

Al Qaesi, Hussein Ali Hussein; Abbas, Abdulmuttaleb; El-Jubouri, Mohamed Dhary Yousif

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Reality and prospects of organic agriculture in Iraq and neighboring countries

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REALITY AND PROSPECTS OF ORGANIC AGRICULTURE IN IRAQ AND NEIGHBORING COUNTRIES

HUSSEIN ALI HUSSEIN AL QAESI¹, ABDULMUTTALEB ABBAS², MOHAMED DHARY YOUSIF EL-JUBOURI³

Abstract. *Agriculture in Iraq represents a vital component of the country's economy. Prior to the development of the petroleum industry, agriculture was the primary economic activity in Iraq.*

Over the past several decades agriculture's role in the economy has been heavily influenced by Iraq's involvement in military conflicts (particularly the 1980-1988 Iran-Iraq War, the 1991 Gulf War, and the 2003 Iraq War). These military conflicts influenced government policy intervention to promote and/or control agricultural production. In 1971 to 1990, Iraq's population grew at an annual rate of 3.2% compared with only a 1.2% growth rate for Iraq's cereal production, given the context that cereals are the principal source of calories in Iraq.

Nowadays, there is a strong debate about which direction should Iraqi agriculture take, for its revival and for contributing to national wellbeing, taking also into account the growing competition for water and the challenges due to climate change.

This study will be divided into four main sections, which is an introduction in which the literature will also be reviewed, the second main section will be dedicated to organic agriculture and related activities since organic agriculture represents an important method for the extension of agriculture. The last two important sections will be dedicated to the results, which will contain tables of statistical data followed by a discussion in which data will be interpreted, and it will end with the conclusions and recommendations for prospects of organic agriculture in Iraq.

Keywords: *organic agriculture, agriculture in Iraq, extension of agriculture*

JEL Classification: O13, Q 50

INTRODUCTION

The present research is situated in the field of agriculture, focusing on evaluating the reality and prospects of organic agriculture in Iraq and neighboring countries, such as Iran, Jordan, Saudi Arabia, Turkey, and Syria.

1. How are environmental conditions in the Iraq and neighboring countries changing?
2. What is the reality of organic agriculture in Iraq and neighboring countries?
3. What are the prospects of organic agriculture in Iraq and neighboring countries?
4. What are practical activities of society responding to the issues?

The aim of this study is also to serve as a baseline that will allow measuring progress in the future and get insights about Organic Agriculture's potential within the current Iraqi agriculture framework.

Agricultural productivity growth is important because it is an essential source of overall growth in an economy, that is why productivity differences among countries, and mainly between developed and underdeveloped ones, represents a central issue of development economics. By Middle-Eastern standards, Iraq is well endowed with agricultural resources that include fertile soils, access to water from two major river systems (the Euphrates and the Tigris), and extensive irrigation potential. Multiple claims to individual land and water rights have evolved, spawned by political patronage and persecution, and outright military conflict.

For centuries Iraq has been a net food exporter, thanks to its abundance of water and land, with a relatively small population. After World War II and independence, oil revenues were invested for a

¹ Ph. D Student, University of Agricultural Sciences and Veterinary Medicine Bucharest, 59 Marasti, District 1, 11464, Bucharest, Romania, Phone/Fax: 00 40773 870 500; mail: hussein_782003@yahoo.com

² Ph. D Student, University of Agricultural Sciences and Veterinary Medicine Bucharest, 59 Marasti, District 1, 11464, Bucharest, Romania, Phone/Fax: 00 40733 230 691; mail: abd_mtlb@yahoo.com

³ Ph. D Student, University of Agricultural Sciences and Veterinary Medicine Bucharest, 59 Marasti, District 1, 11464, Bucharest, Romania, Phone/Fax: 00 40 744 6474 10; mail: mdhj1965@yahoo.com

massive modernization of the agro-industrial complex in Iraq, with capital intensive initiatives and the introduction of modern inputs and the expansion of irrigation (Schnepf, 2003).

Iraq's agricultural sector suffered a first structural change in the late nineteenth century at the creation of large privately-held estates, followed, in 1958, by the rise to dominance of the central state. In 1979, Saddam Hussein assumed power and immediately set out to recreate the state under his control. Many factors, such as population growth, massive urbanization, warfare and domestic turmoil have determined an ever increasing recourse to food imports and during the conflict with Iran, many producers were almost obliged to abandon input intensive production systems and they had to retrieve traditional methods and to rely on local inputs. This is why, at the time, extension of agriculture is an important matter of discussion, since it has a major economic and sociologic impact. According to many Iraqi experts and within the Iraqi population, there is a growing awareness about the pollution problems caused by the misuse of chemicals, while the cost of many imported inputs makes them unaffordable for most small farmers (Bashur, 2008).

There is a pressing need to factor in the impact of climate change on Iraqi agriculture. Iraq's capacity to adapt to climate change at the moment is considered to be marginal, but the country is expected to develop a capacity to adjust since it has the financial resources to invest in its future and to neutralize the negative impact of global warming on its economy.

Regarding the direction that agriculture should take in Iraq, Iran, Saudi Arabia and other neighboring countries, there are strong forces pushing for a westernized type of intensive farming, based on all possible inputs, (USAID 2006) similar to the green revolution, but on the other hand there are also those who suggest various forms of low external inputs agriculture and even organic agriculture, at least for some areas of the country and for some products and markets.

Organic agriculture ranks 6th, after the involvement of international agencies and after the opening in Baghdad of the ISO office, although the organic option, in spite of being appealing, is not considered very feasible over the whole country, due to several reasons, according to Bishay (2003) and Thomas (2008).

One of the most important threats to agricultural development appears to be the continuous reliance on the revenues from oil, which diverts the attention of the policy makers and of much Iraqi population from the need for a sound and balanced development, based on many economic sectors. Another threat would be the lack of water, due to growing urban demand, decreasing rainfall and to likely problems with neighboring countries.

Still, organic agriculture is an important option when considering the extension of agriculture so its reality and future prospects require theoretical and applied research, a good administration that would reflect in society's involvement, through targeted investments, agricultural education, and appropriate legislation, also cooperation with foreign firms or NGOs. The efficiency of organic agriculture can be measured through production and the effects of production on animal farming, plant growth through its impact on society and economy as well.

Relative levels of agricultural incomes and productivity vary largely from country to another, for example Turkey and the United Arab Emirates are characterized by highly uneven urban and rural development of agriculture. Syria, due to the efforts made to encourage agricultural production and reach food self-sufficiency, is characterized by equal productivity. Iraq is the only country where average agricultural incomes seem much higher than in other sectors, as a result of the embargo since the Gulf war. Agricultural exports are less than 10% of the total exports in neighboring countries, except in Jordan (more than 40% of the total exports).

Agricultural growth has been uneven from country to country as well. Saudi Arabia is in the top with a total of 132 % growth / capita over the period considered due to large investments made in irrigation schemes. Iran and Jordan have also had sustained growth (+25%). Turkey has maintained the same level of production during 1980-1996. Agricultural growth has been strong in horticulture (vegetables and fruits), meat and sugar, but insufficient in cereals, oilseeds and milk according to Nordlom and Shomo (1995).

The links of agriculture with the rest of economy are not yet very strongly defined, but are rapidly improving. A more detailed comparison between the expansion of agriculture in Iraq and other neighboring countries will be made in the section dedicated to organic agriculture and the statistical data will be interpreted in the results and discussion section.

MATERIAL AND METHODS

This study involves the use of theory and statistical data. The theory may or may not be made explicit in the design of the research, although it will usually be made explicit in presentation of the findings and conclusions.

In the paper the following indicators have been used: arithmetic mean, coefficient of variation, average annual growth rate, ecologic indicators and statistical indicators.

The formulas used for to calculate these indicators, are:

For the arithmetic mean $= \bar{x} = \frac{\sum xi}{n}$, where \bar{x} = the arithmetical mean, xi = the average production values for a number of years (i); n = number of years taken into account

The average annual rate of growth [1] = $r_{1990-1999}$ (and respectively $r_{2000-20014}$) = $\sqrt[n]{\prod \left(\frac{p1}{p0}\right)} - 1$;
where $r_{1990-1999}$, and respectively $r_{2000-20014}$ = average annual growth rate; $\prod \left(\frac{p1}{p0}\right)$ = entagled growth indicators

The research method followed the following steps, beginning with scientific databases research of the relevant articles concerning organic agriculture in Iraq and neighboring countries, followed by an analysis and selection of the relevant data and the last step was extraction and summarization of the results based on interpretation and evaluation of data.

"Organic Agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic Agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved" (IFOAM, 2005)

There are many definitions of organic agriculture. The one above was adopted in Vignola, Italy, after the General Assembly of IFOAM passed a motion to establish a succinct definition reflecting the four principles of organic agriculture. The four principles of organic agriculture are the principle of health, the principle of ecology, the principle of fairness and the principle of care.

As I mentioned earlier, there are many definitions for organic agriculture but all spin around the idea that it is a system that relies on ecosystem management rather than external agricultural inputs:

"Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system." (FAO, 1999).

It is a system that eliminates the use of synthetic inputs, such as synthetic fertilizers and pesticides, veterinary drugs, genetically modified seeds and breeds, preservatives, additives and irradiation an replaces them with specific management practices that increase long-term soil fertility and prevent pest and diseases. The benefits of Organic Agriculture are multiple and they are not only restricted to a sounder production system but also to different environmental benefits, to animal care and to a healthier food for the consumer. The interest in organic agriculture is driven by: Increase in consumer awareness and interest to have safe food; Higher economic return of organic than conventional products; Eliminating factors negatively affecting the environment; Increased market

share of organic products; Increased number of control bodies for production, processing, and marketing of organic products.

According to Kahouli, agriculture has a high priority in Iran and organic agriculture has recently been introduced into the country (Kahouli 2002) by private initiatives motivated by economic growth since the soils and climate offer a great diversity. Also in Turkey, organic agriculture is very popular and most of the products are exported (Ozkan 2002).

The role of organic farming is to eliminate the use of fertilizers, pesticides, animal drugs and food additives, in order to improve soil, water and environmental quality. The excess use of nitrogen fertilizers in agriculture can lead to nitrate accumulation into plants which constitute a problem when eaten since part of the ingested nitrate may be converted to nitrite causing *methaemoglobinaemia* or even to *carcinogenic nitrosamines*.

In Iraq, the organic matter of cultivated clay soils is between 1.0- 2.5%, while in the calcareous and sandy desert soil, it is usually less than 0.5% under arid and semiarid conditions (Nordblom, 1995)

Other activities, besides organic agriculture, help the expansion of agriculture in Iraq. The project for Harmonized Support for Agriculture Development (HSAD) is a research for development initiative that aims to improve the Iraqi agricultural value. The main objectives of the HSAD project (2014) were improving extension, developing new policies, rules and regulations, testing, validating and distributing new technologies and promoting innovative farming practice. Trainings were held on the following courses: Integrated Pest Management Courses; Water Management Courses; Biotechnology Courses; Information and Communication Technology Courses; Tools and Technologies Courses.

The problems that extension of agriculture and related research systems in Iraq are summarized as follows: a) Issues regarding the agricultural systems production and the needs for agricultural extension not effectively addressed; b) Agriculture problems in economic, social and cultural dimensions not fully addressed by scientific research in order to identify effective projects that could increase agricultural production (Al-Hakim 2011); c) Lack of effective communication on new techniques and trends in innovative production systems; d) Lack of extension services, such as infrastructure facilities, needed to achieve centers of excellence for extension and agricultural development; e) Lack of fitted equipment needed to develop modern extension services (Al-Hakim 2011); f) Improving training facilities with laboratories materials in order to teach students needed technical information and prepare extension guidelines for agricultural technicians in order to be more knowledgeable about the most efficient agricultural practices;

Given these limitations affect the extension services in Iraq, the new government has considered introducing new extension policies that should improve communication and coordination between agricultural research centers and extension services, aiming to strengthen the link between researchers and extension officers and to lay the foundations for best joint approaches in the achievement of effective extension (Ministry of Agriculture, 2008).

The overall extension policies include:

- Documenting the current situation of agricultural extension in Iraq and compare with extension experiences and success stories which involves learning from developed countries' agricultural extension best programs and methods;
- Implementing ways to effectively apply results of scientific research in such a way that they are fully applicable and adaptable to local conditions;
- Developing agricultural technologies for the medium covering all aspects of complex agricultural environment of Iraq; (Ministry of Agriculture, 2008).
- Introducing cost-effective incentives to stimulate agricultural producers to adopt effective agricultural technologies given the socio-economic restrictions farmers might have.

At the time, extension of agriculture is an important matter of discussion in Iraq and its neighboring countries, since it has a major economic and sociologic impact. According to experts

there is a growing awareness about the pollution problems caused by the misuse of chemicals, while the cost of many imported inputs makes them unaffordable for most small farmers (Bashur, 2008). One of the most important threats to agricultural development appears to be the continuous reliance on the revenues from oil, which diverts the attention of the policy makers and of much Iraqi population from the need for a sound and balanced development, based on many economic sectors. Another threat would be the lack of water, due to growing urban demand, decreasing rainfall and to likely problems with neighboring countries. Also, after the fall of the previous regime, Iraq has been to some extent “technologically” invaded, not for the benefit of the country, but for increasing the profits of the foreign input providers and due to the poor research and extension system, a sustainable agricultural development of organic agriculture might be impeded.

RESULTS AND DISCUSSION

Organic agriculture is an important option when considering the extension of agriculture so its reality and future prospects require theoretical and applied research, a good administration that would reflect in society’s involvement, trough targeted investments, agricultural education, and appropriate legislation.

Comparison on the development of agricultural areas in Iraq, Iran, Jordan, Syria and Turkey for the period 1990-1999. During 1990-1999, Iran shows a positive annual growth rate of 0.39 percent, and a mean of 63753, whyle Iraq shows a negative annual growth rate. Jordan and Syria have a relatively close annual growth rate, followed by Turkey with 0.17. The highest coefficient of variation is in Iraq (12,35), whyle the smallest one in Syria (0.56). The next highest mean of agricultural area during this period is shown in Turkey, then is followed by Syria and Iraq. Jordan has the lowest mean of 1069. The negative results of Iraq can be explained given the 1991 Gulf War, which resulted in significant damage to the irrigation and transportation infrastructure which were very important to the agricultural sector, also agricultural machinery, and the means of spraying planted areas with pesticides.

Table 1(a).Evolution of agricultural areas in Iraq and neighboring countries during the period 1990-1999

Country	MU	1990	1995	1999	Mean	St. Dev.	Coefficient of variation	The annual growth rate
					ml. ha	ml. ha	%	%
Iran	1,000 ha	61,500	64,208	63,687	63,753	7,877	12.35	0.39
Iraq	1,000 ha	9,230	9,100	8,750	9,214	552	5.99	-0.59
Jordan	1,000 ha	1,040	1,114	1,067	1,069.2	28	2.60	0.28
Syria	1,000 ha	13,495	13,789	13,767	13,695	76	0.56	0.22
Turkey	1,000 ha	39,677	39,493	40,302	39,803	1,117	2.81	0.17

FAOSTAT: <http://faostat.fao.org/site/679/default.aspx#ancor>

Comparison on the development of agricultural areas in Iraq, Iran, Jordan, Syria and Turkey for the period 2000-2012.

The highest coefficient of variation shows again in Iran, with a mean of 54350 mll./ha and a negative annual growth rate of almost -2 (1.98). Iran also shows a small annual growth rate, followed by Iraq, Turkey and Jordan. Syria is the only country with a positive growth rate of 0.09 during this period of time.

The highest mean of agricultural areas appears to be in Iran, followed by Turkey and Iraq. The smallest development of agricultural areas appears to be in Jordan and Syria. Iraq shows an increase during 2000-2005, which is followed by a decrease starting from 2010.

Table 1(b).Evolution of agricultural areas in Iraq and neighboring countries during the period 2000-2012

Country	MU	2000	2005	2010	2012	Mean	St. Dev.	Coefficient of variation	The annual growth rate
						MI. ha	MI. ha	%	%
Iran	1,000 ha	62,884	47,631	48,699	49,131	54,350	7,877	14.49	-1.98

Iraq	1,000 ha	8,300	9,390	7,870	7,657	8,460	552	6.53	-1.02
Jordan	1,000 ha	1,069	1,013	1,002.3	1042,3	1,015	28	2.74	-0.18
Syria	1,000 ha	13,711	13,828	13,908	13,921	13,851	76	0.55	0.09
Turkey	1,000 ha	40,479	41,223	39,012	38,407	39,955	1,117	2.80	-0.37

FAOSTAT: <http://faostat.fao.org/site/679/default.aspx#ancor>

Comparison on the evolution of certified organic agricultural areas in Iraq, Iran, Jordan, Syria and Turkey for the period 2006-2012. Turkey has by far the highest mean of certified organic areas, with 0.6 % agricultural area. Syria and Iran follow with a mean of 30,5 respectively 16,2. Jordan has a very small mean of 1.4. Iraq has not yet developed organic crop areas during this period, so there is definitely room for improvement.

The share of certified organic farmland in the agricultural area of the country. In Iran, the organic agricultural land consists of 7'256 hectares. The wild collection area mounts to 40'700 hectares, and it is located in the three provinces of Fars, Kerman, and Khorasan. Main products are wild pistachio, herbs, and licorice.

In Turkey, Eastern Anatolia makes up nearly half of the distribution of organic farming in Turkey, with the Black Sea and Aegean regions following with nearly 15% each. In Syria, an FAO project started in 2006, titled "Institutional Development of Organic Agriculture in Syria, but unfortunately there is no organic certification body.

Table 2. The size and weight organic crop areas occupied in the agricultural area during the period 2006-2012

Country	Area	2006	2007	2008	2009	2010	2011	2012	Mean
Iran	1,000 ha			11.4	8.0	6.0	14.4	41.4	16.2
	% area			0.024	0.017	0.012	0.03	0.08	0.2
Iraq	1,000 ha								
Jordan	1,000 ha		1.03	1.03	1.03		2.6		1.4
	% area		0.11	0.11	0.10		0.26		0.1
Syria	1,000 ha			25.66	35.4				30.5
	% area			0.18	0.25				0.2
Turkey	1,000 ha	162.0	135.0	142.0	250.0	192.0	326.0	399.0	229.4
	% area	0.40	0.34	0.36	0.64	0.49	0.85	1.04	0.6

FAOSTAT: <http://faostat.fao.org/site/679/default.aspx#ancor>

Comparison on the development of chemical fertilizers per hectare which is applied in Iraq, Iran, Jordan, Syria and Turkey, during 2002-2010. According to the table, the highest development of chemical fertilizers per hectare is applied in Jordan, followed by Iran and Turkey. The smallest evolution of chemical fertilizer appears to be in Iraq. Syria has a medium mean of development in comparison to the other countries.

Table 3. The evolution of fertilizer (N + P2O5) per hectare in Iraq and neighboring countries, between 2002-2010

Country	MU	2002	2004	2010	Mean	StDev	Coefficient of variation	The annual growth rate
					mll ha	mll ha	%	%
Iran	kg/ha	66.8	83.94	43.09	72	15.2	21.1	-5.0
Iraq	kg/ha	...	23.38	31.44	32	20.8	65.4	5.0
Jordan	kg/ha	300.63	204.64	87.78	208	180.9	87.2	-14.3
Syria	kg/ha	57.76	60.24	27.08	59	13.6	22.8	-9.0
Turkey	kg/ha	62.95	73.57	76.17	73	7.1	9.7	2.0

FAOSTAT: <http://faostat.fao.org/site/679/default.aspx#ancor>

Table 4 (a). Comparison on developments quantities of pesticides applied per hectare in Iraq, Iran, Jordan, Syria and Turkey in 1990-1999.

Country	MU	1990	1995	1999	Mean	StDev	Coefficient of variation	The annual growth rate
					kg/ha	kg/ha	%	%

Iran	kg/ha	0.65	0.47		0.57	0.2	33.28	-12.59
Iraq	kg/ha		0.16	0.1	0.14	0.03	20.70	-5.11
Jordan	kg/ha	2.95	2.36	1.9	3.11	0.8	24.75	-4.63
Syria	kg/ha			0.76	0.66	0.2	36.19	39.60
Turkey	kg/ha	1.08	1.01	1.23	1.06	0.1	12.74	1.46

Pesticides are apparently applied mostly in Jordan. Turkey follows with a mean of 1.06. Syria and Iran have relatively close mean of 0.66 and 0.57 Iraq has the lowest development of quantities of pesticides applied per hectare.

Table 4(b). Comparison on developments quantities of pesticides applied per hectare in Iraq, Iran, Jordan, Syria and Turkey for the period 2000-2010

Country	MU	2000	2005	2010	Mean	St. Dev	Coefficient of variation	The annual growth rate
					kg/ha	kg/ha	%	%
Iran	kg/ha	1.56	1.17		1.14	0.4	39.26	-14.78
Iraq	kg/ha	0.12	0.16		0.17	0.03	16.27	11.84
Jordan	kg/ha	1.99	10.78	4.74	6.68	3.0	44.66	6.81
Syria	kg/ha	0.61			0.62	0.01	2.28	3.28
Turkey	kg/ha	1.27	1.52	1.59	1.38	0.3	21.51	2.09

FAOSTAT: <http://faostat.fao.org/site/679/default.aspx#ancor>

According to the table, in comparison to the other countries, Jordan has the highest mean of pesticides applied per hectare. Turkey and Iran follow, but with a much lower mean, (1.38, respectively 1.14). Syria and Iraq have a relatively close mean of 0.62 and 0.17.

Table 5(a). Comparison on developments quantities of manure that is applied per hectare in Iraq, Iran, Jordan, Syria and Turkey for the period 1990-1999

Country	MU	1990	1995	1999	Mean	StDev	Coefficient of variation	The annual growth rate
					kg/ha	kg/ha	%	%
Iran	kg/ha	4.70	5.06	5.37	4.97	0.36	7.34	1.49
Iraq	kg/ha	1.62	0.64	0.79	0.75	0.32	42.07	-7.60
Iordan	kg/ha	1.66	2.38	2.58	2.34	0.31	13.21	5.05
Syria	kg/ha	0.30	0.33	0.39	0.34	0.03	9.57	2.96
Turkey	kg/ha	9.36	9.43	8.74	9.17	0.32	3.49	-0.75

FAOSTAT: <http://faostat.fao.org/site/679/default.aspx#ancor>

Application of organic fertilizers is one of important practical measures to improve soil fertility. Turkey seems the have the highest mean of manure applied per hectare, followed by Iran. Jordan have comes second, while Iraq and Syria have a mean of 0.75 and 0.34 kg of manure/ha.

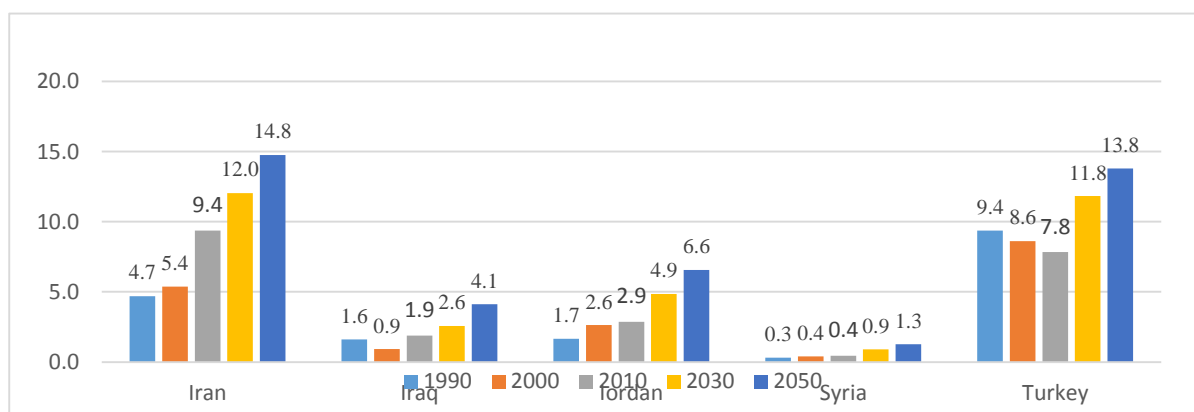
Table 5(b). Comparison on developments quantities of manure that is applied per hectare in Iraq, Iran, Jordan, Syria and Turkey for the period 2000-2012

Country	MU	2000	2005	2010	2012	Mean	StDev	Coefficient of variation	The annual growth rate
						kg/ha	kg/ha	%	%
Iran	kg/ha	5.38	8.51	9.37	9.49	7.63	1.79	23.39	4.84
Iraq	kg/ha	0.92	1.24	1.89	2.04	1.41	0.42	29.70	6.88
Iordan	kg/ha	2.63	3.41	2.87	2.91	2.96	0.21	6.98	0.86
Syria	kg/ha	0.40	0.44	0.44	0.45	0.45	0.03	7.80	1.03
Turkey	kg/ha	8.63	7.61	7.84	9.20	8.13	0.50	6.10	0.53

FAOSTAT: <http://faostat.fao.org/site/679/default.aspx#ancor>

During this period, an increase in manure applied /ha shows in Iraq, Iran, Jordan and Syria. Turkey maintains the highest mean, followed by Iran. Jordan has a very slight increase over the last period, and Syria has again the lowest rate.

Graph 1. The prospect after FAO quantities of manure per hectare in Iraq and neighboring countries, in 2030 and 2050



CONCLUSIONS

Organic agriculture is an excellent option that would help the extension of agriculture, but its diffusion in Iraq will require time to cover applied research and extension, good administration and appropriate legislation.

In conclusion, the problems that extension of agriculture and related research systems in Iraq regarding improving extension, developing new policies, rules and regulations, testing, validating and distributing new technologies and promoting innovative farming practice, should be resolved by taking into consideration the following:

- agricultural systems production and the needs for agricultural extension not effectively addressed;
- create effective communication on new techniques and trends in innovative production systems;
- create extension services, such as infrastructure facilities, needed to achieve centers of excellence for extension and agricultural development;
- provision of fitted equipment needed to develop modern extension services;
- improving training facilities with laboratories materials in order to teach students needed technical information and prepare extension guidelines for agricultural technicians in order to be more knowledgeable about the most efficient agricultural practices;

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