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An assessment of the performance of emergency management agency in the natural hazards management among farm households in the south-east zone, Nigeria

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An assessment of the performance of emergency management agency in the natural hazards management among farm households in the southeast zone, Nigeria

Abstract: An assessment of the performance of emergency management agency in mitigating natural hazards among farm households in Southeast Zone, Nigeria was studied. About 240 farm households who were administered questionnaire were chosen from the states' flood- and erosion-prone regions using multi-stage sampling technique. The results indicate that the EmergencyManagement Based-Performance Index's average level of national emergency management activities was 57.33. The total average ratings of the National Emergency Management Agency/State Emergency Management Agency performance indicators based on their usefulness as a measure of natural hazard were estimated as 47.8% which showed that the NEMA/SEMA key performance indicators' degree of effectiveness in hazard management is deemed to be below average of the index. These key performance indicators (KPI) include; distribution of food, provision of seedlings, provision of agrochemical, training of farmers on postharvest crop preservation, use of weather, rehabilitation of water resources, expansion of irrigation facilities, distribution of fingerlings, provision of household items. The highest weighted score assigned to the distribution of food was 2.89, indicating that it is 57.8% successin mitigating natural disasters, while the average weight score allocated to the distribution of seedlings was 2.62, indicating a 52.4% degree of efficacy. However, the study recommends that the funds allotted to NEMA/SEMA should be monitored to ensure it is utilized in achieving its stated aims and objectives.

Key words: KPI; emergency management; naturaldisasters; farm households; Nigeria

Ocena delovanja Agencije za krizno upravljanje v primerih naravnih nesreč med kmečkimi gospodinjstvi na jugovzhodnih območjih Nigerije

Izvleček: Ocenjeno je bilo delovanje agencije za krizno upravljanje za blaženje naravnih ujm med kmečkimi gospodinjstvi v jugovzhodni Nigeriji. Okoli 240 kmečkim gospodinjstvom iz območja držav, ki so podvržene poplavam in erozijam, je bil razdeljen vprašalnik, pripravljen na osnovi večstopenjske vzorčne tehnike. Rezultati so pokazali, da je bila poprečna velikost indeksa kriznega upravljanja, izračunananega na osnovi aktivnosti na nacionalni ravni 57,33. Celokupne poprečne vrednosti indikatorjev Nacionalne agencije za krizno upravljanje/ Državne agencije za krizno upravljanje, osnovane na njihovi uporabnosti pri blaženju naravnih nesreč, so bile ocenjene kot 47,8 %, kar je pokazalo, de je učinkovitost NEMA/SEMA ključnih indikatorjev delovanja kriznega upravljanja pod poprečjem indeksa. Ti ključni indikatorji (KPI) so vsebovali: razdelitev hrane, dobavo sadik, dobavo agro-kemikalij, usposabljanje kmetov o ohranjanju pridelkov po spravilu, uporabi vremenske napovedi, obnavljanju vodnih virov, razširitvi možnosti namakanja, razdelitvi mladic rib, dobavi gospodinskih pripomočkov. Največja vrednost uteži, 2,89, je bila ugotovljena pri razdelitvi hrane, kar kaže na 57,8 % uspeh pri spopadanju z naravnimi katastrofami, med tem, ko je bila poprečna vrednost uteži, 2,62, pripisana razdelitvi sadik, kar nakazuje 52,4 % uspešnost. Rezultati raziskave priporočajo, da bi bilo potrebno sredstva namenjena NEMA/SEMA aktivnostim spremljati, da bi zagotovili doseganje zastavljenih ciljev in izzivov.

Ključne besede: KPI; krizno upravljanje; naravne katastrofe; kmečka gospodinjstva; Nigerija

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1 INTRODUCTION

Natural risks are frequently unavoidable environmental physical harms. Drought, erosion, flood, earthquakes, wildfires, and other environmental risks have continued to prevail (FAO, 2021). In Nigeria, erosions, floods, and drought are the most often experienced environmental examples of threats. Floods can be brought on by a variety of things, such as excessive rainfall, quickly accelerated snowmelt, strong winds over water, unusually high tides, tsunamis, or the breakdown of dams, levees, retention ponds, or other water-retention infrastructure. Flooding could be made worse by an increase in impermeable surfaces or by other natural disasters like wildfires, which deplete the quantity of plants that can soak up rain. Floods, soil erosion, gully erosion, coastline erosion, insect invasion, disease outbreaks, and related activities are only a few of the numerous natural and man-made risks that Nigeria's southeast states occasionally encounter (National Disaster Management Framework, 2018). Risks typically affect individuals, their health, and agricultural areas in an unexpected, negative, and immediate way. A hazard response team must be well-organized and prepare well when there are several victims and a need for urgent aid. According to the National Emergency Management Agency (NEMA) Act of 1999, natural or man-made hazards include any conditions brought on by a crisis, epidemic, drought, flood, erosion, earthquake, storm, train, aircraft, oil spill, or other accident, as well as the mass deportation or repatriation of Nigerians from other countries. In 35 of the country's 36 states, Nigeria experienced significant floods in 2012, which affected portions of the nation along key river basins and water courses. The recent floods in Nigeria have been attributed to a combination of natural, environmental, and manmade reasons, including the torrential rains and water releases from the Lagdo dam in Cameroon, the Dand dam in Kowa, the Kiri dam in the River Gongola, among others (UNDP, 2012).

Agriculture, which is also the sector of the economy that is the most heavily impacted by erosion and floods, is a common form of livelihood in rural regions. This claim is consistent with the finding of the Inter-Governmental Panel on Climate Change (IPCC) (2018) that agriculture is extremely vulnerable to the increased frequency, intensity, and unpredictability of extreme weather-related events. Nigeria, like many other nations in Sub-Saharan Africa, has been highly vulnerable to the damaging effects of risks brought on by climate change, according to a 2018 assessment from the IPCC. This is because Nigeria is located in tropical latitude. Despite the growing threat of catastrophes and the potential for catastrophic disasters like drought, flooding, and erosion in the future due to climatic and other environmental causes, the research concluded that these nations have not yet demonstrated complete capability to cope with the issues. As a result of ocean expansion brought on by increasing temperatures, one effect is an increase in mean sea levels, which by 2070 will be around 50 centimeters (IPCC, 2018). A compelling reason to review the methods governments in the region have used to address the crisis, such as the governance structure for risk management practice, is the enormity of the challenges that drought, erosion, and flood risk pose in Sub-Saharan Africa, where most people live on less than USD 1.25 per day (World Bank, 2021). To put it another way, dealing with natural disaster situations is still exceedingly difficult, especially in low-income African nations (UNCTAD, 2018). Thus, hazard's negative effects are more severe in developing countries than in low-income ones. In order to regulate and manage natural hazards, particularly erosions, droughts, and flooding, developing nations frequently struggle with a lack of resources, logistics, and infrastructure. Socio-economic, political, and environmental issues, according to United Nations, Department of Economics and Social Affairs (2020), are to blame for the shortcomings and failures of disaster management in developing nations. He emphasized that there is still a significant degree of poverty and a lack of knowledge about managing the external environment among the socio-economic issues. On the other hand, government authorities still lack the political will and commitment to implement pro-active environmental management policies and programs, particularly in the areas designated as hazard zones (Ovosi, 2010). In response to historical development in hazard management in Nigeria, the National Emergency Management Agency (NEMA) was established under Act No. 12 of the 1999 Constitution, as modified by Act No. 50, to manage disasters in Nigeria. NEMA has therefore been addressing disaster-related concerns by erecting concrete structures in Nigeria since its start. Risk management indicators, such as hazard monitoring and forecasting, early warning systems, community involvement, public education, land-use planning, updating and enforcing safety standards, rescue operations, humanitarian help, and financial assistance are used by NEMA to control these hazards. In order to address this issue, the nation (Nigeria) established the National Emergency Management Agency (NEMA). Act No. 50 of 1999 established NEMA to address concerns relating to disasters in Nigeria. Its goal is to manage situations in Nigeria caused by disasters. Moreover, it oversees initiatives and strategies for successful disaster relief at the municipal, state, and federal levels. According to the literature that is currently accessible, there have not been many studies since NEMA's founding that evaluate the agency's perfor-

mance, particularly in terms of how well it is accomplishing its goals.

According to many descriptions, the poorest and most vulnerable groups in society are the farm households, which are the ones most severely impacted by climate change-related dangers. More than any other group in society, they are anticipated to benefit from NEMA efforts. So, this article evaluates how well NEMA manages threats brought on by the climate for farm households in Nigeria from the viewpoint of the farmer. While it impacts the most vulnerable populations in developing nations like Nigeria, managing the risks brought on by climate change is really a worldwide issue. This is particularly true for underdeveloped nations with a very limited capacity for adaptation, so that information from one may be applied in another, such as sub-Saharan Africa, whose socioeconomic aspects are quite comparable. NEMA manages these hazards by using performance management indicators, such as crop/livestock management practices, which include distributing food, providing seedlings, providing agro-chemicals, training farmers on postharvest crop preservation, using weather forecasts, and using early warning signals. Meanwhile, under water and irrigation and infrastructure management, the performance indicators include rehabilitation of water sources, irrigation infrastructure renovation, and training farmers on postharvest crop preservation. Fishing net distribution, the provision of fish feed, the distribution of boats to fishermen, the provision of shelters, medical treatment, and financial assistance all fall under the category of procedures for managing fisheries. The provision of clothing and the supply of domestic goods like stoves and cooking utensils are examples of the relevant sector. The management of natural hazards in Southeast States, Nigeria, is discussed in this paper. Natural hazard management refers to the methodical process of using administrative decisions, organizations, operational skills, and capacities to implement policies, strategies, and coping mechanisms of the societies and communities to lessen the impacts of natural hazards and related environmental and technological disasters. This includes all kinds of operations, including as structural and non-structural safeguards against or limiting the negative consequences of risks (via mitigation and readiness). In Nigeria, two emergency management traditions or patterns have developed throughout the years. The "vulture notion" and the "eagle concept" are how these have been described. When compared to the eagle notion, the vulture concept is essentially reactive. The first is comparable to what is sometimes referred to as a "command and control" strategy, but the second is more appropriately described as a "fire-brigade" approach. The NEMA has begun a paradigm transition away from the enduring reactive heritage of hazard management and toward a proactive approach, in keeping with the dominant worldwide mindset. The tradition of hazard is changing from the passive "vulture idea," in which the agency waits for hazards to occur, to the proactive "eagle concept," which uses forecasting and early warning to avoid and mitigate massive displacements of people and disasters.

1.1 LITERATURE REVIEW/THEORETICAL FRAMEWORK

The theoretical basis for this essay is comprised of risk and social management theory, and contingency theory. The requirement for a theoretical framework in this endeavor stems from the fact that it would provide the debate the much-needed analytical grounding. Moreover, analytical systematization would be utilized in a way that would improve patterned explanation of the subject.

1.2 CONTINGENCY THEORY

In an effort to provide a practical paradigm for strategic management, contingency theory of management was developed. This school of thought holds that the use of management principles and practices should depend on the circumstances at hand and that the functional, behavioural, qualitative, and systems tools of management should be used accordingly. The preceding quotation implies that the manager should be able to understand the distinctive relationships between the sub-systems of different companies inside a particular environment and how to approach a specific issue imaginatively. Contingency theory acknowledged that each individual organizational system results from the dynamic and frequently complicated interplay of the subsystems and their biological environment. Thus, the theory asserts that what qualifies as effective management changes depending on the particulars and idiosyncrasies of the organization's overall environment as well as the structure of the organizational sub-systems (Okenwa & Ugbo, 2003).

1.3 RISK AND SOCIAL MANAGEMENT THEORY

As the research issue in this study is the effectiveness of the state emergency management agency in Nigeria, we will use the risk and social management theory. Goldstein (1988) is credited with creating the risk and social management theory, which has since gained backing from a number of other scholars, including Douglas

(1978) and Dynes (1994). Man's transgression of nature and harm done to the environment by man's actions were factors in the birth and development of the risk and social management theory. For instance, Kielland (2012) noted that the risk and social theory in environmental management marks a timely contribution, given that environmental management is now more about calculating and managing the risk to human communities from rapid environmental and technological changes rather than just protecting pristine ecosystems and endangered species from anthropogenic harm. The idea also holds that effective management of mitigation techniques, which try to lessen the adverse effects of a risk or catastrophe occurring, is necessary to assist society's disaster victims (Enwemeka, 2012).

2 MATERIALS AND METHODS

The survey design was adopted for the study. In the first phase, three out of the five states in southeast zone were purposively selected. This was based upon the predominance of erosion and flood occurrences in the states. The contact farmers, 675 who made up the population of the Agricultural Development Programme (ADP), were used as the sample frame. A multiple-stage random sampling procedures were used in picking only 240 households who gave valid information based on the questionnaire administered to them. The information gathered were on the farm household socio economic characteristics, types of natural disasters experienced, farm households' grassroots management practices and NEMA/SEMA activities in the area. To guarantee that the effectiveness of the data instrument; face and content validation were used. Also the consistency and dependability of the questionnaire was carried out via a pilot research. Using the Cronbach Alpha reliability approach, 25 farmers from each state participated in a trial run of the questionnaire to determine its reliability. Data collected were analysed using descriptive statistics, likert scale and United Nation's Activity-Based Performance Index (API).

2.1 ACTIVITY-BASED PERFORMANCE INDEX (API) ESTIMATION PROCEDURES

To determine how well NEMA/SEMA is doing in terms of achieving its goals for hazard management among farm households in disaster zones, activity-based performance index (API) was utilized. As a set of indicating variables or key performance indicators (KPIs) for hazard management, the API entailed compiling hazard management techniques often utilized by the Emergency Management Agency. The variables that proved the success of the program(s), NEMA/SEMA,) served as the KPIs for gauging performance advancement. The success of NEMA and SEMA's actions will mostly be determined by their efficacy, according to KPI. These indicators are actions related to disaster management, and as such, the API gauges how well NEMA/SEMA employs these techniques for hazard management (Below et al., 2012). Experts and stakeholders in risk management and climate change research gave the indicative factors weights on a 5-point scale. According to how successful they were deemed to be as NEMA/SEMA hazard management operations, the weights were given to the indicative factors in ascending order. A free evaluation of each indicator variable's efficacy as a performance indicator was also given by farmers. The household's activity-based performance index has a direct bearing on how well NEMA/ activities SEMA's are used more frequently as a gauge of natural hazard management (Below et al., 2012). As such, the higher the API of the household, the more effective the increased use of these natural management practices is in the management of disaster. Following Below et al., (2012), the approach is specified as:

$$API_j = W_1P_1 + W_2P_2 + W_3P_3 + \ldots + W_nP_{nj} \quad \text{Eq.1}$$

Where are:

API_j = Activity-based performance index of i_j^{th} household

W_{1n} = Weight of indicating variables;

5- Very effective;

4- Effective;

3- Moderately effective;

2- Poorly effective;

1- Not effective.

$Pn_{1j} = i_j^{th}$ household's assessment of the effectiveness of indicating variable for disaster management (1, if effective, 0 if otherwise).

2.2 LIKERT SCALE RATING

The mean score of respondents in a 4-point scale of 'high incidence = 4, moderate incidence = 3, low incidence = 2, and zero incidence = 1" was used. The mean is 4 + 3 + 2 + 1 = 10/4 = 2.5, using the interval scale of 0.05, the upper limit cut-off is 2.5+0.05 = 2.55, while the lower limit is 2.5-0.05 = 2.45. Based on these limit any mean score above 2.55 was considered high incidence level and any score below 2.45 will be considered low incidence while those between 2.45 and 2.55 were equally

considered moderate incidence level. It was also applied in level of intensity.

3 RESULTS AND DISCUSSION

3.1 SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS

The mean age of the farmers was about 52 years, with majority of them (45.0 %) within the age range of 41 to 55 years old. These findings agree with the study of Nwaru (2010) that the respondents were a bit old with average age of about 52 years for smallholder food farmers in Imo State.

The result showed that 29 % of the respondents had no formal education, while about 71.0 % of them had formal education. Out of the 71 % with formal education, about 22.1 % only attended primary schools, 33.0 % attended secondary school while 15.8 % attended tertiary institutions at various levels. The average years of schooling of the respondents were 8 years (Table 1). This shows that the farmers had a very low level of formal education as majority of them barely completed primary education, with a handful of others attempting secondary education. This has severe implications for their ability to access and utilize new and improved techniques and innovations in agriculture. This is consistent with the results of Otitoju (2013) and Nwaru (2010).

Table 1: Frequency distribution of the respondents by their socio-economic characteristics

Variable	Frequency	Percentages (%)
Age		
25-40	22	9.17
41-55	108	45.0
56-65	94	39.17
66-80	16	6.67
Total	240	100
Sex		
Male	120	50
Female	120	50
Total	240	100
Level of Education Mean = 7.83		
Never Attended	70	29.17
1-6 years	53	22.08
6-12 years	79	32.92
12-16 years	38	15.83
Total	240	100
Household Size Mean = 7.5		
1-5	25	10.42
6-10	211	87.92
>10	4	1.67
Total	240	100

Family labour is recognized as major source of labour supply in smallholder food crop production in Africa. This comprises the labour of all males, females and children in a household, who contribute their labour to the household holdings. Majority of the respondents (88 %) fell within the household size of 6-10, followed by 10.42 % of them, which fell within the range of 1-5 persons per households. This is consistent with the results of Abdulai & Huffman (2000); Otitoju (2013); Ozor et al., (2015); Obi et al., (2021). The result shows that the average household size was 7 to 8 persons. The result equally agrees with the findings of Otitoju & Arene (2010) that majority of the respondents (medium scale soya beans farmers in Benue State Nigeria) had an average household size of about 7 people.

3.2 TYPES OF NATURAL DISASTERS EXPERIENCED BY FARM HOUSEHOLDS'

The type of natural disasters experienced by farm households' is shown in Table 2. A number of natural disasters types with different magnitude were identified by the respondents in the areas. These were flood, erosion, water logging, crop failure, pest attacks and disease outbreak. In Anambra State, about 93.8 % and 87.5 % of the farmers identified flood and erosion as major natural disasters they have faced while 75 % and 68.8 % of the respondents indicated disease outbreak and pest attacks. Crop failure and water logging were shown to be the least natural disasters with 62.5 % and 58.8 % of the respondents indicated them as the natural disasters they have experienced so far. In Enugu State, about 86.3 % and 80 % of the farmers identified flood and erosion as major natural disasters they have faced while 63.8 % and 62.5 % of the respondents indicated disease outbreak and pest attacks. Crop failure and water logging were shown to be the least occurring natural disasters with 61.3 % and 58.8 % of the respondents indicating them as the natural disasters they have experienced. In Ebonyi State, about 85 % and 75 % of the farmers identified flood and erosion as major natural disasters they have faced while 65 % and 58.8 % of the respondents indicated disease outbreak and pest attacks. Crop failure and water logging were shown to be the least natural disasters with 43.8 % and 42.5 % of the respondents indicating them as the natural disasters they have experienced. The Federal Government of Nige-

Table 2: Types of natural disasters experienced by farm households'

	Anambra State		Enugu State		Ebonyi State	
Natural disasters	Frequency	%	Frequency	%	Frequency	%
Flood	72	93.75	69	86.25	68	85
Erosion	70	87.5	64	80	60	75
Water logging	47	58.75	49	61.25	34	42.5
Crop failure	50	62.5	47	58.75	35	43.75
Pest attacks	55	68.75	50	62.5	47	58.75
Disease outbreak	60	75	51	63.75	52	65

ria, FGN (2013) reported that floods are the most common and recurring natural disaster in Nigeria. According to Enete et al. (2016), the Nigeria great flood of 2012 is presumably the worst flooding incidence in the country in 50 years, in which large farmlands under cultivation were submerged. Also Obi et al. (2021) reported that gully erosion was one of the greatest environmental disasters in south-eastern Nigeria, where large areas of agricultural lands have been lost completely. This has been corroborated by several other studies (Akinboade, 2013; Ezeigwe, 2015; Ngwu, Mbagwu & Obi et al., 2005). Wei Zhang et al., (2018) reported that the incidence of pests and diseases was a major constraint to increased agricultural productivity of farmers in Nigeria. Most of the time, the farmers are not well equipped to tackle these menace, either due to ignorance or lack of access to appropriate pesticides or insecticides. This results in fluctuation of agricultural yield and productivity, thereby increasing the vulnerability of the farmers to natural disasters.

3.3 FARM HOUSEHOLDS LEVEL OF EXPOSURE TO NATURAL DISASTERS

The farm households' level of exposure to natural disasters is shown in Table 3. The level of exposure of farmers to these natural disasters was examined using level of incidence on a 4-piont likert scale as shown in Table 3.The mean score of "high incidence =4, Moderate incidence =3, low incidence =2 and zero incidence =1" was used to examine the incidence level.In Anambra State, all the variables were on a high incidence level with their mean scores as follows: flood and erosion had mean scores of 3.3 and 3.25, while water logging, crop failure, pest attacks and disease outbreak had 2.68, 2.75, 2.88, and 3 respectively.

Variables observed in Enugu State were also on a high incidence level with their mean scores as follows: flood and erosion had mean scores of 3.24 and 3.1, while water logging, crop failure, pest attacks and disease outbreak have 2.73, 2.65, 2.75, and 2.79 respectively.

In Ebonyi State, variables were equally shown to be on a high incidence level with their mean scores as follows: flood and erosion had mean scores of 3.2 and 3, while water logging, crop failure, pest attacks and disease outbreak had 2.35, 2.39, 2.68, and 2.8 respectively. From the result, it is very clear that these farmers were highly exposed to the incidence of these natural disasters.

3.4 NATURAL DISASTER MANAGEMENT PRACTICES ENGAGED BY FARM HOUSEHOLDS

The natural disaster management practice engaged by farm households is shown in Table 4. At the grassroots level, farmers may not have relied only on Emergency Management Agencies' natural disasters management effort to cushion the effects of natural disasters on them. The frequency distribution of the female farm households according to their increased use of 25 traditional farm practices as measure(s) of natural disaster management is shown in Table 4 below. For purposes of this presentation, these practices were grouped into four broad categories: land and soil management practices, water management practices, crop and livestock practices and institutional measures.

3.4.1 Land/Soil Management Practices.

The results showed that increased land rotation (bush fallow), P1 (96 %) was the most frequently used natural disaster management practices under land and soil management category. This is because there is reduced frequent use of the same lands each year, which helps in climate change management practices. This was followed by avoiding bushfires P2 (88 %). Avoidance of bushfire is intended to achieve land management and traditional use objectives, by keeping the safeguarding

Table 3: Farm households' level of exposure to natural disasters in the three States

Natural Disasters	Mean	Std Dev	Remarks
Anambra State			
Flood	3.3	0.79	High incidence
Erosion	3.25	0.83	High incidence
Water logging	2.68	1.12	High incidence
Crop Failure	2.75	1.10	High incidence
Pest Attack	2.88	1.04	High incidence
Disease outbreak	3	1.01	High incidence
Enugu State			
Flood	3.24	0.85	High incidence
Erosion	3.1	0.95	High incidence
Water logging	2.73	1.10	High incidence
Crop Failure	2.65	1.11	High incidence
Pest Attack	2.75	1.10	High incidence
Disease outbreak	2.79	1.09	High incidence
Ebonyi State			
Flood	3.2	0.88	High incidence
Erosion	3	1.01	High incidence
Water logging	2.35	1.11	High incidence
Crop Failure	2.39	1.10	High incidence
Pest Attack	2.68	1.12	High incidence
Disease outbreak	2.8	1.08	High incidence

of life, property and resources through the prevention, detection, control, restriction and suppression of fire in forest and other vegetation in rural areas. The knowledge of the impacts of bush fire by female farmers is because of the positive effect of fire management plans in the area. Prompt physical weeding and killing/ removal of insects P4 (88 %), and use of insecticides and herbicides P5 (86 %) were the most frequently used natural disaster management practices under land and soil management category. Increased use of these practices helps to check the devastating effect of erosion and flooding. This is particularly important in southeast Nigeria, where large areas of agricultural lands have been lost completely, or have become unsuitable for cultivation or any other productive economic activity, as a result of erosion. (Akinboade, 2013; Ezeigwe, 2015; Ezezika & Adetona, 2011; Ngwuet al., 2005). Also, this measure helps to soften the soil for easy penetration of crops' roots, expose dangerous organisms that could harm the crops, and concentrate vital plant nutrients within the reach of their roots. These practices have relatively low technical skill requirements and cost implications, and as such, could have informed their widespread application by the farming households, also in the same light, raising of mounds P3 (80 %). Raised fields are constructed by excavating parallel canals and piling the earth between them to form long, low mounds with flat or convex surfaces. These raised platforms increase soil fertility, improve drainage in low-lying areas, and improve local micro-environments, primarily by decreasing frost risk.

3.4.2 Organic Manuring Application

Use of organic compost is a sustainable and climate-smart approach to increase soil fertility. The use of composted organic wastes to enhance soil fertility and productivity is gaining huge attention worldwide. Composting is a traditional practice that has been used for centuries. Composting refers to the natural process of rotting or decomposition of organic matter by microorganisms under controlled conditions. It is a biochemical process in which microbial degradation of organic waste results into a product known as organic manure or compost. Composting is a sustainable approach for organic waste management. It not only removes the waste but also transforms waste into nutrient-rich organic product that can be used to enhance soil fertility. Agro forestry practices P8 (75 %) and fertilizer application P7 (74 %) were equally used by the farm households in land/soil management practices. The result agreed with the study from CGIAR research programme on climate change, Agriculture and food security (CCAFS) among over 700 households in East Africa, which found that agro–forestry, was one of the most widely adopted climate change adaptation strategy. It was revealed that 50 % of those households had begun planting of trees as part of their farm practices 10 years ago (Kristjansonet al., 2012). These trees ameliorate the effects of climate change by helping to stabilize erosion, improve water and soil quality, and provide yields of fruits in addition to their usual farm harvest.

3.4.3 Water Management Practices

The result showed mulching P9 (88 %), mulching is very important because it helps in the management of soil erosion, soil quality, soil water, and weeds, pests and diseases control (Lu et al., 2000). Mulching helps to conserve water in the soil, regulate soil temperature and suppress the growth of weeds through the placing of loose sheets, trees/ plants and grasses on the bare soil. This result is consistent with those of Owomboet al. (2014) in Ondo State, Nigeria which showed that farmers used

mulching as an adaptation strategy. Use of cover crops P12 (86 %) was used as the water management practices by the farmers.In the report of Bergtold et al. (2017), farmers will adapt and continue to utilize cover crops as management practices against hazard. Further, the cultivation of these cover crops does not entail any additional costs or responsibilities on the farmers, and this may have informed their wide use as a measure of climate change adaptation by the farmers. Similarly, a study conducted by Anyoda et al. (2013) revealed the wide application of cover cropping practices by majority of the farmers (90 %) as an adaptation strategy.

Use of manual/ physical irrigation P10 (85 %) was also a predominant water management practices of the farmers. Success of climate change adaptation depends on availability of fresh water in drought-prone areas. It should be emphasized that most adaptation methods provide benefits even with the lower end of climate change scenarios, such as improved irrigation efficiency. As water becomes a limiting factor, improved irrigation efficiency will become an important adaptation tool, especially in dry season, because irrigation practicesfor dry area are water intensive. Climate change is expected to result in decreased fresh water availability (surface and groundwater) and reduced soil moisture during the dry season, while the crop water demand is expected to increase because of increased evapo-transpiration caused by climate change and the continuous introduction of high-yielding varieties and intensive agriculture

The results further showed that about 21 % of the farmers were involved in water harvesting and storage (P13), about 7 % in the prevention of forest losses along water bodies (P14), and about 29 % in construction and maintenance of drainage channels. These practices are capital intensive, even though the benefits are not exclusive to the particular farmers undertaking them. Most of the time, they are carried out on communal basis in the form of community labour.

3.4.4 Crop/ Livestock Management Practices

Under crop/ livestock management practices, almost 80 % of the respondents used crop rotation (P16). Crop rotation refers to the practice of growing a sequence of plant species on the same land. It is an ancient practice that has been used for thousands of years. Crop rotation has been recaptured the global attention to solve the increasing agroecological problems such as declining soil quality and climate change resulting from short rotation and monocropping. Crop rotation is an effective approach for carbon sequestration as compared to growing same type of crop continuously. Crop rotation is a sustainable approach that increases yield and water use efficiency while reducing soil erosion.The result of multiple/ inter cropping (P17) showed that 87 % of the farmers use it as crop/livestock management practices. This finding agrees with the result of Enete et al. (2011) which showed that multiple/ intercropping was the adaptation practice with the highest profitability index among farmers in Imo States, Southeast Nigeria. According to the author, climate change has resulted in the intensification of multiple/intercropping, even though the practice has been identical with smallholder farming in Nigeria. The intent of this practice is to ensure and minimize the level of crop loss, which the farmers could suffer in the event of adverse weather conditions leading to crop failure. That is, multiple/intercropping provides some measure of security (confidence) to the farmers that at the end of the day, they will go home with some yields. It serves as an insurance against complete crop failure (Benhin, 2006). Enete et al. (2011) noted that different crops have varying degrees of resistance to climate volatility, and such, the cultivation of many crops at the same time could guarantee some harvest for the farmers even in the extreme weather conditions. Under changing planting dates (P19), farmers noted that the trend of uncertainties in extreme weather events had generally increased within the past five years in Southeast Nigeria, to avoid crop production risks due to rainfall variability and drought, staggered planting date is very common to most farmers whereby crops are planted before rain onset (dry land) on uncultivated land. Others were planted immediately after rain, while still other plots were planted a few days after the first rains. Tilling the land commences in fields which were planted prior to cultivation on the third week after the onset of rain which also destroys early geminating weeds and reduces weeding. These were done purposely to distribute risk by ensuring that any rain was utilized to the maximum by the crop planted in dry season.Under use of weather forecast (P20), 65.4 % of the farmers intensively used it as their crop management practices.This is because of the continuous update of weather changes to the farmers via their mobile phones and bill boards from Nigeria Meteorological Agency.Under cultivation of improved varieties (P18), cultivation of diseases resistance crops (P21) cultivation of early maturing crops (P22), the results revealed that 95.0 %, 87.9 % and 88.3 % of the farmers used them as their major crop management practices. These were intensified because of continuous research and government projects from research centres and universities on improved varieties, disease resistant crops like the adoption of bio-fortified cassava and high –yielding varieties of rice to help the farmers through community services. Furthermore, the result showed that only 3 % used cultivation of drought-resistance crop

varieties. The result is deduced from the fact that drought is not experienced in Southeast States.

3.4.5 Institutional Measures

Majority of the respondents, 40.2 % agreed that assistance from NEMA/SEMA is one of their natural disaster's management practises, while only 13 % had an on-going insurance cover. It could be a result of unwillingness of the farmers to insure their farm enterprise.

3.5 FARM HOUSEHOLDS USE-INTENSITY LEVEL OF NATURAL DISASTER MANAGEMENT PRACTICES

The level of intensity of use of the practices was examined as shown in Table 3. Under land/soil management practices, all the practices had a high intensity of use score with their mean scores not less than 2.05 (i.e.MS ≥ 2.05) namely; land rotation (bush fallow) (3.61), avoiding bushfire (3.39), raising mounds and ridging across slopes (3.13), prompt physical weeding and killing/removal of

Table 4: Natural disaster management practices engaged by farm households

Natural disaster Management practices	Frequency*	Percentage %
Land/Soil Management Practices		
P1 Land rotation (bush fallow)	230	95.8
P2 Avoiding bushfires	228	87.8
P3 Raising mounds and ridging across slopes	190	79.8
P4 Prompt physical weeding and killing/removal of insects	211	87.9
P5 Use of insecticides and herbicide	207	86.2
P6 Organic manure application	186	77.5
P7 Fertilizer application	178	74.1
P8 Agro-forestry practices	181	75.4
Water Management Practices		
P9 Mulching	211	87.9
P10 Use of manual/physical irrigation	203	84.5
P11 Tree planting	66	27.5
P12 Use of cover crops	206	85.8
P13 Efficient water harvesting and storage techniques	50	20.8
P14 Prevention of forest losses along water bodies	16	6.7
P15 Construction and maintenance of drainage channels	70	29.2
Crop/Livestock Management Practices		
P16 Crop rotation	214	89.1
P17 Multiple/intercropping	207	86.3
P18 Cultivation of improved crop varieties	228	95.0
P19 Changing of planting dates	221	91.2
P20 Use of weather forecast	157	65.4
P21 Cultivation of disease- resistant crops	211	87.9
P22 Cultivation of early maturing crops	212	88.3
P23 Cultivation of drought-resistant crop varieties	29	3.3
Institutional Measures		
P24 Assistance from SEMA	97	40.2
P25 Registration with NAIC (on-going insurance cover)	75	12.9

*Multiple responses

insects (3.32), use of insecticides and herbicides (3.17), organic manure application (3.15), fertilizer application (3.04) and agro-forestry practices (3.14). This is consistent with the study by Ozor et al. (2010) on the mitigation and adaptation to climate change impacts on agriculture in Southern Nigeria, which includes improved use of land management techniques, use of pest and disease resistant crops/species. It also agrees with the study of Mahouna & Barjolle (2018) on farmer's adaptation to climate change and their implications in Benin.

Under water management practices, the following practices were highly intensified mulching (3.34), use of manual/physical irrigation (3.23), tree planting (3.26), use of cover crops (3.2), while efficient water harvesting and storage techniques (1.46), prevention of forest losses along water bodies (1.23), construction and maintenance of drainage channels (1.46) had zero intensity. This agrees with the literature report of Onyeneke (2010) who identified intensified natural disaster management practices by farmers as application of irrigation facilities, ridging and planting of trees. Construction and maintenance of drainage channels, prevention of forest losses along water bodies and efficient water harvesting and storage facilities, which were not majorly used by farm households, could be as a result of being capital projects which they cannot afford. It is also supported by Temes-

Table 5: Farm households' use-intensity level of natural disaster management practices

Natural Disasters Management Practices	Mean	STD. Dev.	Remarks
Land/Soil Management Practices			
P1 Land rotation (bush fallow)	3.612	.65	Moderate intensity
P2 Avoiding bushfires	3.388	.61	Moderate intensity
P3 Raising mounds and ridging across slopes	3.133	.75	Moderate intensity
P4 Prompt physical weeding and killing/removal of insects	3.317	.77	Moderate intensity
P5 Use of insecticides and herbicide	3.167	.77	Moderate intensity
P6 Organic manure application	3.146	.87	Moderate intensity
P7 Fertilizer applicatio	3.042	.84	Moderate intensity
P8 Agro-forestry practices	3.138	.82	Moderate intensity
Water Management Practices	3.342	.79	
P9 Mulching	3.225	.80	Moderate intensity
P10 Use of manual/physical irrigation	3.258	.73	Moderate intensity
P11 Tree planting	3.254	.81	Moderate intensity
P12 se of cover crops	3.200	.60	Moderate intensity
P13 Efficient water harvesting and storage techniques	1.461	.59	Low intensity
P14 Prevention of forest losses along water bodies	1.234	.68	Low intensity
P15 Construction and maintenance of drainage channels	1.467	.74	Low intensity
Crop/Livestock Management Practices			
P16 Crop rotation	3.429	.71	Moderate intensity
P17 Multiple/intercropping	3.258	.61	Moderate intensity
P18 Cultivation of improvedcrop varieties	3.388	.69	Moderate intensity
P19 Changing of planting dates	3.342	.25	Moderate intensity
P20 Use of weather forecast	2.758	.70	Moderate intensity
P21 Cultivation of disease- resistant crops	3.263	.73	Moderate intensity
P22 Cultivation of early maturing crops	3.418	.57	Zero intensity
P23 Cultivation of drought-resistant crop varieties	1.146	.70	Moderate intensity
Institutional Measures			
P24 Assistance from SEMA	1.792	.70	Low intensity
P25 Registration with NAIC (on-going insurance cover)	1.467	.68	Low intensity

Note: MS = Means Score

gen et al. (2014) who identified increase use of irrigation facilities in South Eastern Ethiopia by farmers as one of the major management practices.

The following practices under crop/livestock management practices were highly intensified; crop rotation (3.43), multiple/intercropping (3.26), cultivation of improved crop varieties (3.39), changing of planting date (3.34), use of weather forecast (2.76), cultivation of disease-resistant crops (3.21), cultivation of early maturing crops (3.26) except for cultivation of drought-resistant crop varieties with a mean score of 1.15. It is supported by the study of Nzeh & Eboh (2011) in Enugu State that identified the key indigenous adaptations of farmers to climate change to include change in planting date, change in cropping patterns, change in harvesting date of plants, change in planting distance and introduction of new breeds of crops. In institutional measures, assistance from NEMA/SEMA had a mean score of 1.79 while ongoing insurance coverage from NAIC had zero intensity of 1.47.

3.6 NEMA/SEMA'S ACTIVITY-BASED PERFORMANCE INDEX OF FARM HOUSEHOLDS

NEMA/SEMA's activity-based performance index of farm households is shown in Table 6.

The success of NEMA/natural SEMA's hazard management procedures as measured by its key performance index (KPI) reflects of the average evaluations given by agricultural professionals, farmers, and researchers. As a consequence, the activity-based performance indicator for NEMA/SEMA was on average of 57.33 %. This suggests that out of a possible index score of 120, NEMA/SEMA earned 47.78 %. In order to attain their rated natural hazard management indicators, they need an additional index score of 52.22 %. This is very significant for the efficiency of NEMA/SEMA efforts in the nation. This conclusion conflicts with that of Below et al. (2012), who calculated the efficiency of rural farmers' adaptation strategies to climate change in Tanzania's Morogoro area at 95.6 and 75.3 respectively. In order to support the findings in Table 6, the level of efficacy of each performance measure was also disclosed in accordance with farm families' perceptions. The average weight given to the distribution of food was 2.89, indicating that it is 57.8 % successful in mitigating natural disasters, while the average weight given to the distribution of seedlings is 2.62, indicating a 52.4 % degree of efficacy, and so on.

Table 6: NEMA/SEMA's activity-based performance index of farm households

API	Frequency	Percentage (%)
21 – 40	84	35
41 – 60	20	8.3
61 – 80	80	33.3
81 - 100	56	23.4
Minimum	24	
Maximum	98	
Average	57.33	
Potential score	120	
Total number of observations, N	240	

3.7 WEIGHTED RATINGS OF THE EFFECTIVENESS OF NEMA/SEMA'S ACTIVITIES ON FARM HOUSEHOLDS AS MEASURES OF HAZARD MANAGEMENT.

The weighted ratings of the effectiveness of NEMA/SEMA's activities on farm households as measures of hazard management are shown in Table 7. According to this, an increase in the adoption of these techniques may boost the effectiveness of natural hazard management techniques by an average of 47.78 %. In other words, capacity building for both NEMA/SEMA officials and farmers may still increase the efficacy of these activities by roughly 52.22 %. As a result, there is potential for the creation and use of fresh and creative approaches to the implementation of natural hazard management strategies. The outcome also revealed some differences in the scores from one category of hazard management strategies to another, as well as from one indication to another. Their scores ranged from 50.16 % for crops and animals, through 50.09 % for water/irrigation and infrastructure, to 42.68 % for fisheries and management methods. The management of water resources, crops, and animals was evaluated as having the highest effectiveness in managing natural hazards. This emphasizes the significance of the two as useful indicators for natural hazard management, especially in Southeast Nigeria where agricultural production is heavily dependent on rainfed farming with very few instances of irrigated farming. As a result, measures that will ensure sustainable and timely provision of moisture and water for agricultural production could be useful in managing natural hazards, particularly those associated with climate change issues. The results of the NEMA/SEMA management practice categories revealed that food distribution was the category with the highest level of efficacy in terms of managing crops and animals. The outcome is consistent with the conclusions reached

by FAO (2021) that hazard food assistance is a crucial intervention during flood effects. The results of Enete et al. (2016), who assessed the socioeconomic effectiveness of small-holder farmers' flood coping mechanisms, are likewise consistent with this. On the opinion of farm households toward government food intervention programs, food aid received the highest rating. A higher degree of efficacy was also demonstrated by the use of weather forecasts scoring 54.6 %. This suggests that farmers and stakeholders concurred that personal observations of weather changes, friends, radio, television, and phones about weather forecasts, rainfall predictions or changes in rainfall patterns, wind movement, etc. is a very effective tool in natural hazard management by NEMA/SEMA. The results of this study are consistent with a report from the National Metrological Agency Services (NIMET) from 2012, which showed that farmers are aware of the rising trend in temperature and the declining trend in precipitation through personal observation, billboards on weather forecasts, radio, and updates of weather information sent to their phones. With regard to efficacy, seedling distribution scored 52.4 %. The free distribution of agricultural inputs is the intervention that Hemming et al. (2018) contend is the most successful. For instance, as part of a rehabilitation project following the 1992 Southern African Drought, free seeds and fertilizers have been sent to farmers in Malawi practically every year since 1992. Additionally, the effectiveness of providing agrochemicals (score = 48.6 %), training farmers in crop preservation techniques (score = 48.6 %), disease surveillance (score = 48.0 %), restocking small stock (sheep, cattle, and goats) (score = 47.8 %), vaccination and treatment (score = 47.0 %), and pasture preservation (score = 45.0 %) were nearly equal. Construction and upkeep of drainage channels had the greatest level of efficacy among techniques for managing water, irrigation, and infrastructure (score = 60.8 %). Rehabilitation of water resources, provision of irrigation pumps, and irrigation and infrastructural rehabilitation came next, with corresponding levels of efficacy of 58.2 %, 57.6 %, and 51.4 %. This suggests that water and irrigation as well as infrastructure management strategies are capital-intensive projects that were offered by the agencies, particularly amid the country's 2012 disaster. The supply of modest water treatment facilities, the development of capacity for water management, and the extension of current irrigation systems fall under this category. Their levels of efficacy are, respectively, 47.2 %, 47.0 %, and 45.4 %. Distribution of fingerlings, provision of shelters, provision of money and health care, and distribution of fishing nets had the highest levels of effectiveness under Fishery Management Practices, scoring 47.2 %, 44.6 %, and 43.4 % respectively. In contrast, distribution of boats to fishermen anddistribution of fish feeds had levels of effectiveness of 39.6 % and 38.6 % respectively. In the category "Other Relevant Sector," the provision of clothing scored at 41.8 %, while the provision of domestic goods including stoves and cooking utensils received a score of 39.4 %.

4 CONCLUSION AND RECOMMENDATION

Emergency management agencies have similarly utilized a mix of cataclysmic event key execution pointers to battle catastrophic events for farm households. These Key Performance Indicators rehearses incorporate likewise dissemination of nourishment, arrangement of seedlings and agro–synthetic concoctions, preparing of ranchers on postharvest crop safeguarding, field preservation, water system foundation limit expanding on water treatment, conveyance of fingerlings, arrangement of garments and family things like stove, cooking utensil and so forth. The financial qualities of the respondents, for example, age, gender, training, salary field understanding, nearness of cataclysmic event and potential advantages from NEMA/SEMA altogether affected the view of homestead family on NEMA/SEMA's exercises in their territories. Perceiving the significance of NEMA/SEMA's Activities in padding the impacts of catastrophic event, there is requirement for more exertion of the Agency to work together with these influenced homestead family units for important cataclysmic event the board mediations. Along these lines in perspective on the aftereffects of the examination, Southeast States apparently are generally inclined to debacles, while the board of such catastrophe has remained relatively poor. The different estimates embraced so far by NEMA/SEMA appeared not to have the ability to meet the degree of execution duty, which could be successful in overseeing calamity in the State. Hence, the administration of crisis in the States remains without a doubt unacceptable. To control natural hazards among farm households in South-East Nigeria, this study evaluated the effectiveness of emergency management organizations. The effectiveness of the agency is a function of a number of indices under four categories: crops/livestock management, water/irrigation infrastructure management practices, fishery and other relevant sectors. The outcome indicates that the NEMA Based-Performance Index's average level of national emergency management activities was 57.33. The total average ratings of the NEMA/SEMA performance indicators based on their usefulness as a gauge of natural hazard were at 47.78 %. Based on their average weighting of 47.78 %, the NEMA/SEMA key performance in-

Table 7: Weighted ratings of the effectiveness of NEMA/SEMA's activities on farm households as measures of hazard management

NEMA/SEMA Practice	Weight	Level of effectiveness %
Crop/Livestock management practices		
KP1 Distribution of food	2.89	57.8
KP2 Provision of seedlings	2.62	52.4
KP3 Provision of agro- chemicals	2.42	48.6
KP4 Training of farmers on postharvest crop preservation	2.43	48.6
KP5 Use of weather forecast	2.73	54.6
KP7 Disease surveillance	2.40	48.0
KP8 Restocking of small stock (Sheep, goat &cattle).	2.39	47.8
KP9 Vaccination & treatment	2.35	47.0
KP10 Pasture conservation	2.25	45.0
Subtotal	25.08	50.16
Sub average	25.08	50.16
Water &irrigation and infrastructural management practices		
KP11 Rehabilitation of water resources	2.91	58.2
KP12 Irrigation and infrastructural rehabilitation	2.57	51.4
KP13 Expansion of existing irrigation scheme	2.27	45.4
KP14 Capacity building for water management	2.35	47.0
KP15 Provision of small water treatment plants	2.36	47.2
KP16 Provision of Irrigation pump	2.47	57.6
KP17 Construction and maintenance of drainage channels	2.60	60.8
Sub total	17.50	50.09
Sub average	2.51	50.09
Fishery management practices		
KP18 Distribution of fingerlins	2.36	47.2
KP19 Distribution of fishing nets	2.17	43.4
KP20 Provision of fish feed	1.93	38.6
KP21 Distribution of boat to fishermen	1.98	39.6
KP22 Provision of shelters, healthcare & money	2.23	44.6
Sub Total	10.67	42.68
Sub Average	2.67	42.68
Other Relevant Sectors		
KP23 Provision of clothes	2.04	41.8.
KP24 Provision of household items like stoves and cooking utensils	2.02	39.4
Sub total	4.06	40.6
Sub average	2.03	40.6
Total weighting	57.34	-
Average weighting	2.39	47.78
Potential weight	120	
Total number of observation	-	240

Note: KPI; Key performance indicator

dicators' degree of effectiveness in hazard management is deemed to be below average. The average weight assigned to the distribution of food was 2.89, indicating that it is 57.8 % successful in mitigating natural disasters, while the average weight allocated to the distribution of seedlings was 2.62, indicating a 52.4 % degree of efficacy. The South-East States are therefore regarded to be more vulnerable to catastrophes considering the study's findings, while disaster management has remained comparably subpar. The different NEMA/SEMA mechanisms that have been put in place thus far did not appear to be able to handle the amount of performance responsibility necessary to manage hazards in the state. As a result, there is no question that risk management in the southeast states are inadequate. The research consequently advises the necessity for multi-agency trainings and exercises as well as more proactive performance indicators for the agency to improve the effectiveness of emergency management agencies in managing natural hazards (flood, erosion).

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