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Disaster Management During Tropical Storm Karen: The Story of Trinidad Extension

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Abstract

The purpose of this study was to investigate the weather-related disaster preparedness and response strategies of agricultural extension professionals in Trinidad during Tropical Storm Karen (TSK). Trinidad faces perennial flooding, and Trinidad extension professionals have often been involved in the management of weather-related disasters. TSK was contextualized as a case study, and a qualitative approach was used to investigate the lived experiences of the extension professionals who directly assisted with managing the event. Semi-structured interview data were collected, along with concept maps and participant-rendered drawings. Each interview was compared with the participant's concept map and drawing, while the constant comparative technique was used to evaluate the interview data among the participants to derive themes. Data were collected remotely using internet platforms due to the COVID-19 global pandemic. Findings indicated that disaster preparedness was strategized through field activities, including collecting data and providing disaster advice to clients. Disaster responsiveness was strategized through field actions, primarily through field evaluations for subsidy claims. In addition, related to disaster response, extension professionals faced various challenges in responding to TSK, most notably, the inability to access appropriate transportation. The findings of this study can guide the government of Trinidad and Tobago in bolstering the disaster management strategies of the country, as well as inform regional disaster management plans in other Caribbean countries.

Keywords: Tropical Storm Karen; disaster preparedness; Trinidad Extension; Caribbean

Introduction

On September 22, 2019, the Office of Disaster Preparedness and Management (ODPM) and the Ministry of National Security placed Trinidad and Tobago on a red alert after local weather was forecasted to worsen into Tropical Storm Karen (TSK) (Golembo et al., 2019; Moreno, 2019; Phillip, 2019). After landfall, TSK impacted many areas of North and Central Trinidad to the point of community evacuations in some areas (Phillip, 2019). Beyond the reports of damaged residential property, the agriculture industry in Trinidad faced damages to agricultural lands, crops, livestock, and the fisheries sector by way of sunken fishing vessels (Brackett, 2019; Caribbean Catastrophe Risk Insurance Facility, 2019; Connelly, 2019a, 2019b; Floodlist, 2019; Rampersad, 2019; Sambrano, 2019; Watson, 2019). One newspaper reported upwards of $24 million United States Dollars (estimated) in damages due to Tropical Storm Karen (Nicholas, 2019). For Trinidad's landmass, this can be considered critical economic damage. MALF urged farmers to make claims at extension offices for agricultural losses due to TSK (De Souza, 2019).

TSK was not Trinidad's only recent experience with disastrous flooding. Around mid-October in 2018, consistent heavy rains from Tropical Storm Bret gave way to the worst widespread flooding, landslides, damaged property, and agricultural loss that Trinidad experienced in over 50 years (CARICOM Today, 2018; Wilkinson, 2018). Over 3,500 homes and 120,000 individuals were affected by the flooding, with ripple effects to other economic sectors, like transportation and manufacturing (Achong, 2018; Dixon, 2018; Ragoobir, 2018). After the disaster of 2018, local, regional, and international agencies, including the Pacific Disaster Center (international) (PDC Global, 2019), the Caribbean Disaster Emergency Management Agency (regional) (Caribbean Disaster Emergency Management Agency, 2019), and the Organization of Disaster Preparedness and Management (ODPM) (local), assisted Trinidad with managing disasters.

The effects of Tropical Storm Bret in 2018 immediately triggered the development of new disaster management strategies by the government in Trinidad. Regional and international organizations were also involved in developing new disaster management plans after this event. Ramjattan et. al. (2018) highlighted the need to clarify the roles of extension professionals since extension activities in Trinidad are ambiguous at times. Additionally, there are projections that weather-related disasters will intensify for the country (Middelbeek et al., 2014), while annual disasters still occur. These factors suggest that the agricultural sector in Trinidad, affected by perennial flooding, requires competent disaster management. As such, researchers evaluated the disaster management strategies employed by extension professionals in Trinidad during TSK in 2019.

Literature Review

Trinidad & Extension

The Republic of Trinidad and Tobago consists of two islands in the Caribbean with a total land mass of 1,759 square miles. Based on the former plantation system of the 19th century, the agricultural sector in the country consists of small-scale farmers on parcels of land, less than five acres in size (Ganpat, 2013). Agriculture in the country historically contributed around 1% of total gross domestic product (GDP) to an oil-based economy (Seepersad & Douglas, 2002; Shik et al., 2018). Trinidad

and Tobago has been considered a net food importer, making any agricultural production critical to surviving trade shocks or fluctuations in the global food market (Narine et al., 2019; Shik et al., 2018). Adverse weather conditions have historically impacted the agricultural sector on both islands (Roopnarine et al., 2018; Shik et al., 2018). The islands experience two weather seasons: a dry season from January to May, and a rainy season from June to December (McShine et al., 2019). Hurricane season exists from August to November (McShine et al., 2019). Additionally, close to 50% of Trinidad is affected by perennial flooding (Roberts, 2013; Roopnarine et al., 2018).

While one main government manages the economy of both islands, the agricultural sector is managed differently (Narine, 2018). Agricultural extension in Trinidad is managed by the Ministry of Agriculture, Land, and Fisheries (MALF) (Narine, 2018). Tobago agriculture is managed under the Tobago House of Assembly (THA), which manages agricultural extension differently (Ganpat, 2013; Narine, 2018; Parker, 2016; Ramdwar & Stoute, 2015). The regional administration units of MALF are responsible for frontline extension with farmers, which include farm visits (Narine, 2018; Seepersad & Ganpat, 2008).

Each of Trinidad's eight counties has its own extension office which provides administrative services, accommodates farm visits, and arranges training for farmers, among other crop and livestock services (Narine, 2018; Parker, 2016; Seepersad & Ganpat, 2008). There were 90 frontline extension professionals who mainly used face-to-face methods of contact, each serving approximately 600 farmers (Ramdwar & Stoute, 2015; Ramjattan et al., 2017; Roberts et al., 2016; Strong et al., 2014). In terms of disaster management, extension professionals in Trinidad are expected to assist the government by assessing the financial damage to farms, necessary for farmers to claim reimbursement ("Barrackpore farmers report," 2017).

Disaster Management

Disaster management can be described as "a set of rehearsed actions which will reduce the likelihood of a disaster occurring and further also reduce the extent of damage should a disaster occur" (Asamoah et al., 2018, p. 219). While several disaster management models and theories exist, Jaques (2007) posits that most models take a linear approach, or propose stepwise method of disaster management. However, the Jaques (2007) relational model of crisis management proposes that the phases of disaster management often overlap. The relational model contains four disaster management clusters (crisis preparedness, crisis prevention, crisis management, and post crisis management) in two distinct phases (pre-crisis management and crisis management). The crisis preparedness cluster considers planning processes, training, systems, and manuals. The crisis prevention cluster focuses on emergency response and early warnings among other elements. The crisis management cluster considers crisis recognition, system activation, and crisis management. Finally, post-crisis management focuses on evaluation of the crisis management process, post-crisis impacts, and recovery. The subsequent study was based on the principles of the Jaques (2007) relational model.

Part of the disaster management process for extension professionals in Trinidad was providing information to clients. Providing information to farmers on disaster risk mitigation was found to empower Caribbean farmers and improve

disaster management success (Shannon & Motha, 2015). Shannon and Motha (2015) also stated that extension organizations should work closely with agrometeorological agencies to translate information from these agencies to farmers and encourage relationships to promote disaster resilience. These findings also aligned closely with research by Hasan and Bart (2006) who concluded that technical advice is critical in disaster management in Bangladeshi agriculture. Researchers in South Africa highlighted that extension provided advice during disasters, and extension clients act on the advice provided to improve disaster outcomes (Kgakatsi & Rautenbach, 2014).

However, disaster management support for extension professionals is still a concern. Ramjattan et. al. (2018) stated that Trinidad extension professionals operate without clear directives. Regarding disaster preparedness, Ganpat et al. (2018) found that most extension officers in Dominica had no support for their physical needs in light of Tropical Storm Erica in 2015. Telg et al. (2008) found that among 328 extension faculty in Florida, 94% of respondents knew of the existence of a Florida extension disaster handbook, which contained plans and procedures to manage disasters. However, more than 60% of the respondents either never used the plan, or used it minimally, while approximately 69% of respondents never received training on using the handbook (Telg et al., 2008). Eighmy and Hall (2012) and Kerr et al. (2018) also echoed the importance of disaster planning in disaster management for extension.

Regarding disaster training, Ganpat et al. (2018) found that 67% of extension officers in their study were exposed to disaster management training. However, respondents indicated that they still needed hurricane disaster recovery training (Ganpat et al., 2018). Ricard et al. (2017) found that 79.4% of extension professionals in Connecticut needed disaster training. Ricard et al. (2017) also found that most respondents were unsure of disaster preparedness training availability. However, 88% of respondents in the study indicated that they either agreed or strongly agreed that there should be training available. Additionally, 81% of respondents would welcome disaster training for their job (Ricard et al., 2017). Telg et al. (2008) found over half the extension faculty and directors in the study needed training for personal stress, and personal needs during hurricane relief efforts in Florida. Eighmy and Hall (2012) reported that extension staff were trained on the use of new disaster resources, which involved family preparedness, community strengthening, and emergency planning.

In summary, Tropical Storm Karen damaged the agricultural sector in Trinidad in 2019, which lead to the mobilization of extension professionals to manage their clients' needs during the disaster. This response came after a similar, but more destructive disaster in 2018. However, support for extension professionals in the country is still a concern. Researchers have identified various needs of extension workers during disasters across various regions, most of which highlighted the need for disaster management training. Given that extension professionals in Trinidad act in various capacities during the disaster management process, the current study covers the disaster preparedness and response strategies they employed during the TSK event for Trinidad extension professionals.

Purpose & Research Questions

The purpose of this study was to determine the Trinidad extension professionals' disaster preparedness and disaster response strategies during Tropical

Storm Karen. Specific research questions were as follows:

- RQ1: How did Trinidad extension professionals strategize weather-related disaster preparedness concerning TSK?

- RQ2: How did Trinidad extension professionals strategize weather-related disaster response after TSK?

Methods

Researchers used a qualitative approach for this study. Qualitative research allows researchers to extract data on participants' lived experiences and the meanings associated with those experiences (Elkind, 1964; Englander, 2016; Merriam & Tisdell, 2015). Events (like weather-related disasters) that impact social norms have guided researchers to take an inductive approach to their studies, where themes or concepts were derived from evaluating data (Ary et al., 2010; Creswell & Plano-Clark, 2017; Thomas, 2006). Through the lens of a phenomenological case study, researchers intended to explain the essence of human experiences by providing a rich understanding of the experience from the perspective of research participants (Ary et al., 2010; Moran, 2000). A case study is a research method that emphasizes the details of a single event in context (Dooley, 2002). Contextualizing for case studies has been identified by several authors in research methodologies, where the parameters of the case study are defined (Ary et al., 2010; Baxter & Jack, 2008; Creswell & Plano-Clark, 2017; Gillham, 2000; Merriam & Tisdell, 2015; Yin, 2009, 2016).

Since the research subjects were in a different country during the travel-restricted COVID-19 pandemic, participants were invited to download the Zoom® software on an electronic device from which to conduct the interviews. Alternatively, an intermediary in Trinidad provided a device with internet, a camera, and software to participants for the interviews. The contingency provided all participants with access to the communication technologies for the research.

The data collection process started with semi-structured interviews conducted by the lead researcher, followed by requests for concept maps and participant drawings. A two-week gap occurred between the interviews and the concept maps and drawings. This interview-then-drawing method has been used by many researchers as a measure of participant reflection in the post-interview period (Ångström-Brännstrom & Norberg, 2014; Guillemin, 2004; Kearney & Hyle, 2004; Parrott, 2019). The concept maps and drawings were collected electronically.

Sample Selection & Inclusion Criteria

The sample population consisted of MALF extension professionals who worked through TSK and at least one prior weather-related disaster. The final sample included extension officers, an agricultural assistant, and extension directors who supervise extension officers. While frontline extension officers directly manage flood claims, extension directors provide directives on how to proceed with disaster management. Official Ministry permission to collect data from employees was requested before data collection began. The Ministry also issued a non-disclosure agreement to restrict the publication of sensitive information.

The lead researcher utilized a snowball sampling technique to recruit participants. The non-probability sampling technique helped researchers identify key informants, who provided rich data on the research questions (Ary et al., 2010). The lead researcher sent an initial email or text message to the potential participants, and reminder emails followed every five business days of non-response.

Semi-Structured Interviews

The researchers used semi-structured interviews to initiate the research. Interviews are one of the most widely used data collection strategies in social science (Ary et al., 2010; Dillman et al., 2014; Merriam & Tisdell, 2015; Plowright, 2011). Having guiding questions to encourage responses, while retaining the flexibility to probe further into the discussion, remains a major advantage of semi-structured interviews (Longhurst, 2003; Whiting, 2007). Additionally, participants may provide unguarded responses, which can lead to collecting valuable data (Ary et al., 2010; Merriam & Tisdell, 2015).

Two semi-structured interview guides, one for field professionals (extension officers and the agricultural assistant) and another for extension directors, were developed for this study. The two guides were alike, except when referring to the status of the extension professional. Experts in the field of qualitative research have discussed the benefits of having respondents exposed to a uniformed line of inquiry (Ary et al., 2010; Creswell & Plano-Clark, 2017; Dillman et al., 2014; Plowright, 2011). A panel of disaster management, research methods, communication, and extension experts from the [University] assisted with the development of the guide. Additionally, consultations with Trinidad extension professionals also assisted with finalizing the interview guide. These professionals were not included in the study sample.

While the interview guide encompassed six sections, sections two and three directly related to disaster preparedness and disaster response, respectively. The questions in these sections were based on the preparedness and response segments of the Jaques (2007) relational model. The questions on disaster preparedness considered disaster preparedness strategies, preparedness training, challenges in preparedness, and lessons learned from previous disasters, among others. For example, one question in this section read as follows: How did you, as an extension professional, prepare for Tropical Storm Karen? The questions on disaster response considered response strategies, challenges in disaster response, lessons learned, and responding to future weather-related disasters. For example, one question from this section read as follows: Based on your experience in responding to past weather-related disasters, how did you respond differently during Tropical Storm Karen?

Concept Maps

The lead researcher issued a request for participant-rendered concept maps as part of the data collection strategy. Concept maps can be defined as a schematic device outlining the interconnectedness between concepts within a given context (Butler-Kisber & Poldma, 2009; Daley & Milwaukee, 2004; Kinchin et al., 2010; Novak & Cañas, 2006). Concept mapping has been used in both qualitative and quantitative data collection (Atkinson et al., 2019). Additionally, qualitative researchers employed concept maps in qualitative research to supplement interviews since the 1970s (Butler-Kisber & Poldma, 2009; Wheeldon & Faubert, 2009). Visual modes of inquiry in qualitative approaches suggests that multiple realities and methods of understanding exists in the constructivist epistemology (Butler-Kisber & Poldma, 2009).

For this study, respondents were asked to draw a concept map to review what was covered in the interview. Each respondent was provided with an instruction sheet and examples of concept maps to frame their own map. The provided

examples were not associated with weather-related disaster management. Butler-Kisber and Poldma (2009) highlighted that concept maps can be constructed by hand or by using software. Therefore, two digitally rendered concept maps, and two hand-drawn concept maps were presented to the respondents as examples.

Participant Drawings

Participants also were asked to draw an extension professional assisting with managing TSK. Initial uses of drawings for collecting data was achieved by Goodenough (1962) in the Goodenough Draw-a-Man test (Caskey & Yeo, 2020; Williams et al., 2011). The test has since been rebranded for use in research with children and adults (Adamis et al., 2016; Atanu, Dogra, & Das, 2011; Bat Or & Ishai, 2019; Calvo, 2017; Del Greco et al., 2018; Guillemin, 2004; Klingemann & Klingemann, 2016; Moagi, 2014; Stewart & Brosh, 1997). Authors have used drawings as data collection tools in natural disaster research, including art therapy after natural disasters (Lee, 2018), impact of cyclones (Haring & Sorin, 2016), the depiction of Hurricane Katrina (Kelley-Romano & Westgate, 2007), earthquakes in Haiti (Brolles et al., 2017), and disaster trauma (Roysircar et al., 2019).

A benefit of using drawings in qualitative research is that it moves beyond verbal expression (Filhol et al., 2020; Moagi, 2014). Additionally, humans draw to grasp their physical and natural environment, while reflecting on life events (Calvo, 2017; Hsu, 2017; Kearney & Hyle, 2004). Each participant was given examples of drawings that were based in agriculture.

Data Analysis

The data collected during the interviews were transcribed for analysis. Using the constant comparative technique, each respondent's transcript was compared to every other transcript in the data set. Data chunks were labelled with a code, then grouped by category, and then provided with a theme (see Table 1). In transcribing, start/stop sentences, filler words, and stutters/repeat terms were removed (Widodo, 2009). Verbatim transcriptions are common in qualitative research. However, denaturalized transcripts maintained the substance of the interview, while enhancing the efficiency of transcription and analysis (Halcomb & Davidson, 2006; Oliver et al., 2005). The participant-rendered concept maps and drawings were evaluated to identify visual representations of codes revealed from interviews specific to each participant. Numbers were appended to areas of interest on the illustrations and aligned to codes from the interview analysis at the bottom of each sketch. An example of the participant-rendered drawing analysis is provided in Figure 1.

Table 1

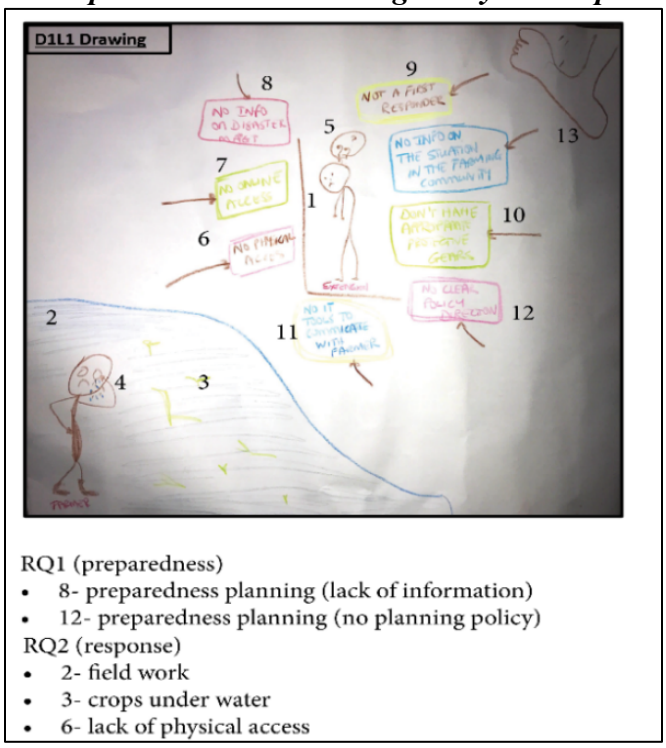
Coding Sample for Disaster Preparedness

Data chunk (Sample Quote)	Code	Category	Theme
Even before (disaster occurs), from the time rain falls and we heard there is rainfall in a certain area, officers are required to go into what is called a reconnaissance to see if they have any flooding in a particular area	Data collection	Field work	Disaster preparedness was strategized through fieldwork

Data chunk (Sample Quote)	Code	Category	Theme
We have a crop registry in place that takes place before any natural disaster situations. That's one of the ways we prepare	Data collection		
So now fast forward to 2019, before the start of the rainy season, that's when we tried to get information out to people about, you know, what to look out for and what to do.	Advising		
Basically what we try to do is encourage proper drainage ensure that farmers try to make a difference.	Advising		

Figure 1

Participant-Rendered Drawing Analysis Sample



RQ1 (preparedness)
- 8- preparedness planning (lack of information)
- 12- preparedness planning (no planning policy)

RQ2 (response)
- 2- field work
- 3- crops under water
- 6- lack of physical access

Results

Thirteen participants comprised the final sample: two extension directors, 10 extension officers, and one agricultural assistant. Pseudonyms were used to maintain respondent anonymity. Collectively, the sample consisted of six men and seven women from six extension locations in Trinidad. Their experience ranged from

under five years of experience to more than 20 years of experience in extension.

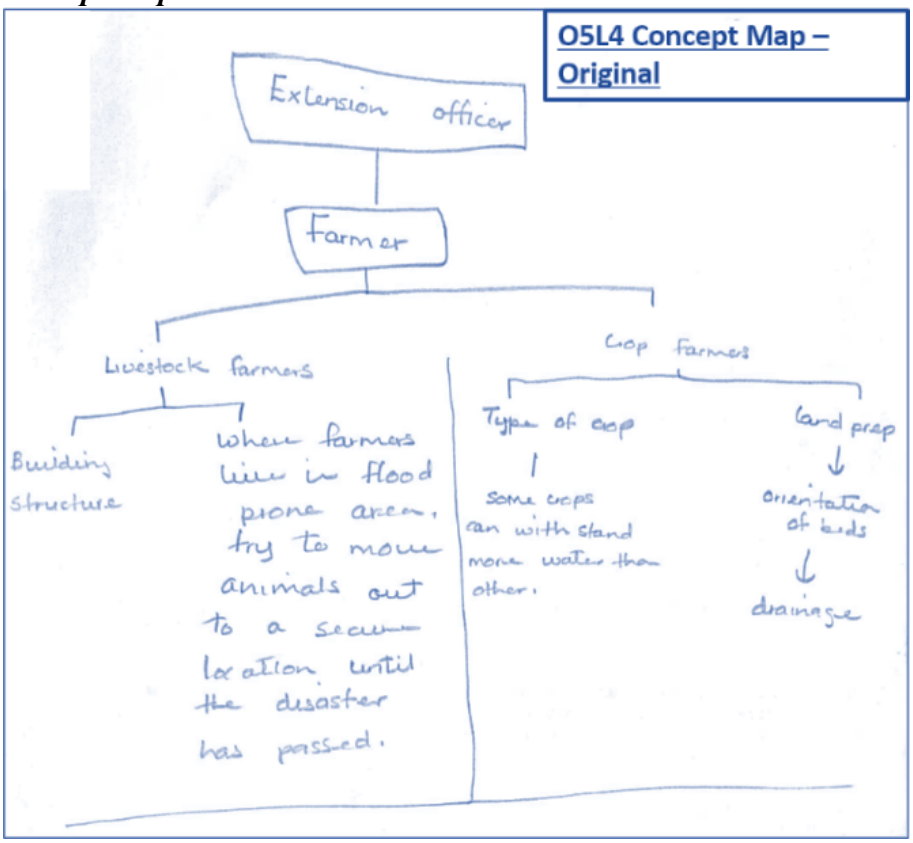
Preparedness Strategies During TSK

The theme that emerged from the data concerning RQ1 was that disaster preparedness was strategized through fieldwork during TSK. This involved collecting data on current farming activities to prepare for flood claims, and providing advice on preventative agriculture to mitigate against disaster damage. Most participants reflected this information in the concept maps. For example, Chris said, "Most of my farmers are in low-lying areas. So, I basically tell them what crops to plant and what not to plant at all because they normally do get flooded." Chris also mentioned to manage livestock during the interview, and both the importance of managing livestock and land preparation were reflected in Chris's concept map. In Chris's concept map (see Figure 2), the *extension officer* was at the top of the diagram, with a direct connecting link to the *farmer*.

The diagram then forks into *Livestock Farmers* on the left, and *Crop Farmers* on the right. Under Livestock Farmers, Chris pointed to the advice he provided to farmers in preparation for TSK, such as referencing building structures and situating livestock to minimize losses. Similarly, the crop section of the concept map pointed to crop varieties that are resistant to floods, as well as land preparation techniques that can mitigate against disaster damage considering TSK.

Figure 2

Chris' Concept Map



Data collection as a category in disaster preparedness was highlighted by the mention of a crop registry. As Samantha stated, "We have a crop registry in place that takes place before any natural disaster situations. That's one of the ways we prepare." Roy also mentioned the crop registry: "We would have started the crop registry maybe last year (2018) because in previous years we would have had difficulties in assessing what the farmers would have had planted when the crop is totally covered (in water) for a couple of days."

In addition to crop registry data, extension professionals conducted reconnaissance work prior to TSK as a measure of observational data collection. As Crystal said, "Even before (disaster occurs), from the time rain falls and we heard there is rainfall in a certain area, officers are required to go into what is called a reconnaissance to see if they have any flooding in a particular area."

Beyond data collection, extension professionals also provided advice on mitigating TSK to farmers. Ashley mentioned:

> Before you would hear about farmers having flood damage, that kind of thing, but I think that one [2018 flooding disaster] was like a big whammy in the country. And then we realize how unprepared the Ministry was… So now fast forward to 2019, before the start of the rainy season, that's when we tried to get information out to people about, you know, what to look out for and what to do.

Vince mentioned that, in most cases, providing advice is the best course of action: "Basically, the most we do is try to advise them."

Participants' responses indicated inconsistencies in disaster planning at extension offices. Most respondents highlighted the lack of a disaster management plan for Trinidad extension, while others suggested that some preparedness planning was available. Tracy, an extension director, stated "There was no plan in place. The Ministry is just now doing a disaster plan. So there is no set structure in place saying you have to do XYZ and having first responders." Other participants made similar statements that no disaster management plan was currently available, but that a plan was in progress where several stakeholders were contributing.

Respondents understood the importance of a plan. Steve talked about the human condition in disaster planning: "Actually there are things that you forget, it's obvious, we as humans forget. So, if we have a plan or schedule, we should have everything listed." To this point, Bill said, "Having a plan puts everything in place."

Several respondents pointed to the need for consistent disaster management training. Ashley also said consistent extension-wide training is not available:

> Nobody is trained, none of the extension officers are trained in disaster preparedness as it pertains to the agriculture community, and how to respond to it, what they should or shouldn't be doing, that kind of thing. There is no formal training that was ever done.

Response Strategies After TSK

A theme that emerged from the data concerning RQ2 was disaster response after TSK was strategized through field activities. The category concerning field evaluations for subsidy claims by farmers was the most

common among the respondents. Overall, Crystal highlighted extension's process in response to TSK:

> Ideally, when a (disaster) takes place, the farmers have seven days within which to come in and make a claim. After that, the officers are assigned to different areas where they would go out and do the evaluation. And they have, depending on the quantity (of produce), a specific time to come in and bring in the calculations. In relation to the actual compensation, they (extension professionals) have the instructions of how to go about doing compensation and they know what to look for in the field, etc. So once that comes in, we have a procedure now to evaluate that administratively to get it checked and double-checked by a number of people.

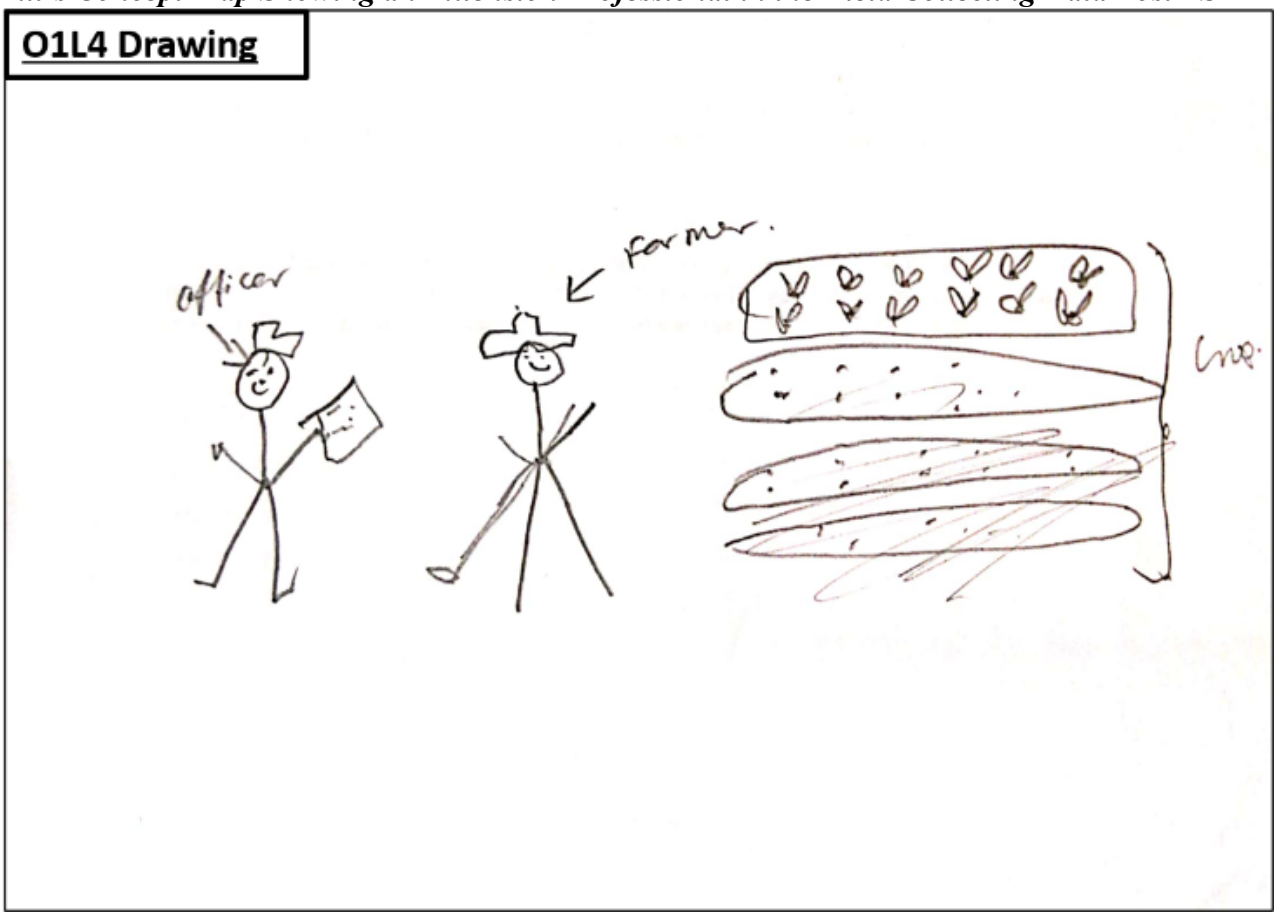
This response was consistent across all respondents and was represented in the participant rendered drawings. For example, Bill said, "As the storm passed, we went out and did a flood assessment…. And we have taken information of floods and affected areas and try to quantify produce and livestock as loss, and feed that information back to the office." Figure 3 showed an extension professional in the field, with a data collection tool, and crops partially under water.

Some respondents expressed concerns about the post-disaster data collection process. Tracy stated that the current system of data collection was "archaic" and "inefficient," referring to the paper-based data collection process. Another theme that emerge from the analysis was that extension professionals faced various challenges in responding to TSK. The categories supporting this theme included the lack of resources and challenges in conducting field work. While collecting flood damage data, respondents noted resource deficiencies, like appropriate transportation and human resources, as major challenges in responding to TSK. For example, Bill stated:

> Number one, the quantity of farmers that was affected for the number of officers that we have to do this assessment to start with is …. really, really difficult. And then, to get into some of the areas, I mean, not all the officers will have 4x4 vehicles, and even some 4x4 vehicles can't even access some of the affected areas. So that was basically a specific challenge, on my side as an officer.

Figure 3

Bill's Concept Map Showing an Extension Professional in the Field Collecting Data Post TSK



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Additionally, personal protective equipment (PPE), such as boots, coveralls,

umbrellas, and raincoats, for responding to TSK was also suggested to be lacking for most respondents. Samantha said, "(PPE is) something that comes with the job, but we were not able to get those facilities for the longest while." Similarly, Fabian said, "Another thing is, a while now, our county didn't get any kind uniform package in terms of boots and safety stuff." Financial resources were also highlighted as a resource constraint by a few participants.

Discussion, Conclusions, & Recommendations

The relational model proposed as presented by Jaques (2007) proposed that the different phases of disaster management may overlap. In this study, disaster preparedness strategies were implemented to improve the success of Trinidad extension's response to TSK. Disaster preparedness has been highlighted as a critical aspect of disaster management (Henkel & Marvanova, 2019; McLean & Whang, 2019; Nyanga et al., 2018). The fieldwork conducted by extension professionals in the preparedness phase of TSK was conducted to improve the response efforts. Advice on flood-resistant crops, mitigative planting practices, crop management, and mitigative livestock practices was provided to Trinidadian extension clients prior to TSK. This is consistent with previous research by Shannon and Motha (2015), Hasan and Bart (2006), and Kgakatsi and Rautenbach (2014). The data collection performed in the preparedness phase also assisted with accuracy of the post disaster flood claims by farmers. Therefore, disaster preparedness in Trinidad extension was performed to improve the disaster outcome during TSK for farmers.

Concerning the inconsistencies in planning, access to a disaster plan was an element in disaster management stated to be important for disaster preparedness (Asamoah et al., 2018; Eighmy et al., 2012; Pitt & Treen, 2017). In this study, respondents said disaster plans and disaster planning were lacking. However, some participants mentioned receiving some training on disaster planning. Asamoah et al. (2018) suggested that when planning is inconsistent, the results of disaster management is difficult to predict. Further, implementing a poor plan can lead to reduced success (Pitt & Treen, 2017). Eighmy and Hall (2012) stated that all educational materials and training were uploaded to an accessible website for extension professionals in North Dakota during a 2009 flood event. A similar solution may be applicable to Trinidad extension for future disasters as a starting point for country-wide disaster management resources. Beyond this, Ministry-wide disaster preparedness training should be implemented to increase the chance of disaster management success across all counties.

Regarding disaster response, all participants revealed that their response strategy involved field work through farm visits and damage estimates for flood relief disbursement. The literature concerning Extension professionals in disaster response point to field work in one form or another (Kerr et al., 2018; Telg et al., 2007, 2008). Data collection allows disaster response teams to make informed decisions with clients (Bonanno et al., 2010; Everhart et al., 2019; Merwaday et al., 2016). Additionally, data collection helped with accessing resources from stakeholders, like state or national funds (Chen et al., 2006; Downey et al., 2018; McLean & Whang, 2019). The lack of appropriate resources in disaster response impedes the success of disaster response efforts (Asamoah et al., 2018; Cummins & Wooden, 2014; Medford-Davis & Kapur, 2014; Norris et al., 2008; Tran et al., 2009). While most participants

mentioned resource constraints, the paper-based data collection method and lack of data collection technologies like unmanned aerial vehicles (UAVs) appeared to hinder response strategies during TSK. UAVs can maximize the data collection process, especially considering the potential for limited field access and time constraints for flood claims after disasters.

The concept maps and drawing data aligned with the data from the interviews. However, some participants provided more data than was originally presented in the interviews. This can be explained by the reflective period between the interviews and the drawing data. When research participants are allowed time to reflect, additional information may surface (Calvo, 2017). Additionally, drawings are alternative reflection tools, thereby soliciting ideas that are different from interview data, but adds to the overall data pool (Calvo, 2017; Caskey & Yeo, 2020; Del Greco et al., 2018; Guillemin, 2004; Hsu, 2014; Moagi, 2014).

Future research can be conducted on disaster management programming to determine the effect of new planning strategies at MALF, eliminating the inconsistency in disaster planning, preparedness, and training provided to Extension professionals involved in disaster management. Further, assessing the efficiency of current data collection strategies compared to digital data management can be assessed to determine the benefit to Trinidad extension during future disasters. Roberts et al. (2016) identified that extension systems across the Caribbean were similar. When weather-related disasters occur, they rarely affect only one country in the region. Therefore, the methodology can be adjusted and applied to other Caribbean countries to investigate disaster management as a region.

A consistent disaster management plan can bring clarity to those on the front lines of disaster response in Trinidad. The results of this study have been shared with the Ministry to improve disaster management resilience of extension professionals in Trinidad. This will also have a ripple effect for the agricultural sector, the food import bill, and government expenditure on agriculture. Finally, regional governments can use the results of this study to maximize disaster management activities in the future.

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