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Opportunities and Challenges of Sustainable Agricultural Development in Iraq

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ABSTRACT

The objective of this research is to study the opportunities and Challenges of Sustainable Agriculture in Iraq. Agriculture is an important element in the achievement of food security and one of the most important resources in the promotion of the national economy. Iraq suffers from inadequate agricultural investments, non-exploitation of its resources , as well as the low level of technology ,lack of financial allocations , credit facilities and human qualified staff, so Iraq has steadily increased dependence on imports to meet domestic food needs, he was importing about half of his food supply since the1980s. By 2002, between 80 and 100 percent of many basic staples (wheat, rice, sugar, vegetable oil, and protein meals) were imported.

The role of agricultural sector in Iraqi economy can be seen through its contribution to GDP which had been declining rapidly due to the lack of a clear strategy for sustainable agricultural development, Policies aimed at supporting agriculture have often led to inefficiencies and decreased production. The average value added in the agricultural sector in Iraq as percent of GDP had been declining from 16.23 percent in 1968 to a minimum of 2.0 percent in 2019, and a maximum of 20.59 percent in 1995. For comparison, the world average in 2019 based on 144 countries is 10.46 percent .

To achieve sustainable agriculture development the optimum use of natural resources, human resources, capital resources and technical resources are required. Strategies may directly improve the efficiency, effectiveness, and management of agricultural development. The revolution in the agricultural sector can make it an engine sector of the economy and supportive of economic development.

Keywords

Sustainable, Agricultural Development, Opportunities, Challenges, Iraq.

1. INTRODUCTION

International organizations like the World Bank Group, the United Nations Development Program and the Food and Agricultural Organization FAO emphasis that the agriculture and food sector can play an important role in rural job creation and income generation and, relatedly, therefore is an important sector that can contribute to political and economic stability. The agriculture and food sector in Iraq is labor intensive and able to absorb large amounts of labor, upstream (input supply and primary production), midstream (handling and processing) and downstream (distribution and marketing) (Bank 2018). Agricultural growth has been shown to be an important driver of poverty reduction and job creation, especially among the rural poor . In addition, if agricultural development can improve the allocation of resources within households, it will likely lead to better health and nutrition outcomes for children as well. Sustainable agricultural development comprises sustainability of agricultural production, sustainability of the rural economy, ecological and environmental sustainability within agricultural systems and sustainability of rural society (Jingzhu Zhao 2007) .Agriculture is critical for human welfare and economic growth. That applies to both developed and developing world. However, it has a particular significance in countries where people still live in extreme poverty with subsistence agriculture as their main source of food and income. Typically, in most developing countries, people depend on farming for their livelihood (Jacek UZIAK 2017).

The agriculture sector is still a major source of livelihood for the poor and food insecure and is the largest source of rural employment. The sector contribution to GDP (agriculture is the second contributor after oil revenues), declined from about 9 percent in 2002 to 3.3 percent in 2008 and 3.6 percent in 2009, but it still provides 20 percent of employment. Population is about 32 million of which one third resides in rural areas and depends upon agriculture for their livelihoods. Population growth rate is about 3 percent at the national level.

Iraq faces a number of challenges with a direct impact on all the economic sectors of the country. These are

related to the security situation, weak institutions, the deterioration of basic services and of social indicators in areas such as health and education, widespread unemployment about 50 percent of the work force according to some estimates, and absolute poverty where more than 60 percent of the population depends on the government's rationed food basket. This study aims to explain the challenges facing the agricultural sector in Iraq to develop some treatments in the light of the existing potentialities to overcome these challenges in the agricultural sector

1.1 Research Problem

Iraq has many and varied agricultural potentials, such as agricultural land, water, labor force ... and others, but it faces a number of challenges in multiple areas such as climate, low level of technology , financing, and the absence of a clear agricultural strategy ... and others, and we believe that adopting a sustainable development approach can allow Iraq Advancement, progress and overcoming all problems and challenges in the agricultural sector in particular and the economy in general.

1.2 Purpose of the Study

1.To analyze the role that agricultural sector has played in Iraq's economy.

2. To understand the capacity of the agricultural sector, including key trends and challenges that existed.

3.To provide preliminary recommendations help to overcome the challenges facing the Iraqi economy in all its sectors .

1.3 Study Methodology

To achieve the objectives of this study, we adopted the descriptive analytical approach, which is concerned with collecting data and information on the agricultural sector in Iraq and the role of sustainable development, to be used in analyzing the agricultural sector in Iraq, and to clarify the challenges facing it and then set a vision and objectives for how to use sustainable development to meet these challenges. The collected information included scientific reports, books, articles, Working papers, national program frameworks to determine the most important information that will be used in the necessary analysis.

1.4 Research Hypothesis

The research is based on the following hypothesis: The adoption of an integrated rational planning approach helps to advance the reality of the agricultural sector in Iraq and addresses all or most of the challenges facing or enhance the stability of the Iraqi economy. It can help in overcoming the challenges facing the Iraqi economy in all its sectors, especially agriculture, otherwise the agricultural sector remains ineffective in the Iraqi economy.

2. Concept of Sustainable Agriculture Development

In 1991, the concept of sustainable agriculture and rural development was put forward for the first time at the Conference on Agriculture and the Environment in The Netherlands, held by the Food and Agriculture Organization (FAO) of the United Nations at Hertogenbosch (den Bosch). Its basic principles are to maintain a sufficiency of land for agriculture, to guarantee food security, to improve current living standards, to safeguard the development of future generations and to establish harmonious mechanisms for agriculture and economic development that ensure a prosperous rural society (Schaller 1993).

Its general goals are to (i) increase grain yield, ensure food security and eliminate famine, (ii) increase peasants' income, eliminate poverty and stimulate comprehensive agricultural development, and (iii) use and protect natural resources and the agricultural environment while improving the natural environment for present and future generations (Jingzhu Zhao 2007).

Food and Agriculture Organization of the United Nations (FAO) defines sustainable agriculture development as 'the management and conservation of the natural resource base, and the orientation of technological and institutional change in such a manner to ensure the attainment and continued satisfaction of human needs for present and future generations (Jacek UZIAK 2017).

Sustainable agriculture is defined as a system that, "over the long term, enhances environmental quality and the resource base on which agriculture depends; provides for basic human food needs; is economically viable; and enhances the quality of life for farmers and society as a whole" From this statement numerous definitions emerged but the concept surrounding agricultural sustainability remains the same. Also sustainable agriculture is defined as a commitment to satisfy human food needs and to enhance the quality of life for farmers and society as a whole, now and into

the future (Attanda 2013).

The prime aim of sustainable agricultural development is to secure enough food for present and future generations. In recent decades, demands for food quantity and quality have been increased sharply in Iraq due to the improvement of people's living standards and continuous economic growth. The potential for increased agricultural production is constrained mainly by the extreme shortage of water and cultivated land resources, low productivity, inefficient agricultural policy and management systems and soil degradation (Jingzhu Zhao 2007).

3. Dimensions of Sustainable Development

Modern sustainable agriculture system includes multiple, different dimensions that overlap with each other, represented by, ecological, economic, and social sustainability.

3.1. Ecological Sustainability

Sustainable agriculture improves fertility and soil structure, increase the organic matter content of the top soil, thus raising its ability to retain and store water that falls as rain , increasing the diversity of crops produced and raising the diversity of insects and other animals and plants in and around the fields. sustainable agriculture reduces the use of hazardous chemical and control pests, reduces the arability of the land, improving productivity, conserving the soil etc.

3.2. Economic Sustainability

Economic sustainability is represented by increasing the welfare of society and eliminating poverty, through the optimal and efficient exploitation of natural resources, i.e. achieving economic growth and the equitable distribution of resources and wealth. And the better exploitation of natural capital (Abboud 2013), (Tarraf 2012).

3.3. Social Sustainability

The social dimension means reaching an adequate standard of living, and a long and healthy life (Al-Taher 2013), Stabilizing demographic growth (controlling population). The full use of human resources, Health and education, Strengthening the role of women and Good Governance (Tarraf 2012).

Sustainable agriculture ensures that the burden and benefits are shared equitably between man and woman. While conventional farming focuses on a few commodities, sustainable agriculture improves food security by improving quality and nutritional value of food, and by producing bigger range of products throughout the years. Traditional farming was also driven by the caste and wealth oriented people. The rich and higher castes benefitted more, while the poor and lower castes are left out. Sustainable agriculture attempts to ensure equal participation, which recognizes the voice and speech of every people (Parihar 2015).

4. Agriculture Sector in Iraq

On a total population of 37.2m, the rural population in Iraq is about 11m people or 30% of the total population today. The urban population is about 26m people or 70% of the total population (World Bank online dataset). Though decline and stagnation of the agricultural sector has contributed to a rural-urban migration, urban unemployment has induced some people to move back into agriculture (RFSAN 2016) .Agricultural growth is considered a potential driver of poverty reduction for the rural poor, this may contribute to a better health and nutritional status of children too (World Bank 2017: 59).

Agriculture is the most important source of rural employment. For women, employment in agriculture amounted about 44% of the total women employment, while for men this was 16% of total men employment in 2017, compared to 26% for women and 13% for men in 20005. Most rural households have an agricultural plot (Beer 2016).

The area suitable for agriculture is about 9.3m hectares, which is approximately 25% of Iraq's surface. The total area under cultivation is much smaller, estimated in between 2-4 million hectares, of which 1.2m hectares is cultivated in the Kurdistan Region. Cereals and grains represent by far the largest share of the agriculture land. Wheat is also the most regulated crop (RFSAN 2016).

In Iraq, all the agricultural strategies and policies undertaken since the middle of the last century aimed at achieving high percentages of food security, a goal that was never reached. However, better food security was achieved during the 1950s and 1960s compared to later decades due to war and economic sanctions. The post-2003 war period has witnessed a negative shift away from this aim as a result of deterioration in the quality of in-use fields and livestock pastures.

Over the past decade, the sector has continued to

decline, compounding the effects of a period of stagnation in the 1990s30. As the sector stagnated, small farmers left the countryside and went to urban areas. The most recent estimates available indicate that the rural population comprises nearly one-third (31%) of Iraq's overall total, suggesting that there are ample opportunities to support livelihoods as well as a need to do so. Pre-conflict estimates also indicate that up to one third of Iraq's population works in the agriculture sector, a figure that corresponds to approximately 11 million out of 35 million Iraqis. In terms of contributions to GDP, Iraq's agricultural sector (10% at most) is relatively small. Oil revenues comprise (38%), and an even larger proportion (61%) of the economy when the oil-funded public sector is taken into account. The oil industry provides few jobs, however, and despite the fact that agriculture makes up as much as one third of employment, Iraq's oil wealth has allowed it to become dependent upon imported food, which has discouraged domestic production and supplied the market with artificially-priced commodities. (FAO has estimated that the contributions of the agricultural sector to Iraq's economy may be even smaller and that they have been decreasing over time 9% in 2002 and declining to 3.6% in 2009) (FAO 2012).

The conflict with ISIS has had a number of short and long-term consequences on agricultural production in Iraq; however, it will be difficult to reliably estimate the extent of damage until a large-scale assessment can be done. According to Iraq's Ministry of Agriculture, ISIS may have reduced Iraq's agricultural production capacity by 40% and destroyed its goals for self-sufficiency. An assessment by FAO published in February 2016 found extensive long-term damage to agriculture in areas that had been under ISIS control. For example, the assessment found that between 70-80% of land planted with corn, wheat, and barley was damaged (leading to lower yields) or destroyed in Salah al-Din Governorate.

Approximately 32% of land dedicated to wheat production was damaged and 68% was lost in areas assessed in Nineveh Governorate. For livestock, an estimated 80% of sheep and goats, 50% of cows, and 90% of poultry throughout the entire area assessed had been lost. Fish production was reported to be down by 20-80% depending on the areas assessed (Nations 2016).

Contribution of agriculture to GDP had been declining rapidly due to the lack of a clear strategy for sustainable agricultural development, Policies aimed at supporting agriculture have often led to inefficiencies and decreased production. The average value added in the agricultural sector in Iraq as percent of GDP had been declining from 16.23 percent in 1968 to a minimum of 2.0 percent in 2019, and a maximum of 20.59 percent in 1995. For comparison, the world average in 2019 based on 144 countries is 10.46 percent (Bank 2019).

Table 1. Value added in the agricultural sector of Iraq as percent of GDP 1968-2019

Year	Added value	rank	Year	Added value	rank
1968	16.23	54	1994	20.11	56
1969	15.3	54	**1995**	**20.59**	**55**
1971	15.79	55	1998	10.91	94
1972	**18.99**	**51**	2000	4.63	129
1973	13.54	55	2002	8.56	97
1974	8.19	65	2004	6.94	104
1975	7.84	65	2006	5.83	108
1980	4.70	86	2008	3.85	122
1982	10.30	70	2010	5.16	111
1984	13.35	64	2012	4.12	118
1986	14.84	65	2014	4.90	111
1988	14.59	71	2016	3.80	120
1990	8.25	92	2018	2.00	136
1992	19.8	57	**2019**	**2.00**	**117**

Source: (Bank 2019).

5. Opportunities (Potentialities)

Iraq has economic potentials that many countries of the world may lack, the most important of which are the distinguished location, wide lands suitable for agriculture, labor and availability of water, in addition to the containment of its lands on wealth and other natural resources, and with regard to the agricultural sector, they are as follows:

5.1 Agricultural Land

The total areas of agricultural land in Iraq (suitable for agriculture), are about (44.46) million dunums. The total area of land available for irrigation is about (22.86) million dunums. The irrigated area is about (13.240) million dunams. The percentage of arable land area is about (26.1%) of the total land area of the country (Al-Aqidi 2009).

The average per capita share of arable land is about 1.7 dunums, which is close to the global average of 2 dunams. This confirms the existence of vast land resources that have not been invested from agriculture so far. As well as the existence of other opportunities for horizontal expansion that requires reclamation operations and this requires additional costs (Resan 2011).

Table 2. Cultivated and Arable land (million acres)

Years	Cultivated land (million acres)	Arable land (million acres)
2005	14.7	34.4
2006	14.1	48.0
2007	14.2	30.4
2008	14.2	44.4
2009	10.5	48.0
2010	12.0	44.0
2011	13.0	43.1

(Central Bureau of Statistics 2011)

A significant decrease in the cultivated areas has occurred , for example in 2005 the cultivated areas amounted to (14.7) million dunums, while the arable lands reached (34, 4) million dunums, that is, more than half of the arable areas are not utilized. In 2011, the cultivated areas amounted to (13.0) million dunums, and the area of arable land reached (43.1) million dunums.

The decrease in the cultivated areas was due to several reasons, including: The low financial returns (Insufficient financial returns from agriculture sector) , Through the availability of cheap imports from neighboring countries on the market, farmers in Iraq are in a disadvantaged position, yet far from being outcompeted on the market , the decline of government support for the agricultural sector had a negative impact on production and productivity.

Crop production is the major source of income for the majority (75 percent) of farmers in Iraq, while the rest depend on livestock or mixed crop and livestock enterprises .Most farming in Iraq entails planting and harvesting a single crop per year. In the rain fed areas, the winter crop, primarily grains, is planted in the fall and harvested in the spring. In the irrigated areas of central and southern Iraq, summer crops predominate. Double cropping, usually of vegetables, exists where irrigation water is available over more than a single season. In terms of area cultivated, there are large variations between the years due to climatic and/or economic reasons.

Wheat and barley are the main crops, followed by dates, maize and rice. Rain-fed farming is concentrated mainly in northern Iraq. In central and southern Iraq, agriculture depends mainly on irrigation from the Tigris and Euphrates rivers . In the central provinces, fruit trees, mainly citrus, are inter-planted in date palm orchards. Vegetables, mainly tomatoes and potatoes, are important irrigated crops.

Cereals, primarily wheat and barley, are Iraq's most important crop (approximately 80 percent of cultivated area). The north and central rain-fed areas are the principal wheat producers. On average, farmers in Iraq cultivate about 3 million hectares of combined wheat and barley each year. Between 0.7 to 1 million hectares of wheat and 0.4-0.8 million hectares of barley may be irrigated each years (Paolo Lucani 2012).

Table 3. cultivated areas, production and productivity of wheat crop

Years	Area(000) donums	Production(000 tons)	Productivity/kg
2005	6411	2228	347.6
2006	6054	2286	377.6
2007	6280	2203	350.8
2008	5741	1255	218.6
2009	5050	1700	336.7
2010	5544	2748	495.8
2011		2808.9	
2012	6914.5	3062.3	604.5
2013	7376.3	4178.4	576.7

(Ministry of Planning 2013)

Table 4. cultivated areas, production and productivity of barley crop

Years	Area(000) donums	Production(000tons)	Productivity/kg
2005	4253	754	177.4
2006	4104	719	244
2007	4375	748	171
2008	5396	404	174.9
2009	2818	502	178
2010	4027	1137	282.4
2011		802.2	
2012	2849.5	832.0	257.3
2013	3363.6	1003.2	358.5

(Ministry of Planning 2013)

Table 5. cultivated areas, production and productivity of Rice crop

Years	Area(000) donums	Production(000tons)	Productivity/kg
2005	428.2	308.7	720.8
2006	507.7	363.3	723
2007	407.4	392.8	789.8
2008	339	248.2	731.9
2009	219.7	173.1	787.6
2010	191.9	155.8	812.1
2011			
2012	318.8	361.3	1133.5
2013	383.8	451.8	1177.2

(Ministry of Planning 2013)

Table 6. cultivated areas of Some crops and vegetables in Iraq ('000 ha)

Crops/years	1985	1990	1995	2000	2005	2009
Maize	21	69	63	73	174	114
Dates	105	124	168	110	50	120
Tomatoes	47	54	77	110	50	51
Watermelons	53	43	37	53	48	53
Eggplants	14	12	10	22	23	21
Potatoes	9	12	26	39	51	20

(Paolo Lucani 2012)

Table 7. Production of Some crops and vegetables in Iraq ('000 tones)

Crops/years	1985	1990	1995	2000	2005	2009
Maize	41	172	90	55	401	238
Dates	390	545	470	650	615	507
Tomatoes	612	722	870	989	939	913
Watermelons	757	561	470	650	615	326
Eggplants	233	144	160	529	439	396
Potatoes	149	195	417	545	808	223
Milk	476	472	298	606.	483.	n.a.

(Paolo Lucani 2012)

Based on that, we can say that there are suitable agriculture lands in large areas that have not been invested until now. This means that there is a possibility of exploiting unused agricultural lands, the imposition of horizontal expansion in land use is still significant. As well as there are other opportunities for expansion that require additional costs , as well as the presence of the possibility to increase the productivity of most agricultural crops in Iraq.

5.2 Labor Force

The agricultural sector makes a significant contribution to total employment in general and rural employment in particular. Small-scale farmers are the back-bone of the agricultural sector, the second most important employer in the country . Employment in agriculture is about 20% of total employment in Iraq. For women, employment in agriculture amounted to about 44% of the total women's employment, while for men this was 16% of total men's employment in 2017, compared to 26% for women and 13% for men in 2000. Some figures suggest that almost 50% rural households have an agricultural plot; while 7% of the households in urban areas have an agricultural plot (Beer 2016) . A survey conducted in the Kurdistan Region suggests that 74% of the households in rural areas are engaged in agriculture.

Agricultural growth is considered a potential driver of poverty reduction and employment for the rural poor, and if agricultural development comes together with a better allocation of resources within households this may contribute to a better health and nutritional status of children too. Yet farmers face poor access to formal credits (commercial and government banks), while the capacity to provide credits of informal networks (trader, community) is limited . It must also be noted that agriculture is not a preferred sector of employment and much of the labor is provided by IDPs and refugees from Syria (Joost Jongerden 2018).

The percentage of rural population differs from the total population from one governorate to another. The highest percentage of the rural population was in Salah al-Din Governorate (55.8), followed by Babylon Governorate (52.8), Anbar Governorate (51.6), and the lowest percentage was in Baghdad Governorate (12.8) and Sulaymaniyah (15.1).

Table 8. Percentage of rural population out of total population by governorate for the year 2011

Governorate	Ratio (%)	Governorate	Ratio (%)
Dohuk	26.6	Karbala	33.5
Nineveh	39.2	Wasit	42.1
Sulaymaniyah	15.1	Salah al -Din	55.8
Kirkuk	28.3	Najaf	28.9
Erbil	16.8	Qadisiyah	43.5
Diyala	52.1	Muthanna	56.3
Anbar	51.6	Thi Qar	37.1
Baghdad	12.6	Maysan	27.6
Babylon	52.8	Basra	20.1

(Central Statistical Organization 2011)

Table 9. Rural population in Iraq (absolute and relative), 1960–2015

Rural Pop. in Iraq	1960	1980	2000	2010	2015
Millions	4.2	4.77	7.4	9.5	11.0
Percentage of total	57.1	34.5	31.5	31.0	30.5

(Joost Jongerden 2019)

It is clear that the country that has an agricultural workforce of 30% of the population is able to go to strengthen and support the agricultural sector, to provide the necessary opportunities to support labor force in this sector, provide them with decent living opportunities, and secure food for the community as a whole. Another advantage is the diversity of the climate in Iraq and the suitability of its lands for various types of crops, vegetables and fruits, all of which are among the factors that support the development of the agricultural sector.

5.3. Water Resources

The water resources of Iraq, diversified and divided into:

a. Rain and Snow:

Rainwater and snow are source of surface and underground water, and their quantities and seasons are affected by the nature of the prevailing climatic conditions, and the percentage of rain's contribution to feeding the Tigris and Euphrates varies annually, as the proportion of the amount of rain reaching the course of

the Euphrates is 58% of the total rainfall compared to 70% for the Tigris River. Accordingly, their participation in the water supply of the Euphrates does not exceed 16.2%, while in the Tigris is high, reaching 48.5%. This is due to the nature of the climate prevailing in the Tigris and Euphrates basins. As the amount of rainfall in Iraq is about (99.865) billion m3. The amount of precipitation in the Tigris and Euphrates varies from year to year, and the following table shows the annual total of rainfall on Iraqi lands.

Table 10. Total rainfall (mm) in Iraq for the period (1998_2009)

The year	Precipitation is in Millimeters	The year	Precipitation is in Millimeters
1998	1678	2004	2073
1999	4656	2005	1796
2000	3829	2006	3115
2001	5481	2007	1478
2002	3560	2008	2892
2003	1768	2009	1472

Source: The General Authority for Meteorology and Seismic Monitoring for several years.

The quantitative variation in precipitation from one year to the next, as well as the variation in rainfall between the different parts of Iraq. The greater part of central and southern Iraq receives rain that does not exceed 250 mm. It is a small amount that is not sufficient for agricultural use nor to finance underground stores with good drainage quantities, in addition to the high evaporation due to the high temperature in them. As for snow, it is limited to the high northern regions of Iraq and the mountain ranges on the borders with Turkey and Iran. The melting snow, fed by the Tigris River, contributes 28.8% of its total water supply. As for the Euphrates, melted snow contributes about 48% of its total annual water supply (Sharif 2010).

B. Surface water

Iraq is the country of the two rivers, the Tigris and Euphrates, which are the source of the largest capacity of irrigation water used in agricultural production. The water resources of the two rivers and their tributaries are estimated at approximately 44 billion m3 in drought years and 77 billion m3 in prosperous years (Beshay 2003) . Both the Tigris and the Euphrates are two cross-border rivers. Where each of the two rivers originates from Turkey, and before they meet, the Euphrates River flows about 1000 km and the Tigris River about 1300 km inside the lands of Iraq.

- The Euphrates River: - It originates from the mountains of Turkey from the area between the Black Sea and Lake Van, and it consists of two tributaries (Murad - Sow) (Karah - Sow) at the village of Kian, where it is known as the Euphrates River. The total length from its sources until its meeting with the Tigris River is about (2940 km, and the area of its basin is about (388) thousand km. It is not connected to the Euphrates River, any tributary, during its entry into Iraqi territory (Hijazi 1996) .

C. Underground Water

The contribution of groundwater to feeding the Euphrates is about 35.7% (it decreases in wet years to 7.9% and rises in dry years to 48.2%), while the contribution of groundwater to recharge the Tigris River is about 22.7% (Sharif 2010) . The availability of groundwater at present is estimated at about 5.9 billion cubic meters of water annually, covering the needs of 64,000 hectares of agricultural land, in areas where surface water is not usually available (Beshay 2003). The diversity of water sources in Iraq, including rainwater, river water, and groundwater, despite the challenges it faces, is an important and supportive source for the agricultural process.

5.4. Livestock

a. Animal Production

Livestock (sheep and goats, cattle, camels, buffaloes), inland fisheries and backyard poultry raising are important as a source of protein and income for the rural population. Livestock production in the past represented 30-40% of the total value of agricultural production and contributed significantly to household nutrition. Performances of small ruminants, namely sheep and goats, were severely reduced during the last two decades, due to massive selling outside the Iraqi borders, loss of genetic potential and reduction in herd size. The small
ruminant sector in Iraq also suffers from the lack of any kind of organization among the producers It is now slowly recovering but is estimated to provide only 2gr. of domestically produced animal protein per capita per day as opposed to 18gr. pre–sanctions (FAO 2018).

Table 11. Animal Products for the Years 2000-2010

Animal products	2000	2002	2004	2006	2008	2010
Red meat 1000 tons	702	1305	1320	1363	1497	1549
White meat 100 tons	994	1680	647	1124	848	826
Milk is 100 tons	1153	2475	2527	2621	2724	282
Wool 100 tons	7585	8180	2900	7971	8043	8116
Hair 100 tons	2741	4214	4365	4521	464	485
Leather 100 tons	1241	2615	2551	2602	26518	2702

Source: Agricultural Statistical Atlas, 2011

We note from the above table that the production of red meat continues to rise, while the production of

white meat fluctuates. In general, this production does not cover the local demand for meat. The high prices of local meat pushed the Iraqi family, especially the poor families, to consume imported meat for its cheap price.

Table 12. Marine and River Catches 2000-2010 (tons)

Fish	2000	2002	2004	2006	2008	2010
Riverine	12416	16015	15495	41167	41432	46381
Navy	15194	29524	2888	15666	62121	9490
Total	27610	45539	18383	56833	47853	55871

Source: Agricultural Statistical Atlas, 2011

The fluctuation and decrease in fish production from year to another, led to import Meat (frozen) fish, which loses its nutritional value due to being frozen for a long time, and the reason for consuming imported fish is due to its low prices, as is the case with red and white meat.

b. Poultry

Iraq's total production of live chicken meat was estimated at (89,811) tons in 2012 with an increase of (2,655) tons of the total production of Iraq for the year 2011, where it was (87,156) tons, an increase of (3%), and the production of private sector projects reached (89,741) tons, at a rate of (99.9%) of the total production of Iraq, and the government sector production was estimated at (70) tons, at 0.1% of the total production of Iraq. Note from the previous numbers and ratios. Poultry projects focus on private sector projects and the government's role is almost non-existent in establishing, operating and supporting poultry projects. The amount of table eggs produced in Iraq for the year 2012 amounted to about (1104) million eggs, an increase of about (85) million eggs from the total production of Iraq for the year 2011. It reached about (1019) million eggs, or (8.3%).

Table 13. Amount of live Meat and eggs Production for the Years (2007-2012)

Years	Live meat production (1000) tons	% Change rate	Eggs produced (1000) Eggs	% Change rate
2007	40.3	-	807729	-
2008	36.9	8.4-	915594	13.4
2009	34.1	7.6-	704652	23
2010	52.8	54.8	926213	31.4
2011	87.2	65.2	1018834	10.0
2012	89.8	3.0	1104204	8.3

(Ministry of Planning 2013)

5.5 . Dates and Fruits

a. Dates

Until 1996, Iraq was the world leading country in terms of number of trees (about 22.3 million) and one of the main producing countries of dates in the world, as Iraq is distinguished by its production of many and rare varieties of dates, compared to the producing countries, and dates are considered one of the most important national wealth, along with other natural resources such as crude oil and other resources. The date production for the year 2013 was estimated at (676.1) thousand tons, with an increase of (3.1%) compared to the 2012 production, which reached (655.5) thousand tons. The average production of the produced palm tree was (68) kg (Ibrahim 2011).

Table 14. The quantity and the average productivity of the produced palm trees for the years (2009 - 2013)

Years	Production (tons)	Annual rate of change	Average of the Palm productivity	Average Palm Production)
2009	507002	6.4	62.4	59.5
2010	566829	11.8	67.6	64.5
2011	619182	9.2	71.1	67.6
2012	655450	5.9	71.1	68.3
2013	676111	3.2	68.0	65.4

(Ministry of Planning 2013)

a. Fruits

Fruits are important and necessary food crops for the sustainability of human life. The central and northern governorates of Iraq are considered habitats in which fruit trees are cultivated in abundance, and they are each of the governorates (Salah al-Din, Baghdad, Diyala, Nineveh, Wasit, Anbar), which are distinguished from the rest of the governorates with the highest production . The following table shows the production of fruits for the years 2012-2013.

Table 15. Production of fruits for the years 2012-2013

The crop	Production (tons) 2012	Production (tons) 2013	Percentage of increase (%)	average productivity Tree / kg
Grape	241842	270072	11.7	25
pomegranate	142648	161822	13.4	30.5
Apples	52318	62433	19.3	32
Apricot	23152	26276	13.5	27.2
Fig	9835	9867	10.4	9.7

(Organization 2013)

The vegetable sector shows high potential for improvement. This improvement should not only be sought at the level of the production, among others by means of protected cultivation and training to improve product quality, but also should add to the ability of farmers to create stronger connections with markets

(e.g. productive alliances). The Iraqi dairy sector and poultry needs to be re-established after its collapse in 2003, with the involvement of the Iraqi private sector. Two opportunities should be considered. One is the further development of the current processing industry, and the other is the reestablishment of dairy collection stations. These could be considered for both central and South Iraq, as the Northern and Kurdistan Region.

The potato sector is a promising sector and is labor intensive. The sector has seen serious growth over the last few years due to involvement of Dutch potato seed suppliers. Most potatoes are produced in the Kurdistan Region, though there are potential in other regions too, such as Mosul and north-west of Baghdad, an important potato producing region in Iraq in the recent past. There seems to be good potential for aquaculture. One of the alleged successes of aquaculture is that there is no competition with subsidized exports from Turkey and Iran, as is the case in other sectors.

Through a preview of the economic potentialities in Iraq , it appears that the Iraqi economy possesses a rich and diversified base of resources. he has agricultural land and water resources, the national labor force is more than ten Millions of people, and it far exceeds the resources found in any country in the region . Despite the record of deterioration in the economic, financial, human and commercial indicators, it is possible for the sum of these and other resources to advance the Iraqi economy again and restore its previous position as a country and place it within the developed countries within a short period. We believe that government support for the agricultural sector can have good effects, and this is what was achieved in the period of the economic blockade in the nineties, as the agricultural sector's contribution to the GDP was approximately 21%, which is the highest rate witnessed in Iraq.

6. Challenges

The agricultural sector faces a number of problems and challenges. Successive years of drought, fluctuation in rainfall, environmental changes, and various risks, in addition to the loss of key cycles in agricultural marketing. This has led to losses in agricultural production from harvesting to consumers and the lack of agricultural insurance companies and associations specialized in agricultural mechanization, marketing, and transport, etc.

Despite the historical heritage of agricultural activity in Iraq, the agricultural sector has suffered, and is still suffering, from significant problems and challenges that can be summarized as shown below.

1. Decline of Production and Productivity:

Decline of agricultural production efficiency, productivity and agricultural products, which caused a deficit in meeting the demand for food and food security requirements. In terms of value, the main food commodities imported included wheat (1.1 billion USD), chicken (692 million USD), sugar (584 million USD), wheat flour (447 million USD), and eggs (293 million USD). By contrast, Iraq exported 48.6 million USD worth of dates, accounting for over 80% of its total agricultural exports (Nations 2016).

Table 16. Iraq main food commodities imported (USD) 2011

food commodities	value
Wheat	1.1 billion USD
Chicken	692 million USD
Sugar	584 million USD
Wheat Flour	447 million USD
Eggs	293 million USD

Source: (Nations 2016)

The productivity of wheat in Iraq is actually higher than in Iran and Jordan, and equal to Turkey. For potatoes, also, Iraqi yields surpass those of Jordan and are quite close to Iran and Turkey. The productivity of vegetables, according to these figures, are low. The high production per hectare in the potato and wheat sector, and the low production per hectare in cucumber, eggplants, and tomato, can be explained by looking at the market. When market prices fall, farmers can sell their potatoes for this fixed price to the trader, for which purpose the company has expanded its cold storage facility. The production is released again at the market, when imports dry up and prices rise again. So, its market regulation results in price security, organized by the trader, which stimulates farmers to produce, and results in high productivity (Joost Jongerden 2019).

The high production per hectare in wheat is the result of central regulation, which stimulates farmers to increase production. The central government buys wheat at silos throughout the country for a pre-declared price above the market price. It determines criteria for the three quality classes it distinguishes and their prices. In 2018, A class grain was purchased at 500,000 Iraqi dinar per ton, the B class at 480,000, and C class at 420,000. According to information obtained from farmers, the market price was between 350,000 and 380,000 Iraqi dinar per ton wheat, so there was a premium in selling to the silo. Production in the Kurdistan region spiked from 517,000 tons to 1,006,000 tons in the period 2012–2016 (Joost Jongerden 2019).

Table 17. Comparison of productivity in four

countries, 2017 (tons per ha)

Crop	Iran	Iraq	Jordan	Turkey
Wheat	2.0	2.9	1.0	2.9
Potatoes	32.1	26.6	26.0	30.9
Cucumber/gherkins	23.7	7.6	96.2	47.2
Eggplants	30.5	16.5	33.1	34.4
Tomatoes	39.6	16.9	67.5	65.4

(Joost Jongerden 2019).

Iraq imports 80% of its food needs, Iraqi Ministry of Trade imported in 2011 food supplies for a value of US$ 6 billion, Iraqi private sector food imports in 2011 reached Nearly US$ 10 billion. The annual food demand in Iraq increased by 25% in 2011 compared to 2010, local product satisfies only 20% of the local market demand according to the ministry of agriculture (The 5th International Exhibition for Agriculture, 2012) (Mahmud 2013).

Table 18. Iraqi Food Needs 2012/ tons

Item	Annual Production	Annual Demand	Self-Sufficiency
Red Meat	175000	500000	30%
White Meat	140000	300000	45%
Fish	65000 tons	120000	55%
Wheat	2 million	4 million	50%

(Agriculture 2012)

2. Nutrition security

The need to import food is increasing, in line with failure Local agricultural production kept pace with population growth, which reached About 2.5 percent per year .The high rates of import dependency on a number of food commodities For example, the import habit is 99.86 percent of sugar 82.96percent from oils, 15.60 percent from rice, and 50.31 percent of dairy products, and 2.73 percent of wheat flour .This has clearly indicated that the availability of adequate food supply In Iraq, it depends to a large extent on its ability to finance imports The food needed to fill the gap, which in 2015 reached a percentage 2.1percent of food exports to imports. And it continued (Program 2018).

3. Natural resources (water and land)

The area of Iraq covers 174.8 million donums, of which about 28 million donums (16.1%) are arable land. Cultivated lands amount to 14.562 million donums (52% of arable land), and there are large agricultural areas (about 4-5 million donums) affected by dunes. Of the latter, 600,000 donums have been reclaimed. There is a clear decline in incoming water resources whether from Tigris and Euphrates rivers outside Iraqi borders, or from feeding rivers inside Iraq, whose water resources, in turn, have declined due to drought conditions. These conditions have negatively affected the tributaries, groundwater, storage levels in dams and reservoirs. In addition, many vital facilities, such as Ramadi and Fallujah Barrages,Warwar and Taqsim regulatory dams, and some other important secondary facilities, were destroyed or damaged.

a. Land Degradation and Salinity

Losses in agricultural livelihoods resulting from land degradation and salinity have been significant in the past two decades, and are expected to continue to increase as a result of climate change and increased drought in Iraq. Based on current salinity levels, an estimated US $ 300 million per year is lost due to salinity impacts. These losses are enormous, especially in dry areas affected by salinity from irrigation. The decrease in crops resulting from the salinity of the Tigris and Euphrates rivers has reduced production from 40 to 65 percent from levels that could be achieved under improved management practices. Reducing soil salinity could double the area planted with crops in irrigation project areas from the current 30%, which could increase agricultural production by about US $ 3.2 billion annually) (Program 2018).

b. Water Shortage

Iraq will witness more shortages in water resources and low quality after Turkey and Syria develop their irrigation projects. Turkey and Syria are aiming at planting more than 2.4 million hectares that will be irrigated from the Euphrates basin, and approximately one million hectares that will be irrigated from the Tigris. This will cause a deficiency in revenues (water availability) from the Tigris and Euphrates of more than 43 percent in 2015 (Paolo Lucani 2012).

Iraq location as a downstream country of the Tigris and the Euphrates created a critical situation and made it vulnerable to actions by upstream states (Turkey and Syria). Turkish and Syrian plans to use the Tigris and Euphrates waters, especially Turkey's East Anatolia Project, which includes building 22 dams to meet the irrigation needs, have negatively affected Iraq. Iranian projects, as well as diverting the stream of some rivers inside Iran and discharging the drainage water towards Iraqi rivers, have also affected the Iraqi joint rivers with Iran. Therefore, the projects of these three states would create two main challenges by 2035, as the following:

1. Decline of Iraqi water resources by 1 billion m3 annually will lower water resources at the borders from 43.7 billion m3 in 2015 to 28.5 billion m3 by 2035, in addition to water losses that lower

irrigation efficiency to less than 50%.

2. Increase in saline concentrations from 320 PPM to 500 PPM in Tigris River, and from 540 PPM to 930 PPM in Euphrates River.

3. High waste ratio in irrigation water of more than 50% because of on-farm losses, and low irrigation and transport efficiency as a result to using old and traditional methods in water management.

4. Weak institutional and legislative system that became unable to address the serious water resources challenges.

5. Low investments in water resources projects.

6. Loss of huge quantities of available reservoir because of military operations against terrorism that negatively affected the environment, agriculture, services and humans.

8. Increase of groundwater extraction rate of about 5.243 billion m3 (8.8% of freshwater sources),representing freshwater extraction of 1.472 billion m3 annually through groundwater systems (Planning 2018).

4. Climate and Geological Changes

Climate change would affect water resources situation in Iraq negatively. This will lead to severe variations in incoming water from Tigris and Euphrates Rivers, causing floods or drought. Furthermore, rainfall in Iraq has decreased compared to past decades, which expanded desertification. Additionally, Iraqi geography has entered in seismic repercussions that may affect existing dams and barrages.

5.Development Challenges

Represent with Poor investment environment, limited private capital investments, and poor allocations and funding in the agricultural sector that is out of proportion to required financial needs for this sector's growth and development. Poor control and monitoring of border outlets that led to increased illegal competition of imported agricultural crops and products with local ones. Failure to optimally exploit arable land due to terrorist operations in Nineveh, Salah Al-Din, Kirkuk and Diyala ; infrastructure sabotage, youth migration, and seeking non-agricultural jobs for higher income, especially in security and defense. Destruction of many infrastructures in agricultural sector such as regulatory dams, irrigation and drainage channels, as well as silos and agricultural machinery and equipment, especially in the provinces affected by terrorism.

It is clear that it is political instability, volatile markets, and climate change, make it obvious that the farming population faces many challenges. Considering the market invasion of the cheap and subsidized imports, the key challenge for the local small-scale family farmers is to have the ability and the chance to produce for the local mark which any development approach or project needs to address to be successful.

7. Conclusions

1. The Iraqi economy has a rich and diversified base of resources, as it has the second largest global reserves of crude oil, and has agricultural land and water resources, which makes it far from the risks of water scarcity currently.

2. Iraqi national labor force is more than ten million people, which far exceeds the existing resources in any of the countries of the region, it is possible for the sum of these resources to advance the Iraqi economy.

3. There is a possibility to increase the percentage of the agricultural sector's contribution to the GDP, increase the coverage of agricultural production in both the plant and animal parts of the Iraqi food basket (food security).

4. Decline of agricultural production efficiency, productivity and agricultural products, which caused a deficit in meeting the demand for food and food security requirements.

5. There are suitable agriculture lands in large areas that have not been invested until now.

6. Iraq faces a number of challenges with a direct impact on all the economic sectors of the country. These are related to the security situation, weak institutions, the deterioration of basic services and of social indicators in areas such as health and education, widespread unemployment.. .

8. Recommendations

Achieving the advancement of the agricultural sector for the next phase in Iraq requires clear strategic priorities and objectives, taking into account the important role of the ministries of planning, agriculture and water resources. Some of these elements and actions that may be taken by the state are summarized as follows:

1. Increasing the percentage of cultivated land from arable land and improving production and productivity.
2. Protect agricultural inputs and outputs from imported products**.**
3. Support Domestic Private Sector and Foreign Investment to invest in integrated plant and animal production projects.
4. Ensuring Iraq's need for financial resources, by claiming Iraq's water rights from the source

countries by concluding an agreement to share the waters of the Tigris River and its tributaries and the Euphrates River, while rationalizing water consumption within the country.

5. Providing the basic necessities for cultivation of improved seeds, fertilizers and pesticides, setting up a policy to enhance national production and ensuring farmers' production of strategic crops.
6. Supporting livestock and livestock production projects by rehabilitating the existing ones, establishing new projects in the public and private sectors, and providing the necessary facilities, especially for the private sector.
7. Supporting development in the rural settlements by securing acceptable levels of infrastructure and services, including rural housing, services, roads, rural electrification, energy provision, and equipping villages with educational, health and recreational services.
8. Increasing the volume of water storage through the implementation of dam projects and the optimal use of water, as well as the use of modern irrigation techniques to prevent wastage in the use of water.
9. Using modern technologies in irrigation and agriculture methods.
10. Increasing water productivity, Preventing losses in the domestic, industrial and agricultural use of water ,prevent losses as much as possible.
11. The enactment of laws and regulations to protect the local product by ensuring fair prices for local agricultural crops not to compete with their counterparts.

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