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A CRITICAL ANALYSIS OF FAO'S EFFECTIVENESS IN IMPLEMENTING STRATEGIES TO COMBAT DESERT LOCUST INFESTATIONS AND ALLEVIATE HUNGER

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ABSTRACT

The Food and Agricultural Organization (FAO), a specialized agency of the United Nations, is dedicated to combating hunger and improving nutrition worldwide. One of its key functions is addressing the issue of locust monitoring and control. Through various committees and teams focused on pest management, the FAO provides training and support to nations vulnerable to locust infestations. This paper examines the effectiveness of FAO's efforts in controlling locust pests, highlighting the need for increased national and international cooperation, technological advancements, and improved surveying methods. It also underscores the impact of climate change on locust outbreaks and proposes solutions to address these challenges.

Keywords: Food and Agricultural Organization, locust infestation, technological advancements, improved surveying methods, climate change.

INTRODUCTION

Hunger remains a significant global concern with multifaceted causes including poverty, unemployment, political instability, financial crises, conflicts, natural disasters, and environmental factors like climate change and pest attacks. Both governmental and non-governmental organizations worldwide work tirelessly to alleviate hunger through various means such as policy-making, strategic planning, cooperation agreements, and financial support. Notably, hunger affects both developed and developing nations, with developing countries bearing a heavier burden. This paper specifically examines hunger resulting from food insecurity caused by locust swarms, with a focus on the Food and Agricultural Organization (FAO) among the plethora of organizations addressing this issue. Locust infestations occur intermittently in specific regions, posing a threat to global food security as they migrate and consume crops and vegetation. Effective coordination among

countries is crucial to tackle this issue collectively.

STATEMENT OF THE PROBLEM

The phenomenon of locust plagues has been documented throughout history, dating back to the origins of locust populations. These swarms emerge suddenly, travel extensively, and devour entire crops and vegetation wherever they settle. While various monitoring and control techniques have been employed, they have not fully addressed the problem. Consequently, humans suffer from food shortages, farmers and herders experience financial losses, and national economies are negatively impacted. This research aims to evaluate the effectiveness of the Food and Agricultural Organization (FAO) in monitoring and controlling locust pests using both conventional and unconventional methods.

LITERATURE REVIEW

Juan Siliezar, East Africa facing massive swarms of locusts, The Harvard Gazette, <https://news.harvard.edu/gazette/story/2>

020/06/researchers-investigate-a-plague-of-locusts-in-east-africa/

The Harvard Gazette conducted an interview with a researcher, an entomologist, who serves as the executive director of the Mpala Research Centre in northern Kenya. In the interview, the researcher delves into various aspects of locust plagues, including their migration patterns, consumption rates, societal impacts, size, swarm quantities, reproduction rates, and rapid proliferation. Notably, the interview focuses on the critical discussion of control techniques that can be employed against locusts, as well as potential reasons behind their sudden surges in population.

Zoe Padelopoulos, 4 REASONS FOR HUNGER IN SOMALIA, Aug. 3, 2020, THE

BORGEN PROJECT,
<https://borgenproject.org/4-reasons-for-hunger-in-somalia/>

The author outlines four main reasons contributing to hunger in Somalia. Firstly, internal conflict and civil war result in the destabilization of government structures, leading to inadequate food distribution. Secondly, locust outbreaks, exacerbated by climate change and irregular rainfall patterns, pose a significant challenge. Efforts to control locust populations include the use of bio-pesticides. Thirdly, prolonged drought, compounded by government instability and insufficient response from donors, exacerbates food insecurity. Finally, seasonal flooding also contributes to the problem of hunger in the region.

Towards a More Effective Response to Desert Locusts and their Impacts on Food Security, Livelihoods and Poverty, Multilateral Evaluation of the 2003-05 Desert Locust Campaign, FAO

An evaluation was undertaken of the locust control campaign conducted from 2003 to 2005 in the western region of Africa. Led by L. Brader, the evaluation team, which included H. Djibo,

F.G. Faye, S. Ghaout, M. Lazar, P.N. Luzietoso, and M.A. Ould Babah, aimed to assess the effectiveness of the campaign and propose improvements for future locust plague control efforts. Questionnaires were developed separately for affected and donor countries, with responses from affected nations informing further monitoring and control operations

The evaluation team offered numerous suggestions to the Food and Agricultural Organization (FAO), emphasizing the need for improved coordination with regional locust control committees. Identified shortcomings included insufficient information provided to donor countries, inadequate consideration of the health impacts on humans, animals, and the environment, as well as economic ramifications in affected nations, and issues such as food insecurity. Discrepancies in control operation costs between countries, and challenges related to cooperation from beneficiary countries with technical staff, were also highlighted in the report.

Constitution Of FAO, Basic Texts Of The Food And Agricultural Organization Of The United Nations.

The FAO constitution, comprised of 22 articles, serves as the foundation for the establishment of the organization. It outlines the purposes and functions of the FAO, including the convening of a conference where representatives from member countries participate. Article IV delineates the specific functions of the organization. Additionally, Article V establishes a 49-member council to oversee FAO affairs. The constitution also addresses the appointment and duties of administrative officers and staff. Processes for the adoption of agreements related to food and agriculture are detailed. Lastly, Article XVI grants legal personality to the FAO.

OBJECTIVE OF THE STUDY

- Investigating the impact of locust plagues on food insecurity

- Examining the biological characteristics of locusts
- Assessing the effectiveness of FAO efforts in managing desert locust populations
- Analyzing current monitoring methodologies and technologies for locust surveillance
- Evaluating existing control methods and techniques for managing locust populations
- Proposing strategies for improved monitoring and control of desert locust outbreaks

METHODOLOGY

This research employs a blend of exploratory and explanatory methodologies. Data collection utilizes both doctrinal and non-doctrinal approaches, encompassing qualitative and quantitative data sources. Within the doctrinal method, primary data is drawn from conventions and agreements, while secondary data includes declarations, reports, research articles, and blogs. Non-doctrinal methods involve convenient sampling, a form of non-probability sampling, to gather responses from 26 participants through online questionnaires distributed via Google Forms.

SIGNIFICANCE OF THE STUDY

This study aims to illuminate the biological attributes of locusts to enhance their monitoring and control. Analysis of past campaigns and committee activities will inform strategies for addressing future challenges.

The effectiveness of FAO and areas requiring improvement are key focuses of this paper. Additionally, various factors contributing to the failure of locust swarm control are detailed to mitigate potential disasters comprehensively. Through suggesting appropriate measures, this research endeavors to alleviate the suffering caused by locust infestations. It evaluates pest control methods and proposes enhancements beneficial to the scientific community.

HYPOTHESES

- Enhanced attention from FAO towards climate change leads to a reduction in locust-related challenges.

- Augmented international funding for research enhances the effectiveness of locust monitoring and control methods.

LIMITATION OF THE STUDY

This research study has several limitations:

1. The short duration of the research period resulted in the collection of a limited amount of primary and secondary data, both doctrinal and non-doctrinal.
2. Financial constraints restricted access to a broader range of resources through various channels.
3. The doctrinal method relied on convenient sampling, leading to data collection from a small number of respondents. Using purposive sampling and increasing the number of respondents would have been preferable for a more comprehensive dataset

RESULTS AND DISCUSSIONS

Locust Swarm an Serious Issue

The desert locust originates from regions in northern Africa, the Arabian Peninsula, and certain areas of Asia characterized by arid or semi-arid conditions. Typically, they begin as solitary insects. However, unanticipated rainfall and flooding prompt locusts to aggregate, leading to swarming behavior as they migrate across various regions worldwide.

Food Insecurity

Locusts are voracious feeders, consuming both crops and non-crop vegetation such as leaves, fruits, flowers, and stems. A swarm covering one square kilometer can contain up to 80 million adult locusts, each capable of consuming its own body weight in food daily, equivalent to the sustenance needed for around 35,000 people. This poses dire consequences for farmers whose livelihoods depend solely on agriculture, exacerbating hunger among affected populations. Found on every continent except Antarctica, locusts have the capability to decimate entire hectares of crop fields in a short period. In Ethiopia, for instance, locusts devoured 167,700 tons of grains in 1958, enough to sustain millions of people annually. Swarming occurs when

locusts breed and mature, often triggered by heavy rainfall or other environmental factors.

The devastating locust plagues that ravaged 22 countries in West Africa from 2003 to 2005 resulted in an estimated 80% crop loss, according to FAO reports. These insects have a lifespan exceeding two years and their invasion in regions like Ethiopia and Kenya in 2019 led to a spike in food prices, pushing rural families to the brink of survival and exacerbating food insecurity crises.

Decline in nations economy

The gregarious behavior of locusts and their consumption of crops lead to significant food losses for communities, resulting in financial hardships for farmers and adverse effects on national economies. Loss of livelihood for farmers exacerbates economic strain both domestically and internationally, as nations are unable to export crops lost to locust swarms. Dino Martins, an entomologist and evolutionary biologist serving as the executive director of the Mpala Research Center in northern Kenya, provided insights on locust plagues in an interview with The Harvard Gazette.

Martins advocates for the use of biosensitive pesticides in controlling locust populations, which minimize adverse effects on other species. Additionally, he highlights the role of natural predators such as birds in mitigating locust populations. Collaborating with scientists from the US Department of Agriculture, Martins aims to unravel the locust genome, which promises valuable insights for pest control efforts. He attributes the proliferation of locusts to various factors including limited resources, governmental stress from the pandemic, political instability in African countries, and the expansion of arid regions.

Causes of Swarming of Locust

There are multiple factors contributing to locust swarming. One significant cause is the gregarious behavior triggered by the release of serotonin molecules when locusts come into contact with each other while foraging for food. Laboratory research has confirmed this phenomenon, with scientists experimenting with serotonin inhibitors to observe changes in locust behavior. Surprisingly, the

use of serotonin inhibitor molecules resulted in reduced locust grouping, suggesting their potential use to mitigate swarming. Another contributing factor is the presence of favorable atmospheric conditions for locust breeding, often exacerbated by climate change-induced phenomena such as unseasonal heavy rainfall, cyclones, and increased precipitation. Wanjira Mathai, the former Vice President and Regional Director of Africa at the World Resources Institute (WRI), highlighted this correlation.¹

Food and Agricultural Organization (FAO)

The Food and Agriculture Organization (FAO), a subsidiary organ of the United Nations, facilitates communication among its members to coordinate actions and monitor progress towards achieving the following objectives:

1. Promoting welfare among nations and eradicating hunger.
2. Conducting research (scientific, technological, social, economic) related to food, agricultural products, and nutrition.
3. Collecting, analyzing, interpreting, and disseminating information related to food, agriculture, and nutrition.
4. Improving education and administration in the field of food, agriculture, and nutrition.
5. Conserving natural resources.
6. Enhancing agricultural production.
7. Improving the processing, marketing, and distribution of food and agricultural products.
8. Providing assistance to governments.
9. Adopting policies related to agricultural aspects such as providing agricultural credits and agricultural commodity arrangements.

FAO & it's Responsibilities

- It serves as a platform for policy, plan, and strategy discussions.

¹ United Nations Conference on the Environment and Development, *Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of all Types of Forests*, A/CONF.151/26 (Vol. III) (14 August 1992), available from <https://web.archive.org/web/20170701164258/http://www.un.org/documents/ga/conf151/CONF15126-3annex3.htm>, (last visited, June 8, 2024).

- It facilitates coordination among various committees and organizations involved in locust monitoring and control.
- It effectively supervises regional committees.
- It coordinates national locust control units with regional committees.
- It offers technical guidance for control operations conducted by states and facilitates international cooperation.
- It conducts surveillance of locust outbreaks and declares emergencies when necessary.

In addition to the FAO, numerous other UN subsidiary organs, non-governmental institutions, and research institutes contribute to locust monitoring and control efforts. Cooperation and support from countries, FAO, and other research institutions are crucial in managing pest attacks effectively.²

Locust Mission

In response to the looming locust plague, Kenya, an African nation, anticipates a significant disaster. To address this challenge, the Kenyan government, in collaboration with the FAO, initiates control operations. The government trains a workforce comprising 696 community scouts, 140 county extension officers, 60 county agricultural officers, and 25 environment, health, and safety experts. Additionally, the National Youth Service (NYS) mobilizes 500 young citizens, with 20 NYS supervisors, for voluntary work and educational programs aimed at combating the locust threat. Following comprehensive training, a contingent of 200 trained individuals is deployed for control operations, under the supervision of Sergeant Brian Odhiambo.

The mission involves two teams, operating both on land and in the air. These trained personnel execute operations to locate locust coordinates and transmit live signals to the regional locust command center. Subsequently, the land and air teams target the identified locust coordinates.

Desert Locust Controlling Committee

The Technical Advisory Committee on Desert Locust Control (TACDLC), formerly known as such, was established in late 1951. Its inception followed an international conference convened by the FAO in early 1951, during which it was agreed that effective planning for locust control could be achieved through FAO oversight. Consequently, the TACDLC was formed. The committee conducted various sessions to deliberate on locust control strategies. Among the strategies discussed was the surveying of desert locust breeding areas and the application of non-persistent chemicals to kill locusts during the late stages of swarm upsurge. It was noted that locust swarms are more effectively controlled at the later, gregarious upsurge stage as compared to the initial upsurge stage.³

Commissions for Locust Control

To combat desert locusts, the FAO has established three commissions, each tasked with conducting research and control efforts in specific regions:

Commission For Controlling The Desert Locust In South-West Asia (SWAC):

Established on December 15, 1964, according to the Agreement for the establishment of a Commission for Controlling the Desert Locust in South-West Asia and Article XIV of the FAO Constitution, this commission comprises four member countries. It is the oldest among the three commissions established by FAO. Its primary objective is to provide early warnings for locust outbreaks and to implement preventive measures to protect crops from locust disasters. The commission is tasked with various responsibilities, including promoting research, providing training on the use of new technologies, conducting surveys, and maintaining stockpiles of pesticides for desert locust control. Additionally, it facilitates the transfer of control equipment among

² Allan T. Showler, *The Desert Locust in Africa and Western Asia: Complexities of War, Politics, Perilous Terrain, and Development*, <https://ijpmworld.umn.edu/showler-desert-locust>, (last visited July, 2024).

³ Desert Locust, Food and Agricultural Organization of the United Nations, <https://www.fao.org/locusts/faqs/en/>.

member countries.

Commission for Controlling the Desert Locust in the Central Region (CRC):

Established on February 21, 1967, with 16 member countries, the Commission for Controlling the Desert Locust in the Central Region (CRC) operates under Article XIV of the FAO Constitution to prevent and control locust plagues. Its primary goal is to ensure food security and eradicate hunger by managing locust swarms. Covering northeast Africa and the Near East, the CRC coordinates activities among member countries, including locust surveys and control efforts. It assists member countries in conducting missions to prevent and mitigate the effects of desert locust outbreaks.

Commission for Controlling the Desert Locust in the Western region (CLCPRO):

Before the establishment of the CLCPRO, the Commission for Controlling the Desert Locust in Northwest Africa was approved by the FAO in 1970 and formally established in August 1971 under Article XIX of the Agreement for the Establishment of a Commission for Controlling the Desert Locust in Northwest Africa. Its primary objective was to control ⁴desert locusts in Northwest Africa and to advance research at both national and international levels. ⁵

In 2002, it was succeeded by the Commission for Controlling the Desert Locust in the Western Region (CLCPRO), which consists of 10 member countries. The CLCPRO continues the mission of promoting research and training at national, regional, and international levels to prevent and control locust plagues in West and Northwest Africa.

Emergency Centre for Locust Operation

⁴ CALL FOR EXPRESSIONS OF INTEREST – Locust Management Specialists, INTERNATIONAL PLANT PROTECTION CONVENTION, <https://www.ippc.int/en/news/call-for-expressions-of-interest-locust-management-specialists/>.

⁵ Tina Huang, Which Countries Are Most Vulnerable to Locust Swarms, WORLD RESOURCES INSTITUTE, <https://wri.org/insights/which-countries-are-most-vulnerable-locust-swarms>, (last visited Mar. 7, 2023).

(ECLO)

In times of locust invasions, FAO collaborates with the Emergency Centre for Locust Operations (ECLO) to provide assistance to affected countries. ECLO coordinates with FAO's three commissions for controlling desert locusts (SWAC, CRC, CLCPRO) to address the situation. Additionally, ECLO engages with donors to support FAO and National Locust Control Units in affected regions, utilizing donor funds to develop and implement emergency projects for locust control. ECLO offers technical advice, equipment, and environmental monitoring support, as well as guidance on pesticide use. It also monitors bilateral assistance provided to affected countries.

The Locusts and Transboundary Plant Pests and Disease Team

This team or group operates within the FAO's Plant Production and Protection Division and is tasked with assisting member countries in managing migratory locusts. Their responsibilities include surveillance, forecasting, early detection, warning, planning, and implementing rapid response measures using eco-friendly control techniques.

Desert Locust information Service

The Desert Locust Information Service (DLIS), operated under the FAO, aimed to offer advice and information regarding locust swarms to countries vulnerable to desert locust outbreaks. DLIS collaborated with three sectors – academic, research, and private – to develop advanced technologies targeting locust breeding areas and swarms, aiming to prevent severe consequences.

Forecast methods:

Through coordinated efforts with various sectors, the Desert Locust Information Service (DLIS) and national programs have implemented innovative methods, including:

Climate Predictions. Forecasts predicting seasonal weather patterns, such as the onset of

rainfall and temperature projections six months in advance, are provided by the World Climate Service (WCS).

Digital Tools. The eLocust suite is utilized for locust forecast and control, enabling the transfer of locust location data via smartphones and GPS to national locust centers. This offline-enabled tool, initiated by FAO in 2020, requires the collaboration of numerous survey teams covering different areas. Data collected by eLocust3m and eLocust3g are inputted into the EarthRanger software, which then converts the data into a format compatible with RAMSES GIS, utilized by National Locust Authorities. Survey and control operation results are stored in the RAMSES application, and GIS displays this data on maps.⁶

Dlocust Drone. Developed by FAO, the dLocust drone is utilized by survey teams to identify locust presence by detecting green vegetation or areas with recent rainfall. However, challenges exist in defining control parameters and establishing standard operating procedures for this technology.

Earth Observation. Satellite imagery is employed for earth observation, with DLIS utilizing information from METOSAT's infrared and visible channels to identify locust breeding areas in the desert. SPOT-VGT imagery is used to assess ecological conditions favorable for locust breeding. DLIS collaborates with NASA and Lobelia to monitor soil moisture levels, crucial for locust egg laying and hatching. DLIS also partners with Columbia University's International Research Institute for Climate and Society (IRI), NASA's World Wind Project, the Italian Institute of Biometeorology, the European Commission Joint Research Centre, and the Catholic University of Louvain to enhance technology and remote sensing capabilities.

Desert Locust Campaign conducted from 2003 to 2005

⁶Juan Siliezar, EastAfrica facing massive swarms of locusts, The Harvard Gazette, <https://news.harvard.edu/gazette/story/2020/06/researchers-investigate-a-plague-of-locusts-in-east-africa/>

The campaign to control locust infestations was carried out by affected countries with funding from FAO and other donor countries. The focus of the campaign was primarily on areas with high crop potential, neglecting low-production areas, which subsequently faced several challenges:

- Food insecurity due to significant crop losses to locusts.
- Increased market prices for crops due to food shortages.
- Migration to urban areas by affected populations.
- Transhumance of livestock as pastures are targeted by locusts.
- Tensions among local farmers and pastoralists due to reduced pasture availability.
- Forced sale of livestock to meet basic needs.⁷

Approximately \$400 million was allocated for the control campaign, including training for staff participating in control efforts. Public awareness campaigns were conducted via radio and television to educate people about the consequences of using chemicals to control locust swarms. An evaluation of the campaign revealed several shortcomings, including the delayed response to the locust plague, lack of proper forecasting and planning, and a narrow focus on controlling the pest during the peak of the infestation. There was also insufficient consideration of the health impacts and food insecurity caused by the locust invasion.

The evaluation team recommended a more comprehensive approach to future locust invasions, including addressing the three phases of locust infestation (recession, pre-emergent, emergent), drawing on the experience of FAO and its members. Although the team's advice to FAO is not legally binding on countries, they suggest a list of environmentally friendly pesticides for

⁷ Emergency Operations Archive, Locust watch, FOOD AND AGRICULTURAL ORGANIZATION OF THE UNITED NATIONS, <https://www.fao.org/ag/locusts/en/archives/2096/index.html>

consideration. In response to the 2020 locust upsurge in Africa, FAO issued a tender for companies to provide aerial surveillance and control operations in Yemen using four rotary-wing and two fixed-wing aircraft.⁸

Funding for research

As the issue of locusts presents numerous questions regarding monitoring, control, and preventive strategies, research is needed to understand various aspects of their biological processes. This includes studying their gregarious behavior, the formation of nymphal bands, group formation, color changes in large numbers, and phase polyphenism. Sir Boris P. Uvarov, considered the father of modern acridology, discovered phase polyphenism in locusts in 1920, but further research is required in this area.

Eco-friendly pesticides, such as the biopesticide Metarhizium, have been developed by scientific groups, but they typically take one to two weeks to kill locusts and require comprehensive testing. Novel pesticide methods, including biological control agents and molecular pesticides that target locust molecular structures using techniques like RNA interference and CRISPR-based gene drives, need further testing to effectively manage this pest crisis.⁹

Locust in holy scripture

In religious texts such as the Holy Bible and the Holy Quran, the locust plague is described as a divine punishment for the arrogance and sinfulness of rulers. It is mentioned that if rulers exhibit such behavior, God may send an immense swarm of locusts to devour crops, leaving nothing behind and causing suffering to humans. However, interpretations of these passages vary and are subject to debate and discussion.

Conventions that may aid to control the locust swarm

The primary cause of locust swarms may stem from climate changes, including heavy and unprecedented rainfall, unseasonal rain, flooding, drought, desertification, and more. Addressing these underlying environmental issues could potentially mitigate locust crises. In 1992, from June 3 to June 14, the United Nations Conference on Environment and Development, also known as the Earth Summit, was held. During this event, several agreements were adopted, including the United Nations Framework Convention on Climate Change (UNFCCC) and the Forest Principles. The UNFCCC's main goal is to mitigate climate change by reducing human activities that contribute to it and ensuring food security. Article 4 of the Convention outlines commitments by nations to achieve these objectives.¹⁰

NON DOCTRINAL RESEARCH

The research aimed to suggest improvements to the efficacy of FAO in controlling locust swarms through empirical methods. Five questions were formulated to gather insights, and the views of 26 respondents from various backgrounds including students, research scholars, public and private employees, retired individuals, and housewives were collected. Each respondent's perspective was considered valuable, given their unique viewpoints. Questionnaire responses were collected online via Google Forms.

The discussion of respondents' views is presented, with tabular representations categorized by occupation for research questions 1, 3, 4, and 5. For question 2, respondents' views are categorized by age. Pie charts depict respondents' opinions for each research question, without categorization.

Based on the respondents' views, explanations are provided for each research question,

⁸ Brader L., Et AL, *Towards A More Effective Response To Desert Locusts And Their Impacts On Food Security, Livelihoods And Poverty, Multilateral Evaluation Of The 2003-05 Desert Locust Campaign 12* (Fao 2006).

⁹ CLCPRO - *Commission for Controlling the Desert Locust in the Western Region [of Africa], Food and Agricultural Organization of the United Nations*, <https://www.fao.org/policy-support/policy-support/mechanisms/mechanisms-details/ru/c/423141/>.

¹⁰ *Commission for Controlling the Desert Locust in South –West Asia*, ULA, <https://nia.org/s/or/en/1100006771>,

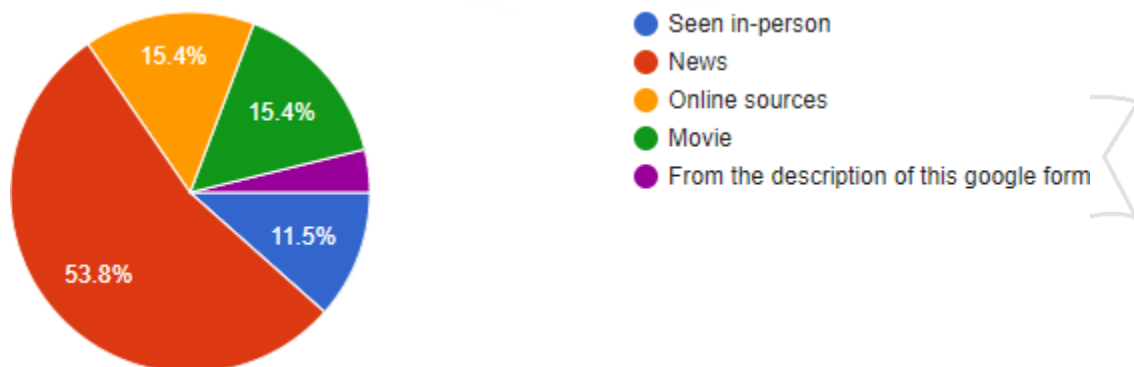
considering both the tabular form and pie chart insights.

Research Question 1: How do you know about locust swarm ? TABLE NO: 1 Occupation & Response of Respondents

Occupation	From the description of this google form	Movie	News	Online sources	Seen in person	Grand Total
House wife	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (3.84)	1 (3.84)
Private Employee	0 (0.00)	1 (3.84)	4 (15.38)	0 (0.00)	0 (0.00)	5 (19.23)
Public Employee	0 (0.00)	0 (0.00)	2 (7.69)	0 (0.00)	0 (0.00)	2 (7.69)
Research Scholar	0 (0.00)	0 (0.00)	1 (3.84)	0 (0.00)	0 (0.00)	1 (3.84)
Retired employee	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (3.84)	1 (3.84)
Student	1 (3.84)	3 (11.53)	7 (26.92)	4 (15.38)	1 (3.84)	16 (61.53)
Grand Total	1 (3.84)	4 (15.38)	14 (53.84)	4 (15.38)	3 (11.53)	26 (100.00)

Source: Computed

PIE CHART



EXPLANATION :

According to the pie chart reflecting respondents' expressions, the majority (53.8%) learned about locust swarms through news sources. The second most common source of information, cited by 15.4%

of respondents, was online platforms. Another 15.4% mentioned obtaining knowledge from movies, while 11.5% claimed to have witnessed locust swarms in person. Interestingly, one respondent indicated learning about locust swarms solely from the description provided in the Google Form. This suggests that media, including news and movies, plays a significant role in raising awareness about the issue of locust swarms.

Research Question 2: Locust is a creature. It's creation is the process of nature.

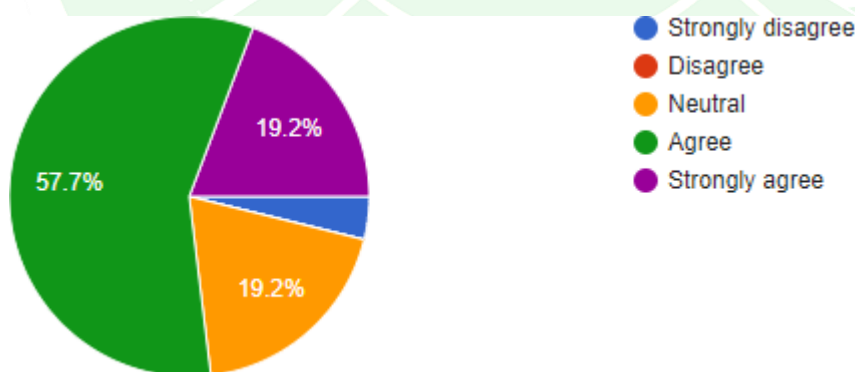
Do you agree or disagree with the above statement ?

TABLE NO: 2 Age & Response of Respondents

Age	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Grand Total
20-30	2 (7.69)	10 (38.46)	4 (15.38)	0 (0.00)	1 (3.84)	17 (65.38)
30-40	1 (3.84)	4 (15.38)	0 (0.00)	0 (0.00)	0 (0.00)	5 (19.23)
Above 50	2 (7.69)	1 (3.84)	1 (3.84)	0 (0.00)	0 (0.00)	4 (15.38)
Grand Total	5 (19.23)	15 (57.69)	5 (19.23)	0 (0.00)	1 (3.84)	26 (100.00)

Source: Computed

PIE CHART



EXPLANATION

According to the pie chart representing respondents' responses, the majority (57.7%) agree with the statement that locusts are created naturally. Additionally, 19.2% strongly agree with this statement, while another 19.2% remain neutral. Only 3.8% of respondents strongly disagree with the notion that locusts are not created in nature.

Therefore, based on the predominant views of respondents, it can be concluded that locusts are indeed created in nature.

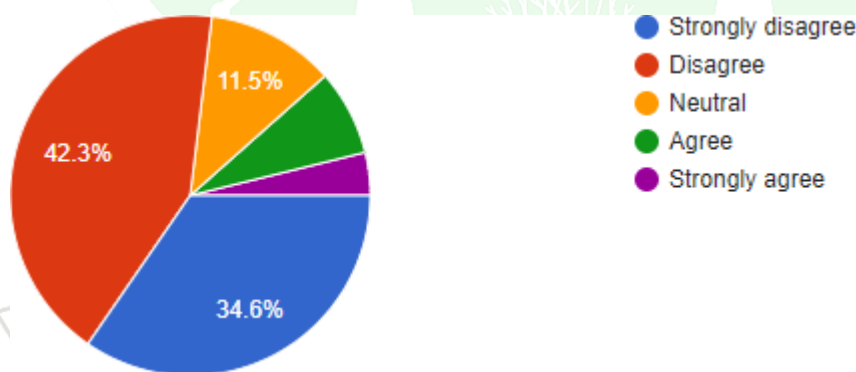
RESEARCH Question 3: As per the Holy Bible and Holy Quran, the locusts plagues are caused as an punishment to the people for their sins. What is your opinion on the above statement ?

TABLE NO: 3 Occupation and Response of Respondents

Occupation	Agree	Strongly agree	Neutral	Disagree	Strongly disagree	Grand Total
House wife	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (3.84)	1 (3.84)
Private Employee	0 (0.00)	0 (0.00)	0 (0.00)	4 (15.38)	1 (3.84)	5 (19.23)
Public Employee	1 (3.84)	1 (3.84)	0 (0.00)	0 (0.00)	0 (0.00)	2 (7.69)
Research Scholar	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (3.84)	1 (3.84)
Retired employee	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (3.84)	1 (3.84)
Student	1 (3.84)	0 (0.00)	3 (11.53)	7 (26.92)	5 (19.23)	16 (61.53)
Grand Total	2 (7.69)	1 (3.84)	3 (11.53)	11 (42.30)	9 (34.61)	26 (100.00)

Source: Computed

PIE CHART



EXPLANATION

The question pertains to the religious aspect as derived from religious scriptures.

According to the pie chart, 34.6% of respondents strongly disagree that locusts are created to punish people for their sins, while 42.3% simply disagree with this notion. Another 11.5% remain neutral on the subject. Only 7.6% of respondents agree that locusts were created for punitive purposes, with a further 3.8% strongly agreeing with this statement.

From these responses, it can be observed that the majority of respondents do not align with the interpretation of locusts as a punishment from a higher power as described in religious scriptures. However, it's important to note a potential bias in the results, as the population surveyed may be predominantly Hindu, whereas the religious scriptures referenced typically belong to Christianity and Islam.

Reaserach Question 4: Climate Change is one of the causes for the Locust swarm. Is it requires FAO to concern on the climate change ?

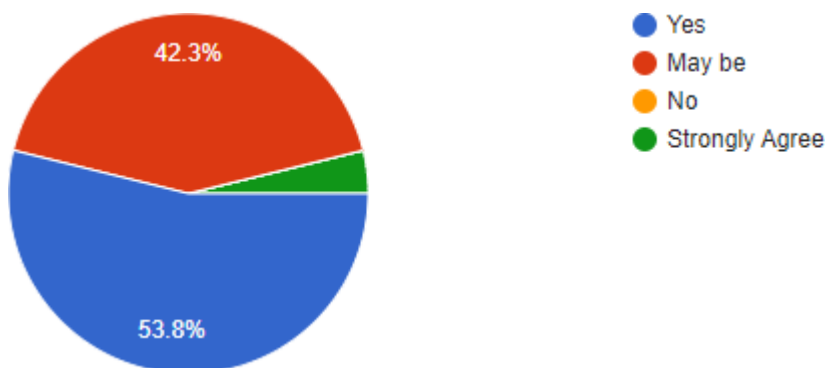
TABLE NO: 4 Occupation & Response of Respondents

Occupation	Strongly Agree	Yes	May be	No	Grand Total
House wife	0 (0.00)	0 (0.00)	1 (3.84)	0 (0.00)	1 (3.84)
Private Employee	0 (0.00)	3 (11.53)	2 (7.69)	0 (0.00)	5 (19.23)
Public Employee	1 (3.84)	1 (3.84)	0 (0.00)	0 (0.00)	2 (7.69)
Research Scholar	0 (0.00)	1 (3.84)	0 (0.00)	0 (0.00)	1 (3.84)
Retired employee	0 (0.00)	1 (3.84)	0 (0.00)	0 (0.00)	1 (3.84)
Student	0 (0.00)	8 (19.23)	8 (19.23)	0 (0.00)	16 (61.53)
Grand Total	1 (3.84)	14 (53.84)	11 (42.30)	0 (0.00)	26 (100.00)

Source: Computed



PIE CHART



EXPLANATION

In response to whether the FAO should prioritize its concern for climate change, 53.8% of respondents expressed agreement, while 3.8% responded positively. On the other hand, 42.3% of respondents remained neutral on the issue, with no objections recorded. Therefore, based on the majority view, it can be concluded that the FAO should indeed prioritize its concern for climate change.

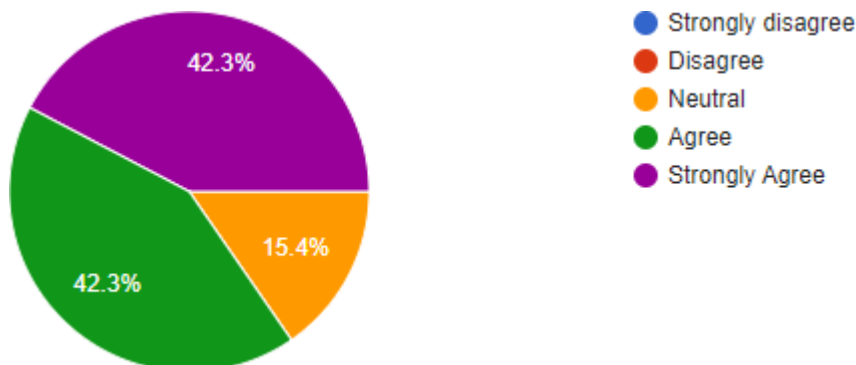
Reserach Question 5: International funding for research activities is required to monitor and control the locusts. Do you agree or disagree with the above statement ?

TABLE NO: 5 Occupation & Response of Respondents

Occupation	Agree	Strongly Agree	Neutral	Disagree	Strongly Disagree	Grand Total
House wife	1 (3.84)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (3.84)
Private Employee	3 (11.53)	2 (7.69)	0 (0.00)	0 (0.00)	0 (0.00)	5 (19.23)
Public Employee	0 (0.00)	2 (7.69)	0 (0.00)	0 (0.00)	0 (0.00)	2 (7.69)
Research Scholar	0 (0.00)	1 (3.84)	0 (0.00)	0 (0.00)	0 (0.00)	1 (3.84)
Retired employee	1 (3.84)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	1 (3.84)
Student	6 (23.07)	6 (23.07)	4 (15.38)	0 (0.00)	0 (0.00)	16 (61.53)
Grand Total	11 (42.30)	11 (42.30)	4 (15.38)	0 (0.00)	0 (0.00)	26 (100.00)

Source: Computed

PIE CHART



EXPLANATION

Based on the responses depicted in the pie chart, it is evident that 42.3% of respondents strongly agree and an additional 42.3% agree with the statement. Meanwhile, 15.4% of respondents remain neutral on the issue. Consequently, it can be concluded that the majority (84.6%) of respondents acknowledge the necessity for international funding for research activities aimed at monitoring and controlling desert locusts.

TESTING THE HYPOTHESIS

Hence, it is confirmed that heightened attention from the FAO towards climate change contributes to a reduction in locust-related issues. Additionally, the augmentation of international funding for research activities facilitates the development of advanced techniques for monitoring and controlling locust populations. As a result, both hypotheses are validated.

CONCLUSION

The primary cause behind the surge in locust populations is attributed to climate change. Although international regulations such as the United Nations Framework Convention on Climate Change (1992) and the United Nations Convention to Combat Desertification (1994) indirectly address issues related to locust swarms, there remains a need for a specialized agreement with detailed provisions specifically targeting locust plague control. While the actions and assistance provided by the FAO, along with support from other organizations, are commendable, they primarily address immediate concerns without effectively addressing the root cause of locust proliferation, namely climate change. It is imperative for countries worldwide, as well as individuals, to take proactive measures to address climate change in alignment

with international agreements and principles. Without addressing the underlying climate issues, control measures implemented by the FAO and other agencies may only offer temporary relief. Thus, there is a pressing need to align global efforts with the original framework of the Earth's natural balance.

The findings from the empirical research involving 26 participants underscore two key recommendations: Firstly, the FAO should prioritize addressing climate change concerns. Secondly, there is a critical need for international funding to support research activities aimed at monitoring and controlling desert locust populations. These recommendations are essential for effectively addressing the locust swarm crisis.

SUGGESTIONS

- Enhancing afforestation efforts is crucial to combat climate change, as deforestation contributes to its occurrence.
- Addressing the issue of heavy, unseasonal rainfall is imperative to mitigate locust swarm upsurges, highlighting the urgent need for climate change control measures.
- Funding should be allocated to support genome research aimed at better understanding locust behavior and genetics.

- International collaborative research efforts should be undertaken to develop improved locust monitoring and control techniques, involving affected and interested countries. http://desertlocustcrc.org/App_Data/App_Uploads/Bulletins/Files/23041905502242%20DLCC%20Report_Eng_final.pdf
- Adequate international funding should be provided to support research activities aimed at addressing locust swarms.
- Further research should be conducted to develop effective and eco-friendly biopesticides.
- Stable government structures are essential, particularly in developing countries, to effectively address locust swarm crises.
- Cooperation and coordinated action between countries are essential, given that locust swarms do not respect national borders and travel according to wind patterns.
- FAO's monitoring efforts must be bolstered at the implementation level to effectively combat locust swarms.
- Coordination among all countries and organizations worldwide is necessary to address the locust swarm issue comprehensively.
- An international convention focused on locust surveillance and control should be established to facilitate global cooperation.
- Serotonin inhibitor molecules could be considered for use on locusts after thorough evaluation of their potential impact on surrounding ecosystems.

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