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## Advisory services, cereal production and consumption in Iraq and in Poland – their influence on achieving food security

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### Abstract:

*Every country in the world is seeking to achieve food security and to provide as much as possible for the needs of its population with regard to food commodities, especially cereals. The aim of this paper is to identify the reality of the production and consumption of cereals in Iraq and Poland and the outlook for cereals and advisory services for achieving food security. The paper concluded that the actual cereal production in Iraq was less than the annual consumption of cereals for the period 2006-2012, which required imports to meet the shortfall. Likewise, the forecast for grain production is less than the expected consumption by the population for the period 2017-2026, which means*

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*it will still need to import from abroad. In Poland, the situation is reversed – production outweighs the annual consumption of cereals by nearly seven times, which is exported and generates benefit from high market prices. The forecast for grain production is also more than the expected consumption by the population for the same period. Therefore, it requires governments to develop successful agricultural policies and strategies. Investment is necessary in agricultural potential and advisory services available in both countries to achieve national food security as much as possible.*

**Key words:** food security, advisory services in Poland, advisory services in Iraq, agricultural possibilities for food production, cereal production and consumption.

## **INTRODUCTION**

The supply of food, in terms of both its availability and its predictability over time, or so-called food security, has been the primary concern for all human societies. Cereals are considered among the most important components of the food-security basket (McInemey 2002, WHO 2015, Fayyadh and Badora 2016). Considering that cereals are involved in a wide variety of food applications, the loaf of bread in its different forms and types remains in the forefront. For cereals have an influential role in the food-security system for all communities and peoples, but to varying degrees, depending on the nature and style of food which prevails in them. Being a basic food commodity that has great importance to the stability and progress of human beings, where these crops are the third most important item of dry food and provide about half the amount of protein that humans need in their nutrition. Proof of this is the issuance in 1990 by the United States Department of Agriculture of an indication of “proper” food, in the shape of a pyramid. Food was graded from the most healthy at the base to the least healthy at the top. Cereal crops formed the basis for

the base of this pyramid, which included the health benefits of cereals and also economic. Italy has supported this guide and has issued a similar healthy-food guide, which relies mainly on cereals (pastries of all kinds); hence the so-called Mediterranean meal (Mohamed 2011, WHO 2015).

Cereal crops are considered commodities indispensable for the majority of the population in the world, including in Iraq and Poland, where they cannot easily replace it or do without it. We often hear about the loaf revolution and the revolution of the hungry, one of their main causes being the shortage of cereal supplies or high prices. In Iraq, cereals constitute more than 70 percent of agricultural production, which makes the largest contribution to gross domestic agricultural production, followed by fruit and vegetables, and livestock (Mohamed 2011, Fayyadh 2013, Haboby et al 2014). As well as in Poland, cereals make up about 70 percent of agricultural production, which makes the largest contribution to gross domestic agricultural production, followed by the same products (FAO 2014, GUS 2015, Fayyadh and Badora 2016).

The population is increasing worldwide, global grain stocks are going down, climatic changes have been sweeping the world in recent years, and there have been high grain prices. All of them are factors and warning messages inviting us to think seriously about finding real solutions to overcome them, in view of the importance of cereals in the achievement of food security for any country. Therefore, Iraq and Poland are looking as much as possible for the stability of their future food security of gross domestic grains. Our prospect for the future is starting to know the reality of the production and consumption of cereals, and advisory services. Knowing the reality of current agricultural production and future expectations for production will point the shapers of agricultural policies in the right direction to draw up economic agricultural policies which will be successful in general and guarantee agricultural expansion particular (Leeuwis and Ban 2004, FAO 2014).

Hence the study was to answer the following questions: What is the reality of cereal production? Is it enough for needs of the population in both Iraq and Poland? What are the future prospects for grain production to achieve the food security of cereals until 2026? What are the capabilities of the advisory services to achieve it? Answering these questions are the objectives of this study.

In order to achieve the objectives of the article, the method used was the collection of descriptive analytical data from FAO and Ministry Reports. It also relied on statistical bulletins issued by the Central Statistical Offices in both Iraq and Poland, and previous studies, as well as the statistics of international organisations.

## **1. BASIC INFORMATION**

To get to know the reality of cereal production in both Iraq and Poland, it is necessary to know some basic information about them, i.a. about arable land, population, climate and water sources.

Agricultural land is considered the foundation on which agricultural production (including cereal cultivation) is built. Agricultural production is influenced to a large extent by arable land, as well as by the soil and fertility. Whenever there is a large area of arable land the country is more powerful and content (Lucani and Saade 2011, Muhaimed 2013). In Iraq arable land is estimated at more than 12 million hectares, representing nearly 27% of the total area of the country. It is estimated that only 3.5 to 5 million ha are actually cultivated annually. This means that only 30-40% of the arable land is actually being used. In 2013 and 2014, the actual figures were 4.95 and 3.60 million ha/year respectively. In Poland arable land is estimated at more than 15 million hectares, representing 50% of the total area of the country. Over 61% of the total area of Poland (9.15 million hectares) is used for

agriculture. This means that there are large areas of arable land in both countries (Table 1) (Muhaimed 2013, CSO 2014, GUS 2015, World Bank 2016).

The Iraqi population is estimated at 37 million people in 2015, with a growth rate of 2.8% per year. The rural population is about 31%. The agricultural labour force constitutes about 20% of the total workforce. The Polish population was estimated at 38 million in 2015, with a growth rate of 0.01%. The rural population is about 39%. The agricultural labour force constitutes about 12.8% of the total workforce. The results shown above are telling that there is an available workforce necessary for agricultural work in both countries (Table 1) (CSO 2014, World Bank 2016).

**Table 1. The total area, arable land and population in Iraq and Poland (Mohamed 2011, AOAD 2013, CSO 2014, GUS 2015, World Bank 2016)**

Specification	Iraq	Poland
Total area (million ha.)	43	31.3
Arable land (million ha), Percentage from total area	12 27 %	15 50 %
Actually cultivated (%)	30-40 %	61 %
Population (million)	37	38
Rural population (%)	31 %	39 %
Agricultural labor force of the total workforce (%)	20%	12.8%

The climate of Iraq is mainly of the continental, subtropical semi-arid type. There is a large difference between the temperatures throughout the year and between night and day in areas of Iraq. In the north and north eastern mountainous regions in winter the average day temperature is 16°C and is dropping at night to 2°C, going down to -5°C with a possibility of snowfall; the same applies to central and southern regions but without snowfall. While summers are moderate in the north, in the central and southern regions they are dry and very hot, with a shade temperature of over 48°C, yet dropping

at night to 26°C. Rainfall ranges from less than 100 mm in the south and south west to 400-1000 mm/year in the north and north east. This difference in temperature and rainfall helps in areas of Iraq the biodiversity of plants and animals (CSO 2015, FAO 2016, World Bank 2016).

The climate of Poland is moderate, characterised by the convergence of temperatures between different regions throughout the year and between day and night. The annual average temperature ranges from 5°C to 7°C. Annual precipitation also fluctuates within the country but is mostly between 500-750 mm per year. The driest zone lies in a wide band across central Poland, where precipitation averages just 450-550 mm. The precipitation most suitable for agriculture falls along the southern border with annual amounts of 600-1300 mm (in the mountains). Rainfall is minimal during the early growing season (April to June) and typically wet during much of the harvests in July and August (Michalczyk and Sposób 2011, World Bank 2016).

Water sources in Iraq are various: water resources are controlled by the twin rivers, the Tigris and the Euphrates. Both rivers have their source in Turkey. The average annual flow of both rivers and their tributaries is about 77 km<sup>3</sup>/year. Additionally there are rainwater in the winter, lakes and groundwater. Subterranean water has been found in the foothills of the mountains in the north east of the country and in the area along the right bank of the Euphrates, and in other areas, at different depths (CSO 2015, World Bank 2016). Polish water sources are also various; nearly all the Polish territory is in the Baltic Sea basin (99.7%); only small parts belong to North Sea and Black Sea basins. The catchment areas of the Vistula and Odra rivers occupy 89.4% of the Polish territory. The remaining 10.6% are the catchments of small rivers flowing directly to the Baltic Sea or to basins of the Neman and Pregola rivers.

Water resources in Poland are fed by precipitation and inflows of water from abroad. In an average year precipitation in Poland ranges from approximately 600 mm in the lowlands to over 1100 mm in the mountains, which significantly influences the quantity of regional water resources. In an average year about 190 km<sup>3</sup> of water comes from precipitation, and about 7 km<sup>3</sup> from surrounding countries. There are 3000 km<sup>3</sup> of static groundwater resources on Polish territory; some 16 km<sup>3</sup>/ year can be effectively exploited (Michalczyk and Sposób 2011, Orlińska-Woźniak et al. 2013).

## **2. THE REALITY OF CEREAL PRODUCTION IN IRAQ AND POLAND (2006-2012)**

In Iraq, the available data indicates (in Table 2) that the cultivated areas of cereals recorded fluctuations during the period of 2006-2012. In 2006, it was 2848 thousand ha, increasing to 2967 thousand ha in 2007, but the area planted with cereals decreased to their lowest level of 1493 thousand ha in 2009, as a result of the lack of rain. It then turned upward but still remained low, in 2012 amounting to 2066 thousand ha. It was accompanied by fluctuations in the areas of cereal cultivation, with a decline in cereal production at the start of the study period (2006-2012), but reaching 2225 thousand tons in 2008. In 2009, production returned to a gradual increase to around 4791 thousand tons in 2012, which is approximately twice the amount of production recorded at the start of the study period. This increase in production was the result of rising productivity per hectare of cereals, which amounted to 2319 kg/ha in 2012 (Table 2).

In Poland, there was a slight increase in the cultivated areas of about 8599 hectares in 2008 compared with 2006. Afterwards, a gradual decrease began in the cultivated area of cereals to around 7617 thousand hectares in 2012. Despite the decline in the cultivated areas of cereals, production quantity

increased gradually to about 28269 thousand tons in 2012, which was an increase of approximately 23% from 2006. The increase in production resulted from the higher productivity per hectare from the cultivated area of cereals, i.e. 2598 kg/ha in 2006 to 3712 kg/ha 2012 (Table 2). This is a good indication of growth in the sphere of cereal cultivation in Poland, which might be a result of support from the European Union. At the same time, however, some observations can be made about the development of cereal production in Iraq and Poland. There is a noticeable progress in the quantities of production in Poland, but Iraq is in need of more concerted efforts in order to best develop its cereal production.

**Table 2. The development of cereal production, cultivated area and yield rate in Iraq and in Poland for the period of 2006-2012 (CSO 2014, CSO 2015, GUS 2015, FAO 2016, World Bank 2016).**

Year		2006	2007	2008	2009	2010	2011	2012	Average
Iraq	cultivated area (1000 ha)	2848	2967	1586	1493	2570	2374	2066	2272
	Production (1000 tons)	3786	3753	2225	2650	4362	4270	4791	3691
	Yield rate kg/ha	1329	1265	1404	1775	1697	1798	2319	1655.3
Poland	cultivated area (1000 ha)	8381	8353	8599	8504	7865	7719	7617	8148.3
	Production (1000 tons)	21778	27143	27664	29571	26653	26508	28269	26798
	Yield rate Kg/ha	2598	3250	3217	3478	3389	3434	3712	3296.9

In Iraq, the productivity of cereals soared from 1329 kg/ha in 2006 to 2319 kg/ha in 2012. The average productivity per hectare for the period of 2009-2013 was about 1957 kg/ha. However, it is still at the lowest level when compared with an average of the productivity for some states in the vicinity of or neighbouring Iraq (Table 3). The productivity per hectare of cereals in countries such as, for example, Turkey, Kuwait, Saudi Arabia, and Arab Emirates, is several times as high as the productivity in Iraq. This indicates the intensity of decline in the productivity per hectare of cereals in Iraq compared to those countries and reflects the weakness of the agricultural (primitive) methods which impact on the country's grain self-



sufficiency and the widening gap between production and consumption ratios. A need therefore emerges to raise the productivity per hectare to more than 100% of the current level in order to fill at least part of that gap. If the productivity remains low, this will affect the economy and the Iraqi citizens. In Poland, the grain yield rose from 2598 kg/ha in 2006 to 3712 kg/ha in 2012. The average productivity per hectare for the period from 2009-2013 was about 3563 kg/ha, but is still low when compared to the average productivity in selected countries in the vicinity of or neighbouring Poland (Table 3). Productivity per hectare of grain rate in countries such as, for example, the Czech Republic, Germany, Belgium, and the Netherlands, are exceeding the output, weakening Poland's productivity, which indicates low productivity per hectare of cereals in Poland as compared to those other countries. This reflects the weakness of the methods used in agriculture, which impact on self-sufficiency in cereals. A need therefore emerges to raise the productivity per hectare to more than 30% of the current level in order to maintain its self-sufficiency ratio.

**Table 3. Cereal production in Iraq and Poland compared with the production of some neighboring countries of both (CSO 2014, GUS 2015, Bank world 2015)**

Countries	Iraq	Kuwait	Turkey	Saudi Arabia	United Arab Emirates	Poland	Czech Rep.	Belgium	Holland	Germany
The total area (1000 km <sup>2</sup> )	435240	17820	783660	2149690	83600	312680	4994	30530	41500	357170
Productivity rate kg\ ha 2009-2013	1957	8302	2931	4914	71934	3563	4994	9189	8520	6932

In Iraq, as evidenced by the indicators in Table 4, the quantity of domestic production of cereals undergoes year-to-year fluctuations. At the same time, the consumption of cereals is increasing by virtue of the increasing population growth. The best cases of grain production were 4791 thousand tons in 2012, while the annual demand for cereals was 6294 thousand tons per year. This means that the Iraqi Ministry of Trade had to provide about 1503 thousand tons of cereals from abroad to fill

the shortage in domestic production. This covered only 76% of the annual demand for grain in 2012, on the assumption that every domestic production is fit for human consumption (Table 4).

The indicators for Poland (Table 4) show that the quantity of domestic production of cereal undergoes year-to-year fluctuations. At the same time, the cereal consumption is almost stable in the conditions of a weak population growth. The best cases of cereal production were 29571 thousand tons in 2009. However, in 2012 the production reached 28269 thousand tons, although the annual demand for cereals is 4567 thousand tons only. This means that domestic production of cereals exceeded domestic consumption sevenfold and constituted about 619% of the annual demand for cereals in 2012, thus providing an excellent opportunity for exports (perhaps to Iraq) and gaining benefit (Table 4).

**Table 4. The annual growth rate of cereal production, the rate of population growth, consumption quantity of cereals and percentage contribution of production from consumption in Iraq and in Poland for the period of 2006-2012 (CSO 2014, CSO 2015, GUS 2015, FAO 2016, World Bank 2016).**

Year		2006	2007	2008	2009	2010	2011	2012
Iraq	Population (1000 person)	27717	28424	29163	29971	30868	31810	32781
	Annual population growth (%)	2.6	2.5	2.6	2.8	3.0	3.0	3.0
	Cereals Production (1000 tons)	3786	3753	2225	2650	4362	4270	4791
	Annual production growth (%)	2.1	-0.9	-40.7	19.1	64.6	-2.1	12.2
	Total consumption(1000 tons)	5322	5457	5599	5754	5927	6107	6294
	Percentage contribution of production from consumption (%)	71	69	40	46	73	70	76
Poland	Population (1000 person)	38141	38121	38126	38152	38043	38063	38067
	Annual population growth (%)	-0.1	-0.1	0.0	0.1	-0.3	0.1	0.01
	Cereals Production (1000 tons)	21778	27143	27664	29571	26653	26508	28269
	Annual production growth (%)	-19.1	24.6	1.9	6.9	-9.8	-0.5	6.6
	Total consumption(1000 tons)	4577	4574	4575	4578	4565	4567	4567
	Percentage contribution of production from consumption (%)	476	593	605	646	584	580	619

### **3. FUTURE EXPECTATIONS FOR CEREAL PRODUCTION IN IRAQ AND POLAND FOR THE PERIOD OF 2017-2026**

The study of the future of the production and consumption of cereals forms an important aspect in the evaluation of food security of any country, giving a valuable insight into the scale of future demand for cereals. Consequently, it can facilitate the programming of production according to consumption needs and the level of demand growth with consumer tastes taken into account. On this basis, the decision on whether importing is needed can be made.

In Iraq, the expectations rely on the expected population growth rate of 2.8% until the year 2026. 2012 was adopted as the base year for measuring future population growth (Table 5). It follows from the table that the total consumption demand for cereals is linked to the preparation of the population, which will reach about 9391 thousand tons in 2026, with the annual consumption rate assumed at about 185 kg/person. This is enough from our point of view, especially in the light of high grain prices and expectations of lower production. This rate is also higher than the per capita rate of production achieved in 2012, amounting to 146 kg/capita, which reflects the deterioration of the relationship between the amount of production and population. The determination of the required amount of consumption will enable us to determine the amount of the shortfall in production, which is compensated with imports from abroad.

In Poland, the expectations have relied on the population growth rate of 0.01% until the year 2026. 2012 was adopted as the base year for measuring future population growth (Table 5). It follows from the table that the total consumption demand for cereals is linked to the preparation of the population, which will reach about 4117 thousand tons in 2026, with the annual consumption rate assumed at about 108

kg/person. This is enough from our point of view, especially in the light of high grain prices and expectations of lower production. This rate is also lower than the per capita rate of production achieved in 2012, amounting to 743 kg/capita, which reflects the strength of the relationship between the amount of production and population. The determination of the required amount of consumption will enable us to determine the amount of surplus production, which requires finding a suitable external market for exports abroad.

**Table 5. A forecast of the demand for cereals for population, with 2012 as the base year and population growth rate of about 2.8% in Iraq and 0.01% in Poland for 2015 for the period of 2017-2026**

Years	Iraq		Poland	
	Forecast of population (1000 person)	Annual needs of cereal (1000 tons)	Forecast of population (1000 person)	Annual needs for cereal (1000 tons)
2017	39590	7324	38087	4113
2020	43010	7957	38099	4115
2023	46725	8644	38111	4116
2026	50761	9391	38124	4117

**Note: Table depends on the previous tables 1, 3.**

#### 4. ADVISORY SERVICES

The provision of food for the population, increasing and improving the production, quality and quantity. The transfer of modern agricultural techniques. Changing people's attitudes towards new technologies. Convincing people of the usefulness of new developments in agriculture; marketing information. Education, extension and training for farmers and agriculture employees; submitting the problems of agriculture to agricultural research institutions. These measures were undertaken by institutions concerned with agricultural extension and advisory services in any country. Being the bedrock of agricultural development, agricultural extension services improve agricultural production in terms of quantity and quality with a view to achieving food security. However,

the development of agricultural sector cannot be achieved without an efficient and effective extension system (Leeuwis and Ban 2004, Omar et al. 2012).

The farmer is considered as primarily responsible for achieving agricultural production, as well as increasing the amount of production and improving its quality. Therefore, the goal of agricultural extension and education is to provide scientific consulting services in the field of agriculture to farmers by means of various programs and educational activities.

Rural technology transfer in Poland is traditionally identified with rural advisory services. Transformation of the economy and accession to the EU emphasized the need to improve the situation. Higher competition and rising production quality requirements stress the necessity for modernization on Polish farms and improvement of farmers is conditioned on effective farm management in market economy conditions [Florjanczyk 2007, Kania et al 2011, Kania et al 2014]. The public agricultural advisory service is composed of 16 advisory centers, and consultative and private companies. It is currently employs over 5600 people (Table 6), including around 3950 specialists and advisers who provide services to around 1850 thousand holdings, i.e. 470 farmers per one adviser. Farmers and agricultural workers are offered a variety of programs and activities (such as field visits, training courses, seminars, festivals, etc.). Funding for them is provided by the government, the European Union or donor organizations. [Florjanczyk 2007, Kania et al 2014, FAO 2014].

The advisory services in Iraq is composed of 15 advisory centers and 56 indicative farms, currently employing more than 1000 people (Table 6). They provide various education, extension and consulting services to farmers and staff in agriculture, as well as a variety of programs and demonstration activities in agriculture (field visits, training courses, seminars, festivals, etc.). Funding is provided by the government and

international donor organizations [Lucani and Saade 2011, El-Haboby et al 2014].

**Table 6. Advisory services in Iraq and Poland [Henriksson 2007, Kania et al 2011, Lucani and Saade 2011, El-Haboby et al 2014, FAO 2014]**

Specification	Iraq	Poland
<b>Advisory centers</b>	15 center + 56 extension farms	16 center + Private sector companies
<b>staff</b>	About 1000 person	About 5600 person
<b>Funded</b>	Government + (United (FAO) and Bank World)	Government +( European Untied )
<b>Services provided</b>	Different educational services, extension and consulting are provided to farmers and staff in agriculture	Different educational services, extension and consulting are provided to farmers and staff in agriculture

## CONCLUSIONS

1. In Iraq nowadays large areas of arable land are unused (about 7 million ha). It is twice the land area actually utilized. The climate is diverse (rain, differences in temperature and other), which gives many opportunities for the growth of a variety of cereal crops. There are multiple sources of fresh water (both surface and groundwater), which can be exploited more to improve agricultural production. In Poland large areas of arable land are unused (about 6 million hectares). The country's climate is moderate, which gives many opportunities for the growth of a variety of cereal crops, and there are multiple sources of fresh water (rain, surface and groundwater), which can be exploited more to improve agricultural production.
2. Being the bedrock of agricultural development, agricultural extension services improve agricultural production in terms of quantity and quality, and allow the achievement of food security; however, the development of agricultural sector cannot be achieved without an efficient and effective extension system. Advisory services in Iraq are well organized (15 heuristic centers and 56 indicative farms in

all provinces) and could be further developed and thus benefitted from. In Poland advisory services are very well organized (16 heuristic centers in all provinces) which could also be developed and benefitted from.

3. The future outlook for both countries in respect of food security from cereal production is that they have the ability and potential to achieve national food security to the broadest possible extent. This requires from governments the implementation of successful agricultural policies and strategies to benefit from the possibilities in this area. To achieve this, they should take concerted and harmonious actions based on the improvement of policies and investment projects, including rehabilitation support services and capacity building. Policies and activities should be aimed at ensuring food supply, the interdependence that exists between food security and agricultural production and sustainable environmental management and climate change. United Nations' investments in support for Iraq and European Union's for Poland should help in accomplishing these policies and activities with the ultimate goal of ensuring food security.
4. The cereal production in Iraq is below the level of consumption, which entails a need for imports from abroad to tackle this shortage. Poland, in turn, is characterized by a surplus of consumption, which means that there is a need for exports.
5. Cooperation between the countries means mutual benefits to both of them. Poland can therefore benefit from the surplus in its production of cereals and export to Iraq at competitive prices to meet the shortfall of cereal production in Iraq.

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