ALTERNATIVE STRATEGIES FOR DEVELOPING DESERT LOCUST MANAGEMENT IN THE CENTRAL REGION: (SWOT) ANALYSIS APPROACH

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ABSTRACT

The goal of the environmental analysis using SWOT for locust management in the Central Region is to propose strategic alternatives by analyzing internal strengths and weaknesses, as well as external opportunities and threats. The analysis involved 139 participants, including workers and experts. Results indicated that strengths include training personnel, emergency plans, and information transmission devices. Weaknesses include budget constraints, personnel and equipment shortages, and neglect of survey operations. Opportunities focus on knowledge exchange, regional cooperation, support for scientific research, and international interest in locust management. Threats include climate change, political instability, pesticide effects, and new habitats suitable for locust proliferation. Through the SWOT analysis, the study identified policies to improve the authority's performance, including benefiting from the expertise of international organizations by training personnel on modern technologies and environmental safety. It also highlighted activating emergency plans, involving representatives from various organizations to facilitate communication with international bodies, and preparing crisis scenarios. Other recommendations include enhancing scientific research through scholarships, promoting knowledge exchange between countries, fostering cooperation, and utilizing advanced technologies like drones in inaccessible areas. Exploiting international organizations' support to compensate for budget deficits, studying the formation of regional rapid-response teams, engaging investors and training them in pest control, and collaborating with specialized companies were also suggested. Withdrawal from operations in cases of insufficient protective tools or required antidotes was advised. The study proposes a new vision for the relevant authority: to develop the Commission for Controlling the Desert Locust in the Central Region and enhance its efficiency in serving the agricultural sector to contribute to food security and sustainable agricultural development in the Central Region countries.

Keywords: SWOT Analysis, Desert Locust Management, Strategies, CRC.

Preface:

The agricultural sector is one of the most important sectors in the global economy due to its vital and effective role in economic activity. This sector has witnessed significant development in recent years due to the introduction of modern and advanced technological methods, which have positively impacted on the overall advancement of this sector and increased the productivity per hectare of most agricultural crops in particular. It is considered the fundamental pillar for progress, growth, development, and achieving prosperity due to its developmental potential and capabilities. It is a vast field that expands and provides everything within it to achieve comprehensive development if the latest scientific innovations are utilized. **(National Specialized Councils, 1990)**

Modernizing agriculture is the primary focus of all local and international bodies and organizations responsible for agricultural sectors worldwide, aiming to raise the standard of living and achieve prosperity for both rural and urban populations. To advance all agricultural sectors, it was essential to establish mechanisms to protect crops from the danger and threat of pests and plant diseases that negatively affect hectare productivity. The desert locust is considered one of the most dangerous pests that voraciously invade crops. The agricultural sector is one of the strategic sectors directly linked to rapid and successive economic and social changes. The Commission for Controlling the Desert Locust in the Central Region, one of the agencies affiliated with the Food and Agriculture Organization (FAO), recommends implementing some structural adjustments required in all its member countries and organizations. These adjustments aim to reshape the institutional structure functionally to enhance performance efficiency, eliminate role duplication among various units within and outside the locust management, provide suitable administrative and organizational conditions to achieve strategic goals in locust management, maximize the benefits of scientific advancements in survey, control, and information fields, and reduce obstacles that hinder the effectiveness of these administrations, enabling them to perform their roles more effectively. **(Abu Qandil, *et al.*, 2020)**

Managing desert locust operations is one of the top priorities adopted by countries (Arab, African, and Asian) located within the locust swarm path, whether they are breeding or invading countries. The Food and Agriculture Organization (FAO) pays special attention to the desert locust problem and has dedicated specialized bodies to provide technical and financial support to the countries affected by desert locusts, encouraging donor countries to direct their support to mitigate the impact of desert locusts in developing countries. In order for desert locust management departments to fulfill their natural role and contribute to the economic development process to primarily achieve food security for the country, it is necessary to establish a strategy and a set of regulations and rules that organize locust management operations for all affected countries. This includes removing all financial, administrative, and bureaucratic obstacles that hinder locust management performance, introducing scientific methods in various locust management operations, and replacing the prevailing traditional methods and approaches used by the public in all countries in dealing with this pest. And the aforementioned will not be achieved unless applied research is conducted to continuously produce innovative technological ideas that can be directly implemented in various fields of dealing with locusts, such as surveying, control, and information gathering. And the management of locust operations needs organizational development.

The need for change in economic and service organizations generally arises due to a gap between the objectives for which they were established and the expected outcomes. This gap usually results from poor management of the constantly changing environmental factors, which may be external such as climatic factors, technological, political, and legal factors, and factors

related to resources. And there may be internal factors such as changes in employee attitudes and the incompatibility of the structure and organizational climate, so management must try to make some changes that achieve alignment and organization with its environment **(Al-Zuhairi, 2008).**

Research Problem:

In recent years, the locust management has faced stagnation due to local and regional events and changes that the region has undergone, such as the outbreak of the COVID-19 pandemic, the Russia-Ukraine war, and the Arab Spring revolutions. This has led to the emergence of many acute and chronic problems and obstacles within the administrative bodies of the countries affected by locusts, which in turn has reflected on the duties and tasks performed by the workers at the locust centers in these countries. Consequently, the level and efficiency of survey and control operations have decreased most of the time, along with the deterioration and decline in the efficiency of conducting operations related to desert locust control in the areas prone to infestation. Therefore, it has become necessary to implement reforms and updates for all locust centers in the countries to enable them to perform their tasks and reduce the technological gap between scientific research results and practical and field applications by attempting to establish a future strategic vision for them.

Research's Aim:

In line with the research problem, the study aims to establish a new vision and mission for the development of locust management in the countries of the central region by achieving the following sub-objectives:

1- Study and analyze the internal environmental factors of desert locust management in the study areas.
2- Study and analysis of external environmental factors for the management of desert locusts in the areas under study.
3- Developing a new vision for locust management at the level of the countries in the region and The Commission for Controlling the Desert Locust in the Central Region.

Area of Research:

The research was conducted in Egypt, Saudi Arabia, Yemen, and Oman either surveys in locust centers in Egypt and Yemen or surveys of those working in the field of locusts in Saudi Arabia and Oman during local and semi-regional training courses organized by the Commission for Controlling the Desert Locust in the Central Region.

Research Sample:

The environmental analysis teams were composed of individuals from both the internal and external environments related to the work in the field of desert locusts, and the sample size was approximately 139 people distributed as follows:

(130 agricultural specialists and technicians, and technicians for the repair and maintenance of spraying machines, and 3 locust center directors in the countries), 6 individuals from the external environment (4 from The Commission for Controlling the Desert Locust in the Central Region of the Food and Agriculture Organization, including the current and former executive secretaries, technical assistants of the organization, FAO project managers, and the main locust information office advisor in FAO Rome). Additionally, 5 university professors and lecturers related to the research field from the Faculty of Agricultural and Environmental Sciences at Al-Arish University were consulted (Table 1).

Table 1. Distribution of the working team and experts involved in the environmental analysis

Item	Category	Number
Internal Environment	Agricultural Specialist and Technician specializing in the repair and maintenance of spraying machines.	**130**
	Director of the Locust Center.	**3**
External environment	The former and Current Executive Secretary of. the Commission for Controlling the Desert Locust in the Central Region	**2**
	Technical Assistant the Commission for Controlling the Desert Locust in the Central Region	**2**
	Project Manager at the Food and Agriculture Organization (FAO) .	**1**
	Advisor at the Locust Information Office in the Information Office in Rome.	**1**
Total		**139**
Experts	Professors and lecturers at the Faculty of Agricultural and Environmental Sciences, Arish University.	**5**

Research method and data collection sources:

The research relied on the SWOT analysis is one of the best methods for linking and benefiting from results. It focused on identifying strengths and weaknesses, determining available opportunities and challenges, and thus coming up with a clear action plan to develop locust management and establishing a new vision and mission for the future development of locust management departments. The main research question was: What are the mechanisms for developing locust management in the authority and the member states?

Data collection relied on designing a questionnaire form that includes a set of strengths and weaknesses, in addition to a set of opportunities and challenges derived from the results of discussions and deliberations with some specialists and professors from the Faculty of Agricultural and Environmental Sciences at Arish University, as well as field experience in participating in locust survey and control campaigns. The questionnaire was designed as a mixed type (closed/open) to include a number of statements under each category, allowing participants to add other points. The weight or relative importance of each statement was calculated by dividing the number of respondents who chose that statement by the total sample size (139 respondents), resulting in weights ranging from (1) or 100% "most important" to (0) or 0.0% "not important." The data collection period lasted approximately 18 months, from November 2022 to May 2024.

The theoretical framework for environmental analysis using (SWOT) Analysis

The concept of environmental analysis: (S) and (W) represent the strategic elements in the internal environment of the organization **(Houben *et al.*, 1999)** where:

- **(S) represents Strengths**: This refers to the internal capabilities of the organization that distinguish it from others, whether they are human or material resources or work systems and can be used efficiently and effectively in achieving the organization's goals and mission.
- **(W) represents weaknesses**: These refer to internal constraints and deficiencies, whether in human or material resources or work systems, that can hinder the institution from achieving its goals and mission. While (O) and (T) represent the strategic elements in the external environment of the institution where:
- **(O) represents Opportunities**: It refers to the presence of elements that strengthen, support, and services offered by the external community to help the institution rise, develop, and progress. The institution must exploit and benefit from them to achieve its strategic goals.
- **(T) represents Threats**: It refers to the existence of one or more challenges that pose a current or potential risk and challenge to the competitive position of the institution or limit its ability to perform its mission and achieve its goals if the institution cannot distance itself from them, avoid them, or reduce their risk. The challenge comes from several external environmental sources (local, regional, global) from the economic, political, legislative, or cultural environment, etc.

The steps of environmental analysis are as follows: Before starting the environmental analysis, a diverse team must be formed to collect internal and external data that impacts the organization's work. The SWOT analysis is conducted by a group of experts who can evaluate the organization from a critical perspective. This group consists of the organization's employees, including leaders, board members, and employees, as well as leaders representing the community and the external environment. **(Valkov, 2010).**

Analysis of Internal Environment Factors:

The aim of internal environment analysis is to identify strengths to maximize their benefits and to identify weaknesses to avoid and address them; thereby increasing the organization's ability to achieve its goals. If internal environment analysis aims to identify strengths and weaknesses, this does not mean merely observing both strengths and weaknesses, but rather that the internal situation analysis of the organization should include a deep analysis **(Ibrahim, 2008).** This means that when identifying and analyzing the organization's strengths, it includes the following:

- Enumerating all the strengths of the institution.
- Ranking the strengths according to their degree of distinction and uniqueness to the institution and based on the possibility of investing in them and directing them to benefit from the available opportunities.
- Identifying the strengths that achieve the highest rates of success and gains for the organization.
- Identifying the practical steps that should be taken to exploit and invest in strengths.

In the same context, identifying and analyzing weaknesses includes the following:

- Analyzing weaknesses that can negatively affect the performance and efficiency of the institution.
- Ensuring the identification of weaknesses and their causes, not the symptoms resulting from these causes (weaknesses).
- Prioritize weaknesses according to their level of importance.
- Identifying the steps that must be taken to overcome weaknesses.

Before identifying strengths and weaknesses, indicators of strengths and weaknesses are first gathered, and the question is answered as to why this factor is considered a strength and that one a weakness; and whether they will remain so, even if some changes occur. Therefore, when analyzing the internal environment, merely observing and identifying strengths and weaknesses is not sufficient. For strengths, they must be justified as strengths, listed, and ranked according to their distinctiveness and the possibility of benefiting from and investing in them, and the steps to be taken to invest in them must be determined. As for the weaknesses, it is necessary to know and identify the causes of the weaknesses, not just the symptoms resulting from these causes. Additionally, they should be prioritized in terms of treatment, and then determine what actions should be taken to overcome them **(Ahmed, 2008).**

Analysis of external environmental factors:

The primary goal of analyzing the external environment is to identify available opportunities for optimal investment and maximum benefit, and to identify challenges with the aim of minimizing their negative impacts and finding ways to solve them, thereby supporting the organization's ability to achieve its goals. One of the most important features of SWOT analysis is that it contributes to a clearer vision of the current conditions of the organization's external environment in terms of opportunities and challenges, enabling it to develop more effective strategies that are more aligned with the external environment, based on seizing available opportunities and mitigating the impact of challenges.

One of the practical limitations of SWOT analysis is the greater focus on analyzing the internal environment to identify strengths and weaknesses, while neglecting external factors that require special analytical skills, more time, and numerous resources. Consequently, the list of SWOT analysis results is incomplete and lacks consistency and coherence between the evaluation of internal and external factors **(Valentin, 2005).** This necessitates a balance between analyzing both the internal and external environments so that the SWOT results are characterized by harmony and consistency between internal and external factors, leading to the derivation of more effective strategies **(Wright and McMahan, 1992).**

One of the most important criteria necessary to ensure the efficiency of external environmental analysis is as follows **(Ahmed, 2008):**

- Ensuring the efficiency and capabilities of the creative analysis teams so that they are able to conduct environmental analysis efficiently and effectively, given the complexity of the external environment and the difficulty of analyzing it, which necessitates the presence of special analytical skills.
- Availability of reliable and accredited sources through which information about environmental variables can be obtained, without any physical or moral obstacles that may limit and reduce the possibility of obtaining them.
- Considering the complexity and multiplicity of environmental variables, prioritizing those that have a greater impact on the organization.
- Familiarity and understanding of the nature of the external environment, whether it is a stable environment or a dynamic one, necessitating continuous updates to the SWOT analysis to align with these fluctuations, or objectively considering different scenarios by answering the question "What if?" And developing strategic options in light of the potential scenarios.

Preparing a (SWOT) analysis results table:

One of the most important features of SWOT analysis is the classification of environmental analysis results and their presentation in a table consisting of four lists to clarify both the strengths

and weaknesses of the internal environment of the organization, and the opportunities and challenges of the external environment of the organization. Then, a SWOT analysis table is prepared to serve as a useful tool that clarifies and presents this data in an easily understandable manner. **(Abou- kandil, *et al.*, 2020)**

The step of preparing the final SWOT table requires sorting and filtering the initial SWOT list after assessing the validity of the opinions and ideas provided by the participants and excluding elements that do not pertain to the organization or do not affect it. This involves re-sorting and analyzing the initial SWOT list to identify the factors of major importance that negatively or positively impact the organization's operations.

That is, after identifying each of the strengths, weaknesses, opportunities and challenges, they must be re-analyzed and the dimensions of their impact in the future must be known, and they must be placed in a table, after sorting, classifying and arranging them according to their importance and the strength of their impact on the institution, while giving them weights that show the extent of their impact. Then this step includes not only preparing the four lists of the SWOT analysis table for each of the strengths, weaknesses, opportunities and challenges, but also determining the importance and priorities, as the priorities must be determined and arranged in each list, where the participants are asked to arrange their options according to the strength of their impact. It is also possible to use a survey of the opinions of some of the participants in the SWOT analysis and SWOT work teams through a questionnaire or personal interview. After completing the application of this form, the SWOT factors can be classified and arranged according to their importance and the strength of their impact on the institution so that they contain only the most important factors that affect the institution’s performance, and it is preferable that the number of elements in each list does not exceed 10 factors.

One of the most pressing issues regarding the preparation of a SWOT analysis table, which has been emphasized by many studies, is the following:
The first issue: Studying SWOT factors according to priorities and coding them.
The second issue: The quantity and quality in preparing a SWOT analysis table.
Regarding the first issue, it can be said that despite the widespread use of SWOT analysis, it has some structural problems in terms of its construction, including the inability to study uncertain factors, the inability to prioritize factors, and the large number of strategies derived from it **(Menga *et al*., 2013).** Strengths and weaknesses should be sorted according to their importance and priority in performance, challenges should be sorted according to their severity and likelihood of occurrence, and opportunities should be sorted based on their exploitability and likelihood of attractiveness and success.

As for the second issue (the quantity and quality in preparing the SWOT analysis table to increase the effectiveness of the SWOT analysis), the analysis should be supported by quantitative criteria and measures to yield better results by assigning a specific score based on which the internal and external factors (strengths, weaknesses, opportunities, and threats) for the SWOT analysis are identified and evaluated. SWOT, and therefore it is suggested to integrate it with quantitative decision-making methods and techniques. One of the most important of these methods is the SFAS method, which stands for Strategic Factors Analysis Summary. This analysis is called the Strategic Factors Analysis Summary (SFAS). The idea behind this method is that after completing the qualitative SWOT analysis, a quantitative analysis is conducted to determine the strategic importance of the SWOT factors, which subsequently affects the choice of strategy. This is done by conducting a quantitative analysis of the strengths and weaknesses of the internal environment through the preparation of a table summarizing the internal factors analysis, known

as the Internal Factors Analysis Summary (EFAS), as well as conducting a quantitative analysis of external opportunities and challenges through the preparation of a table summarizing the external factors analysis, known as the External Factors Analysis Summary (EFAS) **(Al-Sanhouri, 2013).**

Preparing the alternative strategy matrix using the (TOWS) matrix.

The goal of SWOT analysis is not limited to environmental analysis to identify strengths, weaknesses, opportunities, and threats, but extends to contributing to the identification of several strategic alternatives. After completing the SWOT analysis, a SWOT/TOWS matrix is prepared to generate strategic alternatives based on the results of the analysis. The results of the SWOT analysis (strengths, weaknesses, opportunities, and threats) represent a fundamental basis for strategy formulation. One of the most important characteristics and features of SWOT analysis is the preparation of the TOWS Matrix, through which SWOT analysis acts as an intermediary between the internal and external environments by comparing internal factors (strengths and weaknesses) and external factors (opportunities and threats) to generate a number of strategic alternatives. Thus, the TOWS Matrix serves as the foundation for selecting the appropriate strategic direction towards achieving the organization's goals **(Vanêk *et al.*, 2012).** Accordingly, SWOT analysis provides a good framework for generating multiple strategies by reconciling and synthesizing both internal strengths and weaknesses and external opportunities and threats. The SWOT Matrix represents a good foundation for selecting the appropriate strategy, as it allows for the comparison or convergence of internal strengths and weaknesses with external opportunities and challenges. This enables a comprehensive understanding of the strategic position of the organization, which can be relied upon in choosing and formulating the appropriate strategy.

One of the main assumptions and considerations of SWOT analysis is that the most suitable strategy is the one that maximizes strengths and opportunities while minimizing weaknesses and threats. The independent and fundamental factor in formulating SWOT strategies is the internal factors (strengths and weaknesses) that the organization can control and manage through:

- Using strengths to maximize the benefits from opportunities (strengths/opportunities strategies), and strengths can also be used to withstand and confront external challenges (strengths/threats strategies).
- Reducing weaknesses with the aim of seizing and investing in external opportunities (weakness/opportunity strategies), and weaknesses can also be addressed with the aim of facing external challenges (weakness/threat strategies).

Table 2. TOWS's Matrix Structure

External factors / Internal factors	**Strengths**	**Weaknesses**
(Opportunities) O1: O2: O3: O4: O5:	***Strength/Opportunity Strategy (Expansion and growth strategy)*** Develop alternative strategies that enable the organization to use its strengths to take advantage of external opportunities. **Maxi (S)-Maxi (O)** A: S1+O3 B: S1+O5+O1 C: S1+S2+S3+O4	***Weakness/Opportunity Strategy (Development and improvement strategy)*** Develop alternative strategies that enable the organization to take advantage of external opportunities while at the same time overcoming areas of weakness. **Mini(W)-Maxi(O)** A: W1+O5 B: W4+O1+O3 C: W4+O2+O1
Challenges (Threats) T1: T2: T3: T4: T5:	***Strength/Challenge Strategies (Strategy of Stability and Resilience)*** Develop alternative strategies that enable the organization to use areas of strength while avoiding external threats. **Maxi (S)-Maxi (T)** A: T2+S1 B: T2+T1+T3-C: S4+S5+T3	***Weakness/Challenges Strategies (Contraction and Reduction Strategy)*** Developing alternative strategies that enable the organization to reduce areas of vulnerability while simultaneously avoiding external threats. **Maxi(W) – Maxi (T)** A: W1+T2+T3 B: W1+T1+T4-C: W3+T3+T5

Upon close examination of each strategic alternative, it is observed that the first word in each strategic alternative is either strengths or weaknesses that can be controlled and managed. And the concepts related to the strategic alternatives resulting from (SWOT) (SO- WO- ST- WT).

It can be said that the types of strategic alternatives that can be generated from the SWOT matrix range from four to eight types of strategic alternatives, so it is not limited to the four well-known strategic alternatives in the matrix. (SWOT).

Results and Discussion

Results of the environmental analysis (SWOT) for the development of locust management in the countries of The Commission for Controlling the Desert Locust in the Central Region (CRC):

1- After presenting the questionnaire to the respondents (the working team), totaling 139 respondents, the results revealed the internal environment of locust management in the countries of The Commission for Controlling the Desert Locust in the Central Region (CRC) as follows:
   A- (23) points of weakness.
   B- (19) points of strength.
2- The results also revealed the external environment for locust management in the countries of The Commission for Controlling the Desert Locust in the Central Region as follows:
   A- (18) points represent opportunities.
   B- (16) points represent the challenges.
3- After gathering the opinions of the team, the final list for the SWOT matrix was determined by identifying 10 points representing the strengths and weaknesses in the internal environment

strategy and 10 points representing the opportunities and threats in the external environment strategy. These are the top 10 statements that received the highest weights from the team, meaning that after calculating the relative importance (weight) for each statement, the most important ones on each side were selected, resulting in the final matrix as follows:

A- Points representing strengths in the internal environment.
B- Points that represent weaknesses in the internal environment.
C- Points that represent opportunities in the external environment.
D- Points representing threats in the external environment.

4- After that, this final list was presented to five experts related to locust management, including the current and former executive secretaries, the two technical assistants of the Central Region of the Food and Agriculture Organization's Desert Locust Control Organization, and a project manager at FAO. They were asked to assign a score to each strategic factor that determines the institution's current efficiency or ability to deal with this factor, based on a scale consisting of five levels. A score of (5) reflects an outstanding response, while a score of (1) indicates a weak response.

5- The weighted scores were calculated, representing the product of the weight of each factor in the column by the score that this factor received. Based on this, the internal environment strategy, external environment strategy, and alternative strategies were formulated as follows:

Step one: Analysis of the internal strategic factors for the working environment of employees in the locust control centers in the countries of the Commission for Controlling the Desert Locust in the Central Region **(CRC). (Internal Strategic Factor)**

The results in Table (5) indicate that the main strengths in the internal environment for locust management in the countries of the authority are the training of technical staff to enhance their efficiency in the fields of survey, control, information, and forecasting, the availability of modern technologies in survey operations and control methods such as ultra-low volume spraying, the existence of an emergency plan to deal with desert locust invasion crises, the availability of devices to transmit survey and control information from the field to locust centers and vice versa, and the availability of necessary financial support from some countries during crises. While the weaknesses in the internal environment were the limited budget and material resources of some countries necessary for managing desert locust operations and facing crises, neglecting survey operations during outbreaks despite their importance and focusing on control, the inability to detect and monitor all desert locust infestations, the lack of qualified technical personnel to deal with desert locusts, the inadequacy of appropriate personal protective equipment, and the neglect of workers to wear it when handling pesticides.

Step Two: Analysis of the External Strategic Factor for the Working Environment of Employees at Locust Control Centers in the Commission for Controlling the Desert Locust in the Central Region**. (External Strategic Factor).**

The results in Table (6) indicated that the main opportunities in the external environment for locust management in the locust centers of the countries of the Commission are the exchange of experiences with successful countries in the fields of desert locust management, activating cooperation with neighboring countries through joint survey and control operations, collaborating and benefiting from the expertise and research of international bodies and organizations concerned with desert locust issues, such as the desert locust control bodies in the western, central, and eastern regions, seizing the opportunities of interest from international organizations and donor countries to achieve sustainable development and food security, encouraging the state for scientific research

in desert locust operations and providing scholarships and study missions for technical staff locally and internationally, and activating research interested in desert locusts in food manufacturing, fodder, and fertilizers and benefiting from them practically.

While the challenges in the external environment were climate changes and their impact on the distribution map of desert locusts and their negative long-term effects, political instability with neighboring countries hinders survey and control operations, especially in border areas, the negative effects of chemical pesticides on the health of workers and residents near control areas, the risks faced by survey and control teams from reptiles and wild animals in politically unstable regions within some countries, and the availability of new environments suitable for the breeding of desert locusts due to the horizontal expansion of agriculture.

Table 3. Analysis of Internal Strategic Transactions for The Locust Management Work Environment of The Member States of The Organization

	Internal factors	the weight (0.0-1.0) (O)	Degree (Importance) (1-5) (T)	Weighted weights (W×T)
Strength	1-Training technical staff to enhance their efficiency in the fields of surveying, control, information, and forecasting.	0.13	5	0.65
	2- The availability of modern technologies in survey operations and control methods, such as ultra-low volume spraying mechanisms.	0.116	4	0.464
	3- The existence of contingency plans to deal with locust invasion crises.	0.09	4	0.36
	4-Availability of devices for transmitting survey and control information from the field to locust centers and vice versa.	0.086	4	0.344
	5-The availability of necessary financial support from some countries during crises.	0.086	4	0.344
Weakness	6- The weak budget and material resources of some countries are necessary for managing desert locust operations and facing crises.	0.138	2	0.276
	7- Neglecting survey operations during outbreaks and epidemics despite their importance and focusing on control.	0.1	1	0.1
	8- The inability to detect and monitor all locust infestations.	0.086	1	0.086
	9- The lack of qualified technical staff to deal with desert locusts.	0.1	1	0.1
	10- The lack of appropriate personal protective equipment and the neglect of workers to wear it when handling pesticides.	0.068	2	0.136
	Total			**2.86**

Source: Collected and calculated from the field study data of the Locust Center in the countries of The Commission for Controlling the Desert Locust in the Central Region, 2024.

Table 4. Analysis of external strategic transactions for the working environment of the Locust Management Administration in the member states.

	External factors	the weight (0.0-1.0) (O)	Degree (Importance) (1-5) (T)	Weighted weights (W×T)
Opportunities	1 - Exchange of expertise with successful countries in the field of desert locust management.	0.088	4	0.352
	2- Activating cooperation with neighboring countries through joint surveys and control operations.	0.076	4	0.304
	3- Cooperation and benefiting from the expertise and research of international bodies and organizations concerned with desert locust problems, such as desert locust control agencies in the western, central, and eastern regions.	0.118	5	0.59
	4- Seizing the opportunities presented by international organizations and donor countries to achieve sustainable development and food security.	0.108	5	0.54
	5- Encouraging the state to support scientific research in desert locust operations and providing scholarships and study missions for technical staff both locally and internationally.	0.12	4	0.48
Threats	6- Climate change and its impact on the distribution map of desert locusts and its long-term negative effects.	0.104	2	0.208
	7- Political instability with neighboring countries hinders survey and control operations, especially in border areas.	0.134	2	0.268
	8- The negative effects of chemical pesticides on the health of workers and residents living near control areas.	0.084	2	0.168
	9- The risks faced by survey and control teams from reptiles and wild animals in politically unstable areas within some countries.	0.09	2	0.18
	10- The availability of new environments suitable for the breeding of desert locusts due to the horizontal expansion of agriculture	0.078	2	0.156
	Total			**3.246**

Source: Collected and calculated from the field study data of the Locust Center in the countries of The Commission for Controlling the Desert Locust in the Central Region, 2024.

6- The weighted scores for each variable were collected to determine the overall score of the institution. If the total weighted scores are less than 2, the institution's performance is considered weak, indicating that the officials lack sufficient awareness of the strengths and weaknesses within their institution. However, if the total weighted scores approach 3, this indicates that the institution's performance is average and that the officials are aware of the strengths and weaknesses within their institution. Consequently, the chances and likelihood of developing this institution and its ability to achieve its goals and mission in the future increase. If the value of the total weighted scores approaches 5, it indicates that the institution's performance is excellent.

The relative importance (the sum of the weighted scores) for the internal environment strategy was 2.86, while it was approximately 3.246 for the external environment strategy. This means that the performance of the locust management in the countries of the Central Region CRC is between average and above average. The employees in these countries are aware of their strengths and weaknesses and have the ability to identify the opportunities and challenges that the locust control centers may face. This indicates that there are significant opportunities for the

advancement and development of the locust centers in these countries, provided that the appropriate human, material, technical, organizational, and administrative resources, as well as regulations and laws, are available to improve working conditions in these countries.

Step Three: Developing Alternative Strategies Using the TOWS Matrix to Improve the Performance of Locust Centers in the Central Region Countries.

After preparing the internal and external environmental factors, a TOWS matrix can be created as shown in Table (4) to develop the performance of desert locust management. The matrix indicates four types of strategies as follows:

- Weakness-Threats Strategy (WT): It generally aims to reduce weakness factors and avoid challenges.
- Weakness-Opportunity Strategy (WO): It generally aims to reduce the weakness factor and increase opportunities.
- Strength-Threat Strategy (ST): It relies on strengths that can handle risk factors in the environment and aims to increase strength factors and reduce risk factors.
- Strengths-Opportunities Strategy (SO): It generally aims to increase the coefficients of strengths and opportunities.

The study, through the analysis of the SWOT matrix, has identified the following key strategies to improve the performance of desert locust management:

1- Leveraging the expertise and research of international bodies and organizations concerned with locust issues and intensifying the training of technical staff in countries through regional and semi-regional courses to enhance their efficiency and train them on modern techniques and technologies in the field of locust management operations.

2- Activating contingency plans by including representatives from international organizations and donor countries in the coordinating committees of the countries and the authority to facilitate communication with those organizations and streamline the procedures for grants and equipment provided to those countries, especially during locust crises.

3- Taking advantage of the state's encouragement of scientific research and providing financial support to increase scholarships and study missions for technically active personnel locally and internationally in cooperation with the Central Region Desert Locust Control Organization.

4- The importance of the Commission for Controlling the Desert Locust in the Central Region coordinating the exchange of expertise between countries and activating cooperation through joint survey and control operations, especially with countries that possess modern technologies for survey and control operations and information transmission devices or providing this equipment through the organization during joint training, survey, and control operations.

5- Seizing the opportunities presented by the interest of international organizations and donor countries to achieve sustainable development in order to compensate for the weak budgets and material resources of most countries affected by locusts to manage locust operations and confront crises.

6- The authority should play its coordinating role in exchanging experiences between countries with successful ones in the fields of locust management, providing incentives, and encouraging countries not to neglect survey operations during outbreaks and epidemics, and activating joint survey operations.

7- Taking advantage of the interest of donor countries and international organizations to provide appropriate protective gear for those working in locust control.

8- Conducting a feasibility study between the authority, donor countries, and international organizations concerned with locust affairs to establish and form rapid response teams for joint monitoring and control among the member countries, ready to intervene during crises in any country and under the supervision of the Central Region Desert Locust Control Authority.
9- Intensifying the environmental health and safety courses organized by the authority for the countries to enhance the efficiency of workers in handling pesticides, avoiding negative impacts on human health, and dealing with the risks of reptiles and wild animals.
10- The Authority encourages countries to provide incentives for the use of modern technologies such as drones, modern transmission devices, and information transfer, especially in countries and areas that are difficult to access, such as border regions and politically unstable areas.
11- The authority's role in coordinating between countries and donor agencies to provide support to countries for intensifying survey and exploration operations in new environments where locusts are likely to be present due to the horizontal expansion of agriculture in these countries.
12- Developing potential scenarios and how to deal with those scenarios, especially regarding climate changes that may affect the distribution map of desert locusts and new environments attractive to desert locusts due to horizontal agricultural expansion.
13- Involving investors in reclaimed lands and newly expanded horizontal areas and training their workers on survey and control operations to compensate for the lack of qualified technical staff and their insufficiency to monitor those areas and the areas that may be affected by climate changes and could become suitable environments for attracting locusts.
14- Avoid taking risks and withdraw from survey and control operations in the absence of appropriate protective clothing and the availability of antidotes and serums for pesticide poisoning and scorpion and snake bites.
15- Withdrawal from survey and control operations in conflict areas and politically unstable border regions and replacing them with modern technologies such as the use of drones to protect the lives of workers.
16- The contribution of the Commission for Controlling the Desert Locust in the Central Region seeking assistance from specialized private companies in control operations to support locust-affected countries that suffer from a shortage of technical personnel and material resources.

Table 5. TOWS Matrix for Alternative Strategies for Developing Desert Locust Control Centers in the Commission for Controlling the Desert Locust in the Central Region**.**

Internal environment / External environment	Strength	Weaknesses
	S1: Training technical staff to enhance their efficiency in the fields of surveying, control, information, and forecasting. **S2**: The availability of modern technologies in survey operations and control methods, such as ultra-low volume spraying mechanisms. **S3**: The existence of contingency plans to deal with locust invasion crises. **S4**: Availability of devices for transmitting survey and control information from the field to locust centers and vice versa. **S5**: The availability of necessary financial support from some countries during crises.	**W1**: The weak budget and material resources of some countries are necessary for managing desert locust operations and facing crises. **W2**: Neglecting survey operations during outbreaks and epidemics despite their importance and focusing on control. **W3**: The inability to detect and monitor all locust infestations. **W4**: The lack of qualified technical staff to deal with desert locusts. **W5**: The lack of appropriate personal protective equipment and the neglect of workers to wear it when handling pesticides.

Opportunities	Strengths/Opportunities (SO)	Weaknesses / Opportunities (WO)
Q1: Exchange of experiences with successful countries in the field of desert locust management. **O2**: Activating cooperation with neighboring countries through joint survey and control operations. **O3**: Cooperation and benefiting from the expertise and research of international bodies and organizations concerned with desert locust problems, such as desert locust control agencies in the western, central, and eastern regions. **O4**: Seizing the opportunities of interest from international organizations and donor countries to achieve sustainable development and food security. **O5**: Encouraging the state to conduct scientific research on desert locust operations and providing scholarships and study missions for technical staff both locally and internationally.	**A: S1+O3** Leveraging the expertise and research of international organizations and bodies concerned with locust problems and intensifying the training of technical staff in countries through regional and semi-regional courses to enhance their efficiency and train them on modern technologies and techniques in locust management. **B: S3+O4** Activation of emergency contingency plans by including representatives from international organizations and donor countries in the coordinating committees of the countries and the authority to facilitate communication with these organizations and streamline the procedures for grants and equipment provided to these countries, especially during locust crises. **C: S5+O5** Taking advantage of the state's encouragement of scientific	**A: W1+O4** Seizing the opportunities presented by the interest of international organizations and donor countries to achieve sustainable development in order to compensate for the weak budgets and material resources of most countries affected by locusts to manage locust operations and confront crises. **B: W2+O1+O2** The authority's role in coordinating the exchange of experiences between countries with successful practices in locust management, providing incentives, encouraging countries not to neglect survey operations during outbreaks and epidemics, and activating joint survey operations. **C: W5+O4** Seizing the opportunities of donor countries and international organizations to provide appropriate protective equipment for those working in locust control. **D: W4+O4** Conducted a feasibility study between the authority, donor countries, and

	research and providing financial support to increase scholarships and study missions for locally and internationally active technical staff in collaboration with the Desert Locust Control Organization in the central region. **D: S2 + S4 + O1 + O2** The importance of the Commission for Controlling the Desert Locust in the Central Region. Coordinating the exchange of expertise among countries and activating cooperation through joint survey and control operations, especially with countries that possess modern technologies for survey and control operations and information transmission devices, or providing this equipment through the organization during joint training and survey and control operations.	international organizations concerned with locust affairs to establish and form rapid intervention teams for joint monitoring and control among the member countries, ready to intervene during crises in any country and under the supervision of the Commission for Controlling the Desert Locust in the Central Region.
Threats	**Strength and Threats (ST)**	**Weaknesses and Threats (WT)**
T1: Climate change and its impact on the distribution map of desert locusts and its long-term negative effects. **T2**: Political instability with neighboring countries hinders survey and control operations, especially in border areas. **T3**: The negative effects of chemical pesticides on the health of workers and residents living near control areas. **T4**: The risks faced by survey and control teams from reptiles and wild animals in politically unstable areas within some countries. **T5**: The availability of new environments suitable for the breeding of desert locusts due to the horizontal expansion of agriculture.	**A: S1+T3+T4** Intensifying the environmental health and safety courses organized by the authority for countries to enhance the efficiency of workers in handling pesticides, avoiding negative impacts on human health, and dealing with the risks of reptiles and wild animals. **B: S2+S4+T2** Encouraging the authority for countries to provide incentives for the use of modern technologies such as drones, modern transmission devices, and information transfer, especially in countries and areas that are difficult to access, such as border areas and politically unstable regions. **C: S5+T5** The authority's role in coordinating between countries and donor agencies to provide support to countries to intensify survey and exploration operations in new environments where locusts are likely to be present due to the	**A: W4+T1+T5** Involving investors in reclaimed lands and newly expanded horizontal areas in training their workers on survey and control operations to compensate for the lack of qualified technical staff and their insufficiency in monitoring those areas and regions that may be affected by climate changes and could become suitable environments for attracting locusts. **B: W5+T3+T4** Avoid taking risks and withdraw from survey and control operations in the absence of appropriate protective clothing and the availability of antidotes and serums for pesticide poisoning and scorpion and snake bites. **C: W3+T2+T4** Withdrawal from survey and control operations in conflict areas and politically unstable border regions and replacing them with modern technologies such as the use of drones, in order to protect the lives of workers. **D: W4+T5** The contribution of the Commission for Controlling the Desert Locust in

	horizontal expansion of agriculture in these countries. **D: S3 +T1+T5** Developing potential scenarios and how to deal with those scenarios, especially regarding climate changes that may affect the distribution map of desert locusts and new environments attracting desert locusts due to horizontal agricultural expansion.	the Central Region in utilizing specialized private companies for control operations to support locust-affected countries that suffer from a shortage of technical staff and material resources.

Vision and mission for the Desert Locust Control Administration in the Central Region of the Desert Locust Control Organization:

From the research results and the SWOT analysis matrix, a vision and mission for the Desert Locust Control Administration in the Central Region countries can be formulated as follows:

Vision: An agency emerging from the Food and Agriculture Organization aimed at combating poverty and hunger by uniting the efforts and resources of member countries to reduce and combat the increasing numbers of desert locusts, that plague which has accompanied humanity since the dawn of history.

Mission: The Commission for Controlling the Desert Locust in the Central Region, with its qualified human cadres and expertise in the Member States, is able to protect food security in those countries and preserve plant wealth by working together with Member States and specialized research centers to better confront the spread and invasions of locusts and ensure that Member States affected by desert locusts have the same capabilities and capacity to confront desert locust crises and invasions, bearing in mind the inability to confront desert locust crises individually and the need for concerted regional and international efforts to reduce the risks of increasing their numbers and damage.

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