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Scarcity of Barley and Cotton Cultivation in Kirkuk Governorate (A Community Study)

Layla Ali Abid, Mohammed Yashar Omar
College of Basic Education, University of Kirkuk, Kirkuk, Iraq
Hashim Mohammed Ibrahim
Kirkuk Agriculture Directorate, Kirkuk, Iraq

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Annotation: The relationship between population growth and the possibility of achieving food security—especially under the conditions of climate extremism, tense political relations between countries, technological progress, and the disparity in the population pyramid between the working and non-working groups—makes agriculture at the forefront of the economic sectors that the state seeks to study and prioritize in both its branches (plant and animal) and find appropriate solutions for its problems. Among the most prominent problems affecting the agricultural community in Kirkuk Governorate is the scarcity of barley and cotton cultivation, particularly after the increase in barley imports from neighboring countries, namely Turkey and Iran, and the closure of the cotton gin in the governorate.

Therefore, we studied in the first section the geographical distribution of barley and cotton crops in the governorate and the possibility of representing this through maps using the Geographic Information Systems program (ArcView GIS 10.8.2). The second section focused on explaining the most significant reasons that led to the decline in productivity and the rate of change occurring during the period (2012–2022) and the recession of agricultural lands compared to other crops. As for the third section, it addressed providing the most important proposed solutions

through which productivity can be increased, representing this with graphs using Excel, and stating conclusions and recommendations, along with mentioning the sources and the appendix (the questionnaire form) adopted in the study.

Keywords: Data Analysis, Maps, Population Growth, Climate Change.

Introduction:

Agriculture constitutes one of the fundamental pillars in building national power, given its capacity to increase national income and meet local needs for agricultural products driven by population growth. This is especially significant as Iraq ranks among the leading countries renowned for cultivating cereal crops and various types of dates. The oldest agricultural villages appeared here approximately 12,800 years ago in the caves of northern Iraq, known by various names such as Mesopotamia, "Bilad al-Rafidain," "Bilad al-Sawad," and "Land of al-Batha"—all of which signify a generous land of high fertility (Al-Janabi and Ghalib, 2005).

Since the study area is considered an area of both rain-fed and irrigated farming with light alluvial soil, it uniquely combines agriculture and oil production. Agricultural lands account for 61% of the governorate's total area, ranking second among the northern governorates in the production of barley and cotton after Nineveh Governorate. However, production declined after 2003 due to the scarcity of irrigation water and rainfall, in addition to political issues within the governorate (Kirkuk Strategy Project, 2017). Therefore, the study problem centers on the following questions:

1. Is there a scarcity in the cultivation of barley and cotton in Kirkuk Governorate? And how can this be represented using statistical methods?
2. Is there an annual variation in the geographical distribution of barley and cotton crops in Kirkuk Governorate?
3. What are the reasons behind farmers' reluctance to cultivate barley and cotton in the governorate?

To answer the research problem questions, the study hypothesis emerges:

1. Yes, there is a scarcity in the cultivation of both crops in the governorate according to the 2022 agricultural plan. This can be represented by maps (point, area, or linear) via the Geographic Information Systems program (**ArcGIS 10.8.2**), which demonstrates the existence of scarcity in their cultivation within the governorate.
2. Yes, the distribution of the two crops varies across the governorate according to the natural and human factors of each administrative unit.
3. Most farmers have shifted away from cultivating barley and cotton, considering that barley is primarily used as animal fodder with low prices, and the cotton gin was closed due to the lack of government support for both crops.

The current study aims to advance the governorate's agricultural reality by achieving agricultural development and self-sufficiency in the cultivation of both crops, and reducing dependence on imports by addressing the problems facing agriculture as shown in Table (1). The total area of agricultural land reached approximately 3,299,472 dunums, while the area of non-agricultural land reached about 1,296,712 dunums. Through a comparison of the production of both crops, agricultural maps and graphs were produced to demonstrate how they can be utilized for the

public interest. Therefore, a quantitative analytical approach was adopted for data collection, analysis, and final presentation.

As for the spatial boundaries, they are represented by Kirkuk Governorate, which includes diverse administrative units from socio-economic perspectives. It is located in the northern and north-eastern part of Iraq; bordered to the north by Erbil Governorate, to the east and north-east by Sulaymaniyah Governorate, to the south, south-east, and west by Saladin Governorate, and to the north-west by Nineveh Governorate. Its astronomical location is confined between latitudes (34° 45' and 36° 00') North and longitudes (43° 25' and 44° 44') East.

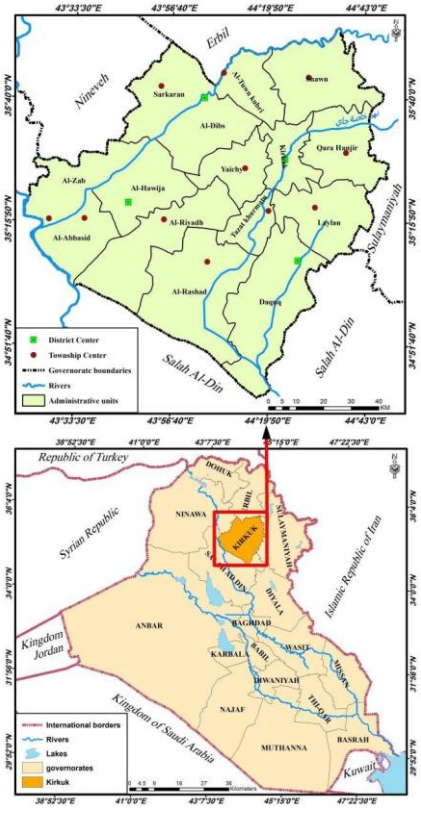
Refer to Map (1). As for the temporal boundaries, they span a ten-year period from (2012 – 2022). This duration is deemed sufficient to study the scarcity of cultivating these two crops in the study area and to provide proposed solutions to advance the agricultural reality of Kirkuk Governorate.

Table (1): Agricultural land areas and the number of agricultural districts in Kirkuk Governorate for the year 2023.

%	Orchards	%	Forests	%	Area of natural pastures	%	Number of villages	%	Number of agricultural districts	%	Irrigated area (dunums)	%	Rainfed area (dunums)	%	Area of arable land (dunums)	%	Area of Non-Arable Land / dunam	%	Area of Agricultural Land / dunam	Administrative Unit	T
33	1564	-	-	0.2	1024	3.9	20	3.1	13	0-1	1077	3-25	38846	2	39923	7	91604	4	131527	Kirkuk District Center	1-
-	-	-	-	23.8	117518	12.5	63	14.2	59	0-1	1418	15	179000	9	180418	4	51775	7	232193	Shwan	2-
-	-	2.1	77	27.2	135068	5.9	30	9.5	39	0-0	728	2-9	34582	1-8	35310	11-2	145590	5-4	180900	Qara Hanjar	3-
4.8	223	-	-	15.1	75000	8.8	44	7	29	0-6	6196	8	94554	5	100750	10-4	135110	7-1	235860	Laylan	4-
12.9	615	-	-	4.8	23467	3.1	16	3.4	14	7-1	65055	3	34953	5	100008	0-6	8642	3-2	108650	Taza	5-
-	-	-	-	4.3	21455	2.6	13	4.3	18	3-2	29212	3-8	45709	3-8	74921	0-2	2860	2-4	77781	Yaji	6-
4.5	212	79.2	2799	12.1	60000	5.6	28	7	29	3-7	33318	6-7	79987	5-6	113305	6-7	87293	6	200598	Diba District Center	7-
3.9	185	1.3	49	1.7	8250	6.9	35	8-2	34	12-1	110510	6-2	74983	4-2	86034	2-2	29755	3-6	115789	Tun Kubri	8-
-	-	-	-	0.4	2412	8.3	42	8.2	34	0-5	5000	5-3	64338	3-4	69338	6-2	81079	5	150417	Sarkaran	9-
23.8	1123	15.8	558	0.2	1445	17.5	88	4.4	18	24	217667	3-4	40858	13	258525	0-7	9300	8-1	267825	Hawija District Center	10-
-	-	1.6	45	2.3	11480	3.6	18	5	21	12-6	114262	10-3	123930	11-9	238192	7-7	100886	10-2	339078	Riyadh	11-
3.3	160	-	-	0.2	1253	5.4	27	3.4	14	7-9	71066	3-5	41842	5-7	112908	7	91187	6-1	204095	Al-Abbasi	12-
5.1	245	-	-	0.4	2000	2.3	12	6.6	27	2-3	20425	13-3	158610	9	179035	3-2	42013	6-7	221048	Zab	13-
5.4	254	-	-	5.6	27425	10.7	54	12	50	16-7	151325	9-2	110021	13	261346	12-9	167541	13	428887	Daquq District Center	14-
3.3	156	-	-	1.7	8000	2.9	15	3.7	15	9-1	82834	5-9	69913	7-6	152747	20	252077	12-2	404824	Rashad	15-
100	4737	100	3528	100	495797	100	505	100	414	100	910093	100	1192126	100	2002760	100	1296712	100	3299472	Al-Majmu'	16-

Source: Ministry of Agriculture, Kirkuk Agriculture Directorate, Planning Department, Unpublished Data, 2023 AD.

Map (1): Location of the Study Area within Iraq



Source: Republic of Iraq, Administrative Map of Iraq at a scale of 1:50,000, and Kirkuk Governorate Directorate, Engineering Department, Geographic Information Systems (GIS) Division, using ARCGIS 10.3 software for the year 2023

Section One: The Geographical Distribution of (Barley and Cotton) Crops in Kirkuk Governorate

Since the appearance of humans on Earth, they have sought their most essential needs: (food and shelter). Over time, population numbers have increased, necessitating expansion into areas adjacent to agricultural lands. Consequently, most agricultural lands have shifted to other uses, including residential, leading to the growth of villages and cities. This is particularly evident in Kirkuk Governorate, which occupies a prominent location in northern Iraq on the road connecting Baghdad and Erbil. It ranks fourth in importance among Iraqi cities after Baghdad, Mosul, and Basra. The Khasa River divides it into two parts: the eastern part, called "Aski Yaqa," and the western part, called "Qorya" (Khalaf, 2015).

Furthermore, it serves as a transitional point between the plains of central and southern Iraq and the mountainous regions of northern Iraq. It features the Khasa Chai River, where water flows in winter and dries up in summer. Therefore, agricultural lands in the governorate depend on rainwater, especially rain-fed (demic) lands, which are divided into (guaranteed rainfall and unguaranteed rainfall), compared to irrigated lands that rely on projects established on the Zab River, irrigation systems, and wells.

1-1: Barley:

Barley is considered one of the crops that most exhausts the soil and reduces its fertility, despite its tolerance for salinity, particularly (black and white barley). Moreover, its low prices compared to wheat have led many farmers to refrain from cultivating it, following the decline in livestock numbers—except in certain administrative units where it is grown in smaller areas for use as animal fodder, as shown in Table (2) and Map (2).Alton Kupri sub-district is among the administrative units most specialized in barley cultivation and production; in 2012, it reached approximately 4,520 dunums and 112 tons, with percentages of 14.4% and 7.5%, respectively, of the governorate's total area and production. By 2022, the cultivated area and production reached about 987 dunums and 296 tons, at percentages of 11.6% and 19% of the total. In contrast, Shwan sub-district showed a different trend over the past ten years; in 2012, the area and production were only 4 dunums and 1 ton (0.0%), but significantly increased in 2022 to reach 5,316 dunums and 797 tons, accounting for 62.6% and 51.1% of the governorate's total production. Meanwhile, the sub-districts of Qarahanjir, Taza, Yaychi, Sargaran, Al-Zab, Al-Rashad, and the centers of Hawija and Daquq districts became entirely devoid of barley cultivation by the year 2022

Table (2): Geographical Distribution of Barley and Cotton Crops in Kirkuk (2012 – 2022)

2022														2012												Administrative Unit	T
%	Cotton productivity/ton	Yield/kg	%	Cotton area / dunum	%	Production / ton	Total Yield / kg	%	Total cultivated area / dunum/	Yield (kg) Barley		Area cultivated (dunums) / Barley		%	Cotton productivity/ton	Yield/kg	%	Cotton area / dunum	%	Production / ton.	Total yield / kg	%	Total cultivated area / dunum	Yield / kg of barley		Cultivated area / dunum of barley			
										Deep	Irrigated	Deep	Irrigated											Deep	Irrigated	Deep	Irrigated		
-	-	-	-	-	2-9	45	150	3-5	300	150	-	300	-	-	-	-	-	-	6-2	417	383	3-5	1090	383	-	1090	-	Kirkuk District Center	-1
-	-	-	-	-	51-1	797	150	62-6	5316	150	-	5316	-	-	-	-	-	-	0-0	1	90	0-0	4	90	-	44	-	Shwan	-2
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5-2	350	100	11-1	3500	100	-	3500	-	Qara Hanjir	-3
-	-	-	-	-	2-3	35	100	4-1	350	100	-	350	-	-	-	-	-	-	6-7	447	100	14-2	4470	100	-	4470	-	Laylan	-4
-	-	-	-	-	-	-	-	-	-	-	-	-	-	6-1	52	100	1-1	528	1.6	104	250	1-3	418	-	250	-	418	Taza	-5
-	-	-	-	-	-	-	-	-	-	-	-	-	-	0-0	28	517	0-1	55	10-5	706	478	4-8	1477	-	478	-	1477	Yaychi	-6
-	-	-	-	-	3-2	50	200	3	250	200	-	250	-	0-0	6	493	0-0	13	1-6	106	530	0-7	200	95	435	100	100	Dibs District Center	-7
-	-	-	-	-	19	296	300	11-6	987	300	-	987	-	-	-	-	-	-	7-5	506	112	14-4	4520	112	-	4520	-	Tun Kobri	-8
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	1000	100	32	10000	100	-	10000	-	Sargaran	-9
-	-	-	-	-	-	-	-	-	-	-	-	-	-	36-2	10400	650	34-2	16000	1-7	113	1050	0-3	108	450	600	-	108	Hawija District Center	-10
-	-	-	-	-	16-5	288	300	11-3	962	100	200	947	15	22	6337	487	27-9	13013	7-9	527	480	3-6	1098	-	480	-	1098	Riyadh	-11
68-8	132	1100	70-6	120	3	48	150	3-0	326	-	150	-	326	5	1451	150	20-8	9677	25	1684	650	8-2	2592	-	650	-	2592	Al-Abbasi	-12
31-2	60	1200	29-4	50	-	-	-	-	-	-	-	-	-	27-8	7980	580	3	1376	0-1	11	450	0-0	26	-	450	-	26	Zab	-13
-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	271	515	1-1	528	9	598	396	4-9	1512	-	396	-	1512	Daqaq District Center	-14
-	-	-	-	-	-	-	-	-	-	-	-	-	-	7-9	2264	410	11-8	5523	2-1	147	454	1	324	-	454	-	324	Rashad	-15
100	192	2500	100	170	100	1559	1350	100	8491	1000	350	8150	341	100	28799	5902	100	46713	100	6717	383	100	31339	1430	4193	23684	7655	Al-Multqa	-16

Source: Ministry of Agriculture, Kirkuk Agriculture Directorate, Planning Department, unpublished data, 2023.

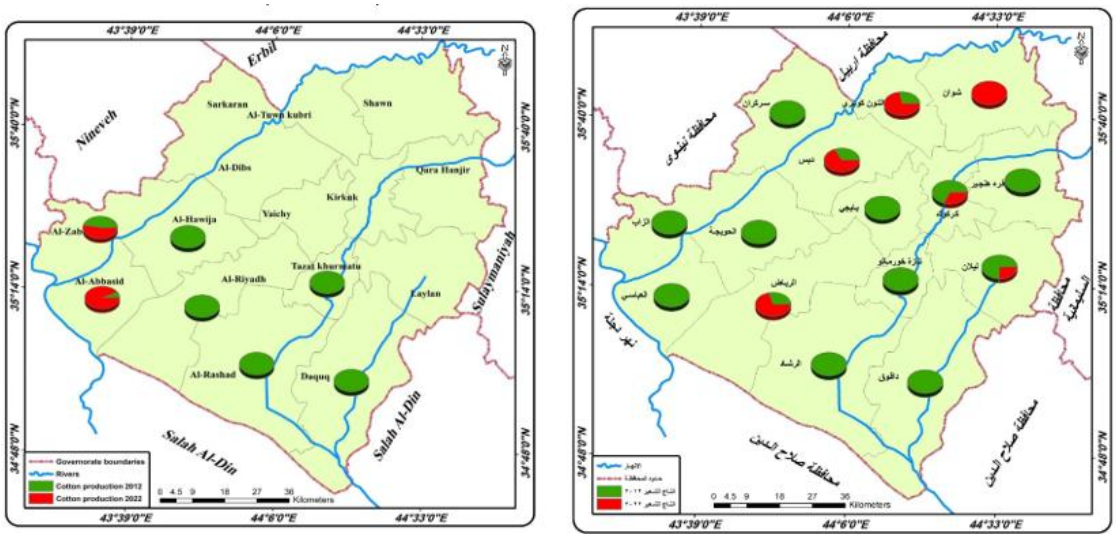
1-2: Cotton

Cotton cultivation and production in Kirkuk Governorate have recently witnessed an abnormal recession. Despite the existence of a cotton ginning plant affiliated with the Ministry of Industry, production has declined unexpectedly, as illustrated in **Table (2)** and **Map (2)**. In 2022, only **Al-Abbasi** and **Al-Zab** sub-districts were dedicated to cotton cultivation, with areas of

approximately 120 dunums and 50 dunums, and production quantities of 132 tons and 60 tons, respectively.

In contrast, in 2012, most administrative units were cultivated with cotton, particularly **Hawija District** and its affiliated sub-districts. Successful cotton cultivation requires specific climatic conditions, notably high temperatures and solar radiation, as well as intensive irrigation. It demands large quantities of water and a significant labor force, especially during the harvest season. Consequently, the highest production levels in 2012 were recorded in **Hawija Center** and **Al-Zab sub-district**, with approximately 10,400 tons and 7,980 tons, covering areas of 16,000 dunums and 1,376 dunums, respectively. However, **Al-Riyadh sub-district** recorded the highest cultivated area (13,013 dunums, 27.9% of the total). The interplay of environmental factors (natural and human) and the requirements of the production process during the growing season have led to the current reluctance of farmers to cultivate this crop.

Map (2): Geographical Distribution of Barley and Cotton Crops in Kirkuk Governorate (2012–2022).



Source: Based on Table (2).

Section Two: Main Causes for the Scarcity of Barley and Cotton Cultivation in Kirkuk Governorate

Kirkuk Governorate possesses natural and human potentials that rank it among the most arable provinces, particularly for cereal crops (winter and summer). While wheat and yellow corn are predominantly grown across all administrative units, there has been a recent "scarcity" in barley and cotton cultivation. Most farmers have completely abandoned these two crops, despite their popularity in previous decades, especially in the 1990s. During that period, their cultivation flourished, creating new opportunities such as reducing unemployment and meeting local needs for textiles and animal/plant products. The expansion of cotton areas led to the establishment of the cotton gin in Kirkuk Center, while barley cultivation supported livestock breeders, leading to the opening of the slaughterhouse in **Taza sub-district** (affiliated with the Ministry of Health) to increase meat production.

Analysis of data from the Plant Production and Planning departments at the Kirkuk Agriculture Directorate, along with field survey results (Questionnaire), revealed that the primary reasons for this decline are as follows, as shown in **Table (3)** and **Figure (1)**:

1. Lack of Government Support: Government intervention aims to assist farmers in overcoming obstacles to achieve self-sufficiency and optimize resource utilization by increasing agricultural output (Sultan, Ali, and Ahmed, 2021). According to **Table (3)**, **32.5%** of farmers

confirmed that the lack of government support is the main reason for abandoning these crops, especially when compared to the support provided for wheat and yellow corn.

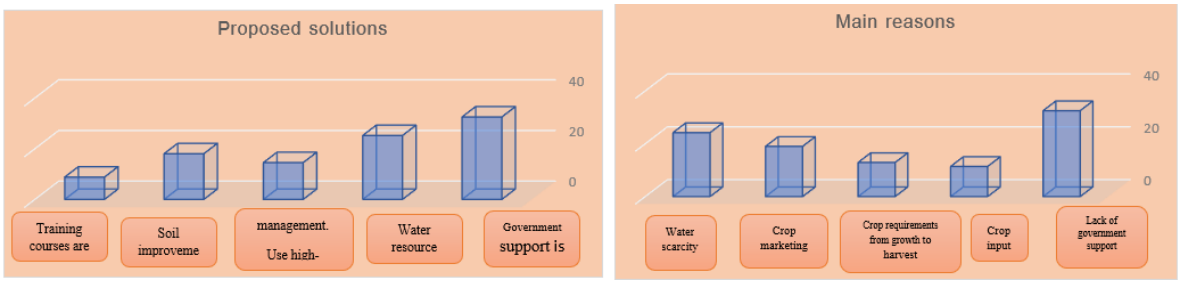
2. Crop Outputs (Utility): The outputs and economic returns of barley and cotton are lower compared to wheat. As shown in **Table (3)** and **Figure (1)**, **11.4%** of farmers emphasized that the utility of these crops is limited; barley is mostly restricted to animal fodder (with very little used for bread), while cotton is limited to the textile industry cotton textiles and some furnishings have seen a complete absence of market demand due to the import process from abroad. This is especially true for Turkish and Iranian barley, which are used in producing barley bread and its derivatives, as well as barley water. Similarly, the import of Turkish and Iranian clothing and furnishings—among other neighboring countries where factories thrive and produce various varieties from these two crops—has turned Iraq into a mere consumer market for their manufactured goods

Table (3): Main Causes for the Scarcity of Barley and Cotton Cultivation in Kirkuk Governorate and Proposed Solutions

%	Proposed solutions to address the problem	%	Main reasons	ت
32.5	Government support is provided	32.5	Lack of government support	1-
25.2	Water resource management (rainwater harvesting)	11.4	Crop inputs	2-
14.5	Using good seed varieties or types in agriculture	12.9	Crop requirements (from growth to harvest)	3-
18	Soil improvement	19	Crop marketing	4-
8.8	Conducting specialized training courses and seminars for two crops only	24.2	Water scarcity	5-
100	Total	100	Total	6-

Source: Appendix (3).

Figure (1): Main Causes for the Scarcity of Barley and Cotton Cultivation in Kirkuk Governorate and Proposed Solutions



Source: Table (3).

3. Crop Requirements (From Growth to Harvest): The cultivation of barley and cotton requires the purchase of seeds, planting, and irrigation, as well as protection against agricultural pests during the growth stage, extending to the labor needed for harvesting. This imposes high material costs that do not align with the profits obtained by the farmer, leading to an abandonment of their cultivation. It was found that approximately **12.9%** of the total farmers in the study area, as shown in **Table (3)** and **Figure (1)**, confirmed that the profits gained from these two crops are disproportionate to the time, effort, and high cost involved in their cultivation.

4. Crop Marketing: The ultimate goal of any farmer in the agricultural process is marketing to achieve high profits or to meet the family's needs, especially regarding seasonal vegetables.

Since the marketing of these two crops has become non-existent in Iraq, it represents a concern for about **19%** of the total farmers in Kirkuk Governorate. This percentage confirms that the marketing process constitutes the most critical factor in the reluctance to cultivate them, as illustrated in **Table (3)** and **Figure (1)**.

5. Scarcity of Water Resources: Cotton is a summer crop that requires a large amount of water during the irrigation process. Barley, on the other hand, is a winter crop whose production depends on the fluctuations of rainfall. Since most agricultural lands in Kirkuk Governorate suffer from water deficit and desertification during the summer, farmers are forced to avoid its cultivation. Climate changes in the study area are a fundamental factor in the scarcity of water resources; thus, **24.2%** of the total farmers in the study area confirmed this. Despite the presence of the Little Zab (a tributary of the Tigris River) and the existing irrigation projects, these resources are primarily utilized for wheat. This is because wheat productivity surpasses barley due to physiological factors; the wheat grain has a larger mass, which results in higher water-use efficiency compared to barley (Al-Rawi and Sabri, 2020).

Section Three: Proposed Solutions to Increase the Cultivated Area of Barley and Cotton in Kirkuk Governorate

The Food and Agriculture Organization (FAO) of the United Nations estimates that global food production must double to ensure food security for a world population expected to reach 8.7 billion by 2025. This problem is further complicated by the loss of approximately 5-7 million hectares of agricultural land due to degradation in developing countries, where population growth far outpaces available natural resources. Rapid population growth leads to the spread of poverty, disease, and low wages, all of which negatively impact agricultural lands (Kamal, 2007). Expanding agricultural production benefits not only farmers but society as a whole by reducing the need for agricultural imports (Freeman, 1991).

In Iraq, food imports have been growing at a remarkable pace, while the growth of food exports has remained slow, limited, or stagnant during the 1980s and 1990s, exacerbating in recent years. In Kirkuk Governorate, the gradual development of agriculture began after oil investment in 1927 through the construction of irrigation, drainage, and flood control projects, such as the Hawija and Kirkuk irrigation projects. These aimed to provide water to farmers and transition them from nomadism to stability. Consequently, the governorate represents a unique economic model combining agriculture and oil (Salem, 2009). Although various winter and summer crops are grown, there has been a recent scarcity in barley and cotton, despite the economic and environmental benefits of including them in crop rotation systems. The primary proposed solutions are:

1. Providing Government Support: The spatial distribution of agricultural land use is influenced by government policies, land ownership patterns, and traditional practices. Understanding the complex, multi-faceted spatial relationship between geographical factors and agricultural land use is essential for effective planning, resource management, and sustainable agricultural development (Khalid & Khader, 2024). This solution accounts for **32.5%** of the total proposed solutions in the study area, as shown in **Table (3)** and **Figure (1)**, and can be achieved through:

- **A.** Providing financial loans to farmers for every agricultural season.
- **B.** Setting a fixed and supportive price per ton for both crops.
- **C.** Reopening the cotton gin in the governorate and reducing the import of cotton textiles and foreign barley (Turkish and Iranian), while relying on local production to meet the needs of the governorate and the state.

2. Water Resource Management (Rainwater Harvesting): The scarcity of water resources leads to a decline in agricultural activity, especially with rising salinity levels in groundwater.

Salinity concentrations gradually decrease toward the north in the recharge zones extending north of Kirkuk (Khalaf & Majid, 2021). Furthermore, urban encroachment on both arable and non-arable lands—whether state-supported or through informal settlements—poses a threat, particularly in the absence of planning policies to accommodate population growth or weak government oversight (Suleiman, 2016). This solution represents **25.2%** of the total proposed solutions.

Given that water resources in Iraq face significant challenges due to climate change and neighboring countries' control over river sources, the state must construct new dams to harvest water during flood seasons. Additionally, there is an urgent need to rehabilitate and expand the Hawija and Kirkuk irrigation projects to compensate for the water shortage required by the cotton crop during the summer season.

3. Using High-Quality Seed Varieties in Cultivation: The cultivation of any crop in any agricultural region requires high-quality seeds, fertilizers, and pesticides to increase production, in addition to adopting diverse modern agricultural methods using high-quality machinery for both planting and harvesting. Cultivating barley and cotton in Kirkuk Governorate requires chemical fertilizers such as Urea, Compound Fertilizer (NPK), and DAP, which were previously distributed to farmers by the Agriculture Directorate at subsidized prices to support the agricultural reality of the governorate. However, the change in the Directorate's policy, oversight, and withdrawal of support for farmers has led to a reluctance to cultivate these crops. This solution accounts for **14.5%** of the total proposed solutions in the governorate, as shown in **Table (3)** and **Figure (1)**.

4. Soil Improvement: Soil is a fundamental element of agricultural production, representing **18%** of the proposed solutions in the study area to improve the cultivation of barley and cotton in Kirkuk. The success of the agricultural process, the quality of yields, and the volume of production depend on studying soil fertility and drainage levels. Agricultural crops vary in their need for nutrients present in the soil; some are soil-exhausting, such as cotton and corn, as they absorb large quantities of nutrients (Al-Zooka, 2000). Consequently, the soil may become unsuitable for production, leading farmers to shift to other uses, particularly residential use. A study conducted on soils in Kirkuk regarding the impact of desertification indicated that they exhibit three levels of sensitivity to desertification (Jassim, Mohammed, & Al-Hindi, 2016).

5. Organizing Specialized Educational and Extension Workshops for the Two Crops: Conducting scientific lectures through seminars and workshops that explain to farmers the importance of these two crops, their role in enhancing the governorate's agricultural reality, and methods to increase profit margins is essential. This was particularly evident during the 1990s, especially with the cotton crop and its role in operating the cotton gin and increasing the demand for labor during the harvest season. Such initiatives, led by the Extension Division of the Kirkuk Agriculture Directorate, encourage farmers to increase cultivated areas and account for **8.8%** of the total proposed solutions. Among the most important seminars held at the Kirkuk Agriculture Directorate are:

Table (4): Selected Scientific Seminars and Workshops for Barley and Cotton at the Kirkuk Agriculture Directorate

T	Title of the seminar or activity	Section
1-	Developing the cultivation of strategic crops to increase yield per dunam (cotton, barley)	Plant Production
2-	Agricultural training courses in the governorates (governorate centers)	All Sections
3-	Developing the cultivation of winter and summer vegetables	Plant Production
4-	Agricultural publications	All Sections

Source: Ministry of Agriculture, Kirkuk Agriculture Directorate, "The Agricultural Reality in Kirkuk Governorate and Future Prospects for Development," unpublished data, 2025.

(*) (NPK): Refers to the primary nutrients: Nitrogen (N), Phosphorus (P), and Potassium (K), such as the balanced **NPK 20-20-20** fertilizer:

- ✓ **Nitrogen (N):** Dedicated to the growth of leaves and stems.
- ✓ **Phosphorus (P):** Specifically for the development of plant roots.
- ✓ **Potassium (K):** Dedicated to the growth of flowers and fruits.

Conclusions:

By studying the geographical reality of Kirkuk Governorate and analyzing the data from the Kirkuk Agriculture Directorate regarding (Cotton and Barley) for the period (**2012 – 2022**), the research reached the following conclusions:

1. A massive decline in the percentage of land cultivated with **Cotton and Barley** in Kirkuk Governorate during the period (2012–2022) compared to other crops. The growth trend for both crops in the governorate has been moving in a negative direction over time.
2. Most agricultural lands in Kirkuk Governorate suffer from water deficit and desertification during the summer season. This forces farmers to avoid summer crops, particularly cotton, compared to barley. This is due to climate change and water fluctuations in the **Kirkuk and Hawija irrigation projects**, which are affected by their sources being located outside Iraqi borders.
3. The suspension of operations at the **cotton gin**, the difficulty of marketing barley, and its low market value due to technological advancements have led farmers to abandon these crops, in addition to the high costs associated with their cultivation.
4. The lack of government support for farmers specializing in these two crops, followed by the insufficiency of financial allocations granted by the specialized lending fund for purchasing seeds or fertilizers, which are supposed to support the farmer and advance the governorate's agricultural reality.

Recommendations:

Based on the conclusions reached in this study, the following recommendations are proposed to address the scarcity of barley and cotton cultivation in Kirkuk Governorate:

1. Increasing the areas dedicated to **Barley and Cotton** cultivation by providing farmers with the appropriate agricultural supplies and incentives to encourage their return to planting these crops.
2. Rehabilitating existing **irrigation projects** and constructing new dams for **rainwater harvesting** to increase the governorate's water quota and ensure its delivery to most agricultural lands during the summer season.
3. Rehabilitating and restarting the **cotton gin** by the Ministry of Industry to receive crops from farmers, thereby creating job opportunities and reducing unemployment in the governorate.
4. Providing robust **government support** through financial loans, setting a fixed and supportive price per ton for both barley and cotton, and subsidizing seeds, fertilizers, and pesticides

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