Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development
Vol. 16, Issue 4, 2016
PRINT ISSN 2284-7995, E-ISSN 2285-3952

THE IMPORTANCE OF AGRICULTURE'S EXTENSION IN THE ARAB REPUBLIC OF IRAQ

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Abstract

The study is situated in the field of agriculture and the main subject is extension of agriculture in Iraq, within the context of creating a clear vision of the current status of agriculture in Iraq, by comparison regarding crop and agricultural areas with neighbouring countries such as Iran, Jordan, Saudi Arabia, Turkey, and Syria. Given the fact that extension is a multidisciplinary function, an educational, political and organizational instrument, several factors will be taken into account, such as the population of Iraq, since it is important to evaluate the efficiency of the agricultural production regarding meeting local needs and not being depended on imported food. The Iraqi educational system will also be considered a factor of extension, which is why a section will be dedicated to it, also the practical activities of society are considered important since they lead to the drafting and implementation of policies that are able to help the development of agriculture and at the same time respect the environment, health and quality of food.

Key words**:** *agriculture in Iraq, extension of agriculture*

INTRODUCTION

Agriculture represents a major component of the economy in Iraq and prior to the petroleum industry it was the main economic activity. The sector of agriculture 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) and has declined considerably due to the lack of investment, isolation from the global economy and counterproductive agricultural policies. Iraqi agriculture is now beginning to take a new direction and markets are just beginning to modernize their operations in order to meet local demands. The direction in which the Iraqi agriculture is going represents an important matter, since it can revive and contribute to national wellbeing, by taking also into account the growing competition for water and the challenges due to climate change, or use pesticides and chemicals in order to increase the production.

"Extension" usually refers to an educational function that applies to an institution which disseminates information with the intention to promote knowledge, skills and methods, in the case of this study it is associated with agriculture. Extension of agriculture represents all the methods that help promote good practices of agriculture, including education, technology and special techniques, which is why a section will be dedicated to the educational system in Iraq.

At the same time, extension is a political and organizational instrument and most ministries of agriculture have an extension unit that deals mainly with crops and other agricultural systems, extension is multidisciplinary.

This study will include sections dedicated to agricultural surfaces in Iraq and population, both urban and rural, in order to obtain a realistic view of the current status of agriculture that will lead to conclusions and recommendations.

MATERIALS 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 r2000 – 2014)= $\sqrt{\prod \frac{(p1)}{(p0)} - 1}$, where r1990-1999, and respectively r2000 -2014= average annual growth rate: $\prod \frac{(p1)}{(p0)}$ = entangled growth indicators.

RESULTS AND DISCUSSIONS

The evolution of the rural population during 2000-2015 in the Arab Republic of Iraq

The total population in Iraq was estimated at 35.9 million people in 2015, according to the latest census figures. The population of Iraq represents 0.48 percent of the world´s total population.

Table 1. Evolution and statistical indicators characterizing the total population and rural population in Iraq and some neighbouring countries during 1990-2015

Country	Indicator	MU	Period 1990-2015					St Dev	Coefficient of variation	The annual growth rate
			1990	2000	2010	2015	Mean			
							Mil. ha	Mil. ha	%	%
Iran	total	mil pers	56.17	65.85	74.25	79.11	67.66	6.99	10.33	1.38
	rural	mil pers	24.53	23.68	21.81	21.06	23.03	1.15	5.01	-0.61
		vs tot %	43.67	35.96	29.37	26.63	x	x	x	X
Iraq	total	mil pers	17.48	23.57	30.87	36.42	25.72	5.65	21.97	2.98
	rural	mil pers	5.29	7.43	9.56	11.12	7.99	1.72	21.58	3.01
		vs tot %	30.29	31.50	30.97	30.53	x	x	x	X
Jordan	total	mil pers.	3.36	4.77	6.52	7.59	5.29	1.23	23.24	3.32
	rural	mil pers	0.90	0.96	1.14	1.24	1.02	0.11	10.71	1.30
		vs tot %	26.71	20.19	17.53	16.32	x	x	x	X
Syria	total	mil pers	12.45	16.35	20.72	18.50	16.98	2.62	15.45	1.60
	rural	mil pers	6.36	7.86	9.18	7.83	7.92	0.84	10.54	0.84
		vs tot %	51.07	48.05	44.32	42.34	x	x	x	X
Turkey	total	mil pers	53.99	63.24	72.31	78.67	65.67	7.34	11.17	1.52
	rural	mil pers	22.03	22.30	21.18	20.93	21.79	0.48	2.20	-0.20
		vs tot %	40.80	35.26	29.28	26.60	x	x	x	X

FAOSTAT, http://faostat3.fao.org/download/E/EL/E [3]

In Iran, it appears that there has been an increase of the total population during 1990-2015, and a decrease of the rural population, maybe due to the economic development.
In Iraq though, an increase appears both to the rural and total population. As of 1 January 2016, the population of Iraq was estimated to be 37,032,056 people. This is an increase of 3.30 % (1,183, 712 people) compared to population of 35,848,344 the year before. In 2015 the natural increase was positive, as the number of births exceeded the number of deaths by 1,066,847.
Jordan also shows and increase of the total and rural population, just as Syria. Turkey shows a relatively constant total population, and shows a decrease in the rural one.
Compared between them, Iran shows the highest mean, followed by Turkey.
The rural population in Iraq was 10,951,000 like in 2015.
A third of Iraq's population works in the agricultural sector, which provides a living for about 11 million out of 35 million Iraqis.

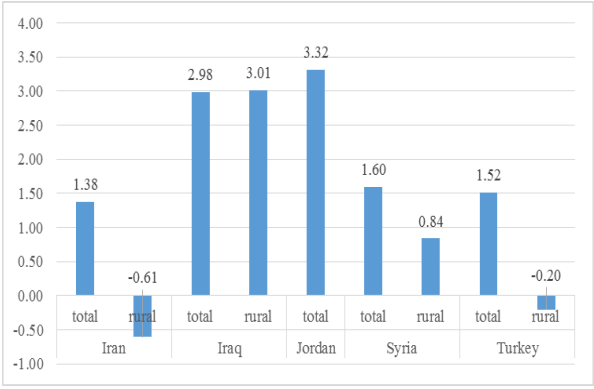

Fig. 1. Total and rural population growth rate in some countries bordering Iraq and for the period 1990-2015

All countries show an increase of the population density since 1990 to 2015. The highest mean shows is Syria (92.44) and in Turkey (85.33). Jordan and Iraq have a relatively close mean (59.8 and 58.95).
Iran however, seems to have a mean of 41.55, which is the smallest in comparison to the development of population density in the other countries.

Table 2. Indicators characterizing population density (people per sq. Km of land area) in Iraq and some bordering countries during 1990-2015

Country	MU	Period 1990-2015					StDev	Coefficient of variation	The annual growth rate
		1990	2000	2010	2015	Mean			
						mll ha	mll ha	%	%
Iran	per/km2	34.5	40.4	45.6	48.6	41.55	4.29	10.33	1.38
Iraq	per/km2	40.0	53.9	71.1	83.9	58.95	13.12	22.26	3.01
Jordan	per/km2	38.1	54.0	73.4	85.5	59.82	13.75	22.98	3.29
Syria	per/km2	67.8	89.0	112.8	100.8	92.44	14.31	15.48	1.60
Turkey	per/km2	70.2	82.2	94.0	102.2	85.33	9.53	11.17	1.52

FAOSTAT, http://faostat3.fao.org/download/E/EL/E [3]

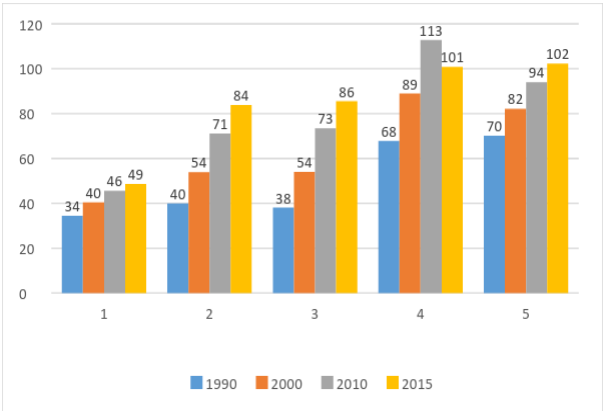

Fig. 2. Size of population density (people per sq. Km of land area) in Iraq and some countries bordering the period 1990-2015

main crops production in the Arab Republic of Iraq during 2000-2013

Agricultural land (% of land area) in Iraq was last measured at 18.90 in 2011, according to the World Bank. Agricultural land refers to the share of land area that is arable.
Of the total area of Iraq (43.7 million ha), 22, percent i.e. 9.5 million ha is cultivable land, suitable for agriculture.
Land actually under crops is about 5 million ha.4 Agriculture is mostly practiced on small farming units. More than 80 percent of the farms have a total size of less than 10 ha and even these 10 ha are on average scattered over several different locations

Evolution of agricultural areas and the

Table 3. Structure and use of land in Iraq during 1990-2013

Land use	1990		2000		2010		2013	
	mil ha	%	mil ha	%	mil ha	%	mil ha	%
Country area	43.832	100.0	43.832	100.0	43.524	100.0	43.524	100.0
Agricultural area	9.230	21.1	8.300	18.9	8.220	18.9	9.230	21.2
Arable land	5	11.4	4.1	9.4	4	9.2	5	11.5
Permanent crops	230	0.5	200	0.5	220	0.5	230	0.5
Total area equipped for irrigation	3.525	8.0	3.525	8.0	3.525	8.1	3.525	8.1
Permanent meadows and pastures	4	9.1	4	9.1	4	9.2	4	9.2
Forest	804	1.8	818	1.9	825	1.9	825	1.9
Inland water	95	0.2	95	0.2	92	0.2	92	0.2
Other land	33.703	76.9	34.619	79.0	34.387	79.0	33.377	76.7

FAOSTAT, http://faostat3.fao.org/download/E/EL/E [3]

Table 4. Evolution of the use of land in Iraq during 1990-2013

Mode of use	MU	1990	1995	2000	2005	2010	2013
Country area	mil ha	43.832	43.832	43.832	43.832	43.524	43.524
	vs % 1990	*100.0*	*100.0*	*100.0*	*100.0*	*99.3*	*99.3*
Agricultural area	mil ha	9.230	9.100	8.300	9.390	8.220	9.230
	vs % 1990	*100.0*	*98.6*	*89.9*	*101.7*	*89.1*	*100.0*
Arable land	mil ha	5.000	4.800	4.100	5.200	4.000	5.000
	vs % 1990	*100.0*	*96.0*	*82.0*	*104.0*	*80.0*	*100.0*
Permanent crops	mil ha	230	300	200	190	220	230
	vs % 1990	*100.0*	*130.4*	*87.0*	*82.6*	*95.7*	*100.0*
Total area equipped for irrigation	mil ha	3.525	3.525	3.525	3.525	3.525	3.525
	vs % 1990	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Permanent meadows and pastures	mil ha	4.000	4.000	4.000	4.000	4.000	4.000
	vs % 1990	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*
Forest	mil ha	804	811	818	825	825	825
	vs % 1990	*100.0*	*100.9*	*101.7*	*102.6*	*102.6*	*102.6*
Inland water	mil ha	95	95	95	95	92	92
	vs % 1990	*100.0*	*100.0*	*100.0*	*100.0*	*96.8*	*96.8*
Other land	mil ha	33.703	33.826	34.619	33.522	34.387	33.377
	vs % 1990	*100.0*	*100.4*	*102.7*	*99.5*	*102.0*	*99.0*

FAOSTAT, http://faostat3.fao.org/download/E/EL/E [3]

Of the total area of Iraq (43.7 million ha), approximatively 9 million ha is cultivable land, suitable for agriculture.
Land actually under crops has a mean of 9.230 mill ha. The total area equipped for irrigation shows a mean of 3.525 mill ha (constant), while a mean of 33.905 mill ha is used for other land.

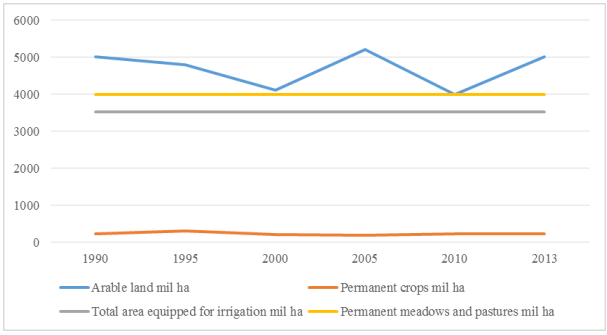

Fig. 3. Size surfaces on usage categories, in Iraq, during 1990-2013

Table 5. Evolution cereal production (kg per hectare) in Iraq and neighbouring countries during 1990-2014

Country	Indicator	Period 1990-2014					St Dev	Coefficient of variation	The annual growth rate
		1990	2000	2010	2014	Mean			
						Mil. ha	Mil. ha	%	%
Iran	kg/ha	1,445.3	1,833.3	2,357.9	1,963.4	1,992.05	315.63	15.84	1.28
	vs 1990(%)	100.0	126.8	163.1	135.8	x	x	x	x
Iraq	kg/ha	1061	363.2	1,697.1	2,187.2	1,190.09	537.35	45.15	3.06
	vs 1990(%)	100.0	34.2	160.0	206.1	x	x	x	x
Jordan	kg/ha	1,220	1,726.3	1,962.6	1,455.4	1,370.36	451.56	32.95	0.74
	vs 1990(%)	100.0	141.5	160.9	119.3	x	x	x	x
Syria	kg/ha	750	1,148.6	1,231.9	1,063.4	1,500.82	391.00	26.05	1.47
	vs 1990(%)	100.0	153.1	164.3	141.8	x	x	x	x
Turkey	kg/ha	2,214.2	2,311	2,727.1	2,831.1	2,420.24	343.83	14.21	1.03
	vs 1990(%)	100.0	104.4	123.2	127.9	x	x	x	x

World Development Indicators, http://data.worldbank.org/data-catalog/world-development-indicators[12]

The highest development of cereal yield (kg per hectare) is registered during 1990-2014 in Turkey, with a mean of 2,420, followed by Iran with 1,992.05 and Syria, with 1,500.82. Iraq and Jordan show relatively close means, respectively 1,190.09 and 1,370.36.

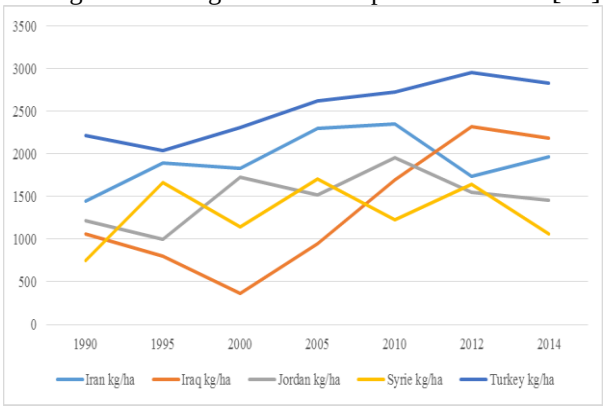

Fig. 4. Cereal grain yield in Iraq and neighbouring countries during the period 1990-2014

In terms of cultivated areas, there are large variations between the years due to climatic and/or economic reasons.

The evolution of the education system in the Arab Republic of Iraq

The political changes from Iraq after 2003 and the transition to democracy have led to a reform of the educational system. The philosophy on which the new educational system was based has been established in 2008, and relies on the moral and religious values, perceived as foundations of the social, educational and scientific processes and on the humanistic values, which is respecting the human dignity of all individuals and the family as foundation of the society.

Table 6. Evolution duration of compulsory education (years) in Iraq and neighbouring countries during 1999-2014

Country	MU	1999	2005	2006	2007	2012	2013	2014	Vs Iraq (+ years)
Iran	years	5	8	8	8	8	8	8	2
Iraq	years	6	6	6	6	6	6	6	-
Jordan	years	10	10	10	10	10	10	10	4
Syria	years	6	9	9	9	9	9	9	3
Turkey	years	8	8	8	8	12	12	12	6

World Development Indicators, http://data.worldbank.org/data-catalog/world-development-indicators

During 1999 -2014, the duration of compulsory education has been of 8 years in Iran (except for 1999, when it was 5 years), 6 in Iraq, and 10 in Jordan. In Syria and Turkey the evolution appears to be more obvious. During 1999-2007 the duration of compulsory education was of 8 years in Turkey, and since 2012 of 12 years.

In Syria, the duration of compulsory education was 6 years and since 2005 it became of 9 years.

Table 7. Evolution adult literacy rate, population 15+ years, both sexes (%) in Iraq and adjacent countries.

Country	MU	1991	2002	2004	2009	2011	2015
Iran	both sexes (%)	65.53	77.00	82.44	82.96	83.63	87.17
	vs. 1991 (%)	*100.00*	*117.50*	*125.80*	*126.60*	*127.61*	*133.02*
Iraq	both sexes (%)						79.72
Jordan	both sexes (%)		89.89	91.13	92.55	95.90	98.01
	vs. 2002(%)		*100.00*	*101.38*	*102.96*	*106.69*	
Syria	both sexes (%)		82.89	80.84			86.30
	vs. 2002(%)		*100.00*	*97.53*			*104.12*
Turkey	both sexes (%)	79.23		87.37	90.82	94.11	95.69
	vs. 2004(%)	*100.00*		*110.26*	*114.62*	*118.77*	*120.77*

World Development Indicators, http://data.worldbank.org/data-catalog/world-development-indicators, [12]

In Iran, during 1991-2015, the adult literacy rate has a mean of 79 %, in Iraq a mean of 79.72 % (in 2015), in Jordan a mean of 93%, and in Syria a mean of 83 %. The more constant literacy rate is registered in Turkey for both sexes, 89.4%.

Table 8. Evolution of employment in agriculture (% of total employment), în Iraq and neighbouring countries during 2000-2014

Country	MU	2000	2006	2008	2011	2014	Error (%)
Iran	%		23.2	21.2		17.9	-5.3
Iraq	%		29.7	23.4			-6.3
Jordan	%	4.9	3.1	2.6	1.7	1.8	-3.1
Syria	%	32.9	19.6	14.5	13.2		-19.7
Turkey	%	36	22.6	22.1	22.8	19.7	-16.3

World Development Indicators, http://data.worldbank.org/data-catalog/world-development-indicators [12]

During 2000-2014, employment in agriculture has represented 17.9% of total employment in Iran, 1/8% in Jordan and the highest rates appear to be in Turkey. The new Curriculum has been drafted with the technical support of the UNESCO International Bureau of Education, and includes the following principles:

-Encouraging excellence and creativity in all the areas of intellectual life, scientific work and the arts

-Increasing the enrolment of learners in educational institutions

-Paying particular attention to the population of rural and remote areas

-Strengthening the role of education in consolidating tolerance and understanding among people based on the principles and practices of learning to live together peacefully at national, regional and international levels.[6]

According to the National Development Plan 2010-2014, Iraq is seeking to be a peaceful and stable nation under the auspices of a federal democracy.[7] In Iraq, the Ministry of Education has the function to elaborate the educational policy, plan and monitor implementation, develop the curriculum, manage schools, teachers and other educational personnel, develop standards for educational guidance and vocational counselling, develop standards for assessment and examinations. Education is under the supervision of the Ministry of Education, Kurdistan Region (According to the Constitution of 2005).

The Ministry of Higher Education and Scientific Research consists of six departments, defines the higher education policy and supervises the administration and organization of the higher education system: universities, colleges and technical institutes. Both the private and the public universities are autonomous in Iraq regarding the financial, administrative and technical matters. In Iraq, the Ministry of Agriculture and Irrigation, just like other ministries, can administer vocational training centers in order to produce skilled workers.[8]

In June, 31, 2015, 144 students were enrolled in formal education (grades 1 – 12); 15,508 in camp settings, and 15,636 in non-camp settings. Of the 29,338 children enrolled in basic education (grades 1 – 9), 69% were boys and 71% girls. 3,810 students were benefitting from non-formal education activities. There are currently a total of 115,000 students enrolled in the 13 public universities and 11 private universities of the Kurdistan Region. The vast majority of these students attend public universities, which tend to be much larger than private universities and do not charge tuition. Most of the universities in the Region are very new: with the exception of Salahaddin University, nearly all of the local universities are less than two decades old. However, because of the Region's stability, Kurdistan's universities are drawing higher-level professors and students from historically more prestigious universities in Baghdad, Basra, and Mosul. While this process is providing the universities a boost in competitiveness, it also places further stress on the capacity of the Region's higher education system. [10]

Table 9. The evolution of life expectancy at birth, total (years), in Iraq and neighbouring countries during the period 1990-2013

Country	Indicator	Period 1990-2013					St Dev	Coefficient of variation	The annual growth rate
		1990	2000	2010	2013	Mean			
						Mil. ha	Mil. ha	%	%
Iran	years	63.9	70.1	74.0	75.1	70.48	3.07	4.36	0.71
	vs 1990(%)	100.0	109.8	115.8	117.6	x	x	x	x
Iraq	years	68.4	70.8	68.8	69.5	69.87	0.90	1.29	0.07
	vs 1990(%)	100.0	103.5	100.6	101.6	x	x	x	x
Jordan	years	69.9	71.8	73.4	73.9	72.01	1.21	1.68	0.24
	vs 1990(%)	100.0	102.7	105.0	105.7	x	x	x	x
Syria	years	70.3	73.3	74.9	74.7	73.35	1.58	2.15	0.27
	vs 1990(%)	100.0	104.4	106.6	106.3	x	x	x	x
Turkey	years	64.3	70.0	74.2	75.2	70.31	3.48	4.95	0.68
	vs 1990(%)	100.0	108.9	115.4	116.9	x	x	x	x

World Development Indicators, http://data.worldbank.org/data-catalog/world-development-indicators[12]

The highest life expectancy at birth, total (years) appears to be in Syria (73,35) during 1990-2013, followed by Iran, Turkey and Jordan. The highest coefficient of variation is showed in Turkey.

Agricultural extension in the Arab Republic of Iraq

Extension is a non-formal educational function that applies to any institution that disseminates information and advice with the intention of promoting knowledge, attitudes, skills and skills. Educational organizations are important elements in the institutional context for extension. The work of universities and training institutes in particular has a significant impact on extension organizations. The content of their curricula as well as the numbers and qualifications of their graduates are limiting or enabling factors in any country[1].

At the same time, extension is a political and organizational instrument utilized to facilitate development. Its purposes may differ, from technology transfer to problem-solving educational approaches and advancing community involvement in the process of development.

Most ministries of agriculture have an extension unit that deals mainly with crops and other agricultural systems. During the 1970s and 80s, efforts were made to unify ministerial agricultural extension operations but with limited success.

Extension is multidisciplinary. It combines educational methodologies, communication and community techniques. When effectively provided extension is known to enhance social and economic development. Many studies have demonstrated the high economic returns of investments in agricultural dissemination, thus investment in agricultural research and extension is a good input of agricultural growth [2]. The role of government is critical for the reconstruction of agricultural extension even if the extension services are provided by private contractors[9]

The agricultural policies in Iraq indicate that many ministries, committees, and institutions are involved in drawing up the agricultural policies of the country. These include the Agriculture Committee in the parliament, Council of Ministers, Ministry of Agriculture, Ministry of Water Resources, Ministry of Environment, and some non-governmental organizations (NGOs). The most important agriculture related policies that have recently been adopted in Iraq are:

-Adoption of the five-year plan (2010-2014) for the development of Iraqi agriculture by the Ministry of Agriculture[7]. The plan has allocated USD 9.5 billion to implement its provisions. The plan targets strategic projects in the fields of water resources and provides the input requirements for agricultural production, including using environmentally friendly approaches to pest control and modern irrigation techniques, in addition to providing seeds of new varieties which are resistant to salinity and drought

-Agricultural initiative. The agricultural initiative was launched by the Iraq Council of Ministers in 2008. It included creating several projects and activities to help the agricultural sector reduce desertification and to provide farmers with agricultural machines and suitable water for irrigation.

-The Ministry of Agriculture allowed 10 years for the country to reach a state of self-sufficiency in strategic crops through the application of the agricultural initiative

-The national strategy for the protection of the environment in Iraq and the executive work plan for the period of 2012-2017 were prepared by Ministry of Environment.

-On the private sector, USAID has invested in programs designed to stabilize communities, foster economic and agricultural growth and build the capacity of national, local, and provincial governments to respond to the needs of the Iraqi people. Currently, USAID assists private Iraqi agricultural businesses in improving their productivity by introducing to them the latest technologies in agribusiness, including soil and water management. The goal is to increase productivity, lower production and marketing costs, increase the profitability of agricultural enterprises, and generate rural employment with technical assistance and business development training. USAID is helping the private sector increase agricultural revenues.[11]

-Of the total area of Iraq (43.7 million ha), 22

percent, i.e. 9.5 million ha is cultivable land, suitable for agriculture.
-Land actually under crops is about 5 million ha.4
-Agriculture is mostly practiced on small farming units.
-There are currently a total of 115,000 students enrolled in the 13 public universities and 11 private universities of the Kurdistan Region.
-The agricultural policies in Iraq indicate that many ministries, committees, and institutions are involved in drawing up the agricultural policies of the country.
-The national strategy for the protection of the environment in Iraq and the executive work plan for the period of 2012-2017 were prepared by Ministry of Environment.
According to the comparison in Tables 3,4 and 5 it appears that Iraq needs some improvement, Turkey shows consistency, Iran and Syria, show mixed results. It is important at the current status to create effective communication on new techniques and trends and generate extension services, such as infrastructure facilities, needed for agricultural development.

CONCLUSIONS

Analysing the distribution of the sample Iraq's agriculture sector has declined \during the last few decades due to the lack of investment and counterproductive agricultural policies. Iraq has been dependent on importing a significant portion of its food. However, Iraqi agriculture and business are just beginning to modernize their operations.
According to Gallagher (2002) "agricultural extension services in developing countries are currently grossly under-funded to undertake the activities required for achieving food security while protecting the productive resource base in order to keep up with population and economic growth[4]".
A weak link between research and extension is a major issue in technology flow in many countries [5].
Private companies and nonprofit organizations also provide advice to farmers on agrochemical and other input use. Extension organizations need to develop communication with fertilizer providers since excessive use of agrochemicals can harm human health and the environment, and programs such as integrated pest management are recommended.
Of the total area of Iraq (43.7 million ha), 22 percent, i.e. 9.5 million ha is cultivable land, suitable for agriculture.
Land actually under crops is about 5 million ha.
Agriculture is mostly practiced on small farming units.
There are currently a total of 115,000 students enrolled in the 13 public universities and 11 private universities of the Kurdistan Region
The agricultural policies in Iraq indicate that many ministries, committees, and institutions are involved in drawing up the agricultural policies of the country
A third of Iraq's population works in the agricultural sector, which provides a living for about 11 million out of 35 million Iraqis.

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