

Reducing the Risk of Food Vulnerability Due to Drought Through the Utilization of Food Vulnerability Atlas in Timor Tengah Selatan Regency

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Abstract

Disaster risk reduction is an effective disaster management paradigm in dealing with various disasters, including food insecurity disasters. One important instrument in reducing the risk of food insecurity disasters is a food vulnerability atlas owned by a government local. The method used is a qualitative method by relying on local government food vulnerability atlas documents. Based on the research results, it is known that 41 villages (14.74%) of the 278 villages throughout the Timor Tengah Selatan (TTS) regency are villages that are very vulnerable to food insecurity. Based on the results of the food vulnerability atlas, it can also be seen the regional government's strategy in overcoming highly vulnerable areas, namely through a program to increase food provision in non-production center areas by optimizing local food resources. This study also recommends that local governments increase basic infrastructure development programs (roads and clean water) in food-vulnerable areas.

Keywords:

risk reduction; food vulnerability; food insecurity; vulnerability atlas; disaster

Introduction

Disaster risk reduction (DRR) is part of disaster management and risk management. The approach to disaster has shifted from the conventional approach (relief and emergency) to risk reduction. The conventional view considers disaster as an inevitable event or incident and victims must immediately receive assistance, so the focus of disaster management is more on relief and emergency. While the risk reduction paradigm is a combination of technical and scientific perspectives on social, economic, political and environmental conditions. Disaster management begins with analyzing disaster risks based on threats/hazards and vulnerabilities, in improving the ability to manage and reduce risks, and reducing the impact of disasters caused. Disaster management should be risk-based by prioritizing a mitigation approach rather than an emergency response approach. The mitigation paradigm in disaster management can be interpreted as an effort to identify disaster-prone areas and provide community preparedness. In the context of disaster risk reduction, disaster mitigation can also be understood as an effort to

increase the capacity of communities in disaster-prone areas to eliminate or reduce the effects of threats and levels of disaster.

The implications of the risk reduction paradigm are: (a) disaster management is no longer focused on the emergency response aspect but rather on overall risk management; (b) protection of the community from the threat of disaster by the government is a form of fulfillment of the people's basic rights and not merely because of the government's obligations and (c) disaster management is no longer the responsibility of the government but becomes a shared concern of the community. Disaster management with a risk reduction approach aims to improve the community's ability to manage and reduce the risk of disasters.

The most important thing in this approach is to view the community as the subject and not the object of disaster management in the development process. disaster risk reduction which is an integrated plan that is cross-sectoral and cross-regional and includes social, economic and environmental aspects. Awareness of the importance of disaster risk reduction efforts has begun to emerge in the decade 1990-1999 which was declared as the Decade of Disaster Risk Reduction. Efforts to reduce disaster risk systematically require understanding and shared commitment from all related parties, especially decision makers. Disaster risk reduction policies and strategies have been well established in the international development community, and are used at the grassroots level to address all forms of hazards (Mercer, 2010). Mitigation-based disaster risk management starts from comprehensive planning, starting from mapping potential disasters in disaster-prone areas. Mapping of disaster-prone areas is based on the type and cause of the disaster, so that efforts that must be made must be adjusted to the causative factors, until an accurate risk map can be obtained. Furthermore, based on the mapping results, detailed disaster risk mitigation planning is prepared. The detailed planning is then integrated into the medium-term and long-term development plans.

The phenomenon of drought disasters that often occur in the Timor Tengah Selatan (TTS) regency has implications for community food insecurity which affects the level of food security in this region. Based on the data obtained, it shows that food insecurity in TTS regency occurs due to drought disasters (interviews with local community leaders).

Drought is one type of disaster that is categorized as a natural disaster. Other natural disasters are; earthquakes, tsunamis, volcanic eruptions, floods, hurricanes, and landslides, while other disasters are categorized as non-natural disasters and social disasters. According to the National Disaster Management Agency (BNPB, 2017), drought is a relationship between water availability that is far below the water needs for life, agriculture, economic activities and the environment. Drought is divided into 2, namely; natural drought and anthropogenic drought.

Drought is a temporary deviation and is very different from aridity which is more permanent in nature where rainfall is always small as often occurs in the province of Nusa Tenggara Timur (NTT). The danger of drought is experienced by various areas in TTS regency, almost every dry season. This is closely related to the decline in land function in storing water. The decline in function is caused by damage to the ecosystem due to low rainfall. The impact of this drought is crops failure, food shortages to the worst impact is the many symptoms of malnutrition and even death. The following data shows the impact of the drought that occurred in TTS regency.

Table 1.
Impact of Drought Disaster in TTS Regency

No	Impact of Drought Disaster in TTS Regency	Quantity
1	Affected districts	13
2	Affected villages	172
3	Head of Family (KK) affected	19.769 KK
4	KK of Serious Transient	64 villages (>30%)
5	KK of Light Transient	49 villages (< 30%)

Source: TTS District Food Security Agency, 2022

Based on the data in table 1, it is known that the impact of the drought disaster experienced in TTS district was quite severe, more than 30% of villages experienced very severe drought, and affected 19,769 heads of families who experienced food difficulties due to failed planting and failed harvests. The number of affected villages is also quite large, reaching 113 villages, both experiencing serious and light transients.

In addition, the impact of drought on local food crops is quite threatening to the food security of the community in TTS regency, as seen in table 2 below:

Table 2.
Crop Failure Due to Drought in 2020

Item	Kinds Crops	Estimated Damage (in tons)
1	Maize	2.913
2	Paddy	47.945
3	Cassava	5.246
4	Sweet Potato	2.450

Source: TTS District Food Security Agency, 2022

Based on table 2, it can affect the community's food supply, thus creating vulnerability to food security in TTS district, which in the end also has an impact on food security.

Disaster Risk Reduction Concept

Disaster risk reduction is a new perspective in disaster management, where disasters are no longer viewed conventionally, the focus of mitigation is on relief and emergency, but disaster mitigation begins with analyzing disaster risks based on threats/dangers and vulnerabilities, in

increasing the ability to manage and reduce risks, and reducing the impacts caused. Disaster risk reduction is defined as the systematic development and implementation of policies, strategies and practices to minimize vulnerability, hazards and impacts of disasters across societies, in the context of sustainable development (UNISDR, 2005). Based on this conception, risk reduction is a policy and strategy that views disaster management from a social, economic and political perspective (Gaillard et al., 2007). Gaillard (2010) views the risk reduction paradigm as considering the broader social, political, environmental and economic environment in which a hazard is located in the policies and strategies to be taken. The expected goal in policies and strategies is to minimize vulnerability, hazards and impacts of disasters.

Disaster risk reduction recognises the link between disaster hazards and the wider environment. The strategies used are disaster hazard assessments, vulnerabilities and disaster response capacities. These strategies highlight the capacity of communities to reduce their own disaster risks, particularly identifying those directly affected by hazards as those best placed to identify risk reduction solutions. However, this strategy should be linked to the strategy taken by the government (Mercer, 2010). Successful risk reduction is risk reduction that can create resilient communities, while ensuring that vulnerability is not increased through development efforts or other externally initiated activities. Some important characteristics of risk reduction (Wisner et al, 2012) include; relevant to all types of hazards; ; origin and culture in humanitarian assistance following a disaster event; Most concerned with the present – i.e. addressing existing risks; Traditional/indigenous knowledge at community level is a basis for resilience; Structural measures designed for safety levels modelled on current; Community-based process stemming from experience; Political and widespread recognition often quite weak.

Food Vulnerability

Vulnerability is the result of conditions and processes that are affected by natural hazards, technological disasters, or certain extreme conditions. Dimensions of vulnerability include social vulnerability, economic vulnerability, and environmental vulnerability. Vulnerability is the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard. Vulnerability can vary significantly within a community and over time, and is specific to each location even if other factors (e.g., economic development) are similar. Vulnerability can be understood as weaknesses and lack of capacity that affect various dimensions of community well-being (Samaraweera, 2023). Meanwhile, Wisner et al (2004) stated that vulnerability is a characteristic of a person or group and their situation that affects their capacity to anticipate, cope with, resist, and recover from the impacts of natural hazards (extreme natural

events or processes). Vulnerability involves a combination of factors that determine the level of risk to lives, livelihoods, property and other assets by separate and identifiable events.

Therefore, in facing a vulnerable situation, preparedness is needed, namely knowledge and capacity developed by governments, professional emergency response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from the impacts of potential, imminent, or ongoing hazard events or conditions. Preparedness is carried out in the context of disaster risk management and aims to build the capacity needed to manage all types of emergencies efficiently and achieve an orderly transition from response to sustainable recovery. Preparedness is based on a comprehensive disaster risk analysis and the establishment of an effective early warning system. It includes activities such as contingency planning, stockpiling of equipment and supplies, developing arrangements for coordination, evacuation and public information, related training and field exercises, and household actions for evacuation (Wisner, 2004).

There are 2 main dimensions of vulnerability situations, namely; (1) susceptibility; and (2) lack of coping capacity (Birkmann et al., 2006). Coping capacities and mechanisms inform and regulate the “ability to” and the “difficulty of” recovering (Birkmann & Wisner, 2006). Vulnerability is a core concept in understanding health, risk, and hazards. Vulnerability is contextual and dynamic, vulnerability is generated through social relationships that continue to develop and are articulated in a particular socio-ecological environment (Bankoff et al, 2004).

According to Thomas et al (2018), there are four (4) important aspects related to vulnerability, namely; (a) resources, access to resources, considering how access varies across communities and how disparities drive different sensitivities to climate impacts. Social processes of marginalization and disenfranchisement play a significant role in creating patterns of unequal access to resources. Design Power differences determine who benefits from government policies and who may be disenfranchised by them; (c) culture, the role of culture in shaping vulnerability. Culture shapes how individuals perceive and explain their environment and influences who is sensitive and exposed to environmental change and how they experience that exposure. Because culture informs perceptions of risk, it also influences the adaptive capacity of those exposed and shapes the ways in which issues of environmental justice and equity are considered; (d) the nature of knowledge and information, the different types of knowledge and information that influence vulnerability, arguing that the inclusion of different forms of knowledge can improve mitigation and adaptation planning.ing and implementing effective disaster risk reduction and adaptation interventions requires attention to these inequalities in the context of ongoing social change; (b) governance, influencing vulnerability to climate change, how local governments,

private companies, and civil society plan and manage climate change risks. Representation and empowerment are fundamental to why there are such striking differences in the vulnerability of various social group.

Food Vulnerability Atlas

The Food Security and Vulnerability Atlas (FSVA) is important information for decision makers in making programs and policies, both at the central and local levels, in the context of interventions and programs based on the needs and potential impacts of high food insecurity. The FSVA can be used as an instrument to manage food crises in efforts to protect/avoid food and nutrition crises in the short, medium and long term.

The results of the 2019 FSVA for TTS Regency have produced analysis down to the village level. The indicators used by FSVA include, namely; (a) the ratio of the standard area of rice fields to the area of the village; (b) the ratio of the number of economic facilities and infrastructure to the number of households; (c) the ratio of the number of residents with the lowest level of welfare to the number of village residents; (d) villages that do not have adequate access by land, water or air; (e) the ratio of the number of households without access to clean water to the number of village households; (f) the ratio of the number of health workers to the number of village residents.

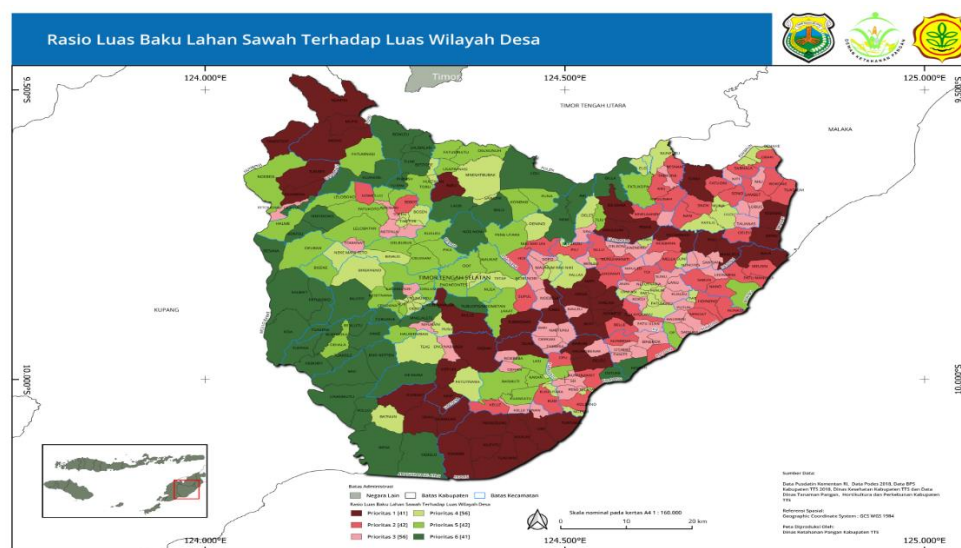
Meanwhile, at the national level in 2020, the indicators used to measure the food vulnerability atlas are; (a) the ratio of normative consumption per capita to net production of rice, corn, sweet potatoes, and cassava; (b) the percentage of the population living below the poverty line; (c) the percentage of households with a proportion of food expenditure of more than 65 percent of total expenditure; (d) percentage of households without access to electricity; (e) Average length of schooling for girls above 15 years; (f) percentage of households without access to clean water; (g) ratio of population per health worker to population density; (h) percentage of toddlers with below standard height (stunting); (i) life expectancy at birth.

Based on the results of the indicator analysis and composite analysis, the regions or villages have been analyzed and grouped into 6 category groups. Regions that fall into group 1 are villages that tend to have a higher level of vulnerability than villages in the group above, conversely, regions in group 6 are villages that have the best food security.

One of the indicators that has been mapped is the ratio of the standard area of rice fields to the area of the village. The ratio of rice fields to the area of the village is used as one of the indicators in the aspect of food availability because rice fields have a positive correlation with the level of food availability by affecting food production capacity. The higher the ratio of rice fields

to the area of the village, it is assumed that food availability will also be better, and vice versa (Strategic Plan of the Food Security Service of TTS Regency, 2020).

Based on the analysis results, information was obtained that of the 278 villages in TTS Regency, 41 villages were in category 1 (14.74%), 42 villages in category 2 (15.10%) and 56 villages in category 3 (20.14%). The sub-districts that have a land ratio with categories 1-3 are mostly spread across Kie sub-district, Amanuban Tengah sub-district, Toianas sub-district, Kolbano sub-district, Kualin sub-district, Kot'Olin sub-district, Amanatu Selatan sub-district, Amanatun Utara sub-district, Nunkolo sub-district, and Mollo Utara sub-district. The following is a atlas of the ratio of the standard area of rice fields to the area of the village.



Source: TTS District Food Security Agency, 2020

Utilization of Food Vulnerability Atlas for Reducing the Risk of Food Insecurity

By utilizing a food vulnerability atlas and based on composite calculation analysis, the causes of food vulnerability can be identified based on priority handling categories. The following are the vulnerability factors for each priority category.

Villages vulnerable to **Priority 1** food insecurity are generally caused by: (a) The ratio of the standard area of rice fields to the area of the village, (b) The ratio of the number of health workers to the number of residents, and (c) The ratio of the number of residents with the lowest level of welfare to the number of village households. Villages vulnerable to **Priority 2** food insecurity are generally caused by: (a) The ratio of the number of households without access to clean water to the number of village households, (b) The ratio of the number of residents with the lowest level of welfare to the number of village households, and (c) Villages that do not have adequate connecting access. Villages vulnerable to **Priority 3** food insecurity are generally caused

by: (a) The ratio of the number of health workers to the number of residents, (b) The ratio of the number of households without access to clean water to the number of village households, and (c) The ratio of the number of residents with the lowest level of welfare to the number of village households.

Based on the information provided by the food vulnerability atlas, various programs have been taken to reduce the level of food vulnerability in TTS regency, including; (a) increasing food supply in non-production center areas by optimizing local food resources; (b) opening new agricultural land; (c) poverty alleviation through the provision of employment, labor-intensive, land redistribution; development of basic infrastructure (roads, clean water), and provision of social assistance; and development of productive businesses/UMKM/labor-intensive to drive the regional economy; (d) increasing access to clean water through the provision of clean water facilities and services; socialization and counseling and; (e) provision of health workers.

Discussion

The Food Security and Vulnerability Atlas (FSVA) is a thematic atlas that depicts geographic visualization based on 6 classes of food security status, namely: Priority 1 is a very vulnerable area, Priority 2 is a vulnerable area, Priority 3 is a somewhat vulnerable area, Priority 4 is a somewhat resistant area, Priority 5 is a resistant area, and Priority 6 is a very resistant area.'

Based on analysis and calculations with the established formula, food insecurity vulnerability for a particular region is characterized by a high ratio of per capita consumption to net production per capita, a high number of poor people, a high ratio of population per health worker to population density; high prevalence of stunted toddlers, and high number of households without access to clean water. Food vulnerability atlas are very useful as a tool used to reduce the risk of food insecurity, allowing policy makers to make decisions that are appropriate to regional conditions.

Vulnerability is a core concept in understanding health, risk, and hazards. Traditionally, vulnerability has been applied at the population level, in epidemiology and public health, to identify groups and communities at high risk of a health threat or disease. However, work by nursing theorist, Speirs (in Thomson et al 2017), revisits the concept. Speirs considered vulnerability from an emic perspective, exploring individuals' experiences of health in their everyday lives. Four key attributes of emic vulnerability were proposed: integrity, challenge, capacity to act, and multidimensionality. These attributes provide a framework for applying and understanding vulnerability to particular risks. The framework has been successfully applied to other health-related areas, including "energy vulnerability." The framework has helped to

understand who is vulnerable, why they are vulnerable, and what can be done to reduce vulnerability (Thomson et al, 2017).

Referring to the view of speirs (2000) on the attributes of emic vulnerability, risk reduction can be done systematically because of the aspects of integrity, challenge, capacity, and multidimensionality. The attribute of integrity makes someone feel healthy in all aspects of their life. Capacity becomes a motivation to try to get out of a difficult situation, they try to find a solution to the food problem. The behaviors demonstrated are making decisions about healthy food (e.g., purchasing, preparing and cooking) and maintaining a healthy diet. While multidimensionality assumes that susceptibility varies from person to person and from experience to experience.

Vulnerability to chronic food insecurity is the long-term inability to meet minimum food needs and is related to local ecosystem conditions and physical, social and environmental factors that do not change rapidly. Food insecurity can be a chronic or transient condition. Chronic food insecurity is a long-term inability to meet minimum food needs and is usually related to structural and non-changing factors, such as local climate, soil type, local governance system, public infrastructure, land tenure system, income and livelihood distribution, inter-ethnic relations, education level, socio-cultural/customs etc. Transient food insecurity is a short-term, temporary inability to meet minimum food needs that is mostly related to dynamic factors that can change quickly/suddenly such as infectious diseases, natural disasters, displacement, changes in market functions, debt levels and migration. Changes in these dynamic factors generally cause food price increases that affect the poor more than the rich, considering that most of the poor's income is used to buy food. Recurrent transient food insecurity can lead to household asset insecurity, decreased food security and ultimately can lead to chronic food insecurity.

Several stages that must be taken so that risk reduction towards food insecurity can be achieved (Bosher, 2008), among others; (a) identifying, characterizing, and assessing hazards/threats towards food insecurity. This stage is the process of finding, recognizing and describing the hazards/threats faced by a food insecure location; (b) assessing vulnerability to certain hazards/threats. At this stage is the process of assessing the vulnerability of intrinsic properties (structures, materials, construction and planning) to hazards/threats that can cause an event with consequences; (c) determining risk (i.e. the expected consequences of a particular hazard/threat on a particular asset). This stage is an act of identifying the level of risk - the magnitude of the risk or combination of risks, expressed in the form of a combination of the likelihood (chance of something happening) and the impact (result) of an incident caused by the hazard/threat; (d) identifying ways to reduce risk. This stage is carried out by identifying (and

prioritizing) actions to address and handle hazards/threats and risks related to food insecurity; (e) the last stage is taking priority steps in reducing the risk of food insecurity.

Based on the stages stated above, there are questions that must be answered by policy makers, namely; (a) questions related to the dangers and threats that may arise if food insecurity occurs; (b) questions related to the implications that may arise from the dangers of food insecurity; (c) questions related to the actions required from the identified possible dangers and (d) questions related to the possibility of risk reduction integrated with the design and construction of the policies to be taken (Bosher and Chmutina, 2017).

Conclusion

Drought is one type of disaster that often hits the TTS district. Drought is a state of water shortage in an area for a prolonged period, several months to years. Usually this incident occurs when an area continuously experiences below average rainfall. A long dry season will cause drought because groundwater reserves will run out due to evaporation, transpiration, or other uses by humans (Yuantari and Hartini, 2005).

The dangers caused by drought are crop failure and harvest failure, which can disrupt community food security. The risks that can arise from food insecurity can be reduced by utilizing the food vulnerability atlas that has been created and paying attention to various situations related to food security. Based on the atlas that has been created, various steps and policies can be made as actions to reduce the risk of drought disasters. Disaster risk reduction is the concept and practice of reducing disaster risks through systematic efforts to analyze and reduce the impacts of disasters.

The United Nations Hyogo Framework for Action 2005–2015 (UNISDR, 2005) and the Sendai Framework for Action 2015–2030 (UNISDR, 2015b) have called on governments to incorporate disaster risk reduction considerations into their planning procedures for construction projects, and there is now widespread recognition that governments need to change the way they do development. UN Secretary-General Ban Ki-moon has argued that the more governments, UN agencies, organizations, businesses and civil society understand risks and vulnerabilities, the better prepared they will be to mitigate disasters when they occur and save more (Bosher and Chmutina, 2017).

The Food Vulnerability Atlas is a tool that can be used to reduce the risk of food insecurity, considering that the atlas contains indicators of food vulnerability, depicts geographic visualization, food security status, food security programs and food vulnerability alleviation. The characteristics of areas vulnerable to food insecurity are marked by a high ratio of per capita

consumption to net production per capita, a high number of poor people, a high ratio of population per health worker to population density; high prevalence of stunted toddlers, and high households without access to clean water (Food Security Agency, Ministry of Agriculture, 2020).

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