

## Review: The State of Agricultural Extension in Iraq and the Challenges It Faces in Achieving the Sustainable Development Goals

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### Abstract

The agricultural sector in Iraq is one of the pillars of the national economy, given its vital role in promoting food security and providing employment opportunities, particularly in rural areas that rely primarily on agriculture as a source of income. Despite Iraq's vast agricultural resources, such as fertile land and water resources represented by the Tigris and Euphrates rivers, this sector has experienced a significant decline in recent decades as a result of successive wars. Climate change, deteriorating infrastructure, and weak agricultural policies have also led the agricultural sector to face serious environmental challenges, most notably water scarcity, rising soil salinity, and desertification, which have directly impacted agricultural production and the efficient use of natural resources. These challenges have contributed to a decline in domestic production and increased reliance on imports to meet food demand.

**Keywords:** *digital extension, agricultural challenges, climate change, natural resource management.*

### I. Introduction

Agricultural extension is one of the agricultural development mechanisms designed to transfer scientific knowledge and modern technologies to farmers in a systematic and coordinated manner, enabling them to improve crop productivity and reduce agricultural losses. This is achieved by training farmers in modern farming methods, integrated pest management, soil and water management, and the sustainable use of fertilizers and pesticides, as well as holding field workshops and distributing extension leaflets that contribute to improving product quality and increasing farmers' economic returns. Furthermore, agricultural extension helps farmers make decisions based on accurate scientific information to adapt to changing environmental conditions such as rising temperatures and water scarcity. (Al-Ta'iy, 2014) By promoting sustainable agricultural practices, such as resource-efficient farming techniques, improved agricultural waste management, and crop rotation, which leads to environmental protection and the reduction of environmental degradation in rural areas, economically, the application of extension knowledge leads to increased resource efficiency, reduced production costs, and enhanced competitiveness of agricultural products in local and international markets. (Muhabib & Al-Ta'iy, 2024) Agricultural extension also serves as a link between scientific research and farmers and their families, as it conveys research findings and new practices to farmers in a way that facilitates their application, thereby narrowing the gap between the theoretical aspects of research and its practical application, as well as promoting innovation in the agricultural sector. (Globe, 2025), making it a vital tool for achieving sustainable development goals and enhancing food security in Iraq.

Nevertheless, the agricultural extension system in Iraq suffers from poor performance due to institutional, technical, and human resource issues, which limit its ability to achieve sustainable agricultural development. (Hameed, 2024), including poor coordination between scientific research institutions and the agricultural extension system, which creates a gap between the production of scientific knowledge and its practical application in agricultural fields. (Al-Ahbab and Al-Ajili, 2021). Agricultural extension in Iraq also relies heavily on traditional methods, and makes only limited use of modern agricultural technologies and innovations, such as digital extension, which weakens and reduces its ability to reach a large number of



farmers. Furthermore, limited farmer participation in the planning and implementation of extension programs may reduce the effectiveness and impact of those programs (FAO, 2022).

Based on the above, the current state of agricultural extension in Iraq and an analysis of the challenges it faces in the field of sustainable agricultural development, particularly in light of global trends toward achieving sustainable development, which require an effective and sustainable agricultural system, this paper aims to analyze studies and literature related to the reality of agricultural extension in Iraq and to identify the challenges facing agricultural extension in achieving sustainable development goals.

## II. Materials and Methods

A descriptive-analytical approach was adopted, based on a review of studies, research, books, and reports related to agricultural extension in Iraq, as well as relying on secondary sources such as reports from the Ministry of Agriculture and the Food and Agriculture Organization (FAO), with the aim of analyzing the reality of agricultural extension in Iraq and identifying the challenges facing agricultural extension in achieving sustainable development goals.

### Literature Review

#### The Concept of Agricultural Extension

Agricultural extension is an educational process aimed at improving the knowledge and skills of farmers and their families (Hlatswayo & Worth, 2019). This concept has evolved from a traditional approach based on the transfer of knowledge and information to a modern participatory approach in which farmers actively and effectively participate in the learning process (Rivera & Qamar, 2003).

The agricultural innovation system approach is one of the most prominent recent trends, as it focuses on strengthening interaction among various stakeholders in the agricultural sector; digital extension has also become an important tool for improving access to agricultural information and knowledge through the use of modern technologies. (Aker, 2011). Agricultural extension is also directly linked to the achievement of the Sustainable Development Goals, particularly The second goal on ending hunger (United Nations, 2015).

#### The Reality of Agricultural Extension in Iraq

##### 1. Institutional Framework

The agricultural extension system in Iraq is characterized by centralized decision-making, which limits its effectiveness in meeting local needs. (Maher, 2017), as well as weak coordination between research institutions and the agricultural extension system, leading to a slow and inefficient transfer of modern technologies to farmers (FAO, 2022).

##### 2. Human Resources

Agricultural extension in Iraq suffers from a shortage of qualified and trained staff (Khamis et al., 2023), weak continuing education programs for agricultural extension workers (Khalaf & Al-Mashhadani, 2024), and brain drain, which has contributed to widening the knowledge gap within agricultural institutions (World Bank, 2018).

##### 3. Methods and Technologies

Agricultural extension in Iraq relies heavily on traditional methods such as field visits (Abdullah et al., 2025). In contrast, the use of technologies such as digital applications remains limited (Hashim & Aljubory, 2025), due to weak technological infrastructure and insufficient funding (World Bank, 2020).



#### 4. Relationship with Farmers

Numerous studies indicate a low level of trust between farmers and the agricultural extension system (Al-Ajeeli,2022). Furthermore, farmers' participation in the design of agricultural extension programs remains limited, which affects the adoption of modern agricultural technologies and innovations (Wang & Capareda,2020).

#### **The Role of Agricultural Extension in Achieving Sustainable Development**

Agricultural extension contributes to sustainable development through the roles it plays (Kamruzzaman et al.,2021), which are as follows:

##### **First: Improving agricultural productivity and reducing poverty**

Agricultural extension helps empower farmers to adopt modern technologies and effective management practices, such as improved seed use, integrated pest management, and good agricultural practices. These interventions lead to increased productivity and improved crop quality, thereby raising farmers' incomes and contributing to the reduction of rural poverty. The World Bank and the Food and Agriculture Organization have noted that quality extension services can make a significant difference in achieving food security and improving livelihoods.(Danso, 2018).

##### **Second: Promoting the sustainable management of natural resources**

Agricultural extension helps raise awareness about the proper and sustainable use of resources such as water and soil by promoting practices like resource-conserving agriculture and crop rotation, as these practices help maintain soil fertility and reduce environmental degradation.(AL-Harout, 2023).

##### **Third: Reducing the unsustainable use of agricultural inputs**

Agricultural extension promotes the rational use of fertilizers and pesticides, thereby reducing costs for farmers and limiting the negative environmental impacts resulting from their misuse, such as soil degradation and water pollution. It also encourages the use of modern irrigation technologies (such as drip irrigation) and precise nutrient management; in this regard, FAO reports indicate that agricultural extension plays an important role in improving resource use efficiency.(FAO, 2019).

##### **Fourth: Adaptation to Climate Change**

Agricultural extension is an important tool for helping farmers adapt to climate change by providing information on appropriate planting dates, selecting drought- or heat-resistant varieties, and managing climate risks. It also helps build the capacity of rural communities to cope with natural disasters. In this regard, the United Nations Development Programme (UNDP) has emphasized that agricultural extension is a key component of climate change adaptation strategies. (Al-Obaidi & Abdulrazzaq, 2020).

##### **Fifth: Promoting Climate-Smart Agriculture**

Agricultural extension services help disseminate the concept of climate-smart agriculture, which aims to achieve several important objectives: such as increasing productivity, reducing harmful emissions, and enhancing resilience, through the use of technologies like precision agriculture, soil carbon management, and improving energy efficiency in agricultural operations, via specialized extension programs of the Food and Agriculture Organization.(FAO,2019).

##### **Sixth: Promoting Innovation and Community Participation**

Agricultural extension is no longer limited to merely transferring information; rather, it has adopted a participatory approach that involves farmers in learning and decision-making processes, thereby promoting



local innovation and ensuring that solutions are adopted more effectively and sustainably.(Al-Ansari et al., 2020).

### Challenges Facing Agricultural Extension in Iraq

#### 1. Economic Challenges

Agricultural extension in Iraq suffers from insufficient government funding allocated to agricultural extension activities, which limits its ability to implement training programs and provide the necessary supplies to agricultural extension workers (Hamada & Ali,2025), (Muhaiabis,2025).Furthermore, limited investment in the agricultural sector in general directly affects the development of agricultural extension services, as insufficient funding leads to a shortage of field extension projects.(Khader & Ali, 2025), and a lack of financial incentives for agricultural extension workers .(Saber, 2020).

#### 2. Environmental Challenges

Iraq faces significant environmental challenges, including water scarcity and climate change, which affect agricultural production and increase pressure on agricultural extension services to provide adaptation solutions(Hamada & Ali, 2025). Furthermore, soil degradation and rising salinity in many agricultural areas pose an additional challenge requiring advanced extension efforts, as studies confirm that the limited use of modern technologies in soil management, such as remote sensing systems and scientific management of salinity levels, exacerbates these problems and reduces the efficiency of agricultural production.(Al-Atabi et al., 2019).

#### 3. Institutional Challenges

Bureaucracy and weak strategic planning within agricultural organizations constitute a major obstacle to the development of agricultural extension, Furthermore, poor coordination among various agricultural entities, such as the Ministry of Agriculture, universities, and research centers, leads to overlapping jurisdictions and authorities and a decline in the efficiency of agricultural extension work(Al-Khazraji & Al-Atwani, 2019). Furthermore, agricultural extension institutions suffer from a shortage of specialized staff and inadequate training and professional development programs. (Saber, 2020)

#### 4. Social Challenges

The low educational level of some farmers affects their ability to understand and adopt modern agricultural technologies, thereby reducing the effectiveness of agricultural extension.(Hamada & Ali,2025),Furthermore, low agricultural awareness and limited access to modern information sources limit farmers' response to agricultural extension recommendations.(Khader & Ali, 2025).On the other hand, migration from rural areas to cities has led to a decline in the agricultural workforce, affecting the sustainability of agricultural activities.(Sadiddin et al., 2023).

#### 5. Technological Challenges

Agricultural extension suffers from the limited use of modern technologies, such as e-extension and digital tools, while reliance on traditional methods persists (Saber, 2020).Furthermore, the lack of digital infrastructure in rural areas limits the potential for implementing digital agricultural extension, as studies indicate that the limited skills of extension workers in using modern technology in agricultural extension represent an additional obstacle to the development of agricultural extension work. (Khalaf, & Al-Mashhadani, 2024).

### III. Conclusions

We conclude the following from this paper:

1. Agricultural extension in Iraq suffers from a decline in its overall effectiveness in supporting sustainable agricultural development.
2. The agricultural extension system is weak in establishing the necessary link between scientific knowledge and practical application in the agricultural sector.
3. The current performance of agricultural extension reflects a weakness in the ability to keep pace with modern developments in the field of agriculture.
4. The impact of agricultural extension on farmers remains limited in terms of improving productivity and adopting modern technologies.
5. Agricultural extension services in Iraq have not yet reached the required level that would enable them to contribute effectively to achieving the goals of sustainable agricultural development.

### IV. Recommendations

1. Restructure the agricultural extension system, promote decentralization, and improve coordination between agricultural research institutions and agricultural extension services.
2. Develop the capacities of agricultural extension workers by intensifying continuous training programs and attracting specialized talent.
3. Adopt digital agricultural extension and improve digital infrastructure in all rural areas.
4. Increase government funding and encourage investment in the agricultural sector and agricultural technology.
5. Promote sustainable and smart agriculture that takes climate conditions into account to address environmental challenges.
6. Engage farmers in extension programs and training courses and enhance their agricultural knowledge.
7. Engage the private sector and international organizations in supporting extension programs that achieve sustainable development.
8. Adopt sustainable agricultural strategies that take climate change into account.

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