number (ha)	The land area held by the household in 2014
Land13	Number (ha)	The land area held by the household in 2013
Affected.gov	Number (ha)	The land area affected by the disaster recorded by Tan Hung commune government
Affected.claim	Number (ha)	The land area affected by the disaster self-claimed by the household head
Totalaid	Number (money)	Total money the household received from the government's relief fund

Appendix 18. Qualitative Codes and Themes: 'How do farmers perceive risks in everyday life?'

Interview topics	Codes [Explanation]	Possible themes
Local expression/definition of hazard	Storm Paddy damaged Crop disturbance Flooding Climatic unexpected changes Salinity God's bad mood Unusual season Sunshine Man-made disaster Drought Tropical low pressure Pest Rice disease God's sickness Climate changes	Natural hazard as God's power going wrong Natural hazard as weather extremes Natural hazard as crop disturbance
Local expression/definition of risk	Luck Risk-taking Following others [risking life] Saline intrusion-induced risk Fear but doable 50/50 Absence in locality Gambling with climate Unexpectedness Harmful possibility Must be acceptable Lacking activeness	Good/bad balance Something worth risking life Inabilities Risk by saline intrusion
Critical risks to local farmers	Natural hazards Pest Rice leaffolders Brown planthoppers Golden apple snails Rice blast disease Mice predation Man-made disaster Landslide Inundation Price impermanence Merchant's deal broking	Natural hazards Market risks Pest and diseases
Ranking of risks by their importance	Order of risks Reasons	Natural hazards as unavoidable/irresistible
Image of the 2015-2016 event	Obsession Hopeless Death Sleepless Sadness Goosebump Miserable Worrying Loss of soul	Physical damages Paddy effects Livelihood crisis Psychological effects

	Scared Anxiety Empty seed Sterile paddy Burning leaves Red leaves Inedible paddy Production drop Partly loss Yield loss Sale difficulties Dried/dead canals Dried rivers Saline attacks Early intrusion Water shortage	
Causes of the event	Saline intrusion Dry canal Drought Upstream flood Salty wind Sea rise level Rice seed Climate change	Saline intrusion Drought Water scarcity

Appendix 19. Qualitative Codes and Themes: 'How do farmers use their capital in forming their risk-taking strategies?'

Specific interview topics	**Codes [Explanation]**	**Possible themes**
Risk taking strategies	Area Production Yield Measures taken	Omitting crop 3 Reducing planted area Maintaining planted area Expanding planted area
Crop structure	Crop 1 [Summer-Autumn] Crop 2 [Autumn-Winter/early Winter-Spring] Crop 3 [Spring-Summer]	Triple cropping
Reasons for risk-taking/crop 3 cultivation in 2015-2016	Lack of job options Poverty [Crop 3 as] Main income source Rice monoculture Live for rice Value of rice field Following others Peer pressures Non-rice crop inability [Inability to cultivate other non-rice crops] Inability to leave land fallow Too old [to do other jobs] Lack of food Availability of canal water Crop 3's superiority [over other two crops] No disaster experience Habit	Values of traditions Inability to do other jobs Food need Crop 3's profitability Peer pressures No disaster experience
Whose supports during and post-disaster	Family Relatives Neighbours Villagers Brokers Merchants Suppliers Government officials Mass organisations Companies	Family Suppliers Government
Types of support during and post-disaster	Food aid Money lending Labour support Remittance Omitting [land borrowing] fees Knowledge [advice, information] Credit sale Debt deferring Dredging canal Non-rice crop model Rice cultivating techniques	Family providing food and labour Supplier providing cash lending and credit sale Government's canal dredges
Negative effects of social relationships	Children care Sick care Older care	Burden
Measures coping with future risks	Land mortgage Land borrowing Non-rice livelihood [change to wage job]	Land Livelihood Rice crop techniques

	Crop 3 omission Seasonal migration Long-term migration Reducing planted areas More investment Reducing inputs [fertilisers and pesticides] Choice of seeds Crop timing changes	

Appendix 20. Qualitative Codes and Themes: 'How can past social structures shape present habitus and risk-taking strategies?

Specific interview topics	**Codes [Explanation]**	**Possible themes**
Timeline of crop 3	Crop 3's year [year starting crop 3]	Starting between 1997 and 2000 Starting between 2001 and 2009 Starting between 2010 and 2012
Reasons for crop 3 engagement	Learning [from others] Dredged canals [Newly built] Dike systems Experiment Success [of other's crop 3] Leisure time Convenience [of crop 3 production] Lack of livelihood Income motivation Government's support	Experiment Following others' Productivity Government's support
Experience with crop 3	Profit Facing no disaster Omitting crop 3 Crop 3's superiority [over other two crops]	No disaster High profit/productivity Fear of disaster
Blame who and reasons	Own will Farmers' choice Spontaneous action Food insecurity Farming as career	Farmers' choices
	The people [người dân] Everyone [ai] Farmers [nông dân] Households [hộ gia đình] I/we [mình].	Collective Individual
	Sluice gate keeper Managers	Officials' responsibility
	No degree [in agriculture] Lack of mechanism [for monitoring and managing sluice gate keepers] Desiccated canals [which have not been dredged local canals for freshwater storage in order to supply water in dry seasons] Leaked sluice gates [which were old but not maintained and fixed regularly]	Government's mismanagement

Appendix 21. Definition of Themes/Sub-themes

Topics	**Themes/sub-themes**	**Definition/Description**
Everyday life risk perception	Crop risk perception	Farmers' perceived risks are the threats to their crop production. This indicates not only the importance of the rice crop to farmers but also its nature of vulnerability.
Local expression of natural hazard	Natural hazard as God/Holy power	Natural hazards are defined as God's power when it goes wrong (e.g., God is sick).
	Natural hazard as unexpected weather changes	Natural hazards are defined as weather changes or extremes that created unexpected situations.
	Natural hazard as crop disturbance	Natural hazards are defined as specific hazards that cause crop pattern disturbance and damages
Local expression of risk	Risk as a balance between good and bad	Risk seen as a balance between good and bad, positive and negative. In seeing so, farmers deemed risk less serious, more positive.
	Risk as an action risking one's life	Risk seen through the action of risking everything including life.
	Risk as an inability	Risk seen as an inability to cope with threats
Risk identification	Natural hazards	Risk from natural hazards such as storms, drought, saline intrusion threatening annual crops.
	Pest and rice diseases	Risk from pests and rice blast diseases as frequent threats to annual crops.
	Market price	Market risks included merchant's breach of (informal) contract and farmers' lack of cooperation.
Risk ranking	Natural hazards as the most threatening risk	Natural hazards considered by many as the most threatening risk because they are unavoidable, irresistible.
	Rice diseases and pests as the most threatening risk	Some poor farmers found it threatening because they did not have enough money to buy pesticides and fertilisers to cope with this threat.
	Market as the most threatening risk	Few farmers were unable to control the price. Without good price, the whole crop fails.
Habitus and social practice	Active farmers in constraining structures	Farmers were active in choosing crop 3 as an efficient income generator. However, their choices are enabled and constrained by the social structures of the fields in which they were inhabiting.
Risk taking	Omitting crop 3	Only one household in the sample omitted the 2015-2016 crop 3 given the lack of upstream flood.
	Reducing planted crop 3	Some reduced planted area, only cultivating crop 3 on rice fields close to water resources.

	Maintaining crop 3 without proper measure	Many maintained the planted area without proper measures to cope with saline intrusion.
	Expanding crop 3 without proper measure	Many expanded the planted area in the hope of winning bumper crop 3.
	Reducing/expanding area with calendar changes	Few planted crop 3 earlier in December to avoid the risk of saline intrusion
Image of the 2015-2016 event	Physical effects	Changes occurred in the surrounding physical environment, including changes in soil, canals, rivers, and built infrastructures such as sluice gates.
	Psychological effects	Effects on feelings, emotions, moods causing sadness, hopelessness, obsession.
	Financial effects	Effects on finance including income drop, livelihood instability, new or expanding debt.
	Crop effects	Effects on paddy crop including seeds, leaves, harvesting, sale capacities.
Causes of the event	Single cause by saline intrusion	Few attributed the event only to the occurrence of saline intrusion.
	Multiple cause by saline intrusion with other threats	Many attributed the events to multiple threats including saline intrusion and other threats, especially water scarcity.
Explanation for water scarcity	Specific appearance of water scarcity	Few only described water scarcity by providing observed changes in canals or fields.
	With drought	Some attributed water scarcity to the drought occurred on larger scale.
	Lack of upstream flood	Some attributed water scarcity to the lack of flood occurred in upstream regions of the Mekong River.
	Drought and lack of upstream flood	Some attributed water scarcity to both the lack of flood occurred in upstream regions of the Mekong River and drought.
Reasons for risk taking	Risk normalisation	The tendency of normalising the risk from saline intrusion resulted from the lack of experience with disaster, combing with other factors including the choice between risk (long-term) and other danger (food insecurity, unemployment – short-term).
	Crop 3's preferences	Crop 3's superiority in productivity and profit compared with the other two crops motivated farmers to cultivate this crop. Although being motivated by the same reason, rich households were concerned more with profit, poor households were more with food insecurity.
	Live for rice, die for rice	The important value of rice and land to farmers, part of a broader tradition, rice monoculture. From the previous tradition, this spirit was inherited by the present generation to become more than just a livelihood, but also a lifestyle, central to farmers' knowledge and skill sets.

	Community pattern	A habitual form of livelihood practice that has both enabling and constraining features, promising farmers rewards if they grow rice crop 3 but also warning them about some sanctions if they go against it (e.g., paying grass cutting fees).
	Inability to work other options	Lack of capacities to change from rice livelihood to non-rice livelihoods. This lack included many factors including age, skills, education, health, family care, highlighting the vulnerability of households with poor access to job opportunities, social welfare, health care.
	Social capital as buffer	Social relationships, especially from those with suppliers created the buffer for farmers in front of risks. They felt more secure with suppliers' support (credit sale, deferred debt payment).
Blame	Farmers as the main responsibility bearers	Farmers considered themselves as the main responsibility bearers because crop 3 was their choice.
	Collective versus individual	Individuals included themselves in an intangible collective to reduce the pressure of responsibility.
	Government as the responsibility bearers	The governments, from some farmers' point of view, should take responsibility because they mismanaged the water resources.
Forming of new practices	Interaction between social structures and farmers in forming new patterns	Both farmers and social structures contributed to the formation and development of a new cropping pattern.
History of crop 3	Starting crop 3 in the late 1990s	Some farmers were pioneers in experimenting crop 3 in the dry season in the late 1990s. They learnt to take advantage of newly built dike systems and sluice gates from other regions such as Chau Khanh.
	Starting crop 3 in the 2000s	Following in other footsteps, some farmers experimented and explored the potentiality of crop 3 in the 2000s, having enjoyed the more efficient salinity control systems built in the late 1990s to the 2000s. They routinised the crop 3, making it a part of a triple cropping system.
	Starting crop 3 in the 2010s	Youngly formed households, most of farmers followed the patterns of local cropping, making this crop a widespread practice.
Reasons for starting/continuing crop 3	Availability of new dike system	The new dike systems protected farmers from saline intrusion. Farmers felt safer to cultivate crop 3 during the dry season. Their caution of the threat was gradually decreased over time.
	Lack of income	Most farmers were dependent on rice livelihoods. They saw crop 3 as a new income generator.
	Learning from others	Some farmers learnt this crop by looking at farmers from the upper part of the delta such

		as An Giang, Dong Thap provinces who already cultivated their own Winter-Spring crop and also from pioneer farmers in the lower part such as Chau Khanh.
	Crop 3's productivity and success	The success of crop 3 was observed and well-articulated among farmers of different regions of Long Phu and Soc Trang. Farmers saw crop 3 as a more efficient income generator, compared to crop 1 and crop 2.
	Government's institutionalisation	The governments encouraged farmers to develop crop 3 and institutionalised it by issuing quota and including this crop in the annual agricultural development plans.
	Support of others like suppliers	Farmers and suppliers have created and maintained a business culture relying on trust and interdependence. This culture creates mechanisms such as credit sale, cash lending, or deferred payment of debt. These habitual practices did not start because of crop 3, but eventually played a role in assuring farmers in front of adversity.
Consequences of crop 3	Water stress	Government officials saw that the practice of triple cropping increasingly consumed a significant amount of water, causing water shortage in the dry season.
	Management problem	The governments must regulate freshwater between different regions that had different cropping timing.
	Environmental problem	Some farmers did not see the changes in their land or water but assumed there would be consequences for the environment as triple cropping goes. Expert agreed on the consequences of going against nature: changing the ecosystem.

Appendix 22. Analytic Narratives in Responses to Research Questions

Research questions	Analytic Narratives/Stories
Sub-question 1: How do past social structures shape present habitus and risk taking strategies?	The present habitus and practice of cultivating risky crop 3 or the triple cropping system has only become popular since 2000s. The process of forming this habitus started in the context of Vietnam since 1975 when the country reunified. In the context of a socialist regime, with the dominance of the political field (e.g., The Communist Party of Vietnam) whose top-down policies (soft and hard policies) created new structural conditions and capitals for farmers. If soft policies (de-collectivisation, land reform, etc.) changed the relations between farmers and the state and the market, hard policies (e.g., irrigation systems) changed the relations between farmers and nature and resources (therefore their relations with risks). In these conditions, farmers were motivated to change their cropping pattern from a single cropping system to a double cropping system. Farmers, however, were not passive agents. They were active in adapting to the new structural rules and resources in the fields of agriculture, economy (including markets), politics, and disaster risk management. This was significantly demonstrated in the way they actively experimented crop 3, then routinised this crop and made it into a mass production system. The government was the dominant agents in the field of politics, who was in full support of this trend, though. The government helped institutionalise the new patterns, encouraging farmers to continuously cultivate crop 3 until the 2015-2016 disaster hit.
Sub-question 2: How do farmers perceive risks in everyday life?	Farmers tended to define, perceive risks associating with their crop production. Farmers viewed them as a balance between good and bad, opportunities and challenges, or something worth risking life for, or situations with which they lack capacities to cope. Natural hazards, considered as the most threatening risks, outweighed the risks of pest and rice diseases and market instability. Farmers did not use big terms like ‘disasters’ or ‘crisis’ to express the 2015-2016 event. They instead described it as a ‘crop loss’, which entailed many nuances, including physical environmental damages, paddy damages, livelihood crisis, and psychological impacts. These impacts made them more cautious in approaching the following crop 3. Farmers attributed the cause of the event mostly to saline intrusion – the most frequent and threatening threat to their crop 3. Other critical causes were water scarcity, with some farmers pointed out the effects of drought and the lack of upstream flooding. While farmers were familiar with saline

	intrusion as it was frequently annual, they often neglected the unexpected effects of drought and upstream hydro-power dams construction – the factors did not happen regularly, but they can intensify saline intrusion once they occur. This way of perceiving risks is the essential part of farmers' habitus, their cognitive schema of risk, which is the reason why they downplayed the 2015-2016 disaster risk.
Sub-question 3: How can the concepts of habitus and capital help explain farmers' risk-taking practices?	Of 28 households, only a few households took proper measures to prevent or mitigate the 2015-2016 disaster risk. These households were more active in approaching information regarding risks. Most of the remaining households used the whole land area to grow the 2015-2016 crop 3 and some even expanded the planted area by borrowing more land in the hope of generating more income. The reasons for taking risks were a complex habitus, which entailed the dispositions formed based on each capital: normalising natural hazard risks and valuing their rice cropping tradition (cultural capital); questing for food (poor/near-poor households) or profit (non-poor households) (economic capital); and distrusting the government's risk warnings, replying on bridging relationships with agricultural input suppliers to withstand risks, and being motivated by neighbourhood practice of crop 3 cultivation (social capital). These dispositions have both positive and negative influence on risk management practices. These dispositions are not simply in harmony; they are competing. Farmers often had to make the choices between these forces. On one pole, there were the reasons why farmers should cultivate crop 3 while on the opposite pole, there were the reasons why farmers should not do it. The former pole represented the natural risks that cultivating crop 3 could suffer from saline intrusion. Perceiving the risk of saline intrusion, however, was weakened prior the 2015-2016 season. Meanwhile, in the latter pole, farmers got more persuasive reasons to grow crop 3. Farmers were motivated by profit or food that crop 3 could bring about; they did not have enough knowledge and skills to move to non-crop 3 livelihoods; they could face a community sanction if they do not cultivate crop; and last but not least, they could be supported by suppliers if the disaster occurs. Thus, between two main dispositions, the motivation to grow crop 3 was stronger. Most farmers agreed in blaming themselves for the 2015-2016 disaster, claiming to be responsible for the consequences of choosing crop 3 as their way of living life. This showed their awareness of their own action and consequences. Nevertheless, they were also motivated and constrained by current conditions which made them stick to rice crop cultivation.

Appendix 23. Example of Consent Form for Household Interviews

CONSENT FORM
(Household)

Project: 'Social capital, vulnerability, and disaster resilience: The case of Vietnam'

Chief Investigators: **Dr Helen Forbes-Mewett and A/Prof Dharma Arunachalam**
Student Researcher: **Kien Nguyen**

I have been asked to take part in the Monash University research project specified above. I have read and understood the Explanatory Statement and I hereby consent to participate in this project.

I consent to the following:	Yes	No
I understand that I will be interviewed by the researcher.	☐	☐
I understand that, unless I otherwise inform the researcher before the interview, I agree to allow the interview to be audio-taped.	☐	☐
I understand that my participation is voluntary and I can choose not to participate in part or all of the project, and I can withdraw at any stage leading up to or during the interview without being penalised or disadvantaged in any way.	☐	☐
I understand that any data that the researcher extracts from the interview for use in reports or published findings will not, under any circumstances, contain names or identifying characteristics.	☐	☐
I understand that data from the interview will be kept in secure storage accessible only to the research team. I also understand that the data will be destroyed after a 5 year period.	☐	☐
I understand that no information I have provided that could lead to the identification of any other individual will be disclosed in any reports on the project, or to any other party.	☐	☐

Name of Participant _____

_____

Participant Signature _____ Date _____

_____

_____

Appendix 24. Example of Explanatory Statement for Household Interviews

EXPLANATORY STATEMENT

(Households)

Project: Social capital, vulnerability, and disaster resilience: The case of Vietnam

Chief Investigator
Dr. Helen Forbes-Mewett
Department of Sociology,
School of Social Sciences
Phone: +619905 5243
Email: Helen.ForbesMewett@monash.edu
Student Researcher: Kien Trung Nguyen
Phone: +61 423862659
Email: kien.nguyen@monash.edu

Co-Investigator
Associate Prof. Dharmalingam Arunachalam
Department of Sociology,
School of Social Sciences
Phone: +61990 52357
Email: Dharma.Arunachalam@monash.edu

Dear Sir/Madam

My name is Kien Trung Nguyen, a PhD student of Monash University. You are invited to take part in this study. Please read this Explanatory Statement in full before deciding whether to participate in this research. If you would like further information regarding any aspect of this project, you are encouraged to contact the researchers via the phone numbers or email addresses listed above.

What does the research involve?

This proposed project will examine how community social capital helps local communities recover from the El Nĩno-induced disasters (i.e., droughts and saltwater intrusion) occurred from late 2014 to late 2016. For the purposes of the project, two rural villages of Tan Hung commune, Long Phu district, Soc Trang province that offers different adaptation strategies in the disaster recovery process will be selected. The first village is the home of Khmer people, while the second village is that of King people. The project also aims to provide a better understanding of how community social capital helps reduce those two villages' vulnerability to future disasters.

As part of my research, I would like to interview the representatives of some local households living in those two villages. I would like to invite you to participate in an interview. The duration and location of the interview will depend on your convenience. The interview will be recorded by a digital voice recorder, but you may decide to stop recording at any time or not to use it at all. Your confidentiality and anonymity will be protected; that means that neither your real name nor your position will be revealed in any of my publications resulting from this project, unless you request it.

Why were you chosen for this research?

I have invited you to take part in this research because of your main role in your household and the influence of the disasters on your households. Your views are important to this study. Your contact details were sought from the provincial Administration Department.

Consenting to participate in the project and withdrawing from the research

If you agree to participate in this research, I will ask you to sign and return to me the consent form below. You can freely withdraw your participation from the interview at any time during its process. You can also withdraw your participation from the research which means no information derived from your interview will be used as well as withdrawing any particular information you no longer wish to disclose during the fieldwork period.

If you choose not to participate in this project, I am very pleased to receive any comments or alternative solutions for the improvement of the project.

Possible benefits and risks to participants

This research will provide a better understanding of how community social capital helps form adaptation strategies for the recovery process following the droughts and saltwater intrusion. As Soc Trang province is at risk of these disasters, this research aims to offer lesson learnt from the bottom-up level for the province and other similar provinces, assisting them in better planning for future disasters. This research has no other risk

other than possible minor discomfort when I conduct the observation. However, you can propose any solutions to reduce that discomfort.

Payment
When taking part in my research, you will be offered a bottle of water for your time of participation at the beginning of the interview. Even if you withdraw your participation during the interview, you can keep the bottle of water.

Confidentiality
I will guarantee the confidentiality to all participants. The reporting of findings will be done in a way (e.g., the use of pseudonyms/codes for each participant/ location) that does not disclose the participants as the source of information unless you request it. This also applies to any publications that will come up based on this research.

Storage of data

All documents or non-digital files will be securely stored in a locked cabinet in the researcher's desk office in the university for a maximum of 5 years. They will be physically destroyed afterwards. Audio recordings and other digital files will be stored in the highly secure Monash network drives for the same duration and completely destroyed afterwards. Wherever and whenever the researching is collecting the data without having direct access to Monash services, the digital data will be temporarily stored in a password-encrypted, external hard disk for convenience. Data will be immediately transferred to the Monash drives once the access is made possible.

Non-digital data will be secretly stored as much as the research can. But, the researcher cannot guarantee its safety in the force majeure condition. All data will be only accessible to the researcher; and only used for the researcher's own research purposes and intended publications.

Results

A copy of the thesis and/or summary of findings will be provided to you if you request. You could indicate your preference on receiving a hard or an electronic copy to the nominated contact information.

Complaints

Should you have any concerns or complaints about the conduct of the project, you are welcome to contact the person below.

Dr. Phuong Viet Dang
Institute of Sociology,
Vietnam Academy of Social Sciences

Room 1512, 15th floor, Vietnam Academy of Social Sciences building, No. 1,

Lieu Giai street, Ba Dinh district, Hanoi, Vietnam

Phone: +84 912 289 693

Email: dangvietphuong@ios.org.vn

Thank you,

Chief Investigator

Dr. Helen Forbes-Mewett

Appendix 25. The Researcher's and Research Assistant's Agreement

AGREEMENT ON JOINING THE PROJECT NUMBER 11022

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Project: Social capital, vulnerability, and disaster resilience: The case of Vietnam

Chief Investigator/Co-investor: Dr. Helen Forbes-Mewett and A/Prof Dharmalingam Arunachalam
Student researcher: Kien Trung Nguyen

I have been asked to take part in the Monash University research project specified above as a research assistant. I have read and understood the Explanatory Statement and I hereby consent to participate in this project and agree with the following statements:

I agree that	Yes	No
I understand that I will support Mr. Kien Trung Nguyen during his fieldwork in Vietnam	☐	☐
My participation is voluntary, based on the agreement on costs and responsibilities between me and Mr. Kien	☐	☐
All the information I receive in this participation will be confidentially kept by me, without disclosing to any third parties.	☐	☐
I will not use any information I receive from this project during the time I work for Mr. Kien.	☐	☐
I will delete immediately information at any forms after completing my tasks.	☐	☐
I will not contact, disclose, or cause any effect on any persons I know from the project I join with Mr Kien.	☐	☐

Name of the assistant _____

Signature of the assistant _____ Date _____