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RESEARCH ARTICLE

Impact of national development programs and legislations on the cereal crops seed sector in Iraq

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Abstract

Agriculture is a crucial economic sector in Iraq, benefiting from abundant natural resources, skilled labor and essential infrastructure. These elements have enabled the sector to play a significant role in agricultural development, particularly in the production of strategic crops. Between 2010 and 2020, the Iraqi government implemented various policies and legislation aimed at advancing the seed sector. These efforts focused on supporting and developing seed-producing entities across governmental, mixed and private sectors, positioning them as essential instruments for executing the strategies of the government. Modern agricultural technologies, especially improved seeds, have been vital in boosting productivity and reducing costs. Therefore, the government has prioritized the adoption of advanced technologies within its agricultural policies and programs. These scientific innovations, particularly in seed production, are key to enhancing the cultivation of strategic crops. Improved seeds have thus become a cornerstone of Iraq's agricultural development, contributing to both increased productivity and sustainable farming practices. This research aims to clarify the role of national development programs and legislation in strengthening the seed sector and increasing the production of strategic crops in Iraq. It reviews the progress in grain crop production between 2006 and 2020 and examines the most significant aspects of government policies, highlighting how legislation and national programs have played a pivotal role in the production of higher-grade seeds and the development of strategic crop cultivation.

Keywords

cereal crops; legal legislation; national programmes; seeds of higher grades

Introduction

Agriculture is the foundation for achieving food security due to its importance in producing crops to meet the population's food consumption needs. Today, food security has become one of the most persistent challenges faced by governments around the world. Increasing the rate of adoption of modern agricultural technologies has become a primary requirement for enhancing food security, boosting agricultural productivity and reducing poverty, particularly in economically disadvantaged countries and communities (1).

The agricultural sector in Iraq plays an important role in the national economy. It is one of these sectors and the most important pillars of the

national economy, as the average contribution of the agricultural sector to the national economy is about (10-14 %) (2). The study of strategic grain crops in Iraq is one of the most prominent matters, in order to know the available possibilities, according to which agricultural production planning can be done in a way that reflects the quantitative and qualitative development of this production. Cereals are considered as one of the most prominent food crops that are closely linked to food security. This importance is due to several considerations, including the simplicity of production conditions and development processes, the ease of marketing and storing products, in addition to the high productivity factor per unit of land compared to the work and capital it requires (3). In addition, cereal crops are widely cultivated in Iraq due to their high relative importance, whether in the components of the Iraqi crop structure or in the individual's dietary pattern (4). The country has a diversity of economic resources, which provides it with a great opportunity. Land and water, climatic diversity, and adequate investment are essential elements for developing agricultural production.

National seeds are of invaluable importance and are considered a cornerstone for enhancing and increasing food security. Agricultural productivity and achieving sustainable agricultural development, as adopting improved seed technology within the framework of directing sustainable agricultural resources to produce strategic crops contributes to maximizing farmers' profits and increasing their incomes. Therefore, development of national seed production is a basis for promoting sustainable agricultural development.

Research problem

The research challenge focuses on the government's insufficient support for the seed sector, which is critical for the development of essential agricultural grain crops like wheat, barley, rice and yellow corn. These crops are necessary for establishing self-sufficiency and maintaining food security, which is an essential component of national security. Despite the seed sector's strategic importance in assuring a steady supply of these critical crops, government funding has not been consistent with its position. A lack of sufficient policies and resources hinders the sector's capacity to achieve its greatest potential, both in terms of economic integration and improving the country's national trade balance.

Research hypothesis

The application of advanced seed technology (Higher grade seeds)has an important beneficial effect on e agricultural production efficiency of strategic grain crops including wheat, barley, rice and yellow maize, improving both production and productivity. Although Iraq has the resources to attain self-sufficiency and food security, the success of this process is hindered by limited governmental support for the seed sector. The full potential of improved seed technology can only be realized if there is sufficient investment and policy alignment in the sector to optimize Iraq's economic resources.

Research objectives

The research aims to analyse the volume of local production of strategic grain crops (wheat, barley, rice, yellow corn) for the period 2006-2020, with a particular focus on understanding the development of Iraq's seed production sector during 2010-2020. This period was selected due to the implementation of key national seed development programs and legislative reforms, such as Seed and Seed Law No. 50 of 2012, which aimed to regulate and improve seed production. By reviewing these national policies and programs, the research evaluates their contribution to increasing the production and productivity of strategic crops, as Iraq sought to rebuild and modernize its agricultural sector after years of conflict and instability.

The importance of research

The importance of this research stems from the strategic significance of seeds in developing and improving agricultural production, particularly the production of strategic grain crops (wheat, barley, rice and yellow corn), to enhance sustainable food security. Improved seeds are considered the most important factor in agricultural production, as crop productivity is directly linked to the quality and characteristics of the seeds used.

Materials and Methods

First: The economic importance of grain crops (The Economic Importance of Green Crops)

Grain crops are among the first crops grown by humans, when agriculture started. The economic importance of grain crops is due to the following reasons (2):

1. The grains crops (wheat, barley, rice, yellow corn) have a high nutritional value, as they contain a high % of carbohydrates (about 70 %), a relatively high % of protein (9 -14 %), also a high % of oil (up to 10 %) in addition to some vitamins and mineral elements. Therefore, grain crops are often referred to as energy crops, as they provide about (53 %) of the total human energy needs.
2. Grain crops are among the most affordable sources of food, which is why they hold a central place in human diets. They provide at least one-third of the calories and proteins required for human growth and activity, offering a more cost-effective and less labor-intensive food source compared to other options.
3. Grains are inputs to many industries such as the starch industry and also used in the production of biofuels in some countries (3).
4. Grains are used to feed animals that provide humans with the necessary food products. Straw and hay of some grain crops after harvest is used as feed material for animals and as a raw material for various industries.
5. The grains of these crops contain a low % of moisture (wetness) (about 15 %), which makes them easy to transport, handle and store for a long time without being exposed to any damage.
6. The cultivation of grain crops offers a relatively high economic return, as these crops yield a large harvest of grains with a small quantity of seed required for planting.
7. Cereal crop plants are distinguished by their ability to

adapt and grow in varying environmental conditions, for example, wheat can be grown in the continents of Europe and Africa despite the great difference in climate between them.

Due to the steady increase in population, interest in achieving food security has increased in all countries of the world, so it can be said that the basic step that should be followed at the present time and in the future is to expand the cultivation and production of grain crops to provide a loaf of bread and fill the food gap (4). Therefore, scientific methods and good agricultural practices must be adopted to increase production (horizontal and vertical) of these crops.

Second: The development of the area, production and productivity of grain crops in Iraq.

The local production of strategic grain crops in Iraq represents great economic importance in the overall agricultural production due to human dependence on them in the components of daily food and the fact that they are raw materials used in the local industry and are also important in global trade in import and export, but in fact. The majority of the production of these crops in Iraq fluctuates greatly in its direction and development. Whether on the scale of cultivated areas, production or productivity, its cultivation is widespread in most regions of Iraq, but the concentration of its cultivation varies from one region to another depending on environmental and climatic conditions.

Table 1 the development in area, production and productivity of these crops for the period (2006-2020), as the average cultivated area reached (9776) thousand dunums, which constitutes (85 %) of the total cultivated area with an annual growth rate (22.4%).

Results and Discussion

First: The economic importance of grain crops

Grain crops were among the first crops cultivated when man knew agriculture and settlement. The economic importance of grain crops is due to the following (2):

1.The grains of these crops have a high nutritional value, as they contain a high % of carbohydrates (about 70 %) and they also contain a relatively high % of protein (9 -14 %), in addition to containing a high % of oil (up to 10 %) in addition to some vitamins and mineral elements. Therefore, grain crops are often referred to as (energy crops), as they provide about 53 % of the total human energy needs.

2.Grain crop products are considered one of the cheapest types of food, which has made them occupy a major place in human diets, providing them with no less than a third of the calories and proteins necessary for their growth and activity when compared to any other food source in terms of effort and costs necessary for production.

3.Grains are inputs to many industries, such as the starch industry and grains are also used in the production of biofuels in some countries.

4.Grains are used to feed animals (within feed rations/fodder rations) that provide humans with the necessary food products and straw and hay of some grain crops after harvest represent feed material for animals and raw material for many industries.

5.The grains of these crops contain a low % of moisture (wetness) (about 15 %), which makes them easy to transport, handle and store for a long time without being exposed to any damage.

6.Cultivation of grain crops with a relatively large economic return, as it gives a large grain crop with a small number of seeds.

7.Cereal crop plants are distinguished by their ability to adapt and grow in varying environmental conditions, for example, wheat can be grown in the continents of Europe and Africa despite the great difference in climate between them.

With the steady increase in population, interest in achieving food security is growing around the world, and a fundamental step to be followed now and in the future is to expand the cultivation and production of cereal crops to provide a loaf of bread and to compensate for food shortages (4). Therefore, scientific methods and good agricultural practices must be employed to increase the production (horizontal and vertical) of these crops.

Second: The development of the area, production and productivity of grain crops in Iraq

Local production of strategic cereal crops in Iraq is of great economic importance in overall agricultural production. However, most of the production of these crops in Iraq is of a nature that its direction and development fluctuate greatly (increase or decrease). However, most of the production of these crops in Iraq is highly variable in its direction and development (increase and decrease).

Table 1 presents the development in area, production and productivity of these crops for the period (2006-2020), as the average cultivated area reached (9776) thousand dunums, which constitutes (85 %) of the total cultivated area with an annual growth rate of Agricultural cycle.

The development of seed production in Iraq for the period 2010-2020

Since the second half of the 20th century, the world has seen significant developments in agricultural technology. As a result of the urgent need to meet the necessary and increasing demand for food due to population growth, we have witnessed tremendous developments in agricultural technology, mainly as a result of science and agricultural research. Agricultural technology means the set of knowledge, skills, methods and technical means that are used in the agricultural production process to obtain the highest possible agricultural production (5), as it has become in our present time the backbone of agricultural development and its tool for achieving food security by increasing agricultural productivity, as studies, including the study of (Dwell & Redout), indicate that the rate of change in agricultural productivity. It depends on the ratio of technical change and on the size of the spread of modern agricultural technology (6, 7).

Table 1. The total cultivated area in Iraq and the production and productivity of grain crops (wheat, barley, rice, yellow corn) for the period (2006-2020).

Productivity (yield) kg/dunum	Production/ (1000) tons	Relative importance %	Area cultivated with grains: (1000) dunums	Total cultivated area/ (1000) dunums	Year
350	3967	80	11317	14059	2006
316	3726	82	11770	14246	2007
183	2194	84	11965	14237	2008
306	2612	81	8541	10517	2009
423	4362	86	10311	12043	2010
386	4270	85	11074	13023	2011
441	4790	85	10861	12741	2012
538	6500	86	12086	14055	2013
506	7093	90	14011	15559	2014
598	3266	87	5458	6253	2015
765	3993	86	5217	6075	2016
685	3728	85	5443	6433	2017
650	2450	85	3769	4436	2018
631	6910	91	10956	12047	2019
641	8878	92	13860	15141	2020
495	4583	85	9776	11391	Average
765	8878	92	14011	15559	Highest value
183	2194	80	3769	4436	Minimum value
%83.1	%123.8	--	%22.4	%7.7	Growth rate

Source: Prepared by researchers based on data from the Ministry of Agriculture, Department of Planning and Follow-up, Statistics and Manpower (13).

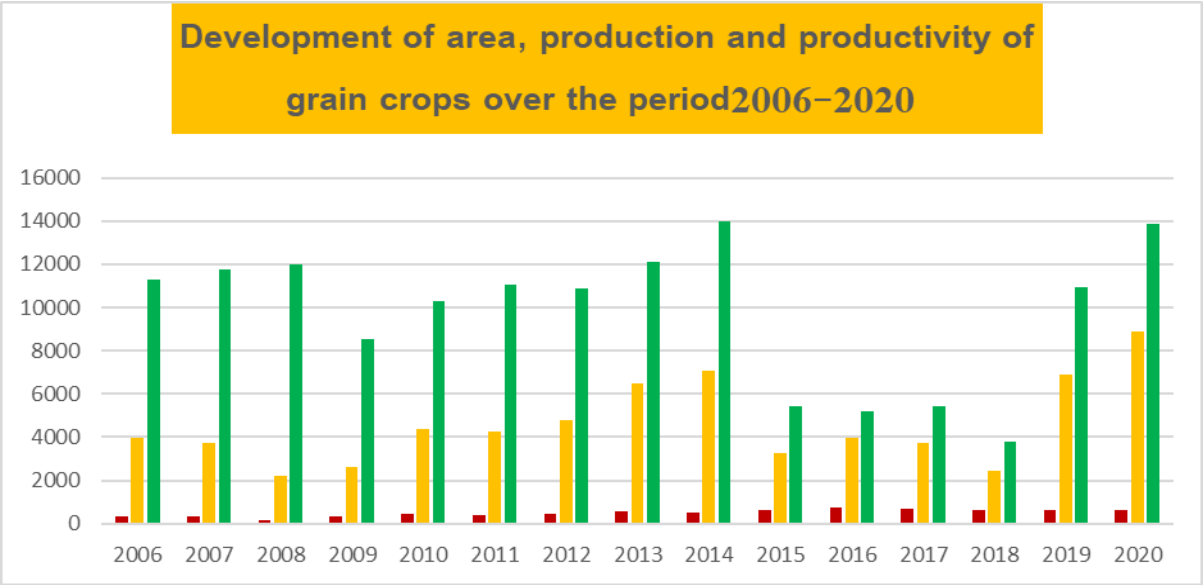

Fig. 1. Development of area, production, and productivity of grain crops over the period 2006-2020.

Source: Prepared by researchers based on Table 1 data.

Improved seed technology is at the forefront of advanced agricultural technical achievements and innovations, as biotechnology and the development of gene engineering have become of distinct importance and even a priority in sustainable agricultural development. The quality and quantity of agricultural crops depend on the quality of the seeds and their characteristics in terms of their nutritional value, their productivity per unit area, their tolerance to salinity, drought and toxic elements, their resistance or tolerance to pathogens and their ability to store for a longer period, which makes them of great marketing value (8). Improving and developing seed quality is the basis for developing and improving agricultural production (7), adopting improved seeds leads to an increase in agricultural production by a rate ranging between (5-20 %), thus increasing the incomes of agricultural families and sustaining economic growth (6).

Seed production in Iraq dates back to the 1950s, with a significant development after the country joined the International Seed Testing Association (ISTA) in 1976. A notable expansion occurred in 1988, with an increase in the area covered by locally produced seeds.

For the 1987-1988 season, locally produced seeds accounted for 25 % of the wheat, 8 % of the barley and 11 % of the rice seed requirements. In the 1990-1991 season, the proportion of barley and rice seeds increased to 9 % and 76 % respectively, while the % of wheat seeds decreased to 17 %.

After 1996, certified seed production, particularly for grain crops, expanded further, but the quantities still did not meet the required levels. From the 1997-1998 season onwards, farmers were increasingly responsible for self-insuring their seeds. By the 1998-1999 season, self-sufficiency rates for wheat and barley seeds reached 77.5

% and 92.5 % respectively. The remaining needs were met by local seed companies.

However, this method of seed provision is criticized for its negative impact on agricultural productivity. Reusing seeds multiple times reduces their quality, leading to decreased yields and ultimately, lower overall production (9).

In providing agricultural seeds in Iraq, 2 sources are relied upon (9):

1. Local production (Domestic production): In turn, it is based on 2 sources as well (in addition to what is provided by local companies that will be discussed later):

A- Seed production by the farmers themselves, as this source provides large quantities of agricultural seeds, but it is criticized for its poor quality, because it is not subject to any kind of control.

B- Seed production by farmers, under the supervision of a government agency, by contracting with farmers distinguished by their competence in this field, after providing them with foundation seeds or pure registered seeds for varieties approved by the Ministry of Agriculture, according to certain conditions.

2.Importing from abroad: It is possible to obtain from this source international varieties and hybrids of good quality and high productivity, but they may sometimes be a source of entry for some agricultural pests, in addition to their high costs in foreign currencies.

Table 2 shows the reality of the production of seeds of strategic crops (wheat, barley, rice and yellow maize) for the period (2010-2020) in terms of the required quantities, the quantities produced and their relative importance, while the quantities produced of wheat seeds for the year (2010) constituted (18.7 %) of the total quantities required gradually increased in the following years, reaching (167 %) of the total quantities required in 2020. This means

Table 2. Required and produced quantities of wheat, barley and rice seeds for the period (2010-2020) (tons).

rice			barley			wheat			Years
%	Quantity The producer	Quantity required	%	Quantity The producer	Quantity required	%	Quantity The producer	Quantity required	
1.4	68	4800	--	--	134200	18.7	34600	184700	2010
0.9.	65	6600	--	--	121700	24.7	54000	218000	2011
0.8	64	8000	--	--	95000	23.6	54500	230400	2012
0.6	57	9600	--	--	112100	46.1	113500	245800	2013
0.8	64	8000	39.2	60600	154400	53.5	104200	194500	2014
2.3	56	2400	280.8	93800	33400	63.3	80100	126500	2015
1.3	50	3900	24.9	8800	35400	84.8	96500	113700	2016
1	56	5600	287.1	78400	27300	74.5	104800	140500	2017
23.6	118	0.50	144.5	28900	20000	133.2	140000	105100	2018
0.6	810	12800	4.2	5200	124000	120.5	254400	211000	2019
5.2	528	10200	0.3	463.6	151000	167.4	478400	285700	2020

Source: Prepared by researchers based on data**:**

1. Ministry of Agriculture, Department of Planning and Follow-up, Statistics and Manpower, Baghdad (6).
2. Ministry of Agriculture, reports of the National Seed Council (12, 14).
3. Mesopotamia General Seed Company/government sector (14).
4. The Iraqi Seed Production Company/mixed shareholding (15).

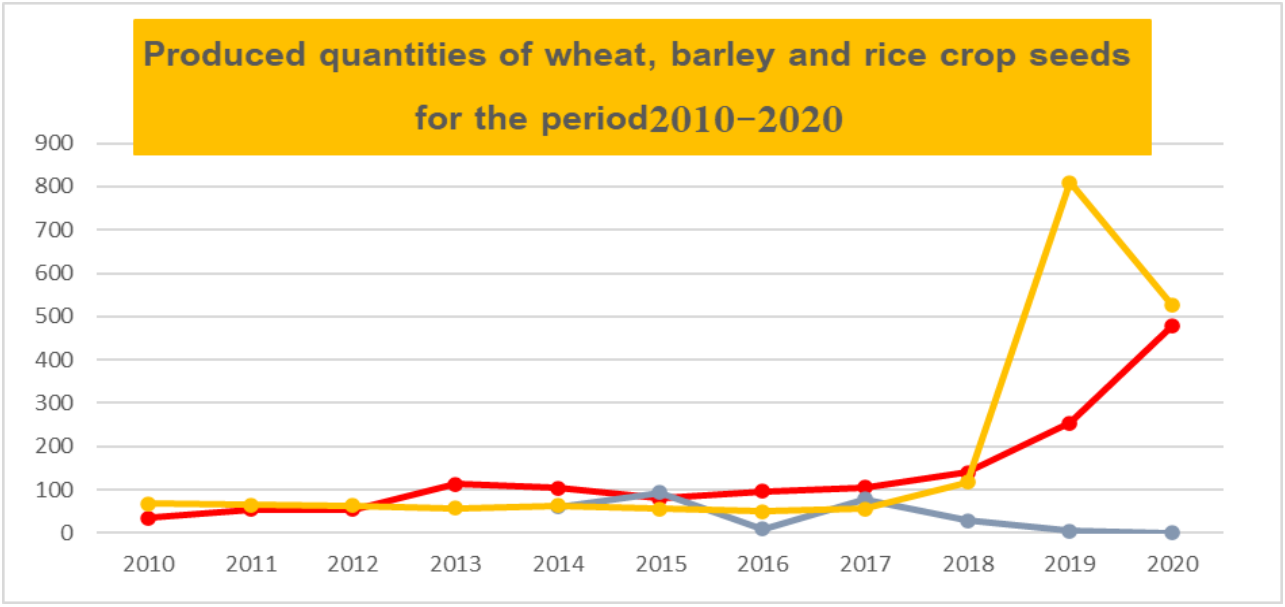

Fig. 2. Produced quantities of wheat, barley and rice crop seeds for the period 2010-2020.

Source: Prepared by the researcher based on the data in Table 2.

Table 3: Covered areas, achieved production and productivity per dunnum according to agricultural seasons

Agricultural season			Agriculture and production indicators for wheat
2017/2018	2016/2017	2015/2016	
1851.24	1137	402.118	Areas covered (dunams)
639.281	452.22	114.781	Total output (tons)
345	398	285	Productivity (kg/dunum)

Source: Dr. Francis Oraha (11).

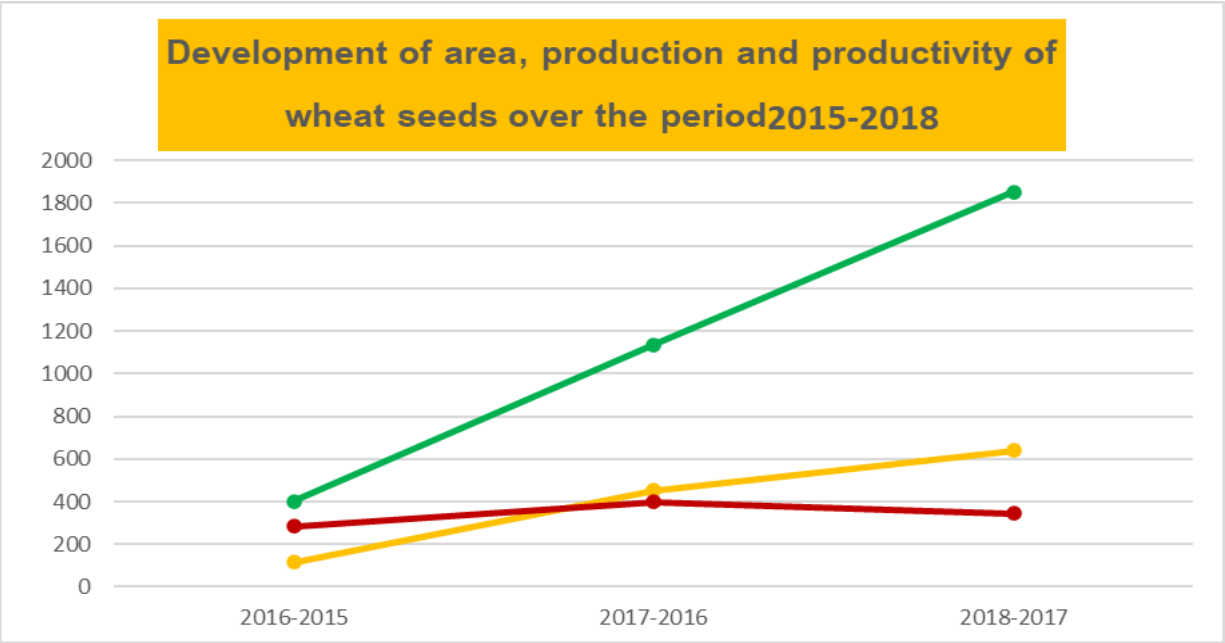

Fig. 3. Development of area, production and productivity of wheat seeds over the period 2015-2018.

Source: Prepared by researchers based on Table data.

covering the farmers' need for high-yield seeds, which had a clear impact on the rates of produced quantities and productivity of the wheat crop.

As for barley seeds, the production rates and relative importance fluctuated between 2014 and 2020, alternating between increases and decreases. The highest quantity produced was in 2017, reaching 78400 tons, which represented 287.1 % of the total required quantities for that year. On the other hand, the lowest production quantity was in 2020, amounting to 463.6 tons, representing only 0.3 % of the total required quantities for that year. The decline is attributed to the government's shift in focus towards increasing the production of wheat and rice, as they are considered essential crops in the daily food basket of the population.

Data from Table 6 also show the development of rice seed production quantities during the period 2010-2020. In 2010, the quantities produced represented 1.4 % of the total required quantities and they gradually increased in the subsequent years, reaching 5.2 % of the total required quantities by 2020. This improvement is due to government support and the focus on developing rice cultivation, especially after the Ministry of Agriculture adopted the program for propagating higher-ranked seeds for approved rice varieties in 2017, which will be discussed later.

Based on the above, it can be concluded that the government's policy in developing the seed industry during the period 2010-2020 had clear results in terms of quantities produced for wheat and rice. Government support for this sector was evident through the adoption of national programs by the Ministry of Agriculture to propagate higher-ranked seeds, along with legislation and laws aimed at developing the seed sector.

National legislation and programs to develop seed production in Iraq

Technical development has become the main and perhaps the only way in many countries for any agricultural development or targeted production expansions, relying on the outcomes of scientific and applied agricultural research and technological development, especially in the areas of selecting varieties, improving breeds, biotechnology, genetic engineering and other modern technologies. Therefore, interest and awareness of the specificity of agriculture and the challenges it faces cast a shadow on the future of agricultural development and made attention focus on establishing agricultural development and technical projects and programs to develop agricultural production in the country, as a national measure to confront global conditions and challenges and their developments in food production while maintaining an emergency and strategic stock of grains. On this basis, the Ministry of Agriculture has adopted the establishment of technical projects and programs to achieve continuous and diverse food production, develop it quantitatively and qualitatively and search for the best methods for devising and disseminating modern agricultural technologies, according to scientific foundations, to improve the level of agricultural production by relying on the integrated

technical package system.

Before discussing about the national programs for seed multiplication of strategic crops adopted by the Ministry of Agriculture, it is necessary to point out the special legal legislation that reflects the extent of the government's interest in this vital sector. In the year (2012), the Seeds and Seeds Law No. (50) of 2012 was enacted, which aims to regulate and encourage the production of seeds and seeds from the public or private sector, or both and provide them in sufficient quantities at the appropriate time to present them to farmers at reasonable prices and in appropriate locations and to provide special procedures for seed certification Pursuant to this law, a council called (National Seed Council) was formed, which undertakes the tasks of developing strategies for national seed policy and works to attract local and foreign investments in the field of seeds and support the private sector to develop, reproduce, market and export seed varieties. This council also undertakes the tasks of approving procedures and standards for seed certification in accordance with international standards as well as developing the resources of the seed fund, in addition to granting licenses to establish, install and operate seed cleaning plants.

The law on Registration, Accreditation and Protection of Agricultural varieties No. 15 of 2013 also contributed to ensuring the documentation of all requirements and distinctive specifications for the new variety as a basis for environmental, technical and commercial operations and creating the legal basis for ownership of the variety in a way that guarantees protection for its owners, It can also identify the true genetic source (parent) that produces the new gene. Then ensure that the new varieties and hybrids are characterized by stability, homogeneity, differentiation and have agricultural, industrial and economic value.

After reviewing the reality of legislation specialized in the seed industry, it is necessary to address the nature of national development programs and their general principles, as national agricultural programs are defined as national projects with specific goals and directions, using integrated packages of technical activities and events and working to adopt them. By peasants and farmers, as it is an advanced formula for transferring the results of agricultural scientific research into practice with the aim of developing agricultural production. By increasing the productivity of a unit area (vertical expansion), especially the productivity of strategic crops, as they constitute an essential pillar of food security (9). In other words, the national programs are represented by implementing a comprehensive system for transferring technologies extracted from the results of agricultural scientific research to farmers by adopting a series of agricultural events, activities, methods and processes that contribute to accelerating the dissemination and adoption of new

Table 4. Areas covered, production achieved and productivity per dunum according to agricultural seasons.

Agricultural season			Agriculture and production indicators for barley
2019/2020	**2018/2019**	**2017/2018**	
1396.5	**184.5**	**23.5**	Areas covered (dunams)
463.625	**55.975**	**4.3**	Total output (tons)
332	**303**	**183**	Productivity (kg/dunum)

Source: Ministry of Agriculture, Department of Agricultural Research (16).

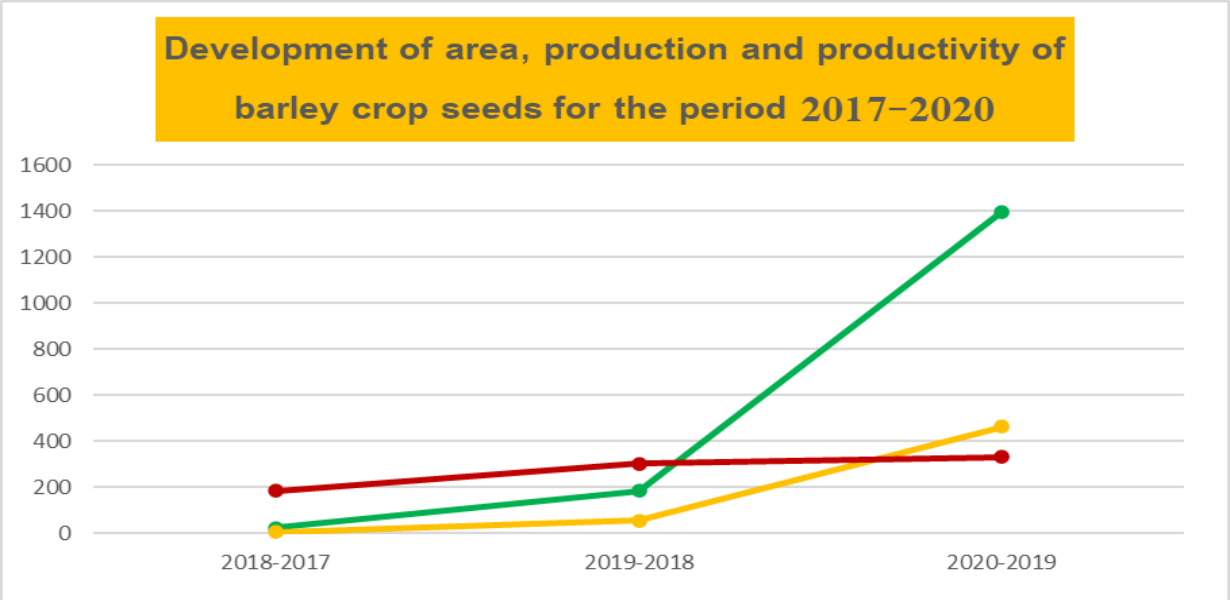

Fig. 4. Development of area, production and productivity of barley crop seeds for the period 2017-2020.

Source: Prepared by the researcher based on Table data (4).

technologies related to the development of production by analyzing the scientific, technical and economic aspects of the problems that prevent Without increasing agricultural productivity.

Agricultural development and technical programs depend on general principles represented in the following (10):

1. Developing and transferring agricultural technologies and accelerating their dissemination among farmers and producers after ensuring the success of their effectiveness in the field.

2. Developing the skills and knowledge of farmers and producers and improving the efficiency of their performance in accordance with the scientific method and modern technologies.

3. Considering the opinions of farmers and producers and their conviction in the developed technologies is one of the most important criteria adopted by the programs for adoption and dissemination in the subsequent stages.

4. Adopting a single research team method, characterized by the integration of scientific research activities, techniques and agricultural extension to reach an integrated technique, according to which researchers work with agricultural extension workers, farmers and producers according to a specific mechanism.

The number of national agricultural technical programs adopted by the Ministry of Agriculture for the period 2015-2020 reached 6 programs, 4 of which work on developing and deriving seeds for strategic crops (wheat, barley, yellow corn, rice), while 2 on developing and developing seeds for fruit and vegetable crops. The Iraqi government appreciates the fundamental importance of the correct use of high-quality seeds (genetic purity %, cleanliness/free from bush seeds, germination %, germination strength) of local and approved varieties, as well as the importance of ensuring the provision of seeds in sufficient quantities at the appropriate time to prepare them for farmers and farmers. Which is considered one of the basic requirements for enhancing crop production through developing and increasing their productive capacity, as it is one of the future strategies necessary for sustainable agricultural development, increasing the agricultural sector's contribution to the gross domestic product and increasing food production.

The following is a presentation of the national programs for developing the strategic crop seed industry (wheat, barley, yellow corn, rice) adopted by the Ministry of Agriculture for the period (2015-2020):

The national program for multiplying seeds of higher grades of wheat

The Ministry of Agriculture took the initiative to adopt the national program for propagating seeds of the upper grades of the wheat crop in 2015 based on the importance of the seed sector and its main role in developing agriculture in the country, in addition to its importance in providing improved seeds to improve production.

wheat harvest and reach the stage of self-sufficiency. The program aims to produce high quality, premium seed of distinctive wheat varieties. (Abaa 99, Abu Ghraib 3, Bahouth 22, Al-Rashid, Tigris, Euphrates, Persia, Baghdad 1, Babylon, Latifiya, July 2, Rashidiya, Tal Afar, Umm Al-Rabi', Sabrbek, Adnaniyah, Sham6, Sham1, Adana), by working to develop environmentally appropriate wheat varieties, with drought and salinity tolerance and high productivity. In addition to encouraging seed producers to use an integrated pest control management system, Improve soil service processes in a sustainable manner that reduces dependence on chemical pesticides, increases seed purity and freedom from injury and also ensures optimal use of production resources and agriculture (11).

2. Program for propagation of higher grades of barley varieties

Given the importance of the food, feed and industrial barley crop, a program to propagate the higher ranks of barley varieties was approved by the Ministry of Agriculture in (2017), which aims to perpetuate and multiply the ranks of barley varieties in Iraq, preserve their genetic and physical purity, and increase productivity rates per unit area by using high-quality seed varieties and enhancing Infrastructure for purifying, packing and storing barley seeds. In addition to providing a strategic storage of these seeds to confront drought conditions and natural disasters, the program has succeeded in sustaining and multiplying barley varieties (abaa 99, Abaa 265, Samir, Amal, Research 244, Rayhan 3, Mosul 1, Al-Nour). It is noted from Table 4 the development in the level of production and productivity of barley crop seeds for the period (2017-2020), as the agricultural season (2017-2018) was the first season after the start of the implementation of the program's work, as it is considered a preparatory season, so production reached 4.3 tonsof seeds, with a yield rate of 183 kg/dunum, then production and productivity rates increased in the (2018-2019) season. Production reached 55975 tons with a yield rate of 303 kg/ dunum, while the agricultural season (2019-2020) witnessed a clear increase in seed.

3. program to maintain and propagate breeds and produce yellow corn hybrids

The program was approved in 2017, as it aims to reduce dependence on imported hybrids for the yellow corn crop that are not suitable for the conditions of the Iraqi environment by perpetuating and multiplying the varieties involved in camel production, especially the production of seeds of the first generation of approved camels and a number have been registered and approved of the hybrids and synthetic varieties, as follows (Ministry of Agriculture, Report of the Program for Sustaining and Propagating Breeds and Production of Yellow Corn Camels, 2022):

1. Nahreen Hybrid, Ur and Babylon is characterized by being suitable for autumn and early ripening agriculture.

2. Synthetic varieties (Sarah, Fajr 1, Al Maha, Baghdad 3, 5018) are characterized by their relative tolerance to salinity, early maturity and low water consumption.

Table 5 shows the production and productivity of yellow corn crop seeds for the period (2017-2020), as the agricultural season (2017) was the first season after the start

of the program's work, and it is considered a preparatory season, so production reached (1152) tons of seeds with a yield rate of 191 kg/dunum, then the cultivated areas and production and productivity rates increased in the (2018) season. Production reached 34585 tons with a yield rate of 335 kg/dunum due to the use of modern agricultural technologies and the success of applied scientific experiments, while production increased in the agricultural season (2020), reaching (8000) tons with a productivity rate of (131) kg/ton.

4. A program to propagate seeds of higher grades of rice crops for approved varieties

The program was approved in 2017 and aims to sustain and multiply the seeds of the upper ranks of the rice crop for the approved varieties (Amber 33, Yasmine, Ghadeer, Tigris, Euphrates 1 and Al-baraka Amber) (12). To cover Iraq's local need and provide it to farmers in accordance with standards and controls for maintaining genetic and physical purity and being free of diseases, with a high germination rate, reducing production costs, increasing the productivity of the area unit and regulating the use of irrigation water by adopting modern scientific technologies, mechanization, fertilization, the intensive agriculture system and the mechanical seedling system (Ministry of Agriculture, report of the program for propagating seeds of the highest grades of the rice crop for approved varieties, 2022).

Table 6 shows the development of production rates of rice crop seeds for the period (2017-2020), as the agricultural season (2017) is the first season after the start of the program's work and production reached 81.97 tons of seeds with a yield rate of 191 kg/dunum, then production rates increased in the (2018) season to 121217 tons with a yield rate of 52.3 kg/A dunum, As for the 2020 season, witnessed a significant increase in the production rate compared to the years (2018 and 2019), as (338.41) tons of seeds were produced and productivity reached the rate of (72.8) kg/dunum, which is explained by the fact that the program has achieved during the agricultural season (2017- Positive results in the development level of rice seed production of genetic and physical purity according to the scientific method, which can be explained by the fact that during the 2020) achieved.

Conclusion

1. The agricultural sector is important for nutritional security and national economy of Iraq.
2. Seeds are the most important inputs on which the development of agricultural depends, as the introduction of new varieties that are resistant to drought and diseases and suitable for the Iraqi environment contributes to raising agricultural productivity rates in quantity and quality.
3. Between 2010 and 2020, the Iraqi government adopted policies that contributed to the development of the seed sector. These policies included the introduction of comprehensive and advanced laws that regulated various aspects of the sector to support its growth.

Table 5. Areas covered, production achieved, and productivity per dunum according to agricultural seasons.

Agricultural season				Agriculture and production indicators for yellow corn
2020	2019	2018	2017	
61	**21**	**5.127**	**6**	Areas covered (dunams)
8000	**5000**	**34585**	**1152**	Total output (tons)
131	**238**	**335**	**192**	Productivity (kg/dunum)

Source: Ministry of Agriculture, Department of Agricultural Research (17, 18).

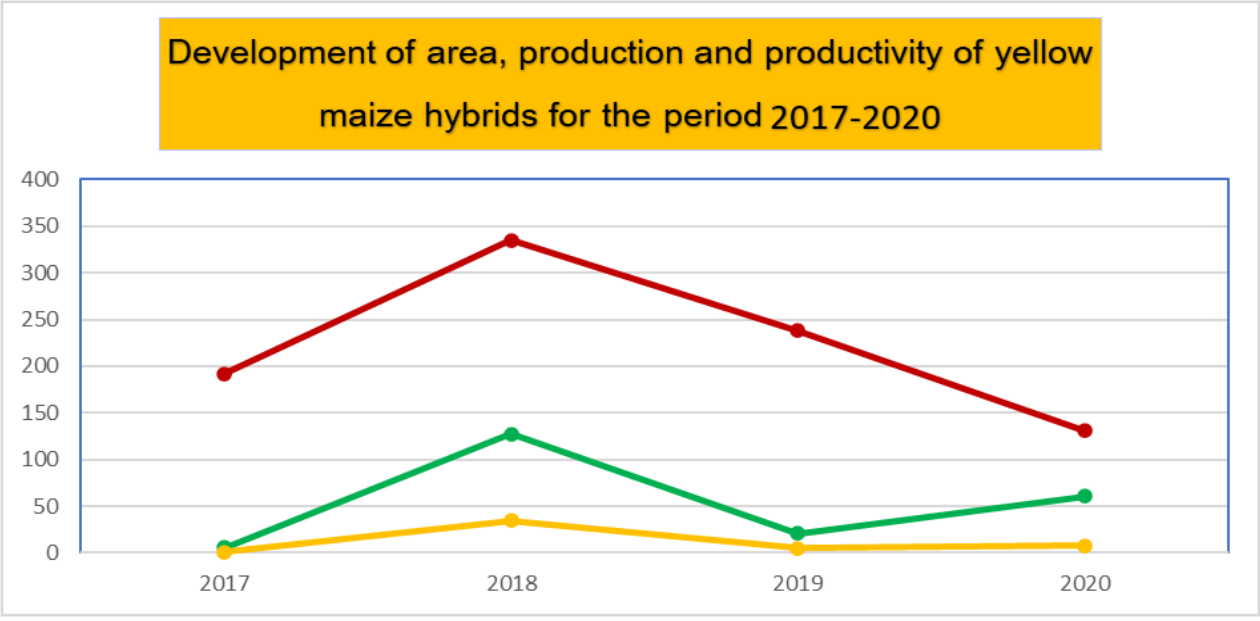

Fig. 5. Development of area, production and productivity of yellow maize hybrids for the period 2017-2020.

Source: From the numbers of researchers based on Table data.

Table 6. Areas covered, production achieved and productivity per dunum according to agricultural seasons.

Agricultural season				Agriculture and production indicators for rice
2020	2019	2018	2017	
465	**300**	**231.5**	**80**	Areas covered (dunams)
338.41	**201**	**121.217**	**81.97**	Total output (tons)
72.8	**67**	**52.3**	**102.4**	Productivity (kg/dunum)

Source: Ministry of Agriculture, Department of Agricultural Research (12).

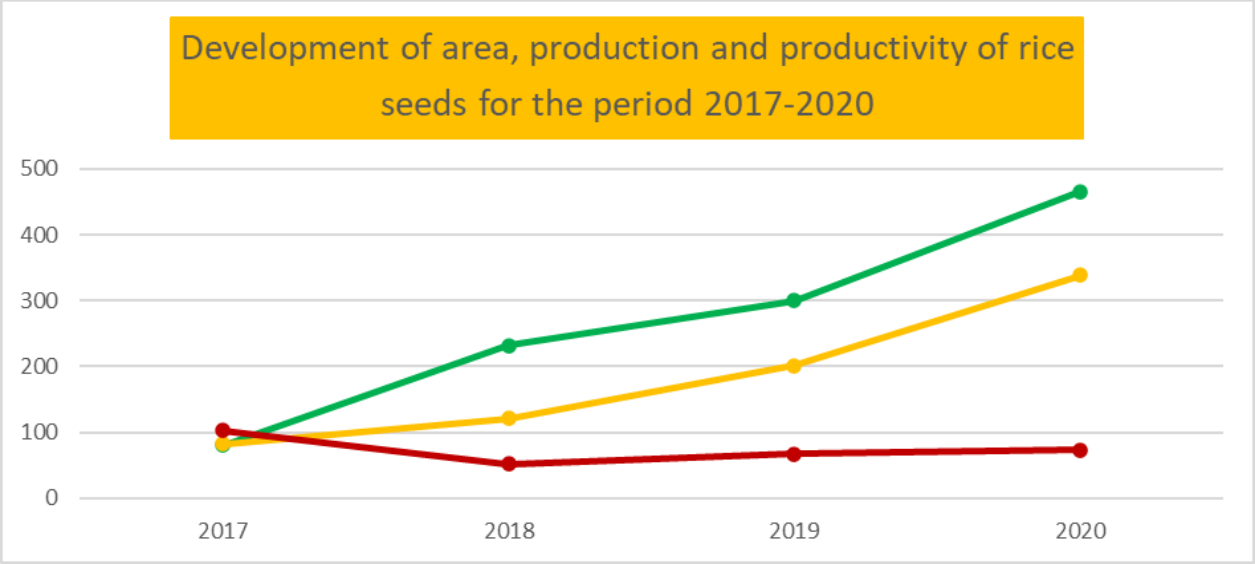

Fig. 6. Development of area, production and productivity of rice seeds for the period 2017-2020.

Source: Prepared by researchers based on table data (6).

Additionally, the government focused on developing and supporting seed-producing entities whether governmental, mixed or private as essential tools for implementing its strategies to advance the seed sector's development.

4. In light of the data of agricultural development and technical programs and projects adopted by the Ministry of Agriculture since 2017 as technical programs and projects aimed at developing agricultural production in the country on solid scientific and technical foundations, which are based on the use of integrated technical packages in the agricultural process, in order to raise productivity rates and agricultural production, By devising and using advanced agricultural technologies and adopting them at the farm level, it is expected that food self-sufficiency rates will increases. Due to the role of these programs in increasing agricultural production, it became clear that they were able to develop high-yielding varieties of seeds for a number of strategic crops, as they gave good positive results in yield and quality, at the level of research centres and stations and at the farm level.

Recommendations

1. Moving towards vertical expansion at the expense of horizontal expansion in agriculture, to achieve the largest production at the lowest costs to develop productivity levels in the agricultural sector. Relying on internal capabilities on the one hand, and using modern agricultural technologies and advanced technical methods, especially in the field of improved seeds, on the other hand.

   Paying attention to the agricultural research and development policy, by supporting and developing institutions and research centers financially, scientifically and technically, especially increasing spending on research and development in the areas of agricultural production, for its major role in maximizing agricultural production by enabling it to absorb and possess advanced scientific developments and transfer and disseminate advanced agricultural technologies, including It suits the conditions and nature of agricultural production in the country.

2. Increasing government support for national technical development programs in the agricultural sector, and providing the elements for their success and continuity, as an agricultural technical base, due to their mobilization of research capabilities in research centers, to achieve quantitative and qualitative agricultural development.

3. The Ministry of Agriculture should coordinate with agricultural seed producing companies, encouraging them and facilitating their tasks, to produce improved seeds of good quality and high productivity, which are desired by farmers and peasants.

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Authors' contributions

All authors contributed equally to this work. SBA led the research and manuscript writing. AMA contributed to manuscript writing, data collection and analysis. AMJAA supervised the project and reviewed the manuscript.

Compliance with ethical standards

Conflict of interest: The authors declare that there are no competing interests.

Ethical issues: None

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