

REVIEW ARTICLE

Application of Sendai Framework for Disaster Risk Reduction in Food Security During Flood Disaster in Malaysia: A Narrative Review

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ABSTRACT

Disaster risk reduction (DRR) plays essential roles in ensuring food security to avoid adverse social, economic and financial implications to the disaster victims. This article aims to review existing DRR strategies in food security during flood disasters and recommend strategies that can be adapted into policies in Malaysia according to the Sendai Framework. Sendai Framework provides comprehensive, globally recognized priority themes in DRR while highlighting governmental and stakeholders' responsibility. A literature review was carried out by searching available published literatures from online databases and selected information used in this review is taken from articles, journals, reports, national reports, news, and thesis regarding the topic from November 2021 to January 2022. This review revealed that DRR strategies of food security during flood disasters in Malaysia lack one out of 14 work areas in four priorities in the Sendai Framework, which is the national-level risk and vulnerability assessment system and tools. This article proposed 19 recommendations to improve eight work areas across all four priority areas to enhance national food security during flood disasters.

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INTRODUCTION

According to the Food and Agriculture Organization of the United Nations (FAO), food security is defined as "when all people always have access to sufficient, safe, nutritious food to maintain a healthy and active life". Ensuring food security is a global effort, penned in Sustainable Development Goal 2 (SDG) by United Nation member states. Food insecurity occurs when there is limited food available with adequate nutrition and safe food, or the inability to acquire food (1). During disasters such as floods, the victims have difficulty in obtaining food supplies, and nutritious and safe food. The victims experiences food outages because their homes and environment were destroyed, including shops or markets that provide food. Floods or any kind of disaster cause the worst consequences on the vulnerable group and people with lower socioeconomic status or dependent on agriculture, especially those in

remote areas (2). This is because they mainly depend on daily wages, have low agricultural productivity, existing malnutrition issues, seasonal hunger, and little resilience to disasters (3-5). Damage to the transportation infrastructures like bridges and roads will hinder the people from doing their daily job activities. Interruption of food production will cause food prices to soar, further worsening the food insecurity issue. Desperation in securing food will lead to complex social and economic implications, including mental distress, chronic debts, poverty, malnutrition and mortality (6,7).

Flood is one of the most common natural disasters in Malaysia. It occurs nearly every year, particularly during the monsoon season. Flood is associated with climate change due to global warming, which causes increased sea levels and extreme weather. This phenomenon leads to short and long-term food insecurity in terms of reducing crops, seed reserves, fisheries and livestock production, damaged farm equipment, infrastructure, and supply systems, as well as affecting food trade. These situations disrupt the food production and distribution system, resulting in the interference of the availability and access to adequate and appropriate food in the

affected areas (7). In 2014, majority of farmers affected by flood disaster in Kelantan perceived low food access and low food availability in the affected areas (8). Along with damage to the food system, disasters also disrupt water and sanitation facilities, creating problems for proper food utilization (9). During flood, the victims will be in a state of transitory food insecurity, which is the temporary sharp reductions in a population's ability to produce or purchase food and other essential items. The length of this phase solely depends on the level of flood preparedness (7). Consequently, there will be economical and internal equilibrium disruption in vulnerable nations. According to Department of Statistical Malaysia report in 2021, total losses due to floods amounted to RM6.1 billion, which equivalent to 0.4% of Malaysia Gross Domestic Product (GDP). Agricultural losses recorded RM90.6 million, which indicated substantial risk for food security to flood victims. The success in achieving food security in flood disasters depends entirely on how well the disaster risk reduction (DRR) is implemented (10,11). DRR aims to reduce or avoid losses from hazards, assure prompt assistance to victims and achieve rapid and effective recovery. Therefore, the main objectives of this article are to 1) review existing strategies for DRR in food insecurity during flood disasters and 2) recommend new strategies that can be adapted into food security policies in Malaysia. To the best of our knowledge, this is the first article reviewing food security during flood disaster in Malaysia.

METHODOLOGY

A literature review was carried out from November 2021 to January 2022 by searching available, relevant published literature from online databases such as PubMed, Cochrane, ScienceDirect, Official Government Websites, Google Scholar and news websites. The search keywords used are “food security”, “food security AND flood”, “food security AND flood AND disaster”, and “food security AND flood AND disaster AND Malaysia”. Inclusion criteria for selection were articles written in English and published between 1st January 2000 and 30th October 2021.

RESULTS

The DRR in food security during the flood is imperative to mitigate the impact of food insecurity in Malaysia. As a member of the United Nations, Malaysia has agreed and adopted the Sendai Framework for Disaster Risk Reduction 2015-2030 (12). This framework is a continuation of the Hyogo Framework, aiming to substantially reduce disaster risk and losses in lives, livelihoods, health, and economic, physical, social, cultural, and environmental assets of persons, businesses, communities, and countries (13). It has four priority areas which are 1) understanding disaster risk; 2) strengthening disaster risk governance to manage

disaster risk; 3) investing in disaster risk reduction for resilience; and 4) enhancing disaster preparedness for effective response, and to “Build Back Better” in recovery, rehabilitation, and reconstruction. Subsequently, FAO has adopted this framework for DRR in the agriculture; food security and nutrition sector (FSN), focusing on 14 main work areas in all four priority areas (14). This article uses the FAO Sendai Framework to analyze DRR in food security during flood disasters in Malaysia as conceptually shown in Figure 1.

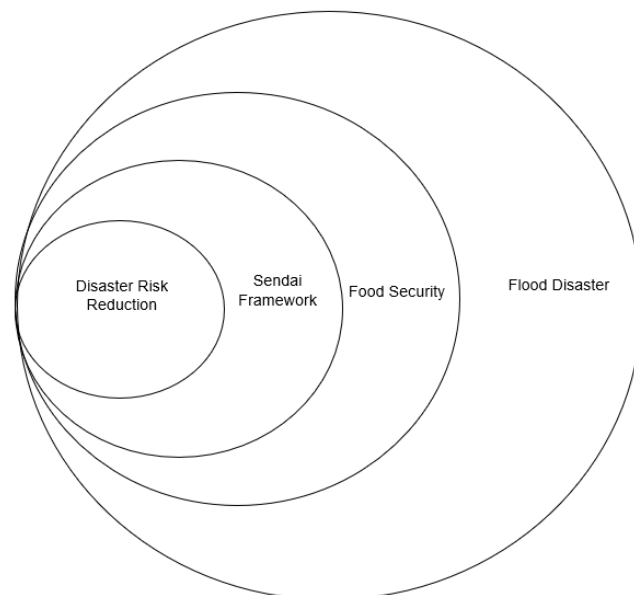


Figure 1: Conceptual framework of Sendai Framework, Disaster Risk Reduction and Food Security in flood disaster

**First Priority: Understanding Disaster Risk
First Work Area: Capacities For The Multi-Threat Assessment Of Risks And Vulnerabilities In The Agriculture And FSN Sectors**

In the first priority area, the first work area requires a nation to have capacities for multi-threat assessment of risks and vulnerability in the agriculture and FSN sector. Malaysia has set up the National Disaster Management Agency (NADMA) to coordinate government agencies in tackling disasters (15). It coordinates efforts to ensure food security during flood disasters from multiple agencies, including the Ministry of Agriculture and Food Industries (MAFI), to secure food availability, stability and sustainability and the Ministry of Home Trade and Consumer Affairs to secure food accessibility. However, risks and vulnerability assessment of food security in flood disasters are non-existence. It is recommended to establish and regularly conduct the national-level risk and vulnerability assessment system and tools for food insecurity during floods. Risk analysis and vulnerability assessment can be conducted in the preparation phase to identify sectors that need to be improved (16). The information and actions to be taken should be conveyed to the public to increase awareness and readiness and promote early recovery if a flood disaster occurs.

Hence, the public can plan for appropriate food storage and sufficient food stock to ensure food security during the disaster and make the best use of the emergency recovery inputs provided (17).

Second Work Area: Information Systems That Gather, Monitor And Share, Periodically, Information On Disaster Risk For The Agriculture And FSN Sector

NADMA utilizes Integrated Disaster Management System (IDMS) to support disaster management through information management, including data analysis, interagency data sharing, and information dissemination to stakeholders (18). It is a secure system, inaccessible for public usage and only used among relevant governmental agencies' officers. IDMS acts as a surveillance system to ensure coordination from all relevant agencies. However, this system does not coordinate flood aids to ensure the flood aids are distributed well without any wastage or without leaving any victims behind. For instance, the Nepal Food Security Monitoring System (NeKSAP) collects, analyses and presents information on household food security, emergency crises, rainfall level, disasters, crop situation, market watch and nutritional status of their population, especially those affected by crises. It is a comprehensive food security monitoring and analysis system initially established by the World Food Programme. This system allows the country to distribute aid accordingly, enabling coordination from various international and local agencies who volunteers to provide aid to the affected communities (19). However, there is no similar system in Malaysia, leading to uncoordinated aids during the flood disasters (20). Department of Social Welfare Malaysia is mainly responsible for food aid to flood victims. However, uncoordinated food aid with other non governmental organizations such as MERCY Malaysia may result in delayed food provision, food wastage and improper food storage. Hence, incorporation of food aid coordination into existing system is highly recommended.

Third Work Area: DRR Training And Sensitization Of Extension Workers, Field Technicians And Professionals Working In Direct Assistance To Producers In The Agriculture And FSN Sector

Basically, there are two mechanisms of DRR, namely formal and informal mechanisms. Formal DRR mechanism in agriculture includes Ex-ante strategies (pest management system, infrastructure, i.e., roads, dams, irrigation systems and supply of quality seeds) and Ex-post strategies (agricultural insurance, social assistance, loan rescheduling and cash transfer). The DRR sensitization and training roles are primarily played by the Malaysian government. Informal DRR mechanism is community-centred, in which individuals or household arrangements play a key role in food security. Such DRR mechanisms include on-farm strategies (crop diversification, advanced cropping techniques and risk

exposure avoidance), risk-sharing strategy (sharing of agricultural equipment, crop sharing and informal risk pool) and coping with shock strategies (sale of assets, mutual aid) (21).

Second Priority: Strengthening Disaster Risk Governance To Manage Disaster Risk

First Work Area: National Legal Frameworks, Policies, Strategies And Plans For DRR Include The Different Sub-Sector Of The Agriculture And FSN Sector

In Malaysia, there are several acts related to national food security, such as 1) Malaysian Agricultural Research and Development Institute Act 1969, which led to the establishment of Malaysia Agricultural Research and Development Institute (MARDI); 2) Pertubuhan Peladang Act 1973, and 3) Bank Pertanian Malaysia Berhad Act 2008. Section 6 of the Pertubuhan Peladang Act 1973 stated the training service for farmers are required to equip them with technology for the crop, animal rearing and others. Grants, loans, and other credit facilities through a bank are stated in Section 10 of Bank Pertanian Malaysia Berhad Act. Both acts help farmers and smallholders regarding finance and training to secure food security, including during flood disasters. The legal policies of DRR for food security are incorporated in multiple national acts and regulations, showing strong food security governance in Malaysia.

Second Work Area: Transversalization Of DRR In The Legal Frameworks, Policies, Strategies And Plans Of The Agriculture And FSN Sector

The second work area requires DRR transversalization into planning. There are multiple examples of food security policies such as National Agrofood Policy 4 (NAP 4), ASEAN Integrated Food Security (AIFS) Framework & Strategic Plan of ASEAN on Food Security in the ASEAN Region 2015-2020 and National Food Security Policy Action Plan 2021-2025. The NAP 4 aims to improve the efficiency of the agro-food industry in Malaysia through food security (22).

Third Work Area: Participation Of The Agriculture And FSN Sector In The Governmental Mechanisms For Inter-Sectoral Coordination For DRR

There are multiple agricultural agencies in Malaysia, such as the Paddy and Rice Industry Division (IPB), Department of Fisheries (DOF), MARDI and Farmer's Organization Authority (LPP) (23), which are involved in DRR for food security during flood. Through DOF, Department of Agriculture (DOA), and Department of Veterinary, MAFI has provided various resources after the flood disaster in December 2021 (23,,24). There are difficulties in securing various farming supplies following flood, distribution of diverse types of seeds, engineered seeds or disaster-resistant cultivars, fertilizer, clean water, pest-resistant storage containers for seeds, drying

nets, fisheries broodstock, animal feed and post-harvest equipment (4,25). Therefore, after the recent flood disaster, MAFI had distributed many farming supplies to help the victims restarting their works (25). In the past few years, Climate Smart Agriculture practices have been growing and considered as the way forward (26). MARDI had used the practices for rice, but only during drought (27). An increase in grain production is stored as a strategic reserve or exported to other countries. The strategic reserve can help a nation to cope with food emergencies by ensuring food availability during flood disasters (28). Cropping intensity should be reduced in areas with flood-prone or during wet seasons to reduce significant losses during a disaster. However, there is no official documentation on implementation of this strategy in Malaysia.

Fourth Work Area: Multi-Stakeholder And Multi-Sectoral Coordination Mechanisms In DRR That Connect The Public Sector With Stakeholders Of The Civil Society, Community Level, Academia And Other Specialized Entities

The fourth work area requires multi-stakeholder coordination in DRR. Malaysia shows systematic inter-agencies collaboration with other relevant stakeholders in efforts to execute DRR preventive strategies on flood disasters. The collaborations can be seen in strategies of 1) farming supply, 2) paddy cultivation, 3) machinery and equipment and 4) animal restock 5) irrigation and drainage systems. In 2021, Malaysia Nuclear Agency had produced and disseminated several types of nuclear paddy seeds such as NMR152 seed that can withstand weather changes, including floods (28,29). Besides, MAFI has spent more than RM63 million since 2014 for nationwide community gardens, benefiting many small-scale farmers. MAFI also collaborated with private sectors, landowners and entrepreneurs to develop large-scale land for paddy cultivation (31).

Machinery and equipment are integral parts of the food production process. Free, discounted, or compensation for repair services of damaged equipment, machinery, and facilities can be made available. Financial assistance for the spare parts cost can also be offered (16,31). To this date, these services and assistances have been provided only for domestic cars, motorcycles, and houses (32,33). Therefore, the extension of these assistances to the farming sectors is highly recommended. For livestock, the veterinarian services, animal medicine, and supplements are greatly needed to nurse the animal back to health, especially as they were exposed to various diseases such as skin disease or ringworm infection during floods (32). However, these services and assistance are mainly given to pets (35). Animal restocks like ducks, chickens, goats, and pigs are advised if there is concerns regarding protein intake decline (4). Livelihood assets (crop, fishery, and livestock) need to be protected from hazards, such as

using insurance. At usual, insurers are less likely to cover poor and high-risk groups than wealthier populations. Therefore, MAFI provides this insurance for all members of the Area Farmer's Organization (35,36).

A lack of communication between the government and the public can obstruct the flood preparation and response process, leading to slow disaster recovery (3). The major flood on December 2021 in Selangor brought about discussion regarding poor and ineffective communication between the government and the public. Thousands of victims expressed that they were not informed adequately about the severity of the situation and preventive measures they could have taken beforehand (37,38). NADMA leadership and coordination during flood disasters are critical to ensure effective resources distribution and avoid wastage, especially related to food donation such as cooked or packed food or raw material (32). During recent flood disaster, some temporary evacuation centers received excessive food donations due to poor coordination (40). Therefore, it is recommended to improve risk and crisis communication between agriculture sectors in governmental mechanisms.

Fifth Work Area: Human Skills And Financial Resources Of The Agriculture And FSN Sector Specifically Dedicated To DRR

The fifth work area requires resource allocation and development, where Malaysia allocated RM80 million in Budget 2022 to MAFI for Tabung Bencana Pertanian. It aims to help farmers and smallholders financially during a disaster. The most well-known short-term strategies in Malaysia are food aid, food voucher, and cash transfer (40,41). Following the recent flood disaster, cash transfers of RM1,000 were given to each affected family (43). For the short-term, cash transfer is deemed a better choice than food aid and food voucher, as it allows flexibility for the recipients to buy their required necessities rather than receiving items they may already have (42). Nevertheless, unspecified cash transfer is also considered as risky because it may be spent unwisely (16). As victims have no source of income due to loss of food production, cash compensation can be given for damaged production, land, barns, inability to grow crops, declining livestock health and production (32). The eligible applicants, the application process, the maximum amount for the compensation should be clearly stated to ease the process so that the victims can claim the optimal amount and avoid abuse (44). The subsidy may be prioritized to the poorest populations first as they are the most vulnerable (16). To help with the recent flood disaster, cash compensation has been given by MAFI and Terengganu State Government (25). For medium- to long-term, food assistance is a better approach to improve nutritional status among malnourished populations to increase their resilience when facing disaster, such as through school feeding

programs (16,45). School feeding programs in Malaysia are not prioritised according to disaster prone areas (46). Therefore, it is recommended that the programs be intensified in flood-prone areas.

The recovery phase in the food production industry is very likely to be long-term as crop replanting, reforestation, animal rearing, and fish repopulation can take decades (47). Therefore, an alternative source of income such as small scale business or building construction can be introduced to the affected population to ensure their food security. Livelihood diversification can increase coping capacity of vulnerable populations (48). They can be provided with training courses for other occupations, especially in industries with labor shortages (32).

Third Priority: Investing In Disaster Risk Reduction For Resilience

First Work Area: Systematic Planning Of The Use Of Natural Resources And Promotion Of Sustainable, Productive Systems In All Government Interventions In The Agriculture And FSN Sector

In the third priority, the first work area requires the use of natural resources in DRR for resilience. In Malaysia, this strategy is used extensively during flood disasters in local stakeholders' activity, including governmental and non-governmental sectors. This includes organizations such as Yayasan Food Bank Malaysia, Kechara Soup Kitchen, Mutiara Food Bank, and Food Aid Foundation Malaysia. One of the activities is to distribute donated, unused, or untouched food to victims and vulnerable populations (49). By systematically using the sustainable module, this strategy helps reducing food insecurity during flood disasters.

Second Work Area: Implementation, Distribution And Systematization Of Technologies And Good Practices That Increase The Resilience Of The Livelihoods Of Men And Women Upon Disaster Risk And, Particularly, That Favour Climate Change Adaptation

The second work area demands for utilization of technology to increase the resilience of livelihood upon disaster risk. The smart farming system has been used in Malaysia, where it uses the Internet of Things (IoT) in agricultural technology. Daily watering and fertilizing times, for instance, are regulated through schedule systematically. In Sabah, Nutribah company has ventured into Smart Organic Farming using technologies such as autonomous robotic vehicles for sustainable agriculture (50). Government funding in technology application in agriculture based on IoT amounted up to RM10 million during Budget 2021 (51).

Third Work Area: Availability Of Formal Mechanisms For Risk Retention And Transfer (Funds, Insurance And Social Protection) Adapted To The Needs Of The Different Types Of Smallholders

The third work area requires a nation to have risk retention and transfer for smallholders. During the flood disaster in early 2015, Malaysia's government has provided a total of RM100.89 million fund relief to affected farmers in the Muda Agricultural Development Authority (MADA) granary area. However, the risk transfer should also be on private sectors, such as insurance companies and financial institutions. The insurance companies should introduce crop insurance for smallholders to ensure the smallholders' survival. The National Agricultural Insurance Scheme to protect farmers in the event of losses due to disasters has been submitted to the Malaysian Cabinet for approval (52). Financial institutions, such as the Central Bank of Malaysia and Agrobank, play roles through loans rescheduling, lending normal or emergency loans for disaster preparedness activities with the utmost flexibility (15,47). All these recovery strategies should include migrant workers. There is a high possibility of miscommunication as limited information is available in their native languages. Many migrant workers were not well informed of the aids or assistances they are eligible to receive and missed the benefits. The information must be translated and disseminated well to ensure broad and equitable resources distribution to all affected populations and better opportunities for the community to improve livelihoods (41).

A thorough incident postmortem process and cost-benefit analysis approximately six months and two years after a flood disaster should be carried out to improve future disaster management and evaluate the effectiveness of strategies implementation. Relevant government agencies responsible for authorizing the budget allocations should also be included from the beginning to ensure effective strategies implementation (32). Collaboration between government, private sectors, non-governmental organizations (NGOs), and community are needed to monitor the implementation process of sources distribution, and compensation to avoid tension, dispute, acts of fraud, corruption, and favouritism. Disaster management plans that had been pre-agreed should also be pre-financed so that they can be implemented immediately without needing any further political decisions. These plans should be changed from ad-hoc to a stand-by financing model because there is a lack of willingness for plan implementation funding when a disaster occurs (16,53).

Fourth Priority: Enhancing Disaster Preparedness For Effective Response And To “Build Back Better” In Recovery, Rehabilitation, And Reconstruction

First Work Area: Risk Monitoring Systems And Multi-Threat Early Warning Systems Adapted To The Different Sub-Sectors: Agriculture, Livestock, Forestry, Fisheries And FSN

Malaysia is one of the countries which participate in the Global Information and Early Warning System on Food and Agriculture (GIEWS). GIEWS monitors food supply and demand continuously, provides up-to-date reports, provides rapid evaluation during a disaster and maintains global food information sharing (54). It monitors food availability through food production forecasts and food accessibility through food price monitoring. However, the early warning system should also monitor specific indicators at the national level, such as livestock, forestry production and fisheries. With multiple early warning system indicators established on food security, susceptible areas or locations for food security during flood disasters can be detected. Hence, the local response protocol for food security in the susceptible areas can be developed.

Second Work Area: Inclusion Of The Different Sub-Sectors Of The Agriculture And FSN Sector In The Processes Of Disaster Preparedness And Contingency Plans At A National Level

The second work area requires the inclusion of different subsectors in the national disaster preparedness plan. To ensure food security, all the food-producing sectors need to be involved, namely agriculture, forestry, livestock, and fisheries (55). This strategy is achieved in Malaysia whereby under MAFI, various agencies such as IPB, DOA, DOF, Fisheries Development Authority of Malaysia (LKIM), Kemubu Agricultural Development Authority (KADA), MADA, Federal Agriculture and Marketing Authority (FAMA) and Malaysia Pineapple Industry Board (LPNM) collaborated under National Security Council during flood disaster (23).

Ministry of Health (MOH) plays essential roles during flood, as the victims are at high risk of developing food and water borne diseases (FWBD) such as hepatitis A, typhoid fever, cholera, leptospirosis, and dysentery. Food safety issues during flood are often linked with unsafe food storage, handling, and preparation. This is often due to the lack of safe water and toilet facilities and poor sanitation. When flood strikes, food and water sources can be contaminated by surface water with pathogens from sewage, wastewaters, dead animals, and humans. Lack of safe drinking water and sanitation affects the hygienic preparation of food and increases the risk of food contamination at all stages of the food chain, from production to consumption. Any disruption in vital services, such as water supply or electricity, also severely affects food safety (56). Therefore, preventive

food safety measures should be carried out immediately during flood disasters by relevant stakeholders, i.e., MOH, Welfare Department, and Food Aid organizations. The measures include confirming the safety of drinking water and boiling them before using it, accessing the agricultural produces affected and contaminated by microorganisms, and harvesting safe agricultural produces. Mechanism of kitchen waste management, vector control and pest control activities need to be carried out at the flood relief centers in order to avoid any infectious disease occurrence at these centers.

During the planning and designing irrigation and drainage infrastructure reconstruction, the principle of “Build Back Better” should be considered. For example, selecting safer locations and increasing possible water supply sources can boost disaster resilience (32). More advanced technology like stormwater and wastewater separation in flood-prone areas could also reduce water contamination. Monitoring and maintenance of the water supply system should be conducted regularly to reduce the risk of failing. As many agencies may be involved with water quality management, there should be one single agency that is responsible for coordination to ensure integrated implementation. This is especially important if there is collaboration or network between government and non-governmental sides (32).

Provision of all the aids during the response phase of flood requires effective transportation. Where there can be disruption in the road networks and damages to the infrastructure, transportation and delivery costs are much higher due to the various unusual delivery methods used such as helicopters, boats and trucks coupled with slower delivery time (4). Malaysia mobilized governmental agencies to provide their vehicles for food transportation to evacuation centers and affected homes to overcome these issues.

Third Work Area: Inclusion Of Risk Prevention And Mitigation Aspects In Programs And Plans For The Rehabilitation Of Livelihoods And Development, As Well As For Sustainable Development Programs

The final work area calls for the inclusion of risk prevention and mitigation in the rehabilitation program. In food insecurity preparedness during flood, the government provided Ex-ante education and services to help familiarize farmers and smallholders with the consequences of risk and help them adopt strategies to deal with the risk. The government also developed relevant infrastructures and adopted social schemes and cash transfers to relieve farmers and smallholders financially.

Based on the Sendai Framework on Agriculture and FSN, the overall strategies implementation showed that Malaysia had established policies in 13 out of 14 work areas. Malaysia has proven to successfully prioritise

and execute DRR strategies as highlighted in Table I. However, the one lacking work area is the national-level risk and vulnerability assessment system and tools under Priority 1. For the way forward, there are a total of 19 recommendations across eight work areas that can be considered to further improve the DRR strategies in Malaysia, as summarized in Table II.

CONCLUSION

DRR strategies of food security during flood disasters

in Malaysia are well-established across various agencies and organizations with national governmental coordination systems according to Sendai Framework. Despite numerous challenges faced during flood disasters, Malaysia has shown that food security is well prioritized. However, some work areas can be further refined and improved. Ultimately, maximizing the DRR strategy in food security will minimize its impacts on the disaster victims. Hence, these strategies should be integrated into existing national strategies on DRR of food security during flood disasters.

Table I: Highlights of DRR in food security during flood disaster in Malaysia

DRR	Highlights
1. Well-established legal acts on food security	<ol style="list-style-type: none"> 1. Establishment of Malaysia Agricultural Research and Development Institute (MARDI) as enacted in Malaysian Agricultural Research and Development Institute Act 1969. 2. Grants, loans, and other credit facilities through a bank are stated in Section 10 of Bank Pertanian Malaysia Berhad Act. 3. Section 6 of the Pertubuhan Peladang Act 1973 stated the training service for farmers are required to equip them with technology for the crop, animal rearing and others.
2. Systematic inter-agencies collaboration with other relevant stakeholders in efforts to execute DDR preventive strategies.	<ol style="list-style-type: none"> 1. Malaysia Nuclear Agency had produced and disseminated several types of nuclear paddy seeds such as NMR152 seed that can withstand weather changes, including floods. 2. MAFI has spent more than RM63 million since 2014 for nationwide community gardens, benefiting many small-scale farmers; and collaborated with private sectors, landowners and entrepreneurs to develop large-scale land for paddy cultivation. 3. Well planned resource allocation and development, where Malaysia allocated RM80 million in Budget 2022 to MAFI for <i>Tabung Bencana Pertanian</i>. It aims to help farmers and smallholders financially during a disaster.
3. Systematic planning of the use of natural resources and promotion of sustainable systems	<ol style="list-style-type: none"> 1. Distribution of donated, unused, or untouched food to victims and vulnerable populations by organizations such as Yayasan Food Bank Malaysia, Kechara Soup Kitchen, Mutiara Food Bank, and Food Aid Foundation Malaysia. 2. Utilization of Internet of Things (IoT) in agricultural technology such as Smart Organic Farming using autonomous robotic vehicles for sustainable agriculture in Sabah.

Table II: Malaysia priorities of DRR in food security during flood disaster

Priority / Work Area	Implemented	Recommendations For Improvement
Priority 1: Understanding disaster risk.		
1. Capacities for the multi-threat assessment of risks and vulnerabilities in the agriculture and FSN sector.	Nil	1. Establishment of national-level risk and vulnerability assessment system and tools for food insecurity during flood.
2. Information systems that periodically gather, monitor, and share information on disaster risk for the agriculture and FSN sectors.	Yes	1. Incorporation of food aid coordination into existing national IDMS system.
3. DRR training and sensitization of extension workers, field technicians and professionals working in direct assistance to producers in the agriculture and FSN sector.	Yes	-
Priority 2: Strengthening disaster risk governance to manage disaster risk.		
1. National legal frameworks, policies, strategies and plans for DRR include the different sub-sector of the agriculture and FSN sector.	Yes	-
2. Transversalization of DRR in the legal frameworks, policies, strategies and plans of the agriculture and FSN sector.	Yes	-
3. Participation of the agriculture and FSN sector in the governmental mechanisms for inter-sectoral coordination for DRR.	Yes	1. Cropping intensity in areas with flood-prone or during wet seasons.
4. Multi-stakeholder and multi-sectoral coordination mechanisms in DRR that connect the public sector with stakeholders of the civil society, community level, academia and other specialized entities.	Yes	<ol style="list-style-type: none"> 1. Improvement of leadership, coordination, and risk and crisis communication between government and public to ensure food security during flood. 2. Extension of repair services and financial assistance to food-producing sector. 3. Veterinarian services, livestock medicine, and supplements for livestock.
5. Human skills and financial resources of the agriculture and FSN sector specifically dedicated to DRR.	Yes	<ol style="list-style-type: none"> 4. Training courses for other types of work, especially in industries with labor shortages. 5. Clear statement on eligible applicants, application process, maximum amount for the compensation. 6. Subsidy prioritization to poorest populations. 7. Intensification of school feeding programs in flood-prone areas.

(Continues.....)

Table II: Malaysia priorities of DRR in food security during flood disaster (Continued)

Priority 3: Investing in disaster risk reduction for resilience.		
1. Systematic planning of the use of natural resources and promotion of sustainable productive systems in all government interventions in the agriculture and FSN sectors.	Yes	1. Policies and programs planning for disaster management should consider inputs from local population.
2. Implementation, distribution and systematization of technologies and good practices that increase the resilience of the livelihoods of men and women upon disaster risk and, particularly, that favour climate change adaptation.	Yes	-
3. Availability of formal mechanisms for risk retention and transfer (funds, insurance and social protection) adapted to the needs of the different types of smallholders.	Yes	1. Introduction of national crop insurance for farmers and small-holders. 2. Migrant workers inclusion in all strategies. 3. Cost-benefit analysis to evaluate strategies effectiveness. 4. Collaboration between government, private sectors, NGOs, and community to ensure transparency and accountability. 5. Pre-finance the pre-agreed disaster management plans. 6. Sharing of disaster management burden between public and private sectors.
Priority 4: Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction		
1. Risk monitoring systems and multi-threat early warning systems adapted to the different sub-sectors: agriculture, livestock, forestry, fisheries and FSN.	Yes	1. Susceptible areas of food insecurity during flood disasters should be mapped out based on early warning system indicators. 2. Local response protocol for food insecurity based on early warning system indicators in the susceptible areas must be developed.
2. Inclusion of the different sub-sectors of the agriculture and FSN sector (agriculture, livestock, forestry production and fisheries) in the processes of disaster preparedness and contingency plans at a national level (cross-sectoral).	Yes	-
3. Inclusion of risk prevention and mitigation aspects in programs and plans for the rehabilitation of livelihoods and development, as well as for sustainable development programs.	Yes	-

Note: Yes: implementation strategies are documented and published. Nil: implementation strategies are absent or not documented and published.

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