Management of Salinity Issues in Iraq's Agricultural Sector using SWOT Analysis

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ABSTRACT

Iraq's agricultural sector suffers from the salinity problem of agricultural land which reflects negatively on the production of field crops and agricultural land investment, particularly in the governorates geographically located in the sedimentary plain. The management of salinity problems facing by the agricultural sector has become crucial priorities for the Iraqi government. In this study, SWOT analysis was applied to suggest proper strategies that might be followed to fix the problem of salinity. After the internal and external factors have been identified, 17 strategies planning were developed. Internal–External Matrix (IE matrix) was used to select the appropriate type of strategy. Based on the results of Internal–External Matrix, government should consider the conservative strategies. Quantitative Strategic Planning Matrix (QSPM) was also used in this study. By applying the QSPM, re-arrangement of the proposed strategies has been made by importance and priority. The first three suggested strategies in term of importance and priority were establishment of National Center for Agricultural Policy, investing in improved irrigation systems such sprinkler and drip irrigation and innovative agricultural technologies to control salinity are urgent.

Key words: SWOT analysis; QSPM; Salinity; Iraq; Agriculture.

إدارة قضايا الملوحة في القطاع الزراعي العراقي بأستخدام تحليلSWOT

المستخلص

يعاني القطاع الزراعي بالعراق من مشكلة الملوحة في الاراضي الزراعية مما ينعكس سلبا على إنتاج المحاصيل الحقلية واستثمار الأراضي الزراعية سيما في المحافظات الواقعة في السهل الرسوبي. وأصبحت إدارة مشاكل الملوحة التي يواجها القطاع الزراعي من الأولويات الحاسمة للحكومة العراقية. في هذه الدراسة، تم تطبيق تحليل SWOT لأقتراح الأستراتيجيات المناسبة التي يمكن اتباعها لحل مشكلة الملوحة في القطاع الزراعي. وبعد تحديد العوامل الداخلية والخارجية، فقد تم تطوير 17 أستراتيجية. أستخدمت هذه الدراسة المنضومة الداخلية - الخارجية لتحديد نوع الأستراتيجية المناسب. أظهرت نتائج المنظومة الداخلية – الخارجية، أنه ينبغي للحكومة أن تتبع

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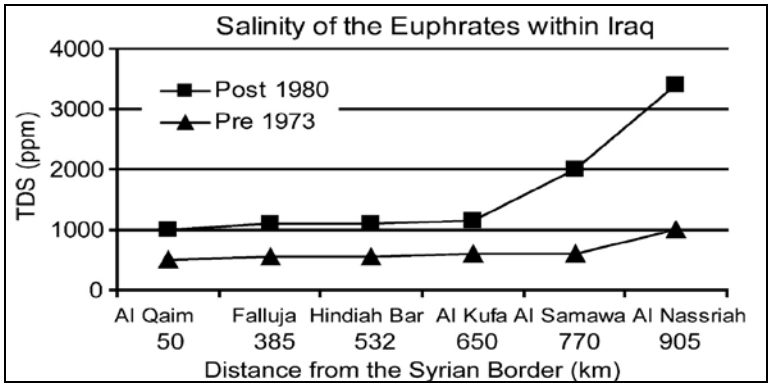
الاستراتيجيات المحافظة. كما تم أيضا استخدام مصفوفة التخطيط الاستراتيجي الكمي (QSPM) ، حيث تم أعادة ترتيب الأستراتيجيات المقترحة حسب الأهمية والأولوية.

INTRODUCTION

Soil and water salinity considered as a major agricultural problem in many countries in the world [1]. Iraq has much suffered from the problem of soil and water salinity. The management of salinity has become essential priorities for the Iraqi government, and many studies on salinity problem have been stated by the researchers [2-6]. Soil and water salinity affect the quality of water for irrigated agriculture and domestic and industrial use across the country. Soil salinity mainly affects irrigated land; application of irrigation water combined with poor drainage has led to high water tables and hence soil salinization. Soil salinity in Iraq is thus very much an irrigation-based issue. In Iraq, salinity and irrigation are intimately bound together: irrigation causes waterlogging and salinization and these in turn reduce the productivity of irrigated agriculture. Iraq's extensive irrigation and drainage infrastructure has fallen into poor condition. As a result, a large area of land is lost every year due to salinization and waterlogging. Halting and eventually reversing soil salinity problems will require large-scale, concerted efforts. Investment in rehabilitation of the irrigation and drainage infrastructure might be required.

In water, if salinity concentration exceed 1000 mg/L, water becomes less useful as it is no longer potable for human consumption [7]. Similarly, if it goes above 3,000 mg/L, it is no longer suitable for most municipal or even agricultural uses. Hence, most crops are affected when irrigated with comparatively higher saline water [1]. Iraqi agricultural lands depend mainly on the Rivers Euphrates and Tigress for agriculture and municipal water supplies [8]. As salinity increases in the two rivers, the uses for the water must change and thus becomes limiting for supporting the local economies. The level of salinity in a whole Euphrates river has increased from approximately 500 mg/L to over 4500 mg/L [9-11] (see Fig. 1). Several factors are responsible for increased salinity throughout the river system [5].



Figure(1) Salinity of the Euphrates River in Iraq (adopted from [5])

Expansion in the cultivation of irrigated land without paying attention to salinity levels on such water has high content of salinization beyond the level plants can leading

to the well-known salinity problem. A total of 74% of the irrigated areas suffered from some degree of salinity in central and southern Iraq. The Ministry of Water Resources reported that 1,500,000 dunam per year is affected by salinity and is becoming non-arable. Soil salinity is a serious problem in Iraq, with more than 70% of the alluvial plain affected [12]. Salts have accumulated in increasing proportions in soils over time, and produced a very great deterioration in agricultural land and resulted in low productivity. This has reduced agricultural production over time and led to migration of large numbers of villagers (rural) to the cities (urban) and leaving agriculture activities, therefor, adversely affected their incomes.

This study analyzes the agricultural sector of Iraq and in particular the salinity problem, from a government perspective. The SWOT (Strengths, Weaknesses, Opportunities, and Threats) methodology was used for this analysis. SWOT analysis is an important support tool for decision-making, and is commonly used as a means to systematically analyze an organization's internal and external environments [13]. It is the first stage of planning and helps decision makers to focus on key issues. It involves specifying the objective of the business venture or project and identifying the internal and external factors that are favorable and unfavorable to achieve the objective. The technique was found by Albert Humphrey, who led a convention at Stanford University in the 1960s and 1970s using data from Fortune almost 500 companies. Many researchers have used the SWOT approach in various fields [14-18].

The strengths, weaknesses, opportunities, and threats (SWOT) framework is proposed by many as an analytical tool which should be used to categorize significant environmental factors both internal and external to the government. This analysis can help decision makers, e.g. the Minister of Agriculture, to determine whether a particular objective to reduce salinity can be achieved, given the SWOT profile of the country and of the Ministry of Agriculture with regard to salinity control.

In this study, SWOT analysis was used to identify the internal and external factors that are favorable and unfavorable for the Ministry of Agriculture and other stakeholders to achieve effective policies to control the salinity problem in Iraq.

Methodology

The methodology applies SWOT approach as given bellow:

- The strengths are the characteristics of the country and the stakeholders (e.g. the Ministry of Agriculture) that give an advantage in controlling the salinity issue and boosting agricultural activities in Iraq;
- The weaknesses (refer to limitations) are characteristics that place Iraq and the Ministry of Agriculture at a disadvantage;
- The opportunities are external prospects to reduce salinity and improve the environment;
- The threats are mainly external elements that presently or in the near future could cause problems to the country and to the agricultural sector in particular.

The identification of SWOT for Iraq can be very important, as subsequent interventions can use the SWOT in the process of planning specific measures to control salinity and to sustainably improve the farming system. It can summarize the SWOT of this research, in the Fig.2.

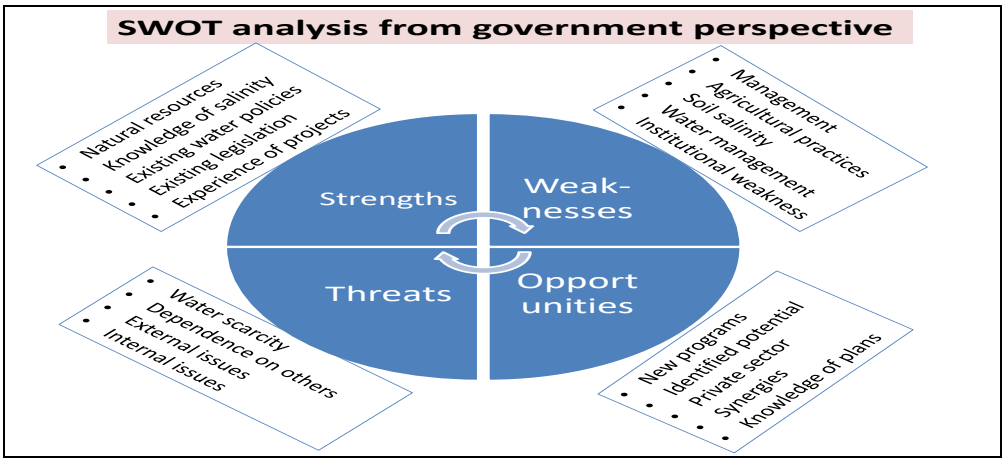


Figure (2) Internal and external factors in the SWOT analysis

The *Strengths*, from an agricultural policy point of view, are in (i) natural resources, (ii) knowledge and experience in management and reclamation of saline soils, (iii) existing water policies for water and salinity control, (iv) existing legislation related to irrigation and salinity control, and (v) experience with programs and projects for soil salinity control and water management. On the other hand the *Weaknesses* are estimated to be in (i) management of natural resources, (ii) agricultural practices, (iii) soil salinity and saline waters in Iraq, (iv) water management impacting on agriculture and irrigation, and (v) institutional issues. The *Opportunities* are (i) new programs on the way, (ii) already identified potential of the agricultural sector, (iii) involvement of the private sector in agricultural activities, (iv) agriculture seen as a value for social and rural development, (v) possibility of synergy among agricultural initiatives shown by region, and (vi) knowing the viewpoints and plans of policy makers. The *Threats* are (i) water scarcity, (ii) dependence on water resources from other countries, (iii) general threats to the agricultural sector, and (vi) internal threats as identified by the Ministry of Agriculture.

Establishment of External and Internal Strategic Factors Identification Matrices

External factor evaluation matrix (EFE) and internal factor evaluation matrix (IFE) are used to assess strategic factors. Internal factors consist of strengths and weaknesses presented by the internal environment to the government. Strengths and weaknesses constituted factors within the system that enable and hinder the government from achieving its goal, respectively [19]. Many factors for strengths and weaknesses related to salinity issue are determined with the help of the Iraqi experts in various ministries such as ministry of agriculture, ministry of water resources, ministry of science and technology, ministry of higher education and ministry of environment. After identification of the internal factors, critical success factor (CSF) was determined. For this purpose, a questionnaire was drawn up and employed. In this questionnaire a three-point scale (Weak, Moderate and Excellent) was used for each of the factors. Stakeholders were asked to rate each factor according to this scale. Then the mean value of each factor was calculated and these values have been normalized to obtain weights

between 0 and 1 (sum of these weighs is equal to one). The weight assigned to a given factor indicates the relative importance of the factor. Zero means not important, while one indicates very important. Then, a score (rating) is allocated to each factor according to the judgment of the experts. Practitioners usually use scores on a scale from 1 to 4. Score 1 denotes severe weakness, score 2 shows common weakness, score 3 indicates for a common strength and finally score 4 brings out important strengths. Therefore, there are a weight and a score for each factor. Then, Multiply each factor weight with its rating in order to calculate its weighted score. Finally, add all the weighted scores of each factor, in order to calculate the government total weighted score. If sum of weighted score is less than 2.5, one can concludes that weaknesses are more than strengths. However, sums more than 2.5 indicate that strengths dominate over weaknesses [19]. External factors consist of opportunities and threats presented by the external environment to the government. Opportunities and threats were considered as exogenous factors that facilitate and limit the government in attaining its goals, respectively [19]. In this regard, all the steps are similar to IFE matrix, except that instead of opportunities and threats, strengths and weaknesses have been evaluated. Internal factor and external factor matrices of management of salinity Iraq's agricultural sector are shown in Tables 1 and 2, respectively.

Table (1) evaluation of Internal factors (IFE) matrix.

	Internal factors	**Weight**	**Rating**	**Weighted score**
Strengths	Natural resources	0.11	4	0.44
	Knowledge and experience in management and reclamation of saline soils	0.10	3	0.33
	Existing water policies for water and salinity control	0.09	3	0.27
	Existing legislation related to irrigation and salinity control	0.09	3	0.27
	Experience with programs and projects for soil salinity control and water management.	0.12	4	0.48
Weaknesses	Management of natural resources	0.12	1	0.12
	Agricultural practices	0.08	2	0.16
	Soil salinity and saline waters in Iraq	0.12	1	0.12
	Water management impacts on agriculture and irrigation	0.10	1	0.10
	Institutional issues.	0.07	2	0.14
Total weighted score		**1.00**		**2.43**

Table (2) evaluation of External factors (EFE) matrix.

	External factors	Weight	Rating	Weighted score
Opportunities	New programs on the way	0.12	4	0.48
	Already identified potential of the agricultural sector	0.12	3	0.36
	Involvement of the private sector in agricultural activities	0.08	4	0.32
	Agriculture seen as a value for social and rural development	0.09	3	0.27
	Possibility of synergy among agricultural initiatives shown by region	0.10	4	0.40
	Knowing the viewpoints and plans of policy makers.	0.08	3	0.24
Threats	Water scarcity	0.12	1	0.12
	Dependence on water resources from other countries	0.10	1	0.10
	General threats to the agricultural sector	0.12	1	0.12
	Internal threats as identified by the Ministry of Agriculture	0.07	2	0.14
Total weighted score		**1.00**		**2.55**

Quantitative Strategic Planning Matrix (QSPM)

The Quantitative Strategic Planning Matrix or a QSPM approach attempts to objectively select the best strategy using input from other management techniques and some easy computations. From a theoretical point of view, QSPM can reveal strategies. In other words, QSPM can determine the quality of strategy that can successfully use the internal and external effective factors. The QSPM approach used in this study to prioritize or determine the attractiveness of the strategies generated in the EFE and IFE matrices [20]. The following steps are involved in conducting (QSPM):

1.The left column of a QSPM consists of external and internal key factors, and lists factors is obtained directly from the EFE and IFE matrixes (see Tables 4-7).

2.The top row consists of feasible alternative strategies derived from the SWOT analysis. However, the first column with numbers includes weights assigned to factors (see Tables 4-7).

3.Attractiveness scores (AS) in the QSPM indicate how each factor is important or attractive to each alternative strategy.

4.The range given for Attractiveness Score: 1 = not acceptable; 2 = possibly acceptable; 3 = probably acceptable; 4 = most acceptable; 0 = not relevant.

5.Estimation of total attractiveness scores (TAS) which indicate the relative attractiveness of each key factor and the related individual strategy. However, the sum of the total attractiveness score (STAS) is calculated by adding the total attractiveness scores in each strategy column of the QSPM. The QSPM sum total attractiveness scores reveal which strategy is most attractive. Higher scores point at a more attractive strategy, considering

all the relevant external and internal critical factors that could affect the strategic decision.

Results and Discussions

SWOT analysis has been applied for its simplicity and practicality. As a framework, it has been widely adopted but, generally, its application has been accepted uncritically. It is timely to reappraise its value as a strategic management tool [21]. As it can be concluded from the results of (Table 1) the sum of the internal factors equals 2.43 which is evident of dominance of weaknesses over the strengths in the area of study. Moreover, the sum of the coefficients in Table 2 equals 2.55 that indicate opportunities and the threats are present in the region [22]. In addition to relationship among strengths, weaknesses, opportunities and threats, the possible strategies were identified. Then the appropriate strategies in four categories SO, WO, ST and WT are suggested. The strategies for the management of salinity problems in Iraqi agricultural sectors can be shown in Table 3.

Table (3): SWOT strategies matrix: Derivation of the key strategies in management of salinity

Internal factors / External Factors	Strengths (S) Natural resources Knowledge and experience in management and reclamation of saline soils Existing water policies for water and salinity control Existing legislation related to irrigation and salinity control Experience with programs and projects for soil salinity control and water management.	Weaknesses (W) Management of natural resources Agricultural practices Soil salinity and saline waters in Iraq Water management impacts on agriculture and irrigation Institutional issues.
Opportunities (O) -New programs on the way -Already identified potential of the agricultural sector -Involvement of the private sector in agricultural activities -Agriculture seen as a value for social and rural development -Possibility of synergy among agricultural initiatives shown by region -Knowing the viewpoints and plans of policy makers.	(SO) Strategies SO_1: Promoting water-users' associations to significantly reduce or eliminate traditional wasteful water practices, such flood irrigation, so as to reduced water losses. SO_2: Implementing water extension programs, aiming at better management in water transport and storage. SO_3: Strengthening the laws, regulations, and legislation in this area that lack judicial provisions. SO_4: Activating the role of the agricultural initiative. This initiative is concentrated on ensuring different types of loans to agricultural producers are given. It also contributes to: (i) the institutional development of the agricultural sector and (ii) the policy formulation (laws and regulations) for agricultural development and environmental conservation. SO_5: Encouraging the private sector to invest in agricultural projects	(WO) Strategies WO_1: Investing in new pipe networks for improved irrigation and salinity control, aiming at rationalizing water consumption. WO_2: Encouraging Iraqi nationals to study abroad on areas related to water management. WO_3: Since 2003, a number of organizations and international bodies have operated in Iraq. However, the bulk of their work focuses on the training of staff. Yet, more contribution is needed on institutional development of effective legislations that can be pragmatically implemented in the rural sector. WO_4:Investing in improved irrigation systems,such sprinkler and drop irrigation,aiming at more efficient use of water resources.

Threats (T) -Water scarcity -Dependence on water resources from other countries -General threats to the agricultural sector -Internal threats as identified by the Ministry of Agriculture such as land use change, high ground water tables and marshes drain	(ST) Strategies ST_1: Coordinating water policies with neighboring countries, particularly for the Euphrates and Tigris ST_2: A number of ministries and institutions should share responsibilities in terms of land degradation, salinity and water contamination. ST_3: Focus on aspects of growth and development of the marshes in Nassiriah and neighboring provinces. It is needed to build up an updated database in relation to lands and marshes that need to be reclaimed. ST_4: Increasing the rationalization in the use of groundwater, aiming at not overexploitation of groundwater sources and increased salinization.	(WT) Strategies WT_1: Innovative agricultural technologies to control salinity are urgent. They should be easy to implement, not costly for even resource-poor farmers to be able to afford, and of quick results so farmers can perceive that their investments pay-off. WT_2: The use of modeling is needed for forecasting future scenarios in relation to climate change, agricultural production, employment in the rural sector, poverty, etc. WT_3: Creating sort of 'National Center for Agricultural Policy' as a national department or division within the Ministry of Agriculture. This national center should specifically contribute with solving agricultural policy and institutional issues at both national and provincial levels, in particular issues related to salinity and land reclamation. WT_4: Improve productivity of agricultural crops and farm animals through adoption of modern methods of production, administration, and guidance.

Internal and External Analysis Using Internal–External Matrix (IE matrix)

For simultaneous analysis of internal and external factors, a tool called internal–external matrix is used. This matrix is used to determine the strategic position of organization/government [23]. To determine the type of strategy (position) that should be adopted by government, assessment scores from internal factor matrix is taken on X-axis and assessment scores from external factor matrix is taken on Y-axis are plotted [16]. Thus, position of management of salinity agricultural sector and appropriate strategies has been determined. Considering the framework based on SWOT, four category strategies (SO, ST, WO and WT) are given for the government. IE matrix highlights the proportional area of strategies in the SWOT framework [24]. IE matrix of salinity management is shown in Fig.3. According to the matrix and EFE and IFE scores (EFE score = 2.55 and IFE score = 2.43), WO strategies as appropriate strategies are selected.

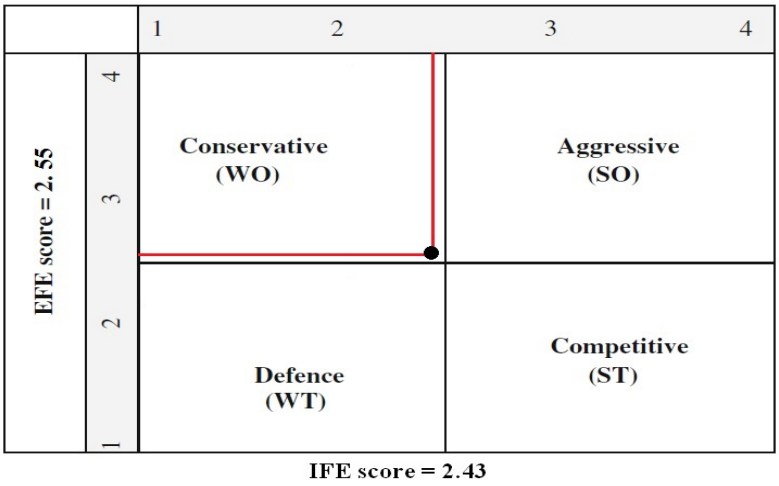


Figure (3) IE matrix

From the Fig.3 ,the situation of the region under study is using a *conservative strategy*. This means that special attention must be paid to the conservative strategies, i.e. the proper strategies for government to fix the problem of salinity in Iraq's agricultural sector should considered: the investing in new pipe networks for improved irrigation and salinity control, aiming at rationalizing water consumption, encourage Iraqi nationals to study abroad on areas related to water management, institutional development of effective legislations that can be pragmatically implemented in the rural sector, and investing in improved irrigation systems, such sprinkler and drop irrigation, aiming at a more efficient use of water resources.

Quantitative Strategic Planning Matrix (QSPM)

As mentioned above, QSPM can determine the quality of strategy that can successfully use the internal and external effective factors. The associative effects of each one of such internal and external effective factors could determine the relative interaction of each strategy within the application strategy aggregate. Finally by applying appropriate scores and coefficients, strategies were set in accordance to their attractiveness (Tables 4-7). Attractiveness scores of QSPM were assigned based on the experts and specialized using critical success factor (CSF).

Table (4): QSPM of SO strategies

Key factor	SO_1			SO_2			SO_3			SO_4			SO_5		
	W	AS	TAS	W	AS	TAS	W	AS	TAS	W	AS	TAS	W	AS	TAS
O1	0.12	4	0.48	0.12	3	0.36	0.12	0	0	0.12	0	0	0.12	0	0
O2	0.12	3	0.36	0.12	3	0.36	0.12	1	0.12	0.12	2	0.24	0.12	2	0.24
O3	0.08	2	0.16	0.08	0	0	0.08	2	0.16	0.08	3	0.24	0.08	4	0.32
O4	0.09	2	0.18	0.09	4	0.36	0.09	2	0.18	0.09	2	0.18	0.09	2	0.18
O5	0.10	2	0.2	0.10	4	0.4	0.10	3	0.3	0.10	4	0.4	0.10	2	0.2
O6	0.08	2	0.16	0.08	2	0.16	0.08	4	0.32	0.08	2	0.16	0.08	3	0.24
T1	0.12	4	0.48	0.12	4	0.48	0.12	2	0.24	0.12	1	0.12	0.12	2	0.24
T2	0.10	4	0.4	0.10	3	0.3	0.10	3	0.3	0.10	1	0.1	0.10	2	0.2
T3	0.12	2	0.24	0.12	2	0.24	0.12	2	0.24	0.12	3	0.36	0.12	4	0.48
T4	0.07	3	0.21	0.07	4	0.28	0.07	2	0.14	0.07	2	0.14	0.07	2	0.14
SUM Weights	100%			100%			100%			100%			100%		
S1	0.11	4	0.44	0.11	3	0.33	0.11	0	0	0.11	0	0	0.11	1	0.11
S2	0.10	0	0	0.10	0	0	0.10	2	0.2	0.10	0	0	0.10	2	0.2
S3	0.09	2	0.18	0.09	2	0.18	0.09	4	0.36	0.09	2	0.18	0.09	3	0.27
S4	0.09	2	0.18	0.09	1	0.09	0.09	4	0.36	0.09	3	0.27	0.09	1	0.09
S5	0.12	2	0.24	0.12	4	0.48	0.12	1	0.12	0.12	3	0.36	0.12	3	0.36
W1	0.12	4	0.48	0.12	2	0.24	0.12	3	0.36	0.12	0	0	0.12	1	0.12
W2	0.08	3	0.24	0.08	3	0.24	0.08	2	0.16	0.08	1	0.08	0.08	2	0.16
W3	0.12	1	0.12	0.12	2	0.24	0.12	2	0.24	0.12	2	0.24	0.12	2	0.24
W4	0.10	4	0.4	0.10	4	0.4	0.10	2	0.2	0.10	2	0.2	0.10	0	0
W5	0.07	2	0.14	0.07	3	0.21	0.07	2	0.14	0.07	3	0.21	0.07	2	0.14
SUM Weights	100%			100%			100%			100%			100%		
SUM of TAS	5.29			5.35			4.14			3.48			3.93		
Priority	10			9			13			16			15		

W: Weight, AS: Attractiveness scores, TAS: Total attractiveness scores

(Attractiveness Score: 1 = not attractive; 2 = *somewhat attractive*; 3 = reasonably attractive*;* 4 = *highly attractive*; 0 = not relevant)

Based on results of QSPM, government may consider the following strategies after arrangement by priority:

1. **WT3:** Creating sort of 'National Center for Agricultural Policy' as a national department or division within the Ministry of Agriculture. This national center should specifically contribute with solving agricultural policy and institutional issues at both national and provincial levels, in particular issues related to salinity and land reclamation.
2. **WO4:** Investing in improved irrigation systems, such sprinkler and drip irrigation, aiming at a more efficient use of water resources.

3. **WT1:** Innovative agricultural technologies to control salinity are urgent. They should be easy to implement, not costly for even resource-poor farmers to be able to afford, and of quick results so farmers can perceive that their investments pay-off.

Table (5): QSPM of WO strategies

Key factor	WO_1			WO_2			WO_3			WO_4		
	W	AS	TAS	W	AS	TAS	W	AS	TAS	W	AS	TAS
O1	0.12	3	0.36	0.12	2	0.24	0.12	4	0.48	0.12	4	0.48
O2	0.12	2	0.24	0.12	0	0	0.12	3	0.36	0.12	3	0.36
O3	0.08	4	0.32	0.08	1	0.08	0.08	2	0.16	0.08	4	0.32
O4	0.09	0	0	0.09	2	0.18	0.09	3	0.27	0.09	2	0.18
O5	0.10	1	0.1	0.10	0	0	0.10	2	0.2	0.10	1	0.1
O6	0.08	2	0.16	0.08	0	0	0.08	2	0.16	0.08	2	0.16
T1	0.12	4	0.48	0.12	1	0.12	0.12	2	0.24	0.12	4	0.48
T2	0.10	3	0.3	0.10	1	0.1	0.10	2	0.2	0.10	3	0.3
T3	0.12	2	0.24	0.12	1	0.12	0.12	2	0.24	0.12	3	0.36
T4	0.07	3	0.21	0.07	1	0.07	0.07	2	0.14	0.07	4	0.28
SUM Weights	100%			100%			100%			100%		
S1	0.11	2	0.22	0.11	1	0.11	0.11	1	0.11	0.11	4	0.44
S2	0.10	4	0.4	0.10	3	0.3	0.10	1	0.1	0.10	3	0.3
S3	0.09	4	0.36	0.09	2	0.18	0.09	2	0.18	0.09	4	0.36
S4	0.09	3	0.27	0.09	2	0.18	0.09	2	0.18	0.09	2	0.18
S5	0.12	4	0.48	0.12	2	0.24	0.12	2	0.24	0.12	3	0.36
W1	0.12	3	0.36	0.12	2	0.24	0.12	3	0.36	0.12	3	0.36
W2	0.08	3	0.24	0.08	2	0.16	0.08	3	0.24	0.08	4	0.32
W3	0.12	4	0.48	0.12	2	0.24	0.12	2	0.24	0.12	4	0.48
W4	0.10	4	0.4	0.10	2	0.2	0.10	1	0.1	0.10	3	0.3
W5	0.07	2	0.14	0.07	1	0.07	0.07	2	0.14	0.07	3	0.21
SUM Weights	100%			100%			100%			100%		
SUM of TAS	5.76			2.83			4.34			6.33		
Priority	6			17			12			2		

W: Weight, AS: Attractiveness scores, TAS: Total attractiveness scores
(Attractiveness Score: 1 = not attractive; 2 = *somewhat attractive*; 3 = reasonably attractive*;* 4 = *highly attractive*; 0 = not relevant)

4. **ST3:** Focus on aspects of growth and development of the marshes in Nassiriah and neighboring provinces. It is needed to build up an updated database in relation to lands and marshes that need to be reclaimed.
5. **ST4:** Increasing the rationalization in the use of groundwater, aiming at not overexploitation of groundwater sources and increased salinization.
6. **WO1:** Investing in new pipe networks for improved irrigation and salinity control, aiming at rationalizing water consumption.

7. **ST2:** A number of ministries and institutions should share responsibilities in terms of land degradation, salinity and water contamination.
8. **ST1:** Coordinating water policies with neighboring countries, particularly for the Euphrates and Tigris rivers.

Table (6): QSPM of ST strategies

Key factor	ST_1			ST_2			ST_3			ST_4		
	W	AS	TAS	W	AS	TAS	W	AS	TAS	W	AS	TAS
O1	0.12	3	0.36	0.12	1	0.12	0.12	4	0.48	0.12	2	0.24
O2	0.12	2	0.24	0.12	2	0.24	0.12	2	0.24	0.12	3	0.36
O3	0.08	0	0	0.08	1	0.08	0.08	1	0.08	0.08	1	0.08
O4	0.09	1	0.09	0.09	4	0.36	0.09	4	0.36	0.09	4	0.36
O5	0.10	1	0.1	0.10	4	0.4	0.10	2	0.2	0.10	0	0
O6	0.08	4	0.32	0.08	4	0.32	0.08	4	0.32	0.08	3	0.24
T1	0.12	4	0.48	0.12	3	0.36	0.12	4	0.48	0.12	3	0.36
T2	0.10	4	0.4	0.10	1	0.1	0.10	2	0.2	0.10	2	0.2
T3	0.12	3	0.36	0.12	2	0.24	0.12	3	0.36	0.12	3	0.36
T4	0.07	1	0.07	0.07	2	0.14	0.07	3	0.21	0.07	4	0.28
SUM Weights	100%			100%			100%			100%		
S1	0.11	3	0.33	0.11	2	0.22	0.11	4	0.44	0.11	4	0.44
S2	0.10	1	0.1	0.10	2	0.2	0.10	3	0.3	0.10	2	0.2
S3	0.09	4	0.36	0.09	3	0.27	0.09	2	0.18	0.09	3	0.27
S4	0.09	4	0.36	0.09	4	0.36	0.09	1	0.09	0.09	3	0.27
S5	0.12	3	0.36	0.12	4	0.48	0.12	3	0.36	0.12	4	0.48
W1	0.12	4	0.48	0.12	3	0.36	0.12	4	0.48	0.12	4	0.48
W2	0.08	2	0.16	0.08	3	0.24	0.08	2	0.16	0.08	3	0.24
W3	0.12	3	0.36	0.12	4	0.48	0.12	3	0.36	0.12	4	0.48
W4	0.10	3	0.3	0.10	4	0.4	0.10	4	0.4	0.10	3	0.3
W5	0.07	2	0.14	0.07	3	0.21	0.07	2	0.14	0.07	2	0.14
SUM Weights	100%			100%			100%			100%		
SUM of TAS	5.37			5.58			5.84			5.78		
Priority	8			7			4			5		

W: Weight, AS: Attractiveness scores, TAS: Total attractiveness scores
(Attractiveness Score: 1 = not attractive; 2 = *somewhat attractive*; 3 = reasonably attractive*;* 4 = *highly attractive*; 0 = not relevant)

9. **SO2:** Implementing water extension programs, aiming at better management in water transport and storage.
10. **SO1:** Promoting water-users' associations to significantly reduce or eliminate traditional wasteful water practices, such flood irrigation, so as to reduced water losses.
11. **WT4:** Improve productivity of agricultural crops and farm animals through adoption of modern methods of production, administration, and guidance.

12. **WO3:** Since 2003, a number of organizations and international bodies have operated in Iraq. However, the bulk of their work focuses on the training of staff. Yet, more contribution is needed on institutional development of effective legislations that can be pragmatically implemented in the rural sector.

Table (7): QSPM of WT strategies

Key factor	WT_1			WT_2			WT_3			WT_4		
	W	AS	TAS	W	AS	TAS	W	AS	TAS	W	AS	TAS
O1	0.12	3	0.36	0.12	1	0.12	0.12	3	0.36	0.12	4	0.48
O2	0.12	3	0.36	0.12	2	0.24	0.12	4	0.48	0.12	3	0.36
O3	0.08	4	0.32	0.08	0	0	0.08	0	0	0.08	2	0.16
O4	0.09	3	0.27	0.09	0	0	0.09	2	0.18	0.09	2	0.18
O5	0.10	2	0.2	0.10	1	0.1	0.10	3	0.3	0.10	4	0.4
O6	0.08	2	0.16	0.08	2	0.16	0.08	3	0.24	0.08	2	0.16
T1	0.12	2	0.24	0.12	3	0.36	0.12	4	0.48	0.12	1	0.12
T2	0.10	2	0.2	0.10	1	0.1	0.10	3	0.3	0.10	1	0.1
T3	0.12	3	0.36	0.12	2	0.24	0.12	4	0.48	0.12	2	0.24
T4	0.07	3	0.21	0.07	4	0.28	0.07	4	0.28	0.07	2	0.14
SUM Weights	100%			100%			100%			100%		
S1	0.11	3	0.33	0.11	2	0.22	0.11	3	0.33	0.11	2	0.22
S2	0.10	4	0.4	0.10	2	0.2	0.10	3	0.3	0.10	3	0.3
S3	0.09	4	0.36	0.09	2	0.18	0.09	4	0.36	0.09	3	0.27
S4	0.09	4	0.36	0.09	4	0.36	0.09	4	0.36	0.09	3	0.27
S5	0.12	4	0.48	0.12	3	0.36	0.12	4	0.48	0.12	3	0.36
W1	0.12	3	0.36	0.12	2	0.24	0.12	4	0.48	0.12	2	0.24
W2	0.08	3	0.24	0.08	3	0.24	0.08	3	0.24	0.08	4	0.32
W3	0.12	3	0.36	0.12	3	0.36	0.12	4	0.48	0.12	2	0.24
W4	0.10	3	0.3	0.10	2	0.2	0.10	4	0.4	0.10	2	0.2
W5	0.07	2	0.14	0.07	1	0.07	0.07	4	0.28	0.07	2	0.14
SUM Weights	100%			100%			100%			100%		
SUM of TAS	6.01			4.03			6.81			4.9		
Priority	3			14			1			11		

W: Weight, AS: Attractiveness scores, TAS: Total attractiveness scores
(Attractiveness Score: 1 = not attractive; 2 = *somewhat attractive*; 3 = reasonably attractive*;* 4 = *highly attractive*; 0 = not relevant)

13. **SO3:** Strengthening the laws, regulations, and legislation in this area that lack judicial provisions.
14. **WT2:** The use of modeling is needed for forecasting future scenarios in relation to climate change, agricultural production, employment in the rural sector, poverty, etc.
15. **SO5:** Encouraging the private sector to invest in agricultural projects

16. **SO4:** Activating the role of the agricultural initiative. This initiative is concentrated on ensuring different types of loans to agricultural producers are given. It also contributes to: (i) the institutional development of the agricultural sector and (ii) the policy formulation (laws and regulations) for agricultural development and environmental conservation.
17. **WO2:** Encouraging Iraqi nationals to study abroad on areas related to water management.

SWOT analysis should be carried out from time to time to meet with new situations [22].

CONCLUSIONS

In the present study, proper strategies were developed using the SWOT method. These strategies cover wide range of policies that should be implemented by government. SWOT analysis was investigated in the period (2010–2013). The internal and external factors are dynamic, changes need to be examined and strategies in different time sections are extracted. Thus, different modes that may occur in the future should be reviewed and predicted.

Strengths, weaknesses, opportunities and threats analysis was applied in order to evaluate the SWOT of the Iraq salinity problem in the agricultural sector. Based on SWOT analysis results, government should take into account the conservative strategies, the following actions are proposed in order to address the problem of salinity in Iraq:

- improvement of irrigation and salinity control, aiming at rationalizing water consumption
- encouragement the Iraqi nationals to study abroad on areas related to water management
- institutional development of effective legislations that can be pragmatically implemented in the rural sector
- investment in improved irrigation systems, such sprinkler and drop irrigation, aiming at a more efficient use of water resources.

Re-arrangement of the 17 proposed strategies according to their priority have also been introduced using QSPM. The results showed vital and important related facts, in which indicates that SWOT provides a good overview and makes it easy to pinpoint important problem areas.

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